[SRI GANESHA] FINGERTIPS REVISION FOR EVERY ENTRANCE EXAM EXEMPLAR EXPLORER [FREEEEE] BOOK [1 of 182]

Max. Time : $3\frac{1}{2}$ Hrs

Max. marks : 200

- 1. The amount of heat measured in calories needed to raise the temperature of 1 gram of substance by 1 degree centigrade is known as
 - (1) heat of fusion (2) specific heat
 - (3) coefficient of expansion
 - (4) latent heat.
- 2. What is the potential energy of a 10 kg steel ball which has been raised vertically 9 m above the floor ?
 - (1) 441 joules (2) 98 joules (3) 90 joules (4) 882 joules.
- 3. The volume of a confined gas varies inversely with the absolute pressure provided that the temperature remains unchanged. This statement is known as
 - (1) Dalton's law (2) Bernoulli's law
 - (3) Avagadro's law (4) Boyle's law.
- 4. What is the work done in joules if a 100-kg ball is raised to 3 m above the floor in 1 second?
 - (1) 1960 joules (2) 980 joules
 - (3) 2940 joules

(4) 3240 joules.

- 5. You are standing 1000 m from the point where a steel block strikes the sidewalk. How long will it take the sound to reach your ears if the speed of sound in air at 0° C is about 333 m sec. ?
 - (1) 3 seconds(3) 1 second

(2) 2 seconds (4) 5 seconds.

- 6. Shadows consist of two portions, the umbra and the penumbra. Which statement below applies ONLY to the umbra?
 - (1) It receives no tight from any part of the source
 - (2) It receives tight from part of the source

- (3) It is a partial shadow
- (4) It is circular in shape.
- If a force of 30.6 kg acts on a 60 kg mass, calculate the resulting acceleration. (1 kg of force = 9.8 newtons)
 - (1) 5m/sec² (3) 0.5 m/sec²

(118



8. If the uniform acceleration near the surface of the earth is about

9.8 m/sec.² for a free-fall, what is the velocity at the end of 2 seconds of fall (neglect friction)?

- (1) 14.6 m/sec (2) 17.0 m/sec
- (3) 196 m/sec (4) 9.8 m/sec.

9. If the mass of a moving projectile is tripred and its velocity is doubled, the kinetic energy will be multiplied by

(2) 6 (3) 2 (4) 12.

10. Which ratio below best defines the efficiency of simple machines ?

- (1) $\frac{\text{useful work output}}{\text{work input}} \times 100\%$
- (2) $\frac{\text{work input}}{\text{work output}} \times 100\%$
- (3) $\frac{\text{theoretical mechanical advantage}}{\text{actual mechanical advantage}} \times 100\%$
- (4) $\frac{\text{useful work input}}{\text{useful work output}} \times 100\%.$
- useful work output
- If an object is moving with a constant acceleration, the net force acting on that body is
 - increasing
 decreasing
 - (3) constant (4) zero
- 12. The direction of the force exerted on a surface by a liquid at rest is

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- normal to the surface
- (2) parallel to the surface
- (3) tangential to the surface
- (4) 30° to the surface.
- In simplest terms, the energy of a wave is directly proportional to the square of its
 - (1) height (2) refraction
 - (3) reflection (4) length.
- A good floor lamp has a wide heavy base to increase its stability through
 - (1) banking
 - (2) lowering the center of gravity
 - (3) raising the center of gravity
 - (4) None of the above.
- 15. A resultant force of 45 kg is acting on a body whose acceleration is 10 m/sec². Calculate the mass of the

body.

- (1) 450 kg (2) 44.1 kg
- (3) 4.5 kg (4) 1960 kg.
- 16. Two forces of 45 kg-f and 40 kg-f act on a body in opposite directions. What is the resultant force ?
 - (1) 45 kg-f (2) 40 kg-f (3) 5 kg-f (4) 90 kg-f.
- 17. $F = Gm_1$, m_2/d_2 is the equation representing Newton's law of universal gravitation. Which of the statements below is true?
 - (1) G is called the gravitation constant
 - (2) The law can be used to calculate the mass of an object on another planet if the mass and radius of that planet are known
 - (3) Knowing the value of C, one can easily calculate the mass of the earth.
 - (4) All of the above are true.
- 18. Which of the statements below is conrect?
 - (1) The angle of bank for a road is obtained from a consideration of the centripetal force required
 - (2) There is no tendency for the vehicle to ske if a road is banked for the speed at which the vehicle is moving

- (3) The resultant force action on a vehicle will be that which maintains it in a circular path.
- (4) All of the above statements are correct.
- 19. How far will a body free-fall in 1 second if released from rest ?
 - (1) 0.0 m (2) 4.9 m
 - (3) 9.8 m
- 20. Which statement below is true ?
 - (1) Radiant energy is propagated as a wave motion

(4) 19.6 m.

- (2) Positrons have the same mass as an electron
- (3) When a nucleus emits a beta particle, its mass number is unchanged.
- (4) All of the above.
- 21. Radium Ra²³⁶ has a half-life of 1590 years. How much of the original amount of Ra²³⁶ would remain after 6360 years

 $(2)\frac{1}{4}$

- 37 1/16 (4) 1/2.
 22. A ball is located in a semicircular trough. The ball is moved slightly to one side and returns to its original location. The ball is said to be in
 - (1) neutral equilibrium
 - (2) unstable equilibrium
 - (3) stable equilibrium
 - (4) all of the above.
- 23. Using the figure below as a reference, identify the true statement. The large tank is full of water and is exposed to the atmosphere

d₁ = diameter of opening

v1 = velocity at d1

 v_2 = velocity at d^2

(1) $v_1 / v_2 = 1$ (2) $v_2 > v_1$

(3) $v_1 > v_2$

(4) none of the above.

- 24. If a color disc composed of red, orange, yellow, green, blue, indigo, and violet pie-shaped sections is rapidly rotated, which color will your eye see ?
 - (2) black (1) red
 - (3) brown (4) white.
- 25. The amount of a liquid's cohesive force per unit of length is called
 - (2) adhesion (1) depression

(3) apparent weight (4) surface tension.

- 26. When light is reflected from a surface it can be either regular reflection or diffuse reflection. The essential difference between regularly and diffusely reflecting surfaces is that
 - (1) regularly reflecting surfaces are smoother than diffusely reflecting surfaces
 - (2) light can not be reflected from a diffusely reflecting surface
 - (3) the regularly reflecting surface is coarser than the diffusely reflecting surface
 - (4) all of the above are essential differences between regularly and diffusely reflecting surfaces.
- 27. If the density of a given body is 10 gm/cm³, what is its specific gravity
 - (1) 0.01.
 - (3) 1.0

(2) 1.0 gm (4) 10.0.

28. When analyzed, most complicated machines are found to consist of a combination of various simple machines. Which machine below is NOT a simple machine?

(1) lever (3) inclined plane

- 29. Calculate the pelocity of a test sled that is propelled by a device that has 2500 joules of available energy to propel a sled of 50 kg mass
 - (1) 10 m sec (2) 25 m/sec (3) 50 m (see
 - (4) 1 m/sec.
- § 30 32 (based on this statement or data).

In uniformly accelerated motira the following equations hold :

$$V = Vo + at$$

$$k = Vot + \frac{1}{2} at^{2}$$

When X = displacement, V = velocity at time t, Vo = initial velocity, t = time, and a = acceleration. A ball is projected directly upward at a velocity of 15 m/sec.

- 30. What is the highest point this ball will reach ?
 - (2) 11.48 m (1) 38.66 m
 - (3) 9.80 m (4) 1.53 m.
- 31. What is the distance above the ground after 3 seconds ? \mathcal{L}
 - (1) 1.8 m (2) 0.9 m
 - (4) 3.6 m. (3) 0 m

32. What is its velocity at that point ?

- (1) 14.4 m sec. downward
- (2714.4) m/sec. upward
- 3 29 4 m/sec. downward
- (4) 29.4 m/sec. upward.

33 What is the velocity of the light in the medium if

Sin $\theta_1 = 0.707$, Sin $\theta_r = 0.500$, and the velocity of light in a vacuum is

- 3.0 × 10⁸ m/sec. ?
- (1) 2.1×10^8 m/sec
- (2) 2.8×10^8 m/sec
- (3) 1.4×10^8 m/sec
- (4) 4.2×10^8 m/sec

34. The ray of light as it enters will

- (1) bend away from the normal
- (2) be totally reflected
- (3) bend toward the normal
- (4) do none of the above.
- 35. The index of refraction can be defined as the velocity of light in a vacuum divided by the velocity in the medium $(N = \frac{C}{c})$. If this is the case, another valid expression for Snell's law is

(1)
$$\frac{\sin \theta_i}{\sin \theta_r} = \frac{C_r}{S_r}$$
 (2) $\frac{\sin \theta_i}{\sin \theta_r} = \frac{C_i}{C_r}$
(3) $\frac{S_i}{S_r} = \frac{N_r}{N_i}$ (4) $\frac{\sin \theta_i}{\sin \theta_r} = \frac{S_i}{S_r}$

Ş **Directions : Using the illustration when** both surfaces 1 and 2 are exposed to the atmosphere, P1 and P2 are gauge pressue, and h1 and h2 are heights.



The Bernoulli equation for this situation is

 $h_1 + \frac{P_1}{W} + \frac{V_1^2}{2} = h_2 + \frac{P_2}{W} + \frac{V_2^2}{2}$

- 36. If an identical outlet were placed at exactly the same point on the left side of (the container, the velocity would be
 - (1) zero (2) computable
 - (4) none of the above $(3) 2V_2$
- 37. The value of P1 and P2 are such that
 - (1) $P_1 = P_2 = 0$ (2) $P_2 < P_1$ (3) $P_1 > P_2$. (4) $P_1 / P_2 \neq 0$
- 38. The velocity of the fluid leavening point (2) is constant and can be expressed as
 - (1) $V_2 = (P_1/P_2)V_1$
 - (2) $V_2 = (P_1 / P_2) a h$

(3)
$$V_2 = [(h_1 - h_2)(2a)]^{1/2}$$

- (4) None of the above
- Ş DIRECTIONS: Que. (39 - 42) . In the following questions, four words or phrases are presented that have been labeled (1)-(4). For each question, choose the word or phrase that is most closely associated with the given word. You may use a choice more than once.

or not at all. Eliminate those choices that you think to be incorrect and mark the letter of your choice on the answer sheet

Questions

- (1) Graham's law of diffusion
- (2) Charles' law (3) Ohm's law
- (4) Gresham's law
- 39. $\mathbf{F} = \frac{\mathbf{MV}^2}{\mathbf{R}}$ 41. $\frac{\mathbf{V}}{\mathbf{V}_1} = \frac{\mathbf{T}}{\mathbf{T}_1}$ $\mathcal{O} \mathbf{R}_1 / \mathbf{R}_2 = \sqrt{\mathbf{M}_2 / \mathbf{M}_1}$
- 43. An astronaut is accelerated in his spacecraft from rest to 800 mi./hr. in 60 sec. He was subjected to an acceleration of
 - (1) 4800 ft. sec./sec.
 - (2) 1200 m²/hr.² (3) 4800 mi./hr.²
 - (4) 48,000 mi./hr.².

44 The proposal that no more than two electrons may occupy a particular atomic orbital was made by

- (1) Pauli (2) Pauling (4) Curie. (3) Einstein
- 45. An object is thrown upward with a vertical velocity of 128 ft./sec. It will return in
 - (2) 16 seconds (1) 64 seconds
 - (3) 8 seconds (4) 4 seconds.
- 46. The particle accelerated at a constant rate from 23 mi/hr. to 58 mi./hr. in 3.5 sec. Its acceleration was
 - (1) 10 mi./hr. per sec.
 - (2) 58 mi./hr. per sec.
 - (3) 23 mi./hr. per sec.
 - (4) less than 10 mi./hr. per sec.
- 47. Since speed changed at a uniform rate and the average velocity is equal to the average of the initial and final speeds, how far has the particle traveled while it was accelerating ?
 - (1) 51 ft (2) 600 ft (3) 210 ft (4) less than 20 mi.

anone sul a star	els 336 mi in 6 hrs; its	53. Assertion(A). A pool of water looks
average velocity	IS (0) (() 1	shallower than it actually is
(1) 33.6 mi./hr	(2) 66 mi./hr.	Reasoning (R). Light bends towards the
(3) 56 mi. /hr.	(4) 40 mi/km/hr.	normal while travelling from water to all
49. The volume of t	he piece of glass is	(1) Both A and B Cornet and Babalater A
(1) 166cm ³	$(2) 60 \text{ cm}^3$	(1) bour A and K Correct and K explains A
$(3) 1.6 \text{ cm}^3$	(4) 1666 cm^3	(2) A is right, K is wrong
50. If the buoyant	force of the water is	(3) Both A and K correct but hodoes not ex-
equal to the we	eight of the water dis-	(4) A and R are both (more)
placed, then the	e piece of glass sus-	54 Weight of a normal sea he zero when
pended in water	weighs	J4. weight of a person can be zero when
(1) 16 N	(2) 100 N	1. he is falling freeky
(3) 83 N	(4) 50 N.	2. he is orbiting in a satellite
51. If the piece of g	lass were suspended in	3. he is in aeroplane flying at a high altitude.
air, it would weig	the buoyancy of air	4. he is having ride in a gas filled balloon.
is neglected)		(1) 1, 2, 3 and 4 are correct
(1) 100 Newtons	(2) 50 Newtons	(2) 1 and 2 are correct
(3) 10 Newtons	(4) 600 Newtons	(3) A and 4 are correct
1818 - 1989 - 1999 - 19		(4, 1, 2) and 4 are correct.
52. Assertion (A).	When an electric motor	55. Assertion(A) : The earth revolves
is started the init	tial current in it is con-	around the sun an elliptical orbit
siderably more th	an the final current	Reasoning(R) : The sun always attracts
Reasoning : The	current falls due to the	the earth with the same force
fall in the back en	mf C	(1) both A and R are both are both wrong (1)
(1) A is true, R is fa	lse	(2) A is right, R is wrong
(2) A is false, R is tr	rue 🔆	(3) both A and R are correct and R explains A
(3) Both A and R a explanation of A	the true and R is the correct	(4) both A and R are correct, but R does not explain A.
(4) Both A and R a	re true but R is not the cor-	
rect explanation	of A.	а.
§ Directions : - Qu	estions (56 to 60) Consist	of two statements, Assertion and reason. Mark
		이 같은 것이 같은 것이 같은 것이 같이 같은 것이 같은 것이 같은 것이 같은 것이 같은 것이 같이
a clear cross Cor	responding to each question	n as follows :
a clear cross Cor (1). If both asser	responding to each question tion and reason are true stat	n as follows : tements and the reason is a correct explanation of
a clear cross Cor (1). If both assentine assertion	responding to each question rtion and reason are true stat	n as follows : tements and the reason is a correct explanation of
a clear cross Cor (1). If both assen the assertion	responding to each question rtion and reason are true state	n as follows : tements and the reason is a correct explanation of ements but the reason is not a correct explanation
a clear cross Cor (1). If both asser the assertion (2). If both asser of the assertion	responding to each question rtion and reason are true state thon and reason are true state	n as follows : tements and the reason is a correct explanation of ements but the reason is not a correct explanation
a clear cross Cor (1). If both asset the assertion (2). If both asset of the assertion (3).If the assertion	responding to each question rtion and reason are true state from and reason are true state in is true but the reason is a fa	n as follows : tements and the reason is a correct explanation of ements but the reason is not a correct explanation alse statement
a clear cross Cor (1). If both assent the assertion (2). If both assent of the assertion (3).If the assertion (4) If both assertion	responding to each question rtion and reason are true state that and reason are true state in is true but the reason is a fa- tion and reason both are false	n as follows : tements and the reason is a correct explanation of ements but the reason is not a correct explanation alse statement statements.
a clear cross Cor (1). If both assent the assertion (2). If both assert of the assertion (3).If the assertion (4) If both assertion	responding to each question rtion and reason are true state rtion and reason are true state in is true but the reason is a fa- ion and reason both are false	n as follows : tements and the reason is a correct explanation of ements but the reason is not a correct explanation alse statement statements.
a clear cross Cor (1). If both assent the assertion (2). If both assert of the assertion (3).If the assertion (4) If both assert Assertion 56 The control of the assertion	responding to each question rtion and reason are true state tron and reason are true state in is true but the reason is a fa- ion and reason both are false	n as follows : tements and the reason is a correct explanation of ements but the reason is not a correct explanation alse statement statements. Reason Couple and KE have different dimensions
a clear cross Cor (1). If both assent the assertion (2). If both assent of the assertion (3). If the assertion (4) If both assertion (4) If both assertion 56. The couple acting the optimized KE of	responding to each question rtion and reason are true state from and reason are true state in is true but the reason is a fa- ion and reason both are false on a body is not equal to f the body	n as follows : tements and the reason is a correct explanation of ements but the reason is not a correct explanation alse statement statements. Reason Couple and KE have different dimensions.
a clear cross Cor (1). If both asset the assertion (2). If both asset of the assertion (3).If the assertion (4) If both assertion (4) If both assertion 56. The couple acting the rotational KE of	responding to each question rtion and reason are true state than and reason are true state in is true but the reason is a fa- ion and reason both are false on a body is not equal to f the body	n as follows : tements and the reason is a correct explanation of ements but the reason is not a correct explanation alse statement statements. Reason Couple and KE have different dimensions.
a clear cross Cor (1). If both asset the assertion (2). If both asset of the assertion (3). If the assertion (4) If both assertion 56. The couple acting the rotational KE of (1)	responding to each question rtion and reason are true state that and reason are true state in is true but the reason is a fa- ion and reason both are false on a body is not equal to f the body (2) (3) auid resist deforming forces	n as follows : tements and the reason is a correct explanation of ements but the reason is not a correct explanation alse statement statements. Reason Couple and KE have different dimensions. (4)

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(1) (2)

(3)

58. A thin aluminium disc, spinning freely about a centre pivot, is quickly brought to rest when placed between the poles of a strong U-shaped magnet

(1) (2) (3)

59. In Rutherford's experiment, α -particles from a sodium source were allowed to fall on a 10^4 mm thick gold foil. Most of the particles passed straight through the foil.

(1) (2) (3)

- At ordinary temperatures, the Vibrational degrees of freedom do not contribute to the specific heat of gases
 - (1) (2) (3)

(4)

A current induced in a disc rotating in a magnetic field produces a force which tends to oppose the disc's motion.

(4)

The entire positive charge and nearly whole of the mass of an atom is concentrated in the nucleus.

The average charge corresponding to a degree of vibration is not kit and hence the molecular vibrations are not excited.

(4)

PART II. CHEMISTRY

- 1. If one wished to remove substantially all of the chloride ions from an aqueous solution, this could be done by the addition of an aqueous solution of
 - (1) gelatin (2) starch (3) AgNO₃ (4) Na₂SO₄
- 2. The basic building block of proteins is (are)
 - (1) ammonia
 - (2) amino acids
 - (3) nitrogenous bases
 - (4) messenger RNA.
- 3. If it is known that H_2S is a weak acid that ionizes to form 2H² and S²⁻, lowering the pH of a solution of H_2S by adding HCl should
 - (1) lower the S $^{2\ominus}$ concentration
 - (2) have no effection S^{2-} concentration
 - (3) raise the S^{2-} concentration
 - (4) not be possible.
- 4. In transcription of RNA from DNA, thymine will form a base pair only with
 - (1) cytosine (3) adenine
- (2) guanine
- nine (4) thymine.

- 5. Theoretically, the ring monobromination of 4-bromo-1, 2 - disopropylbenzene could produce ______ isomers. (1) (2) 4 (3) 3 (4) 2.
- 6. Prolonged boiling of animal fat with lye
 - (1) saponification (2) stain removal
 - (3) ecology (4) conjugation.
- 7. The hydronium ion is
 - (1) an uranium byproduct
 - (2) an ion with the formula of H_2O^+
 - (3) really a free radial rather than an ion
 - (4) a protonated water molecule.
- 8. The smallest organic ring compound that may be synthesized contains _______ carbon atoms

(1) 5 (2) 4 (3) 3

9. The process of fermentation can be considered to be

(4) 7.

- (1) dehydration (2) oxidation
- (3) anaerobic respiration
- (4) aerobic respiration.
- Without considering stereoisomers the number of possible dibromobutane isomers is



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(4) kentucky fescue grass.

21. Transuranium elements are

- elements that have been postulated but not found naturally or produced artificially
- (2) man-made elements with more than 92 protons in the nucleus
- (3) found naturally in abundance greater than that of uranium isotopes
- (4) found on earth as a result of bombardment by particles from the planet Uranus.

22. Black and white photographic film is based on the light-catalyzed chemical reaction

(1) quinone₁ \longrightarrow quinone

 \rightarrow hydroquinone

(2) $Ag^+ He \longrightarrow Ag^o$

(3) Cd⁺⁺He \longrightarrow Cd⁺

(4) gelatin_c \longrightarrow gelatin_B + H₂O.

23. Solids

- are rigid and have a definite form
- (2) possess molecules which vibrate very slowly in a fixed position
- (3) possess molecules which are close together
- (4) have all of the above characteristics.
- 24. In order to produce polyvinyl alcohol we would expect to
 - (1) ask for another task. This one has not been done successfully
 - (2) hydroxylate polyethylene
 - (3) polymerize another vintel (monomer and convert the polymer to polyvinyl alcohol
 - (4) polymerize the monomer, vinyl alcohol.
- 25. Ethyl bromide, methyl bromide, and sodium will react to form
 - (1) propane (2) butane
 - (3) ethane $(1)^{(4)}$ (4) all of the above.
- 26. If acetylene is reacted with an excess of sodium metal in hexane and the reaction product is treated with 1-bromopropane, the final product will be
 - (1) 3 octene (2) 4-octyne
 - (3) 8-octane (4) none of the above.

- 27. Reaction of propanal with HCN followed by acid hydrolysis of the reaction product will produce
 - (1) propanoic acid
 - (2) 1-butylamine
 - (3) α-hydroxybutanoic acid
 - (4) all of the above.
- 28. A Grignard reagent, such as (CH₃MgBr) will react with C₂H₅OH and then with acidified water to produce
 - (1) a secondary or tertiary alcohol
 - (2) an aldehyde (C(3) a ketone
 - (4) none of the above
- 29. The predominant ring structure of glucose in aqueous solution is called
 - (1) cyclopentyl (2) furanose
 - (3) pyranose (4) none of the above.
- 30. When two free radicals collide
 - (1) (termination of the free radical reaction re-
 - value \mathcal{X} where explode with the release of a large \mathcal{X} quantity of energy
 - (3) ionization results
 - (4) none of the above is possible.
- 31. According to the principle of LeChatelier, a higher pressure applied to the reversible reaction

$N_2 + 3H_2 \xleftarrow{} 2NH_3$

would be expected to result in

- (1) shifting the equilibrium to the right
- (2) shifting the equilibrium to the left
- (3) no change in the equilibrium
- (4) increased percentages of NH3 and H2.
- Acetaldehyde, in the presence of NaOH, will
 - (1) produce 3-hydroxybutanol
 - (2) be converted to acetic acid
 - (3) produce ethyl acetate
 - (4) do none of the above.
- 33. The pH of a weak solution of ammonium hydroxide has been measured. If ammonium chloride is now added
 - (1) the pOH will decrease

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- (2) the pH will increase
- (3) the pH will decrease
- (4) the acidity will decrease.

34. Which of the following is an incorrect statement?

- Certain substances break up into ions when dissolved in water
- (2) Atoms and ions of the same element have different properties
- (3) The fewer ions formed, the greater the electric current carried by an electrolyte
- (4) Ions have a charge equal to the number of electrons gained or lost.
- 35. In a titration of iodine with sodium thiosulphate, the formation of a blue color on the addition of colorless starch solution indicates that
 - a blue complex of starch, iodine, and sodium thiosulphate has been produced
 - (2) all of the iodine has not been reduced
 - (3) the glassware has not been washed sufficiently
 - (4) all of the iodine has not be oxidized.
- 36. A negative iodoform test (i.e., no yellow precipitate) will be the result when NaOH + I₂ is reacted with



(2) concentration, substrate, cofactors

(3) enzyme poisons (4) all of the above.

38. The alpha helix in a protein is classified as the

- (1) tertiary structure (2) secondary structure
- (3) primary structure (4) quaternary structure
- 39. Methyl iodide and n-propyl iodide may be reacted with sodium metal to produce _____ organic products

(1) 4 (2) 3 (3) 2 (4) 8

- 40. In the previous question the compound listed below that would be produced in greatest yield is
 - (1) hexyl iodide (2) sodium propane
 - (3) n-hexane (4) n-butane.
- 41. Catalytic hydrogenation of phenyl diazonium bromide produces
 - (1) phenylhydrazine (2) bromobenzene
 - (3) benzene () (4) phenylamine
- 42. Addition of water to metallic sodium produces
 - (1) hydrogen and sodium hydroxide
 - (2) sodium hydrate
 - (3) oxygen and sodium hydride

4 nitrogen and sodium hydride.

43. The common lead storage battery produces electricity by two hall cell reactions, one of which is (written in the direction of production of electricity)

(1)
$$Pb + SO_4^{2-} \longrightarrow PbSO_4 + 2e^-$$

(2)
$$PbSO_4 + 2e^- \longrightarrow Pb + SO_4^{2-}$$

(3) PbSO2 + 2H2O

$$\longrightarrow PbQ_2 + 4H^+ + SQ_4^{2-} + 2e^-$$

(4) none of the above.

- 44. Calcium carbide reacts with water to produce
 - (1) methane (2) carbon dioxide
 - (3) acetylene (4) carbohydrate.
- 45. Which of the following aqueous solutions will have the lowest freezing point?
 - (1) 1.5 M glucose (2) 0.3 M Na₂SO₄
 - (3) 1 M NaCl (4) H₂O.
- 46. The reaction of HBr with 1-propene in the presence of peroxides will produce primarily
 - (1) 2-bromopropane
 - (2) 1-bromopropane

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(3) 2-bromopropene

(4) 1,2-dibromopropane.

47. A zwitter ion is a molecule containing

- (1) more than one cationic or anionic function
- (2) polar and nonpolar groups
- (3) both cationic and anionic functions
- (4) none of the above.
- 48. Use of helium is preferred over use of hydrogen in airships (e.g., blimps) because
 - (1) helium is chemically less reactive
 - (2) helium has a lower density
 - (3) both of the above
 - (4) none of the above.

49. Low molecular weight mercaptans are often added to natural gas to

- (1) provide a stench which is helpful in the detection of gas leaks
- (2) prevent corrosion of the pipelines
- (3) produce a pleasant deodorant during burning
- (4) slightly retard the burning.

50. Nucleotides are composed of two types of sugars

- (1) glucose and ribose
- (2) glucose and maltose
- (3) ribose and deoxyribose
- (4) maltose and deoxyribose.
- § Answer questino 51 to 60 according to the given choices
 - (1) Assertion is true but the Reason is false
 - (2) Assertion is false, Reason is true
 - (3) Both A and R are true and the R is a correct explanation of the R.
 - (d) Both A and R are true but R is not a correct explanation of the assertion.

51. Assertion Nobel gas can be liquefied. Reasoning Attractive force can exist between non polar molecules.

(3)(1) (2)(4). 52. Assertion : Alkali metal salts give colour to the bunsen flame.

Reasoning : This is due to excitation of valence shell electrons of sodium ions from lower to higher orbitals.

(4)

- (1)(2) (3)
- 53. Assertion : Amongst the halogens, fluorine can oxidise the elements to highest oxidation states.

Reasoning : Due to small size of fluoride ion, it is difficult to oxidise fluoride ion to fluorine. Hence reverse reaction takes place more easily

- (2) (1)(4).
- 54. Assertion : A solution of bromine in CCI4 is decolourised on passing acetylene gas through it

Reasoning ; Bromine is expelled from the solution by acetylene gas

(1)(3)(4). 55. Assertion : When transition metal atoms ionises, the 4s orbital electrons electrons are ionised before the 3d orbital electrons.

Reasoning : The energy of 3d orbital electrons is lower than that of 4s orbitals

> (3)(4)(2)

56. Assertion : Nitrogen is unreactive at room temperatures but becomes reactive at elevated temperatures (on heating) or in presence of catalysts.

Reasoning : In nitrogen molecules, there is extensive delocalization of electrons

(1)(2)

(1)

(3)(4).

57. Assertion : Fluorescein is an adsorption indicator.

Reasoning : The indicator fluorescein is a dye.

- (2)(3) (4). (1)
- 58. Assertion : All enzymes are protein, but all proteins are not enzymes

Reasoning : Enzymes are bio-catalysts and Possess a stable configuration having an active site packet.

(1)(2)(3) (4)

59. Assertion : The alkali metals are	60. Assertion : Many endothermic reac-
strong reducing agents	tions that are not spontaneous at room
to be lost from their valence shells.	high temperature
(1) (2) (3) (4)	Reasoning : Entropy of the system in-
	creases with increases in temperature.
	(1) (2) (3) (4)
. PART III.	BIOLOGY
1. Suberin in cork cell wall is a	(3) Apothecium (4) Cleistotheciun
(1) polypeptide (2) polysaccharide	8. The normal or polygonum type embryo
(3) fatty substance (4) none of the above.	sac is
2. The sequence of spores produced in the	(1) monosporic 8 nucleate
wheat rust life cycle is	(2) tetrasporic 6 fucleate
(1) basidiospores, aeciospores, pycniospores	(3) monosporie 4 nucleate
and teliospores	(4) bisporic 8 nucleate.
(2) teliospores, basidiosores, uredospores and	9. A close relation between flower and polli-
pycniospores	nating agent is best exhibited by
 (3) teliospores, aeciospores, uredospores and basidiospores 	(1) Solution \circ (2) Avena (2) Grand (2) Grand (3) Gran
(4) aeciospores, uredospores, teliospores,	(3) Caesos (4) Fucca.
basidiospores and pycniospores.	10. Spirocyclic (nemicyclic) numerous nee
3. Heterotrichous habit is shown by	found in the family
(1) Ulothrix	(1) Cucurbitaceae (2) Cruciferae
(2) Oedogonium (3) Chlamydomonas	(3) Ranunculaceae (4) Labiatae.
(4) Stegeocladium.	11. Plant whose seeds are known to have
4. Streptomycin is produced by	longest viability period
(1) Streptomyces scoleus	(1) Triticum vulgare (wheat)
(2) Steptomyces fradie	(2) Zizyplius jujuha (ber)
(3) Streptomyces venezuela	(3) Nelumbo nucifera (lotus)
(4) Streptomyces griseus	(4) Carica papaya (papaya)
5. Garner and Allard are related with	12. Which one of these are necessary con-
(1) Photolysis (2) Phototropism	ditions for Hardy-Weinberg principle for
(3) Photo-periodism	applying to a genetic population ?
(4) Photophosphorytation	A high mutation rate and random mating
6. Plasmids are	(2) A low mutation rate and a small popula-
(1) viruses	tion
(2) new type of micro organisms	(3) Selective mating and a small population
(3) extra chromosomal genetic element of	(4) Non-migrating and a large population.
bacteria	13. The Singer model of plasma membrane differs from Robertson's model in the
(4) genetic element of bacteria.	(1) arrangement of proteins
7. The truiting body of Aspergillus or Penicil-	(2) arrangement of livid layer
	(2) number of linid laws
(1) Hypanthodium (2) Perithelum	(4) absence of proteins in Singer model
	(+) absence of protents in Singer model.

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14. Alburnum is

- (1) heart wood (2) sap wood
- (3) soft wood (4) none of the above

15. Padma is a variety of

(1) millet (2) maize (3) rice (4) wheat.

16. Mitochondria are rich in

- (1) iron (2) cobalt
- (3) molybdenum (4) manganese.

17. Velamen is present in

- (1) parasitic roots (2) assimilatory roots
- (3) epiphytic roots (4) fusiform roots.

18. Auxins does not increase the

- (1) rate of photosynthesis
- (2) rate of respiration
- (3) uptake of water by cells
- (4) plasticity of the cell wall.

19. Foldings of inner membrane of mitochondria are called

- (1) sacs (2) endoplasm
- (3) cristae (4) grana.

20. Ginger is a stem and a root because it

- (1) lacks chlorophyll
- (2) grows parallel to soil surface
- (3) stores food material
- (4) has nodes and internodes.

21. The largest flower in the world is that of

(2) Rafflesia

- (1) Lotus
- (3) Giant cactus (4) Parasite

22. Systematic position of Cucurbitaceae according to Bentham and Flooker's system is

- (1) gamopetalae, caluciflorae, cucurbitales
- (2) polypetalae, discillorae cucurbitales
- (3) polypetalae, calyciflorae, passiflorales
- (4) polypetalae thatamiflorae, cucurbitales.

23. Spraying of PMA (Phenyl mercuric acetate) on leaves

- (1) increases the rate of guttation
- (2) increases the rate of water absorption
- (3) decreases the rate of transpiration
- (4) increases the rate of transpiration.

24. Litmus yielding lichen is known as

- (1) Roccella tintoria
- (2) Lecanora esculenta
- (3) Cladonia rangiferina
- (4) Cetraria islandica.
- 25. One of the following is a source of rubber
 - (1) Cedrus deodara
 - (2) Tectona grandis
 - (3) Hevea brasiliensis
 - (4) Michelia champaca

26. Plica semimularis is found in

- (1) kidney of mammals
- (2) heart of rabbit
- (3) ear of mammals
- (4) eyes of frog.

27. Which one of the following substances is actively secreted into the glomerular filterate of the kidney tubule?

- (1) amino acids
- (2) chloride ions
- (3) sodium ions
- (4) potassium ions.

28. Holocene is

- ()(1) golden age of mammals
 - (2) golden age of reptiles
 - (3) epoch of human civilization
 - (4) age of fishes and amphibians.
- 29. The present century has witnessed remarkable increase in the population of the world and specially in India. One major factor for this is that
 - many children per family begin to reach the reproductive age
 - (2) more children are born in each family
 - (3) many people are marrying in younger age group
 - (4) older people have begin to live longer.

30. Haeckel's theory of recapitulation (Biogenetic law) means that

- life history of an animal reflects its evolutionary history
- (2) progeny of an organism resembles its parents
- (3) body parts once lost are regenerated
- (4) all organisms start as an egg.

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21 Red gran colour blindness anness	(1) and
due to	(1) SOII
(1) over activity of adrenals	(2) numan population growth and planning
(2) deficiency of vitamin A	(3) study of human environment
(3) inheritance through X chromosome	(3) pertaining to numan training and devel-
(4) excessive drinking of alcohol	41. Graft of an organ like kidner between
32 In the development of from the black	genetically dissimilar people is known
topore forms the future	as
(1) tympanum (2) mouth	(1) demigraft (2) hernigraft
(3) pares (4) anus.	(3) allograft (4) none of the above.
33. In the heart of rabbit the bicuspid	42. The infective stage of Entamoeba his-
(mitral) valve is situated between	tolytica is
(1) right ventricle and pulmonary aorta	(1) premature cyst (2) sporozoite
(2) left auricle and left ventricle	(3) trophozoite (4) mature cyst.
(3) right auricle and right ventricle	43. The most important characteristic of a
(4) postcaval and right auricle.	mammal
34. In what physical form the glycogen is	(1) a four chambered heart
found in cells	(2) presence of diaphragm
(1) Liquid (2) Soluble	(3) presence of corpus callosum
(3) Crystallized (4) Insoluble.	(4) presence of the codont dentition.
35. Pyruvic acid before combining with ox-	44. In which form CO ₂ is carried in the
aloacetic acid of citric acid cycle be-	C blood ?
comes	(1) Potassium bicarbonate
(1) cis-aconitic acid (2) acetyl CoA	(2) Potassium carbonate
(3) lactic acid (4) aceto -acetic acid	(3) Sodium bicarbonate
36. The sucker fish (Remora) on a shark is	(4) Sodium carbonate.
an example of	45. Mendel did not recognise phenomenon
(1) predation (2) symbiosis	of linkage in his experiments because
(3) parasitism (4) commensalism.	(1) he studied only pure plants
37. Blatta orientalis can be distinguished from	(2) there were many chromosomes to handle
Periplaneta americana in that the female of Blatta is with	(3) characters he studied were located on dif- ferent chromosomes
(1) smaller wings (2) vestigeal wings	(4) he did not have powerful microscope.
(3) large wings	46. Protective resemblance of animals
38. Trypanosoma causes sleeping sickness	with their environment and background
in man, it finally invades	is
(1) liver (2) blood	(1) batesian
(3) brain (1) (4) cerebro-spinal fluid.	(2) mimesis (3) Mullerian mimicry
39. The change in mammalian sperm	(4) mimicry.
which prepares it to fertilize the ovum is	47. Some animals have constant high body
termed	temperature. This is because
(1) Territizin (2) caudation	(1) they can work fast at this temperature
(3) activation (4) capaciation.	(2) they prefer to live in cold region
40. Demographic studies are related to	(3) they are active animals

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(4) they like this temperature.

48. Gaucher's disease is associated with

- (1) abnormal carbohydrate metabolism
- (2) abnormal protein metabolism
- (3) deficiency of ACTH
- (4) abnormal fat metabolism.

49. Sustentacular cells are found in

 brain of rabbit and are concerned with memory

- (2) liver of vertebrates and are secretory
- (3) kidney of frog and are excretory
- (4) testis of rabbit and are nutritive.
- 50. One of the following group deaminates uric acid
 - (1) fishes(3) birds
- (2) amphibians (4) mammals

§ (Directions) Q51 to 60 consists of two statements, one labelled the 'Assertion (1)' and the other labelled the Reason (R)'. Examine these statements carefully and decide if the statements Assertion (1) and the Reason (R) are individually true and if so, whether the reason is a correct explanation of the assertion. Select your answers to these questions from the codes given below

- (1) Both A and R are true and R is the correct explanation of A
- (2) Both A and R are true but R is not a correct explanation of A
- (3) A is true but R is false
- (4) A is false but R is true

Assertion

51. In a DNA molecule the total quantity of purines (Adenine pairs with thymine and cytosine pairs equals the total quantity of pyrimidines (With guanine

(1)

52. A cholera patient is given glucose electrolytes and These plasmalyse the disease causing germs water

(3)

(3)

(3)

- (1) (2)
- 53. Excess consumption of alcohol results in damage to liver (1) (2) (3)

(2)

- (1) (2) 54. XXX iemales are called super females (1) (2)
- 55. The male Anopheles does not spread malaria (1) (2) (3)
- 56. A persons of AB blood group are called universal acceptors
 - (1) (2)
- 57. A doctor advised a patient to take plenty of citrus fruits, survas, tomatoes and amlas over a period of two months regularly
- (1) (2) (3) 58. Life would have been impossible without green plants (1) (2) (3)

(4)

(4)

Reason

It promotes formation of fatty tissue in the liver

(4)

They often give birth to triplets and quadruplets

(4)

It does not carry plasmodium

(4)

They carry no antibodies

(4)

The patient's complaint was that he had swollen and spongy gums that bleed easily

(4)

The food we consume and the oxygen we breath are products of their activities

(4)

- 59. A man cannot pass on a sex-linked gene to his A male's X-chromosome is inherited from his mother son . (1) (2)(3)(4)60. Biomonitoring is reliable for determining the The living organism reacts to minute cha pollutants in air, water and soil the environment (1) (2)(3)(4)GENERAL KNOWLEDGE 1. Which of the following commissioned (3) Arvabhatta (4) Rohin ranks in the Air Force is higher? 11. Galileo was a scientist who belonged to (1) Group Captain (2) Squadron Leader (2) Great Britain (3) Air Commodore (4) Wing Commander. (1) France 2. Who said "I have no further territorial (3) Germany (4) Italy. claims to make in Europe"? 12. Some personalities and their countries are matched below. Which of these is (1) Hitler (2) Mussolini wrong ? (4) Stalin. (3) Napoleon (1) Pablo Picasso Spain-3. Name the person associated with Tal-(2) Jesus Christ Bethlehem wandi (3) Nicolas Copernicutaly-(1) Guru Arjan Dev (2) Guru Gobind Singh (4) Genghis Khan Mongolia. (3) Guru Nank (4) Mahatma Gandhi. 13. Skylab was launched into space by the 4. How many years come between one U.S. in B.C. and one A.D. ? (1) 1975 (2) 1974 (3) $\frac{1}{2}$. (4) $1\frac{1}{2}$ (2)1(1)0(4) 1979. (3) 197314. Which European leader was called the 5. Pulitzer prize is given for 'man of blood and iron' (1) Agriculture (2) Journalism (2) Mussolini (1) Hitler (4) Social work (3) Literature (3) Napoleon Bonaparte 6. Land of white elephants is (4) Bismarck. (1) Kenya (2) Burma 15. Ludwing Von Beethowen was a (4) Thailand. (3) India (1) Musician (2) Painter 7. Jews were originally nomads from (3) Poet (4) Sculptor. (2) Sahara desert (1) Palestine 16. The highest dam in the world is (4) North Europe. (3) Germany 8. Which of the following is the largest (1) Bhakra (2) Grande Dixence multipurpose project in India (4) Nurek. (3) Inguri (2) Bhakra Nangal 17. Which of the following languages is (1) Hirakund O (4) Damodar Valley. spoken by the largest number of people (3) Beas in the world 9. 'Asian' Drama' was written by (2) Arabic (1) English (1) Gunbar Murdal (2) William Shakespeare (4) Chinese. (3) French (3) Jawaharlal Nehru(4) Mulkh Raj Anand. 18. Official reports of the British govern-10. Which of the following is India's comment are called as munication satellite ?
 - (1) APPLE (2) Bhaskara

(1) Blue Books (2) Grey Books

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 (3) Green Books (4) White Papers. 19. Who was that ruler of India who transferred his capital from Delhi to Daulta- 	20. Which Hindi writer is the founder of 'Khari Boli' in Hindi literature (1) Hazari Prasad Dwivedi
bed or Devangir	(2) Bhartendu Harish Chandra
(1) Feroz Tughlak (2) Mohd. Taughlak	(3) Munshi Prem Chand
(3) Allauddin Khilji (4) Auranzeb	(4) None of these.
Answers with	Explanations
PHY	'SICS
1. (2) The amount of heat needed to raise the	Therefore KE will be multiplied by 12.
temperature by 1 degree centigrade of 1 gram	10. (1)
of substance is known as specific heat	useful work output
2. (4) $PE = Wh$ when $W = 10 \text{ kg and } h = 9 \text{ m}$	Efficiency = (work input × 100%,
$PE = (10)(9.8)(9) = 10 \text{kg} \times 9.8 \text{n} \times 9 \text{m}$	by definition,
= 882 joules.	or Efficiency
3. (4) The statement is known as Boul's law	actual mechanical advantage x 100%
4. (3) $W = $ force × distance when force	theoretical mechanical advantage
$= 100 \text{ kg} \times 9.8 \text{n} = 980$	11. (3) \neq ma if $m =$ mass of body and $a \approx$
and distance = 3 m .	constant. Since boin m and d are constant, r
W = (980) (3) = 2940 joules.	12 (1) The direction of the forme everted against
f (1) f (1) f (1) distance(x)	a surface by a fluid at rest is normal or per-
5. (1) Speed of sound (5) = time(t)	pendicular to the surface
when x = 1000 m and s = 333 m/sec.	13. (1) Energy of a wave is proportional to the
S = x/t therefore $t = x/s$	square of its height
1000m 2 ()	14. (2) Lowering the center of gravity increases
$T = \frac{333 \text{ m/sec}}{333 \text{ m/sec}} = 3 \text{ sec.}$	the stability of the table lamp
6. (1) The umbra is that portion of a shadow	15. (2) $F = ma$ where $F \approx 45$ kg force, $m = ?$.
which does not receive light from any part of	and $a = 10 \text{ m/sec}^2$
the light source $7(1)$ like $f = ma$ when $m = 60$ km and $f = 30.6$ km	$1 \text{ kg force} = 1 \text{ kg} \times 9.8 \text{ m/sec}^2$
force (convert to newtons)	$45 \text{ kg force} = 45 \text{kg} \times 9.8 \text{ m/sec}^2$
f = (30.6)(9.85 = 300 newtons)	F = 441 newtons
$a = f/m = 300 kg 60 a = 5 m/sec^2$	$m = F/a \approx \frac{441 \text{ kg m/sec.}^2}{10 \text{ m/sec.}^2} = 44.1 \text{ kg}$
8. (3) At a uniform acceleration of 9.8 m/sec	$16(3)45$ ko-f $\cdot 40$ ko-f
second and from 9.8 m/sec. to 19.6 m/sec. at	$\Sigma F = 45 - 40 - 5ka-f$
the end of the and second of fall.	$x_{\rm X}$ = 10 = 10 = 0 kg 1 (40 subtracted from 45 because the forces are in di-
9. (4) KE = 12 m/^2 , KE = 12 m/^2	rect opposite to one another).
Increase that 3m increase y to 3y then	17. (1) All the statements are correct concerning
	the application and characteristics of New-
$M_{2}^{2} = \frac{1}{2} (3m_{0}) (2v_{0})^{2}$	19 (1) All of the observe are taxed at the set of the
$KE \approx \frac{1}{2} (12)(m_0 v_0^2)$	10. (4) All of the above are true statements regarding the banking of a roadbed.

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19. (2) Use $x = v_0 + \frac{1}{2}at^2$ where x = distance of fall, $v_0 = initial velocity = 0,$ $a = acceleration, 9.8 \text{ m/sec.}^2, and$ t = 1 second

$$x = 0 + \frac{1}{2a^2}$$

x = (1/2) (9.8) (1)²
x = 4.9 m.

- 20. (4) All the statements are true
- 21. (3) Each 1590 years 1/2 of the remaining element would decay. Therefore, for the 6360 years (1/2)⁴ of the original would remain or 1/16 would remain
- 22. (3) Stable equilibrium.
- 23. (1) $v_1/v_2 = 1$ Bernoulli's equation holds here. Since the container is exposed to the atmosphere, the pressures at the surface and outlets are the same and the velocity at the outlet becomes a function of the heat and acceleration due to gravity making $v_1 = v_2$ therefore $v_1/v_2 = 1$.
- (4) A color disc as described induces the sensation of white by integrating its component colors.
- 25. (4) Definition of surface tension
- 26. (1) The smoother the surface, the more regularly reflecting the surface is. Mirrors are smooth enough that they reflect in a regular fashion.
- 27. (4) Specific gravity is numerically equal to density, so long as density is measured in gm/cm³.
- 28. (2) The six devices known as simple machines are inclined plane, lever, pulley, screw, wedge, and wheel- and axle.

29. (3) KE =
$$\frac{mv^2}{2}$$
 when KE = 2500 joules,
 $m = 50$ kg, and $v = ?$
 $2500 = \frac{50}{2}$ v^2 j.e. $100 = v^2$
 $v = 10$ m/sec.
30. (2) At highest point
 $V = 0$, $V_0 = -15$ m/sec., $a = 9.8$ m/sec.²
and $v = ?$
 $V = V_0 + at$

Q = -15 + 9.8t15 = 9.8 t.i.e.t = 1.53 $X = (-15)(1.53) + \frac{1}{2}(9.8)(1.53)^2$ X = -22.95 + (4.9)(2.34)X = -22.95 + 11.47X = 11.48m above the ground 31. (2) Choose the upward direction) as negative and downward as positive. Then $V_0 = -15 \text{ m/sec}$ and at t = 3 seconds, X = ? a = 9.8 m/ser 2 $X = V_{ot} + \frac{1}{2at^2}$ $X = (1 - 15)(3) + (1/2)(9.8)(3)^2$ 9m above ground. 32. (1) What is $h_0 + at V = -15 + (9.8)(3)$ =)14.4 m/sec. downward. Using $\frac{\sin \theta_i}{\sin \theta_r} = \frac{S_i}{S_r}$ and knowing that 33. $S_1 = 3 \times 10^8 \text{ m/sec.}$ $S_{r} = S_{i} \left(\frac{Sin \theta_{r}}{Sin \theta_{i}} \right) = \left(3 \times 10^{8} \right) \left(\frac{0.500}{0.70} \right)$ $S_r = (3)(.7)(10^8) = 2.1 \times 10^8 \text{ m/sec}$ 34. (3) The answer is simple in that we know that $N_r = 1.5$ and $N_i = 1.0$, $\therefore \frac{N_r}{N_r} > 1.0$; therefore, the ray of light slows

down and bends towards the normal.

35. (4) If
$$N = \frac{C}{S}$$
, $\therefore N_r = \frac{C}{S_r}$ and

$$N_i = \frac{C}{s_i}$$
 substituting in the Snell's law given

$$\frac{\sin \theta_{i}}{\sin \theta_{r}} = \frac{\frac{C}{S_{r}}}{\frac{C}{S_{i}}} \qquad \begin{array}{l} \text{where } C = \text{speed of} \\ \text{light in vacuum and} \\ S_{i} \text{ and } S_{r} \text{ is speed of} \\ \text{light in medium.} \end{array}$$
Then $n \frac{\sin \theta_{i}}{\sin \theta_{r}} = \frac{S_{i}}{S_{r}}$

- 36. (2) The question is self--explanatory
- 37. (1) Since pressure is measured in gauge, pressure and P_1 and P_2 are measured at surfaces exposed to the atmosphere $P_1 = P_2 = 0$.
- 38. (3) $h_1 + \frac{P_1}{W} + \frac{V_1^2}{2a} + h_2 + \frac{P_2}{W} + \frac{V_2^2}{2a}$ at 1 the velocity in all practical purposes = 0 and $P_0 = P_2 = 0$ then the equation above can be written as

$$h_{2} + \frac{V_{2}^{2}}{2a} = h_{1}$$

$$V_{2}^{2} = (h_{1} - h_{2})2a$$

$$V_{2} = [(h_{1} - h_{2})(2a)]^{\frac{1}{2}}$$

- (3) Mathematical expression of Centripetal force
- 40. (4) Mathematical expression of Ohm's law
- 41. (2) Mathematical expression of Charles' law
- (1) Mathematical expression of Grahams law of diffusion.

43. (4) V = at; t = 60 sec. =
$$\frac{60}{3600}$$
 hr.
800 = $a\frac{60}{3600} = \frac{a}{60}$
 $a = 48.000^{\text{mi}}$ /hr²

- 44. (1) The Pauli exclusion principle states that no more than 2 electrons may occupy a particular atomic orbital. In order for 2 electrons to occupy the orbital they must possess opposite spins.
- 45. (3) S, the distance, equals zero when the object has returned. V₀, the initial velocity, equals 128 ft./sec. g, the acceleration of gravity equals 32 ^{ft}/sec².

$$0 = 128t + \frac{328}{2} = 128t - 16t^2$$

Factoring, t (10t -128t = 0When the product equals zero, one of the factors must equal zero

Either t = 0 (not valid)

or
$$16t - 128 = 0$$
 and $t = \frac{128}{16} = 8$ sec.

46. (1)
$$a = \frac{v_2 - v_1}{t}$$

 $= \frac{58 \text{ mi}_{\text{Arr.}} - 23 \text{ mi}_{\text{Arr.}}}{3.5 \text{ sec.}}$
 $= 10 \text{ mi}_{\text{Arr.}} \text{ per sec.}$
Or, since 35 mi./hr. = 51 ft./sec
 $a = \frac{51 \text{ ft}_{\text{/sec.}}}{3.5 \text{ sec.}}$
 $= 12.7 \text{ ft.} \text{ per sec.}^2$
47. (3) $v = \frac{v_1 + v_2}{2}$
 $v = \frac{1}{2}(23 + 58) \text{ mi}_{\text{Arr.}} v = 40.5 \text{mi}_{\text{Arr.}}$
 $v = 40.5 \times \frac{5280}{360} \text{ ft./min.}}{3600 \text{ sec./hr.}} = 59.4 \text{ ft./sec.}$
X = 59.4 ft./sec. × 3.5 sec X = 208 ft.
48. (3) $v = \frac{336}{6} = 56 \text{ mi}_{\text{Arr.}}$
49. (4) The volume of the glass may be calculated as follows :
10.000 gm × $\frac{1 \text{ cm}^3}{6 \text{ gm}} = 1666 \text{ cm}^3$
50. (3) 1666 cm³ × $\frac{1 \text{ gm}}{\text{ cm}^3} = 1666 \text{ g of H}_2\text{O}$
1.7 kg H₂O × 9.8 m/sec.² = 16.66N
Therefore 100 N - 17 N = 83 N.
51. (1)

 $F = mg. \ 10 \text{ kg} \times 9.8 \text{ m/sec.}^2$ $= 98 \text{ kg} - \text{m/sec.}^2 = 98 \text{ N}$

The acceleration of gravity is 32 ^{ft}/_{sec}². This may be converted to acceleration in the Mks system by working out a conversion factor

 $\frac{2.54 \text{ cm}}{\text{in.}} \times 12 = 30.48 \text{ cm/ft.} = 0.30 \text{ m/ft.}$

 $32 \times 0.30 = 9.6 \text{ m/sec.}^2$.

The smaller number results from rounding, but this is close enough.

52. (3) 53.(2) 54.(2) 55.(3) 56.(1) 57.(2) 58.(1) 59.(1) 60.(3)

CHEMISTRY (ANSWERS WITH EXPLANATIONS)

- (3) Silver ions will react with chloride ions and precipitate as AgCl.
- 2. (2) The equation is self-explanatory.
- 3. (1) $H_2S \leftarrow \rightarrow 2H^+ + S^{2-}$. By the common ion

effect, lowering the pH (increasing the H⁺ concentration) will lower the S⁻² concentration by displacing the reaction to the left. $K_{i} = \frac{(H^{+2})(S^{2-})}{(H_{2}S)} \text{ If } H^{+} \text{ increases, } S^{-2} \text{ must de-}$

crease.

- 4. (3) In DNA there are principally 4 nitrogen bases: adenine, thymine, guanine, and cytosine. In RNA uracil is present instead of thymine. During transcription of RNA from DNA, the DNA bases of adenine, thymine, guanine, and cytosine will pair with the RNA bases of uracil, adenine, cytosine, and guanine, respectively.
- (3) The starting compound may be pictured as.



Monobromination in the 3,5 or 6 positions will produce different compounds. The identity of the alkyl groups is not important since ring monobromination was specified.

- 6. (1) Lye soap was produced in earlier days by boiling animal fat with lye. This process of forming the salt of fatty acids by treating at fat with alkali is called saponification
- 7. (4) The hydronium ion, H_3O^+ , is a protonated water molecule.

$$2H_{0} \leftrightarrow H_{3}O^{+}OH^{-}$$

- 8. (3) Cyclopropane, containing 3 carbon atoms, is the smallest organic ring compound.
- 9. (3) Anaerobic oxidation is far less efficient than aerobic oxidation. Pasteur showed that fermentation can take place in the absence of air. The common equations are written in the following manner: Aerobic respiration:

 $\begin{array}{c} C_6H_{12}O_6+6O_2 \longrightarrow 6H_2O+6\ CO_2\\ +\ Energy\ (673\ calories)\\ \text{Anaerobic respiration (alcoholic Fermenta$ $tion):}\\ C_6H_{12}O_6 \longrightarrow 2C_2H_5OH+2CO_2\\ +\ Energy\ (25\ calories).\\ \end{array}$

- 10. (2) The different isomers are 1, 2, 1,3; 1,4; and 2,3. There might appear to be other possibilities; but 2,4 is more property 1,3 and 3,4 is more properly 1,2.
- 11. (4) A reaction in which electrons (e) are removed is termed an axidation reaction; the adding of electrons to an atom or molecule is termed a reduction reaction
- 12. (4) As long as the volume units are the same, $N_1V_1 \notin N_2V_2$

$$V_2 = \frac{N_1 V_1}{N_2} = \frac{(50) (0.25)}{0.50} = 25 \text{ ml}$$

The fact that the acid produces two hydrogen ions per molecule does not enter into the calculations.

- (2) Hemoglobin is the oxygen carrier in red blood cells of all vertebrates. With carbon monoxide hemoglobin forms carboxyhemoglobin. The binding capacity (affinity) of hemoglobin for carbon monoxide is over 100 times that of the binding capacity for oxygen
- (3) A compound can only be separated by chemical means and not be physical means. A mixture can, however, be separated by physical means.
- 15. (3) The first reaction

 $CO_2 + H_2O \longrightarrow H_2CO_3$

is a synthesis reaction.

The second reaction

 $2HgO \longrightarrow 2Hg + O_2 \uparrow$

is decomposition reaction.

The third reaction

 $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$

issingleeplacementeaction.

Thefourthreaction

 $HCl + NaOH \rightarrow NaCl + H_2O$

is a double replacement reaction (as well as a neutralization or acid-base reaction).

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- (1) James Chadwick discovered the neutron in 1932.
- (3) The compound whose structural formula was listed in the question was

Н Н Н Н | | | | Butane H-C-C-C-C-H | | | | Н Н Н Н

Pentane has the following structural formula

 (1) This precipitate reacts with acid or base and therefore, is amphoteric. It could be aluminum hydroxide.

 $AI(OH)_3 + 3H^+ \longrightarrow AI^{+++} + 3H_2O$

 $Al(OH)_3 + OH^- \longrightarrow Al(OH)_4.$

- 19. (4) Follow the above explanation.
- 20. (2) 2,4-D is applied to field and lawns to eliminate weeds. Most of the weeds are dicotyledonous plants which are more sensitive to this potent stimulator of plant metabolism. The proper concentration must be carefully adhered to so that when the material is applied, the weeds will be stimulated to metabolize at such a great rate that they will consume their own protoplasm and die while the monocytyledonous grasses (or crops) will remain unharmed.
- 21. (2) Transuranium elements are those having more than the 92 protons of uranium. Several may be produced by neutron bombardment of lighter elements such as uranium.
- 22. (2) Light-catalyzed reduction of silver salts to produce elemental silver is the basis for black and white photographic film.
- 23. (4) The question lists the properties of a solid.
- 24. (3) Polycinyl alcohol can be formed by polymenzing vinyl acetate and then removing the acetate groups (transesterification or saponification). Attempts to produce the monomer, vinyl alcohol, lead only to the production of acetaldehyde.

- (4) This is the usual Wurtz reaction, and a mixture would be predicted.
- 26. (2) Sodium metal reacts with acetylene to form disodium acetylide. This acetylide reacts with alkyl halide, substituting the alkyl groups for the sodium substituent.

27. (3)



- 28. (4) A Grignard reagent will react with the active H of an alcohol to produce an alkane. In this case, H4 will be produced.
- 29. (3) Glucose in solution primarily contains the pranose ring (five carbons and one oxygen atom).
- 30 (1) A free radical reaction can often be propagated for some time unless a terminating collision occurs. The collision of two free radicals results in formation of a stable compound and thus in termination of the reaction (at least with respect to these two free radicals).
- 31. (1) The principle of LeChatelier, stated simply, says that a system, placed under stress, changes to relieve the stress. Four volumes of gas are on the left side of the equation, and only two volumes are on the right. A change of equilibrium toward the right would thus tend to relieve the stress brought about by higher pressure.
- (1) This is an example of the aldol condensation. It requires an aldehyde or ketone possessing α-hydrogen.
- 33. (3) The concentration of (OH) will decrease due to the common ion effect. Since $(OH) \times (H^+) = 10^{-14}$, H⁺ must increase, pH decreases and pOH increases.

- 34. (3) The more ions formed, the greater the electric current carried by an electrolyte solution.
- 35. (2) $I_2 + 2S_2O_3^{-2} \longrightarrow 2I^- + S_4O_6^+$. Iodine is being reduced. lodine (i.e., l2) but not iodide (i.e., I -) reacts with starch to form a blue complex.
- 36. (1) A yellow precipitate of iodoform is produced in this reaction with methyl ketones, alcohols that may be oxidized to methyl ketones, or acetaldehyde.
- 37. (4) Enzymes are influenced by ;temperature

1. inactivated usually above 60° C

2. rate of reaction is controlled as in any chemical reaction; the rate is approximately doubled by each 10° C increase

3. low temperatures slow the reactions PH. There is an optimum pH for every reaction

poisons

some enzymes themselves can be harmful to the organism but they are also susceptible to compounds like cyanide, etc., which inactivate them

concentration.

the rate of a reaction is directly proportional to the amount of enzyme present in relation to substrate. If a coenzyme or specific activator is required, that substance may control the overall rate of the reaction also.

- 38. (2) The alpha helix contributes to the secondary structure of proteins, but not all proteins (nor all regions of proteins) contain the alpha helix secondary structure.
- 39. (2) The four products of this Wurtz reaction are n-hexane, n-butane, and ethane. On the basis of probability only, the butane should represent 50 % of the product on a molar basis.
- 40. (4) See explanation for question 39.
- 41. (1) $\phi N_2^+ Br + H_2^-$ catalyst $\phi NH NH_2$ 42. (1) $H_2 \oplus Na \longrightarrow H_2 + NaOH$
- 43. (1) During the production of electricity the two half cell reactions of the storage battery are

$$Pb + SO_4^{-2} \longrightarrow PbSO_4 + 2e^{-1}$$

 $PbO_2 + 4H + SO_4^{-2} + 2e^- \longrightarrow PbSO_4 + 2H_2O$ During recharging of the battery the two halfcell reactions are reversed.

44. (3) $CaC_2 + 2H_2O \longrightarrow C_2H_2 + Ca(OH)_2$

45. (3) Freezing point depression in water depends only on the number of solute particles per unit volume

1 MNaCl = $2 \times 1 \times 6.02 \times 10^{23}$ particles per liter

- $0.3 \text{ M NaSO}_4 = 3 \times .03 \times 6.02 \times 10^{23}$ particles per liter.
- 1.5 M glucose = $1 \times 1.5 \times 6.02 \times 10^{23}$ particles per liter.
- 0.5 M BaSO4 = 3 × 0, 5 × 0,02 × 10 23 particles per liter.

Dividing by 6.02×10^{23} we can see that the comparative figures are NaCl, 2; Na2SOn, 0.9; glucose, 1.5: and BaSOa, 1.5. Thus, the NaCl solution has the greatest number of particles per unit volume (considering the ionization of NaCl, Na2SO4 and BaSO4), and its will have the lowest freezing point.

- 46 (2) Markovanikov's rule predicts that in the absence of peroxides the addition of hydrogen halide across a double bond will occur with hydrogen being added to the carbon, which already contains the most hydrogen. In the presence of peroxides, however, a free radical mechanism results in hydrogen bromide being added in the opposite orientation.
- 47. (3) This is a definition of the zwitterion; an example is the amino acid, glycine.
- 48. (1) Helium has a higher density and cost than hydrogen, but it is much safer. Hydrogen readily escapes through tiny holes, and if ignited, it reacts quite readily with oxygen. Helium is essentially inert chemically.
- 49. (1) Low molecular weight mercaptans have a very unpleasant odor even in low concentration. They are added to give an odor to the odorless natural gas. This is guite helpful in detecting leaks and thus avoiding explosions.
- 50. (3) The question states a fact and the information should be learned.

- 51.(4) Certain condition like extremely low temperature and very high pressure can liquefy the nobel gases. Reason is also true but not the correct explanation of assertion
- 52.(3) Due to excitation of valence electrons of alkali metals, their salts give colour to the bunsen flame
- 53.(4) It is true that among halogens, chlorine oxidises to highest oxidation state but reason is not correct explanation, though it is individually correct.
- 54.(1) Decolouration of Br₂ water shows unsaturation in hydrocarbon. As acetylene have tripple bond, it consist of one σ and one π —bond. π —bond is replaced by bromine and addition reaction is taking place here.
- 55.(1) It is true that 4s electrons ionises before 3d-orbital electrons but the energy level of 3d- orbital electron is more than 4s-orbital electrons.
- 56.(1) N₂ molecules contains triple bond, hence, less reactive because of high bond energy. But reason is incorrect because there no delocalization of electron in it.

- 57.(4) Both assertion and reason are true but reason is not correct explanation of assertion because it never explain about the adsorption nature of fluorescein
- 58.(4) Assertion and reason are true but not explaining why all enzymes are proteins. In general all enzymes are proteinous macromolecules made of amino acids.
- 59.(3) Alkali metals are strong reducing agent because it has a tendency to get oxidised by removing one electron easily. The main reason for this, they have (s¹ electronic configuration and by removing ns¹ electron it can attain noble gas configuration which is a stable configuration.
- 60.(3) As we know that all exothermic reactions are not spontaneous whereas all such type of reactions where the entropy of system increases are spontaneous. So, we can say where the internal energy of system decreases and randomness increases the reaction become spontaneous. Hence, both assertion and reason are true and reason explains the assertion.

BIOLOGY

EXPLANATIONS

- 1. Suberin is a protein and gives rigidity to the cell wall
- 2. It is caused by puccinia graminis and has 5 stages
- 3. Heterophous stage is the arrangement of different types of flagella on the body
- 5. Gamer and Allored found out that tobacco plants could flower only after exposure to a number of short days
- 7. Cleistothecium is a closed structure containing spores on the inner wall
- It is so named because it was discovered for the 1st time in polygonum by strasburger

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- Robertson model says a phospholipid layer is sandwitched between two layers of proteins are discontinuosly embedded in two layers of lipids
- 16. Mn helps in the electron transport reactions
- Auxins help in cell elongation, cell division phototropism geotropism, apical dominance, root initiation, abcission etc.
- Nodes and internodes are exclusive characteristics of stem
- 21. Smallest flower is Wolffia
- 22. Classification of Cucurbitaceae is Polypetalae, Calyciflorae, Passiflorales, Cucur-

bitaceae

- 23. PMA covers stomata as a film and allows CO_2 diffusion but restrict diffusion of water and thus reduce transpiration without affecting CO_2 uptake. Other anti transpirants is ABA
- 28. Holocene represents the age of man
- 29. Due to development in the field of medicine, mortality rate in chlidren have lowred.
- 30. Heckels theory takes into account the comparative embryological evidences
- 31. Colour blindness is a sex linked disease and therefore it appears due to inheritance through X chromosome
- 32. Archenteron opens through blastopore
- 33. The heart of rabbit is a manimum heart and therefore mitral valve is situated at the left auriculoventircular opening.
- 38. Trypanosoma affects blood and nervous tissue due to which man feels sleepy and may

cause death. It is also called African sleeping sickness or gambian fever .

- 42. Its infection takes place by contaminated water .
- 44. Carbon dioxide reacts with water forming carbonic acid in the presence of carbonic anhydrase carbonic acid dissociates into hydrogen ion and bicarbonate which diffuse into plasma

 $CO_2 + H_2 O \rightarrow H_2 CO_3 + H^+$

- 47. Body temperature is a function of rate of metabolism thus active animals have high body temperature.
- 49. Sustentacular cells are found in germinal epithelia of seminiferous tubules of testis. These are also known as nurse cells or sertoli cells
- 51. This is expressed by chargaff's base pairing rule
- 52. Cholera patient is given these to over come dehydration to which human cells may plas-
- 53. Excessive alcohol hampers metabolism
- 55 Plasmodium vivax the protozoan due to which malaria is caused and it is carried by female anopheles mosquito
- 56. Since no antibodies are present in AB blood group thus no antigen in required and therefore AB is universal acceptor
- 57. The patient had scurvy which is caused due to deficiency of vitamin 'C' thus to provide vitamin 'C' doctor advised him citrus fruits
- Sexlinked gene is found on X chromosome of male thus can not be transferred from male.

GENERAL KNOWLEDGE

1.(3) 2.(1) 3.(3) 4.(1) 5.(2) 6.(4) 7.(1) 8.(2) 9.(1) 10.(1) 11.(4) 12.(3) 13.(3) 14.(4) 15.(1) 16.(4) 17.(4) 118.(1) 19.(2) 20.(2)

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Max. Time : $3\frac{1}{2}$ hrs.

PART I. PHYSICS

1. A metal rod of length L is clamped at a distance L/4 from one end. It is set into longitudinal vibrations by pulling on length-wise with a resin cover cloth piece. The wavelength for fundamental mode of vibration will be

- 2. A thin equiconvex lens has focal length 10 cm, refractive index 1.5. One of its faces is now silvered, and it is seen that an object placed at distance U in front of it, has its image coinciding the object. The value of U is
 - (a) 20 cm (b) 10 cm
 - (c) 5 cm (d) 20 cm
- 3. Six resistors each of resistance R and two resistors each of resistance r are connected in the network shown below. The equivalent resistance between A and B is



4. A circular loop of radius carries a current i. It is equivalent to a magnetic dipole of magnetic moment

(a) $\pi r^2 i$ (c) $2\pi ir$ (b) ir

5. Power factor in a series R-L-C resonant circuit is

Max, Marks : 200

- (a) 0.5 (c) 1
- 6. In the network given below all the five capacitors have the same capacitance C each. Then the capacitance between the terminal A and B will be

(b) 0.707

(d) zero



7. The stationary wave produced in a stretched string is given by

$$A \cos\left(\frac{2\pi x}{\lambda}\right) \sin\left(\frac{2\pi t}{T}\right)$$

The corresponding progressing wave has an amplitude equal to

a) A/2	(b) A
c) 2A	(d) A/12

A sinusoidal a.c. flows in an inductor as shown in the graph below :-

Then the p.d. across the inductor is a maximum at the instant indicated on the graph by the point



(a)S (b)P (c)R (d)T
9. Which of the following relations between weber, second, ampere and volt is correct?

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- (a) weber/second = volt
- (b) weber \times second = volt
- (c) weber/second = ampere
- (d) weber \times second = ampere
- 10. A circular coil of radius R carries a current in it. The magnetic field along its axis decreases as we move away from its centre. The space rate of fall of this field is constant at distance equal to
 - (b) R (a) 2 R
 - (c) 3 R (d) R/2
- 11. A soap film is formed on a wire ring held vertically and allowed to drain. A diffuse source of while light is observed by reflection in the soap film. In this connection indicate the wrong statement:
 - (a) The colours are due to refraction of light by the wedge-shaped film
 - (b) The thickness of the film is of the same order as the wavelength of visible light
 - (c) The band of colours move downs wards as the film drains.
 - (d) Just before the film breaks, it may appear black at the top.

12. The specific charge of an electron i

- (a) 5.7×10^7 Coulomb/kg
- (b) 1.76 × 10¹¹ Coulomb/kg
- (c) 1.6×10^{-19} Coulomb (m)
- (d) 1.6 × 10⁻¹⁹ Coulomb.
- 13. Vectors 31 21 + 12 and 21 + 61 + mk will be perpendicular to each other if

(a)
$$m = 8$$
 (b) $m = 6$

(c) m = 3 (d) m = 1. 14. "Newton-second" is the unit of

- (a) energy . 0 (b) momentum
- (c) angular momentum
- (d) velocity.
- 15. In the S.I. system the unit of energy is
 - (a) electron-volt (b) joule
 - (c) calorie (d) erg.

16. Two rods of the same length L but cross-section in the ratio $S_B/S_A = 4$ are joined at a heater H and a heat sink S as shown. The rate of heat flow to S is found to be Ro. If points of A and B at distances L/3 each from H are now joined by a conductor C of length L and the cross-section of C is such that 3c = 2S/A, the new rate of heat flow to S will be (see figure)



12. Most of the comets moving round the sun have orbits of the shape of

- (a) a hyperbola (b) a parabola
- (c) an elongated ellipse
- (d) a circle.

18. Kirchoff's laws are applicable to

- (a) A.C only (b) D.C only
- (c) Both (a) and (b)
- (d) Intermittant currents only.
- 19. In the given diagram, a current of 0.5 A is caused to pass through a resistor as shown. The emf of the cell is 2 V, and its internal resistance is zero. Indicate the wrong statement :



(a) the p.d. between a and c is 1.0 V (b) the p.d between a and b is 1.0 V

- (c) b is at a higher potential than c
- (d) a is at a higher potential than c.

20. In LCR circuit if
$$\frac{1}{LC} > \frac{R^2}{4L^2}$$
, the circuit

is

- (a) oscillatory (b) dead beat
- (c) critically damped
- (d) none of the above.

21. To use a transistor as an amplifier

- (a) the emitter-base junction is forward biased and collector-base junction is reverse biased
- (b) both junctions are reverse biased
- (c) both junctions are forward biased
- (d) it does not matter how the transistor is biased, it always works as an amplifier.

22. An oscilloscope measures the

- (a) Peak to peak value of AC voltage
- (b) RMS value of AC voltage
- (c) D.C. value of a voltage
- (d) None of the above.
- 23. De Broglie wavelength λ is proportional to
 - (a) $\frac{1}{\sqrt{F}}$ for photons and 1/E for particles
 - (b) 1/E for photons and $\frac{1}{\sqrt{F}}$ for particles
 - (c) 1/E for both photons and particles in motion
 - (d) $\frac{1}{\sqrt{E}}$ for both photons and particles.
- 24. A given semiconductor has electron concentration of 8 2 10 13 per cm³ and a hole concentration of 5 \times 10 ¹² per cm³. What is the resistivity of this sample if the electron mobility is 23,000 cm²/V and hole mobility is 100 cm²/V?
 - (a) 3.395×10^{-4} ohm × cm (b) 3,395 ahm × cm (c) 5×10^{-6} ohm × cm (d) 45×10^{-6} ohm x cm.

25. What angle θ to the horizon will be formed by the surface of petrol in the tank of a motor car moving horizontally with constant acceleration of 2.44 m/s^2 ?

(b) $\theta = 45\%$

(d) $\theta = zero$

(a)
$$\theta = 14$$

- (c) $\theta = 30^{\circ}$.
- 26. Unit of "Pascal" is the same a
 - (b) poundal/inch² (a) 10^6 dyne/cm² (c) 1 newton/metre² (d) 1 dyne/cm².
- 27. A car accelerates from rest at a constant rate a for sometime after which it decelerates at a constant rate b to come to rest. If the total time of travel is t, then the maximum velocity reached in this interval is



28. A narrow bent tube open at both ends is lowered from a bridge over a stream into the stream as shown in the figure. Water rises in the tube to a height of 15 cm above water level. The speed of water current must be



- (a) 1.7 metre/sec (b) 1.5 cm/sec
- (c) 1.2 cm/sec (d) 15 cm/sec.
- 29. A spherical bowl of radius R rotates about the vertical diameter with angular velocity (), the bowl contains a small object inside and in absence of friction, this object takes up a position inside the bowl such that its radius vector





30. A dry clean steel needle of diameter dand density ρ when carefully placed on the surface of water remains floating. If T is the surface tension of water, then maximum value for the diameter d of the needle for enabling it to float will be

(a)
$$d = \sqrt{\frac{8 \rho \pi}{T g}}$$
 (b) $d = \sqrt{\frac{4 \rho \pi}{T g}}$
(c) $d = \sqrt{\frac{8 T}{\rho \pi g}}$ (d) data incomplete.

31. In S H M with amplitude a, the potential energy and kinetic energy are equal to each other at displacement

(d) a/2

(a) $a/\sqrt{2}$ (b) a/4 (c) a/3

32. The acceleration α of a particle starting from rest varies with time according to the relation α kt + c, where c and k are constants. The velocity v of the body after time t will be

(a)
$$kt^{2} + \frac{1}{2}ct$$
 (b) $\frac{1}{2}kt^{2} + ct$
(c) $\frac{1}{2}(kt^{2} + ct)$ (d) $kt^{2} + ct$

- 33. A particle simultaneously participates in two mutually perpendicular oscillations; $x = 2 \sin \omega t$, and $y = 2 \cos \omega t$. The trajectory of motion will be
 - (a) a straight line (b) a parabola (c) a circle (d) none of these
- 34. A steel wire of length 1.5 meter has density = 7.7×10^3 kg/m³ and Young's

modulus = 2.2×10^{11} N/m². It is subjected to a tension which produces an elastic strain of 1 %. Its fundamental frequency of vibration must be

(a) 256 Hz	(b) 178 Hz
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- (c) 170 Hz (d) 200 Hz
- 35. Indicate the only correct statement in the following
 - (a) The maximum amount of heat that can be converted into mechanical energy is 100 %
 - (b) The maximum amount of mechanical energy that can be converted into heat is 100 %
 - (c) By opening the door of a working refrigerator in a room, you can cool the surrounding air
 - (d) In an adiabatic expansion of a gas, the product of pressure and volume increases.
- 36. Two gases O_2 and H_2 are at the same temperature. If E_0 is the average kinetic energy of a molecule of oxygen sample, and E_H is the average kinetic energy of a molecule of hydrogen sample, then
 - (a) $E_o = \frac{1}{16} E_H$ (b) $E_o = 16 E_H$ (c) $E_o > E_H$ (d) $E_o = E_H$.
- 37. Which one of the following is not a "Black-body"?
 - (a) A highly polished black car
 - (b) Uniform temperature enclosure
 - (c) Platinum black (d) The sun.
- 38. A beam of monochromatic light of wavelength λ is refracted from air into water of refractive index 4/3. The wavelength of light beam inside water will be

(a)
$$\frac{9}{16} \times \lambda$$
 (b) $3 \lambda/4$ (c) $\lambda \times \frac{4}{3}$ (d) λ .

39. Four perfect polarising plates are stacked so that the axis of each is turned 30° clockwise to the preceding plate, the last plate therefore being crossed with the first. A beam of unpolarised light of intensity I passes through the stack perpendicularly. The transmitted beam has intensity

- (a) $\frac{27}{128}$ I (b) $\frac{81}{256}$ I (c) $\frac{1}{8}$ I (d) $\frac{27}{64}$ I
- 40. Two sounds in a gas differ in their loudness level by 20 db. What is the ratio of the amplitudes of the pressure oscillations ?
 - (b) 10^4 : 1 (a) 10 : 1 (c) $\sqrt{10}$: 1 (d) 100 : 1.
- 41. Speed of Electro Magnetic wave depends
 - (a) only upon the electric properties of the medium
 - (b) only upon the magnetic properties of the medium
 - (c) both upon the electric and magnetic properties of the medium
 - (d) mechanical and thermal properties of the medium.
- 42. If µo represents the magnetic permeability constant in free space and Σ_0 is the permitivity in vacuum, and C the speed of light in vacuum, then

(a) $\Sigma_{o} = \sqrt{\mu_{o} C}$ (b) $\Sigma_{o}^{-2} = \mu_{o} C^{-1}$

(c) $\Sigma_0^{-1} = \mu_0^{-1} C^{-2}$ (d) $\Sigma_0 = \mu_0^{-1} C^{-2}$

43. In a nuclear reactor,

- (a) the thick concrete shield is used to slow down the speed of neutrons,
- (b) heavy water or graphite is used to moderate the activity of the reactor
- (c) the chain reaction is controlled by rods of uranium whose going in reduces the rate
- (d) out of U^{238} and U^{235} , the natural ura-nium has less than 1% of dU^{235} .

44. In a hot wire anymeter the deflection angle θ of the pointer is related with the current I as

(b) [α vθ (a) $|\alpha \theta|$ (c) I a tan a

 $(d) \mid \alpha \theta$.

45. Television signals reach us only through ground waves. The range R is

related to the height h of the transmitter antenna as

- (a) $R \alpha h^{\frac{1}{3}}$ (c) $R \alpha h^2$
- (d) R a h.

(b) $R \alpha h^{1/2}$

46. Which energy-state of triply ionized beryllium (Be^{+ 3}) has the same orbital radius as that of state of hydrogen atom

(a) $n = 8$ state	(b) n = 5 state
(c) $n = 4$ state	(d) $n \neq 2$ state.

47. A capacitor of capacitance $C_1 = 1 \mu F$ can withstand a maximum voltage V1 = 6.0 KV while another capacitor of capacitance $q_2 + 20 \mu F$ withstands the maximum voltage $V_2 = 4.0$ KV. What maximum will the system of these two capacitances withstand when connected in series as shown below.



- 48. A battery is connected across a resistance wire of uniform cross-section. If another resistance wire is connected in parallel, then the intensity of electric field in the first wire will
 - (a) be halved (b) be doubled
 - (c) become zero (d) remain unchanged.

49. Transistor is a

- (a) current operated device
- (b) voltage operated device
- (c) both current and voltage operated device
- (d) none of the above.

50. Satisfactory explanation of the phenomenon of photo electric effect is based on

(a) Planck's quantum theory

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(b) Einstein's theory of relativity

(c) Huygen's wave theory

§ (Directions) Q51 to 60 consists of two statements, one labelled the 'Assertion (A)' and the other labelled the Reason (R)'. Examine these statements carefully and decide if the statements Assertion (A) and the Reason (R) are individually true and if so, whether the reason is a correct explanation of the assertion. Select your answers to these questions from the codes given below

(c)

(c)

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true but R is not a correct explanation of A

Assertion

51. A pulsar is a source of radio waves that varies in intensity at regular intervals

- 52. Activity of **10⁸** undecayed radioactive nuclei of half life 50 days is equal to that of 1.2 × 10⁵ number of undecayed nuclei of same other material with half life 60 days.
 - (a)
- (6) 53. A laser beam of 0.2 watt power can drill holes through a metal sheet whereas a 1000 watto
 - torch light cannot (a) (b)
- 54. In a radioactive disintegration an electron emitted by the nucleus (c)
- (a) (b) 55. We always see the same face of the moon
- (b) (a) (c) 56. In an electric bulb, the filament is in the form of a coiled coil
- (a) (c) 57. Wood is a bad conductor of electricity
 - (a)
- 58. A sail boat cannot be propelled by air blown at the sail from a big fan attached to the boat (a) (b) (c)
- 59. Cooling inside a refrigerator is not proper when a thick layer of ice deposits on the freezer (b) (c)

(c) A is true but R is false

(d) Newton's corpuscular theory.

(d) A is false but R is true

A pulsar is a rotating neutron star

Reason

Activity is proportional to half life

The frequency of laser light

(d)

d

Electrons are always present inside nucleus

(d)

The period of rotation of the moon about its axis and its period of revolution about the earth are egual

(d)

A coiled coil filament occupies less space and is, therefore, not cooled significantly by the convection currents in the bulb

(d)

Wood has a large number of free electrons

(d)

Action of the air from the fan and reaction of the sail, both act on the boat

(d)

Ice is a bad conductor of heat

(d)

(c)

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60. Even a small bird hitting a flying aeroplane can The bird imparts a large impulse and a large cause heavy damage to it force during the short time of impact (a) (b) (c) (d)PART II. CHEMISTRY 1. Bohr's model of the structure of atom is (c) $Cl_2(q) + 2O_2(q)$ not in conformity with ----- 2ClO2(g) - 49.4 kca (a) Heisenberg's uncertainty principle (d) $2NF_3(g) \longrightarrow N_2(g) + 3F_2(g) \longrightarrow 4.4kcal$ (b) Hund's rule of maximum multiplicity 8. Among the oxy-acids of chlorine, the (c) Aufbau principle strongest oxidizing agent is (d) Paulis exclusion principle (6) HC103 (a) HClO₄ 2. The first ionization energy of hydrogen HOLD HCIO (c) HClO₂ is 2.179×10^{-18} J The second ioniza-9. When dry silver chioride is fused with tion energy of helium atom will be sodium carbonate, silver is obtained as (a) 8.716×10^{-18} J (b) 4.358×10^{-18} J (b) Ag2C2 (a) free metal (c) 5.45×10^{-17} J (d) 1.09×10^{-18} J (c) Aq_2O (d) Ag2CO3 10. Which one of the following tetrachlo-3. The spectrum of He may be expected to rides does not undergo hydrolysis be similar to that of (a) Shel (b) GeCL (c) He^+ (b) Li⁺ (d) Na. (a) H (c) \$161 (d) CCl4 4. Among the following species, the one that does not exist is 1. The unit of dipole moment is (a) [SiCla] 2a curie (b) $[CCk_{6}]^{2}$ (b) debue (c) faraday (d) none of these. (c) [GeCla] 2 -(d) [SnCl6]²-12. Among the following acids, the one 5. The conjugate acid of NH²⁻ is that can act as both an oxidizing agent $(b) > NH^{2}$ and a reducing agent is (a) N^{3-} (a) HNO₂ (b) HClO₄ (d) NH_4^+ (c) NH3. (c) HNO₃ (d) H2SO4. 6. Transition metals are often paramag-13. The osmotic pressure of a dilute solunetic owing to the presence of tion increases when (a) valency electrons in the outer two elec-(a) more of solute is added trons shells (b) more of solvent is added (b) unpaired electrons in their atoms (c) temperature is increased (c) vacant d orbitals in the n th orbit (d) any one of the change is made. (d) electrons in d orbitals of the (n-1) orbit. 14. Which of the following statements 7. High pressure and high temperature will about boron halides is WRONG? be favourable conditions for a high equi-(a) They form tetrahedral molecules librium yield in the reactions (b) They react with ethers to form addition (a) 2C1207 (g) compounds $\Rightarrow 2C_{b}(g) + 7O_{2}(g) + 126.8$ kcal (c) They all hydrolyse in water (b) Ng(g) + 8H2(g) (d) They are all strong Lewis acids. -→ 2NH3(g) + 22.08 kcal 15. The As₂S₃ colloid will be most readily coagulated by

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(a) MgCl ₂	(b) $AlCl_3$
(c) Na ₂ SO ₄	(d) Na ₃ PO ₄

16. The [OH] in a solution is 1×10^{8} . The pH of the solution is

(a) 10.0	(b) 8.0
(c) 6.0	(d) 4.0.

17. Equal weights of hydrogen and methane are mixed in an empty container at 25° C. The fraction of the total pressure exerted by hydrogen is

(a) 16/17	(b) 1/9
(c) 8/9	(d) 1/2.

- 18. Heat of neutralization of HCl by NaOH is 13.7 kcal per equivalent, and by NH4OH is 12.27 kcal. The heat of dissociation of NH4OH is
 - (a) -25.97 kcal (b) 25.97 kcal

(c) -1.43 kcal (d) 1.43 kcal.

19. That the conventional representation of oxygen molecule

:0::0:

is wrong is suggested by the fact that

- (a) oxygen is a colourless gas
- (b) oxygen atoms join to form the thatomic ozone molecule
- (c) oxygen is paramagnetic
- (d) oxygen is highly reactive
- 20. The alkane with the carbon chain C
 - C C C could not be named
 - (a) 2 methyl isobutane
 - (b) neopentane

C

- (c) 2, 2, dimethylpropane
- (d) tetramethyl methane.
- 21. Given the enthalpy of formation of $CO_2(g)$ is -94.0 kJ, of CaO (s) is -152 kJ, and the enthalpy of the reaction $CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$

CaCO₃ (s) is (a) -288 kJ (b) + 202 kJ (c) -202 kJ (d) -42 kJ. 22. Acidic hydrogen is present in (a) arenes (b) ethyne (d) ethane. (c) ethene 23. In the series of reactions CH3 · COOH Heat the end product Cis (a) CH4 (b) acetonitrile (c) CH3OH $\mathcal{C}(d)$ methyl cyanate. 24. Dry distillation of a mixture of the cal-

is 42 kJ, the enthalpy of formation of

24. Dry distillation of a mixture of the cal cium salts of acetic acid and propionic acid will yield

(Dimethyl ethyl ketone

(c) acetone

(b) agetic acid (d) acetaldehyde.

25.) Among the following compounds, the one that DOES NOT dissolve in conc. H₂SO₄ even on warming is

- (a) aniline (b) benzene
- (c) hexane (d) ethylene.
- 26. A nucleophilic reagent is

(a) CO ₂	(b) BF ₃
(c) dAICI3	(d) NH3.

- 27. Lucas reagent consists of
 - (a) am. Cu₂Cl₂
 - (b) conc. HCl + anhydrous ZnCl₂
 - (c) NaNO2 + dil HCl
 - (d) acidified KMnO4.
- 28. Natural rubber is vulcanized by heating it with
 - (a) carbon disulphide(b) sulphur
 - (c) carbon black (d) zinc oxide.
- 29. Cannizaro's reaction is given by
 - (a) benzaldehyde
 - (b) trimethylacetaldehyde
 - (c) formaldehyde (d) all of the above.

30. The salt A forms a colourless solution. When NaHCO3 was added to the aqueous solution of A1 there was no change observed. However when the mixed solution was boiled, it became milky. The salt A contains the cation

(a) Mo^{2+} (b) Ca^{2+} (c) either Ca^{2+} or Ma^{2+} $(d) K^+$

- 31. The function of anhydrous AlCl₃ in the FriedelCraft reaction is to
 - (a) produce a nucleophile
 - (b) produce an electrophile
 - (c) absorb hydrogen chloride
 - (d) absorb water.
- 32. The ultimate product of the hydrolysis of starch is
 - (a) maltose (b) sucrose
 - (d) glucose. (c) fructose
- 33. For testing nitrogen in organic compounds, they are fused with sodium metal, extracted with water, and treated with FeSO₄ soln. and acidified. The presence of nitrogen is indicated by a blue or green colour or precipitate. This test is not given by
 - (a) urea
 - (c) phenylhydrazine (d) anthranilic acid.
- 34. The use of NH4 Cl in the detection of third group radicals is to
 - (a) decrease the solubility of the hydroxides of the group III cations

(b) hydrazine

- (b) counter the activity of any interfering anions
- (c) prevent the precipitation of group IV cations as hydroxides
- (d) ensure complete precipitation of the third group cations?
- 35. DDT is prepared by condensing chlorobenzene with
 - (a) hexachloroethane
 - (b) chloroform (c) chloral
 - (d) methyl chloride.

36. The best indicator for titrating 0.1 N Na₂CO₃ against 0.1 N HCl is

(a) methyl red (b) litmus

- (c) phenolphthalein (d) universal indicator,
- 37. The standard enthalpy of formation of CO is -110 kJ and of CO2 is -394 kJ, the heat of combustion when one mole of graphite burns is
 - (b) 394 k (a) -504 kJ
 - (d) (+110 kJ. (c) -284 kJ
- 38. Aldehydes and ketones may be distinguished by using
 - (a) saturated solution of NaHSO3
 - (b) 2: 4 dinitrophenylhydrazine
 - (c) Tollen's reagent (d) Baeyer's reagent.
- 39. Cyclisation of n heptane will give
 - (a) tokene (b) naphthalene (c) benzeme
 - (d) all the above.
- 40. A sample of chloroform for use as anaesthetic is tested with
 - (a) Fehling solution
 - (B) Ammonical Cu₂Cl₂ soln.
 - (c) AgNO3 soln. (d) BaCl₂ soln.
- 41. The protons and neutrons in the nuclei of atoms undergo inter-conversions through the exchange of
 - (a) electrons or β particle
 - (b) charged mesons
 - (d) positrons. (c) photons
 - 42. The percentage of gold in 18-carat gold is
 - (a) 90 (b) 75 (c) 50 (d) 25.
 - 43. Liquid hydrogen is being seriously considered as automobile fuel. It is because liquid hydrogen
 - (a) is an abundant and cheap fuel
 - (b) is non-corrosive
 - (c) is a pollution-free fuel
 - (d) has a high calorific value.
 - 44. One a.m.u is equal to
 - (a) 1.66×10^{-8} g (b) 1.66×10^{-4} g
 - (c) 1.66×10^{-16} g (d) 1.66×10^{-24} g.

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45. The normality of conc. HCl used in the laboratory is

a) 10 N	(b) 8 N
(c) 4 N	(d) 2 N.

- 46. Which of the following will have the least hundred rotation about the carbon carbon bond
 - (a) Ethyne (b) Ethene

(c) Ethane (d) Hexachloroethane.

47. Units for the rate constant ,k, of the zero order rate equation are

(a)
$$L^2 \mod^{-2} \sec^{-1}$$
 (b) $L \mod^{-1} \sec^{-1}$
(c) \sec^{-1} (d) $\mod L^{-1} \sec^{-1}$.

 Proteins are characterized by the linkage



49. Among the following sulphides, the one that does not dissolve in dil HNO₃ is



50. Which of the following ions is not isoelectronic with the other three?

(b) NO_3^- (d) BO_3^{3-} .

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(a) CO-

(c) SØ3

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true but R is not a correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true Assertion
- 51. Both 12 g of carbon and 27 g of aluminium will have 6.12×10^{23} atoms

(a)

52. Sucrose is sweetest in taste)

(a)

)

- .
- (c)

(c)

53. Potassium cannot be obtained by the electrolysis of fused XCI in CaCl₂, melts

(b)

(a)

- (c)
- 54. Electron are ejected from a certain metal when either blue or violet light strikes the metal surface. However only violet light cause electron ejection from a second metal

Reason

Gram atomic mass of an element contains Avogadro number of atoms

(d)

Sucrose is converted by the enzyme invertase present in living systems to glucose and fructose

(d)

Metallic potassium is soluble in the melt (molten CaCl₂) and hence the cell for electrolysis gets short circuited

(d)

The electrons in the first metal require less energy for ejection [SRI GANESHA] FINGERTIPS REVISION FOR EVERY ENTRANCE EXAM EXEMPLAR EXPLORER [FREEEEE] BOOK [34 of 182]

- (a) (b) (c)
- 55. Cyclobutane is less stable than cyclopentane

 Benzoyl chloride is used for the preparation of derivative of tertiary amines

(b) (c)

57. In formaldehyde, all the four atoms are in the same plane

(a)

(a) (b) (c)

58. A spectral line will be seen for a $2p_x - 2p_y$ transition

- It is very difficult to subject vinyl chloride to nucleophilic substitution as compared to ethyl chloride
 - (a) (b) (c)
- 50. The configuration of boron atom cannot be $1s^2 2s^3$

(b)

(a)

(d)

The bond angles in cyclobutane and cyclopentane are 90° and 108° , respectively

(d) It forms solid benzoyl derivatives

The carbon atom in formaldehyde is sp³ hybridized

(d)

Energy is released in the form of wave of ligh when the electron drops from $2p_x$ to $2p_y$ orbita

The vinyl group is electron donating in viny chloride

(d) Hund's rule demands that the configuration should display maximum multiplicity

(d)

PARTILL BIOLOGY

- 1. The cell bodies of the motor neurons are located in the spinal cord in
 - (a) intermediolateral cell column
 - (b) dorsal root ganglia
 - (c) dorsal horn (gray matter)
 - (d) ventral horn (gray matter).
- 2. The developing embryo is a hollow sphere of cells, one cell thick during the stage
 - (a) cleavage

(c) gastrula (d) blastula.

- 3. A hog breeder would use a backcross to
 - (a) determine if a particular hog is genotypically pure

(b) polar body

- (c) eliminate chances of congenital malformations
- (c) maintain a pure line of desirable traits
- (d) produce a bigger and healthier strain.

- 4. Characteristics which are common to the Arthropod, Mollusk, Echinoderm and Chordate lines are a (an)
 - (a) segmentation and a coelom
 - (a) endoskeleton and a coelom
 - (c) compound eye and segmentation
 - (d) coelom and a parietal eye.
- 5. Mesoderm, one of the germ layers, gives rise to a group of structures in animals. Which group includes structures of exclusively mesodermal origin ?
 - (a) skin, brain, bladder, vagina
 - (b) muscle, outer layer of digestive tract, cartilage, bone
 - (c) bone, lens of the eye, pars distalis, gall bladder
 - (d) trachea, lungs, stomach, skin.
- 6. Characteristics of epithelial tissues may include

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(a) absorption (b) secretion	(a) blood pressure (b) reabsorption
(c) protection (d) all of the above.	(c) blood flow (meters/sec.).
7. The contractile vacuole of protozoa	(d) osmotic phenomenon.
functions to	15. Which of the following structures are
(a) remove surplus water	NOT considered modifications of the
(b) secrete proteins	cell membrane ?
(c) regulate the pH of the internal milieu	(a) desmosomes
(d) digest food materials.	(b) terminal bars
8. A mink breeder finds that 50 % of the	(c) basement membrane
offspring are aa. What genotype were	(d) microvilli.
their parents ?	16. An aggregation of nerve cell bodies in-
(a) AA x aa (b) Aa x Aa	side the CNS (central nervous system) is
(c) aa x aa (d) Aa x aa.	(a) colony
9. The primitive condition of the cyclosto-	(a) coloriy
(a) account reproduction	17 The most have been loukocutes are the
(a) asexual reproduction	17. The most publicious leukocytes are the
(c) passession of scalar	(a) eosinophis (b) monocytes
(d) toothloss issue	(c) iomphocytes (d) heutophils.
10 The vital centers for control of heart	ing compound (s) increases clotting
rate, respiratory rate, and blood pres-	time
sure are located in the	(a) dicumarol (b) aspirin
(a) cerebellum (b) medulla	(d) all of the above.
(c) pons (d) midbrain.	19. In ant lions the gene for dull teeth is
11. The stimulus that induces migration in	dominant D. The recessive gene d pro-
animals is	duces sharp teeth. Another gene T, when
(a) chemotrophic (b) hydroperiodic	homozygous, produces dark-brown
(c) geotrophic (d) photoperiodic	coats. Its allele t, when homozygous,
12. All of the following may be considered	Tt is chocolate colored. If a chocolate-
as secondary sex characteristics of the	colored, dull-toothed male whose father
male EXCEPT	was sharp toothed is mated to a choco-
(a) increase in sex drive	late, sharp-toothed female, what is the
(b) external genitalia	probability that an albino, sharp-toothed
(c) pattern of hair and beard growth	offspring will be produced ?
(d) development of a deeper voice.	(a) $8/16$ (b) $12/16$ (c) $4/16$ (d) $2/16$.
13. The reflex arc is of utmost importance	20. Blood-sucking insects usually carry
ing is NOT a component of the reflex	parasites in their
arc?	(a) lungs (b) blood
(a) sunanse (b) medulla	(c) salivary glands (d) tentacles.
(c) ventral porn cell (effector)	21. An-related nemolytic anemia of the
(d) departs (receptor)	result when the
14. Filtration in the kidneys results mainly	(a) mother is Rh negative and the foetus is Rh
from	positive

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- (b) father and mother are Rh positive, but the fetus is Rh negative
- (c) mother is Rh positive and the foetus in Rh negative
- (d) father, mother, and fetus are all Rh positive
- 22. During the follicular phase of a normal menstrual cycle ovarian changes occur which are due to pituitary secretions of
 - (a) oxytocin
- (b) LH only
 - (c) FSH and LH (d) vasopressin.
- 23. Body temperature is regulated by the
 - (b) medulla (a) pons
 - (c) thalamus (d) hypothalamus.
- 24. The experiments of Miller and Urey enhanced the validity of Oparin's theory on the origin of life. They essentially
 - (a) discharged electricity into a medium consisting of water vapor, methane, ammonia, and hydrogen
 - (b) were able to produce simple viruses
 - (c) were able to produce a simple form of living organism after placing DNA in mixture of hydrogen and oxygen and irradiating it
 - (d) were able to produce bacteria.
- 25. Which of the following patterns would you expect to find in the blood one hour after a rich meal ?

Insulin

low

low

high

no change

- Blood Sugar
- (a) high
- (b) low
- (c) high
- (d) no change
- 26. Vigorous exercise will cause muscle fatigue which is primarily due to
 - (a) a sodium and potassium imbalance
 - (b) the accumulation of carbon dioxide
 - (c) the accumulation of lactic acid
 - (d) the accurputation of ADP
- 27. Man can become infected with trichinosis by
 - (a) eating poorly cooked beef
 - (b) eating poorly cooked pork
 - (c) wading in polluted water or eating raw fish

- (d) cutting himself while dressing wild game.
- 28. The state of a continuously mild or partial contraction of a muscle is denoted as
 - (a) tonus

(c) a twitch

- (b) tetanus
- (d) a reflex contraction.
- 29. Which of the following type (s) of lens (es) is used to correct the vision of a near-sighted individual 2th
 - (a) biconcave (b) biconvex
 - (d) all of the above. (c) convex
- 30. When a physician informs a patient that his blood pressure reading is 160/90, she refers respectively to
 - (a) systolic pressure of the right ventricle
 - (b) systolic pressure of the aorta and diastolic pressure in the superior vena cava
 - (c) systolic and diastolic pressures of the brachial artery
 - (d) blood pressure in the veins of the arm.

31. A sustained contraction is called

(a) tetany

c tonus

- (b) recovery period
- (d) contraction period.
- 32. The functional role an organism plays in a community is referred to as its
 - (a) niche (b) home range
 - (c) habitat (d) ecosystem.
- 33. Bile, which is important in the digestion of fats, is produced by the
 - (a) liver (b) duodenum
 - (c) stomach (d) lacteals.
- 34. A patient awaiting selective surgery presents the following symptoms. Which of them indicate (s) a heightened activity of the sympathetic portion of his autonomic nervous system?
 - (a) pale skin (b) sweaty palms
 - (c) a yearning for water due to a dry mouth
 - (d) all of the above.
- 35. If a cell is viewed under low power and then under high power, and no fine adjustment is necessary to see it clearly, the microscope is considered

(a) parfocal (b) bifocal
(c) achromatic

(d) apochromatic.

- **36.** In an auto accident the driver suffers complete sectioning of several anterior (ventral) roots of spinal nerves. What would be the result of such a lesion to the regions supplied by those spinal nerves?
 - (a) loss of sensation
 - (b) loss of sensation and motor activity
 - (c) loss of temperature and pain sensation
 - (d) loss of motor activity.
- 37. The plasma membrane of plant and animal cells
 - (a) may not be seen by any microscope
 - (b) contains two layers of lipid between layers of protein
 - (c) is not selectively permeable.
 - (d) can only be visualized with the aid of the electron microscope.

Follicle-stimulating hormone is to estrogen as luteinizing hormone is to

- (a) vasopressin (b) testosterone
- (c) progesterone (d) androgen.
- 39. Nitrogen comprises 78 percent of the atmosphere; the source of this atmospheric nitrogen in due to
 - (a) denitrification by bacteria in the soil
 - (b) combustion of wood and fossil fuels
 - (c) volcanic activity (d) all of the above.
- § Use the following diagram to answer question (40 42)



- During inspiration, intra-alveolar pressure (Palv)
 - (a) equals intrapleural pressure
 - (b) equals atmospheric pressure
 - (c) transiently goes below intrapleural pressure
 - (d) transiently goes above atmospheric pressure.
- 41. The alveolar ventilation per minute refers to the amount of tresh air which reaches the alveolt of the lungs per minute. Alveolar ventilation per minute equals the
 - (a) (tidal volume anatomic dead space) × frequency of breathing
 - (b) tidal volume × frequency of breathing
 - (c) anatomic dead space × frequency of breathing
 - (d physiologic dead space × frequency of breathing.

12. The driving pressure (ΔP) in breathing which causes air to flow into the lungs

- (a) atmospheric pressure minus the intra-alveolar pressure
- (b) the intrapleural pressure (Ppl)
- (c) the intrapleural pressure minus the intraalveolar pressure
- (d) the intra-alveolar (intrapulmonary) pressure (Palv).
- § Genetic ratios are probability ratios. If, for example, we mate (B = black dominant; b = gray recessive) two heterozygous black cows (Bb) and 4 offspring are produced, the ratio of 3 black and 1 gray should be possible. However, what are the chances of all black and all gray litters ?

43. In order for it to be determined whether the phenotype is heterozygous or homozygous you would cross with a dominant phenotype of the above an animal with a genotype

- (a) bb (b) Bb
- (c) BB (d) none of the above



(d)

The optimum temperature required during this period of 21 days is 37°C

(b)

55. The gestation period of a hen is 21 days

(a)

(c)

- (a) (b)
- 56. During the period of water deprivation on the desert, the camel utilizes water stored in the hump on its back.
 - (a) (b) (c)
- 57. There are more colour blind men than woman throughout the world

(a) (b) (c) 58. In coronary heart disease there is impairment

- of heart muscle
 - (a) (b) (c)
- 59. Mitochondria are believed to originate by growth and division of previously existing ones.
 (a) (b) (c)
- AIDS is considered to be one of the deadliest diseases.
 - (a) (b)

(d).

Fatty substance occurring in the hump of the camel following metabolism yield water called 'metabolic water'.

(d) Colour blindness is a sex-linked disease resulting from a recessive gene on the chromosomes.

(d).

Reduced blood sapply

They contain DNA and Bibosomes.

Its virus destroys suppresser T lymphocytes.

(d).

PART IV. GENERAL KNOWLEDGE

(c)

1. Dodge is the name of

(a) Motor-car (b) Hotel

- (c) Term in sports (d) None of the above.
- 2. How did Liaquat Ali Khan, Prime Minster of Pakistan, die in 1951 ?
 - (a) Hanged after a trial
 - (b) By illness (c) Assassinated
 - (d) None of these.
- 3. Bard of Avon is a nickname given to
 - (a) G.B. Shaw (b) Shakespeare
 - (c) Winston Churchill
 - (d) Shelley.

(c) Kaveri

- 4. Cuttack is located on the bank of
 - (a) Godavari o (10) Mahanadi

(d) None of the above.

- 5. Who was the recipient of Jawaharlal Nehru Award for Peace & International understanding for the year 1990 ?
 - (a) Olaf Palme (b) Yassar Arafat
 - (c) Dr. Helumt Kohl
 - (d) Javier Perez de Cuellar.
- 6. Which State leads in India in the production of glassware

- (b) Tamil Nadu
- Karnataka

(a)UP

(d) Maharashtra.

(b) Yamuna

- a (a) Mar
- Which of the following rivers is not a tributary of the Ganga?
 - (a) Kosi
 - (c) Gomti (d) Teesta.
- 8. The Mazgaon Dock has recently constructed
 - (a) Off-shore drilling platforms
 - (b) Submarines (c) Naval ships
 - (d) None of the above.
- 9. Which of these pairs is correct ?
 - (a) Jai Shankar Parsad Kamayani
 - (b) Nank Singh Guide
 - (c) Rabindra Nath Tagore Panchtantra
 - (d) Vishnu Sharma Geetanjali.
- 10. Who created the character Malaprop in 'The Rivals'
 - (a) Dickens (b) Sheridian
 - (c) Marlowe (d) None of these.
- 11. Who discovered transistor ?
 - (a) Galileo
 - (b) W. Shockley
 - (c) Sholes (d) None of these.



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So,

$$\frac{\overline{R}_{(\text{effective})}}{\overline{R}_{(\text{effective})}} = \frac{\overline{2R}}{2R} + \frac{\overline{2R}}{2R} + \frac{\overline{2R}}{2R}$$
$$\frac{1}{R_{(\text{effective})}} = \frac{1+1+1}{2R} = \frac{3}{2R}$$
$$R_{\text{effective}} = \frac{2R}{3}$$

1 1

1

Here, no current will flow in 2r(r+r), because this will behave as null point circuit.

1

4.(a)



Here, r is radius of loop

So, area of loop = πr^2

Therefore, its magnetic moment will be

$$\pi r^2 \times i$$

5.(c)

6.(c) Here C₁ and C₂ are in series. Similarly C₃ and C₄ are also in series. This whole setup is in parallel.



Here, no current will follow the C_5 path because it is null point circuit.

- (a) On account of super position the amplitudes ger added. Since the two waves travelling in opposite directions are sinuites they produced maximum displacement equal to twice the amplitude of either.
- 8. (a) This is so because here voltage leads the current by $\pi/2$ in phase

9. (a)
$$e = -\frac{d\phi}{dt}$$
 or volt = $-\frac{weber}{second}$

- 10. (d) Obtain the value of magnetic field B at distance x from the centre of the coil on the axis. Find the rate of change of B with respect to $x = \frac{dB}{dx}$. Putting the value to zero gives x =
 - R/2.
- 11. (a) First three statements are correct. The fourth statement *alone* is wrong, the fringes are due to reflection and interference.

12. (b)
$$\frac{e}{m} = \frac{1.6 \times 10^{-10}}{9.1 \times 10^{-10}}$$
 Coulomb/kg.

- 13. (b) 14. (b) Check dimensions 15. (b)
- 16. (c) The fall of temperature from H to A is the same as the fall of temperature from H to B. Hence of joining A and B by the conductor, no heat transfer will take place through the conductor.
- 17.(c) 18.(c) 19.(a) 20.(a) 21.(a) 22.(a)

23 ((b) Remember momentum for photon
$$\alpha E$$

and momentum for particle $\alpha \sqrt{E}$

24(6) Use the relation $\rho = \frac{1}{e(n_e \mu_e + n_h \mu_h)}$

- 25. (a) The resultant of force of gravity and force of inertia must be 1 to the surface.
- 26. (c) 27. (b) If the car accelerates for time t_1 , then $at_1 = b(t - t_1)$
- 28. (a) Use the relation

$$p_1 + \frac{1}{2} d v_1^2 = p_2 + \frac{1}{2} d v_2^2$$

for a horizontal tube.

- 29. (a) Reaction N has component in vertical direction equal to the weight of the object. The horizontal component of N provides the centripetal force. Now {ω can be calculated
- 30. (c) Force due to surface tension = 2 I TForce of weight of needle = $\pi \frac{d^2}{4} \times l \times \rho \times g$ Equate the two.

31. (a) At the required displacement, the kinetic energy = $\frac{1}{2} \times$ maximum kinetic energy. This gives sin $\theta = 1/\sqrt{2}$.

- 32. (b) Integrate with respect to time, once.
- 33. (a) Here the two mutually \perp vibrations have phase diff. $\pi/2$ and amplitudes are equal.

34. (b) Note that
$$n = \frac{1}{2l} \sqrt{\frac{T}{\pi r^2 d}}$$

and $\gamma = \frac{T}{\pi r^2} / \text{strain.}$
 $\therefore \frac{T}{\pi r^2} = \gamma \times \text{strain} = \frac{1}{2l} \sqrt{\frac{\gamma \times \text{strain}}{d}}.$

- 35. (b) To show that (d) is wrong, use the relation $P V^{\gamma} = constant.$
- 36. (d) 37.(a) 38.(b)
- 39. (a) Apply Law of Malus and remember that the first plate reduces the intensity to half.

40. (a) 41.(c) 42. (d) We know that
$$C = \frac{1}{\sqrt{\Sigma_0 \ \mu_0}}$$

43. (d) 44. (b) Deflection θ is proportional to heat produced which is proportional to (i)².

CHEMISTRY (ANSWERS WITH HINTS)

- (a) In Bohr's model, an electron in the atom is located at a definite distance from the nucleus and revolving around it with a definite velocity. According to Heisenberg's uncertainty principle, it is impossible to determine simultaneously the exact position and momentum (i.e. velocity) of an electron in the atom.
- (a) According to Bohr's theory, the energy of the electron, E, is related to the nuclear charge Z, and the number of election orbit n, by the equation
- For hydrogen atom, n = 15 so, first I. E. of hydrogen

$$2^{2} = 2.179 \times 10^{-18} \text{ J}$$

second I E. of the is the energy involved in removing electron from He⁺ from its first orbit. Here, Z = 2 an m = 1.

Hence, $\Delta E(He) = 4 \times \Delta E_{(H)}$ = 4 × 2.179 × 10⁻¹⁸J

$$= 8.716 \times 10^{-18}$$
J.

3. (b) The electron configuration of He is 1s² which is also the electron configuration of Li⁺.



Second term on the rt. Nand side is negligible as compared to the first term $\therefore B \alpha \sqrt{h}$

- 46. (d) $v_n \alpha n^2 / Z$. (d) Note that $E = -\frac{V}{2}$
- 49. (a) 50 (a) \$1 (a) 52.(c) 53.(c) 54.(a) 55.(a) 56.(a) 57.(c) \$8.(a) 59.(a) 60.(a)

Since the atomic spectra depend on electron transitions, similar electron configuration species give rise to similar spectra.

- 4. (b) The elements C, Si, Ge, and Sn all belong to group IV A. The coordination of C is limited to 4 as it has no vacant d orbitals available in the valence shell and, so, it cannot form ([CCl₆]²⁻). Other elements have the maximum coordination number of 6.
- 5. (c) The conjugate acid and base differ by H⁺, the acid has H⁺ added to the base : NH₂⁻ + H⁺ ---> NH₃.
- 6. (b) A single spinning electron behaves like a small magnet. Two electrons that are paired in an orbital have opposite spins, and their magnetic moments oppose each other and cancel. The magnetic properties of unpaired electrons cause paramagnetism in atoms containing such electrons. An atom is diamagnetic if all of its electrons are paired.
- (c) The given conditions will favour an endothermic reaction (i.e., a reaction that proceeds with absorption of heat) in which the volume

of the product (s) is less than the volume of the reactant (s).

- 8. (d) The stability of the oxy-acids of chlorine increases with the oxygen content owing to the increasing number of electrons involved in the formation of σ and π bonds. So, the oxidising strength, which depends on the ease of losing oxygen, decreases from HCIO to HCIO₄
- 9. (a) Ag₂CO₃ and Ag₂O are thermally unstable and decompose to give free silver on heating. Ag₂C₂, silver carbide, is formed when acetylene is passed through AgNO₃ soln. and not in this reaction.
- (d) The coordination number of C is limited to 4, hence, it cannot coordinate with water molecules which is essential to undergo hydrolysis. The coordination number of Si, Ge, and Sn can increase to 6.
- 11. (b) 12. (a) In H₂SO₄, HNO₃ and HClO₄, the central atoms, S, N, and Cl, are in their highest oxidation states, i.e., + 6, + 5, and + 7 respectively. So, they can only act as oxidizing agents. The central N atom in HNO₂ is in the oxidation state of + 3 which may increase up to 5 or decrease. Hence, HNO₂ can act as both an oxidizing agent and a reducing agent.
- 13. (b) The general osmotic pressure equation is $\pi v = nkT$, where π is osmotic pressure, where v be volume of the solution, n the number of moles of solute, k is equal to R, the gas constant and T is absolute temperature. From the equation, $\pi = \frac{nkT}{v}$, it follows that decreases in

T or increase in v (by adding) more solvent) will cause osmotic pressure to decrease. Addition of solute will increase n causing osmotic pressure to increase.

14. (a)



They form addition compounds with ethers; one of the lone pairs of electrons on the O atom in the ether is donated to the electrondeficient B atom is $B \times 3$. In boron tribulides, the central B atom is sp^2 hybridized and, therefore, the molecules are planar land not tetrahedral).

16. (b)
$$pOH \neq -\log |OH| = -\log 1 \times 10^{-8} = 8$$

 $pH + pOH = 14$
 $\therefore \qquad pH = 14 - 8 = 6$

17. (c) The pressure exerted by a gas is proportional to the number of its molecules in the container. Suppose, the weight of methane and hydrogen is 16g each. Mol. wt. of CH₄ is 16) so, 16 g methane = N molecules of methane. Mol. wt. of H₂ is 2; so, 16g of hydrogen = 16/2 = 8N molecules. The total no. of molecules = N + 8N = 9N. Hence, the fraction of the total pressure exerted by hydrogen = 8N / 9N = 8 / 9.

18. (d) Here,

 $H^+ + NH_4OH \longrightarrow NH_4^+ + H_2O,$

$$H = -12.27$$
 kcal.

The neutralization may be regarded to proceed in two steps :

i. $NH_4 OH ---> NH_4^+ + OH^-$, $\Delta H_1 = ?$

ii. $H^+ + OH^- - - > H_2O$, $\Delta H_2 = -13.7$ kcal

- So, $\Delta H = \Delta H_1 + \Delta H_2$
- or, $\Delta H_1 = \Delta H \Delta H_2$

= - 12.27 - (- 13.7) = 1.43 kcal.

- (c) Paramagnetism of O₂ molecule suggests the presence of unpaired electron (s). The conventional formula shows all electrons paired.
- 20. (b) The alkane with the given carbon chain is



- Since it has all the four H in CH₄ substituted by CH₃ groups, (a) is correct. Neopentane is the common name for this alkane and, so, (b) is correct. The longest carbon chain consists of 3 carbon atoms and, so, in the IUPAC system it is (c). (d) is the incorrect name.
- 21. (a) The enthalpy of formation of CaCO₃ (s) = Enthalpy of formation of CaO (s) + Enthalpy of formation of CO₂(g) -Enthalpy of the reaction

 $CaCO_3(s) \longrightarrow CaO_3(s) + CO_2(g)$

= -152 kJ - 14.0 kJ - (42 kJ) = -288 kJ.

- 22. (b) It is only in ethyne, CH ≡ CH, that the hydrogen atoms can be replaced by metals, such as Na, Cu, and Ag. These replacement reactions show the acidic character of hydrogen in ethyne.
- 23. (b) A is CH3 · COONH4,

B is CH3 · CO · NH2,

C is $CH_3 \cdot CN$ called methyl cyanide or ace tonitrile.

- 24. (a) Distillation of mixture of Ca-acetate and Ca - formate yields acetaldehyde. Acetone is produced by the distillation of Ca-acetate alone. Acetic acid is not formed when Ca-acetate is heated alone or mixed with Ca-formate.
- 25. (c) Ethylene dissolves in cond. H_2SO_4 forming $C_2H_5 \cdot HSO_4$ by addition across the double bond. Benzene dissolves forming its sulphonic acid. Aniline is a base and readily dissolves in acids. Hexane, an alkane does not dissolve in cond. H_2SO_4 .
- 26. (d) A nucleophilic neagent acts by donating or sharing its electrons. Among the given molecules only : NH3 can act thus. AlCl₃ and BF₃ are electron deficient molecules and $O = C = O^3$ is a saturated molecule.
- 27.(a) 28.(b) 29. (d) Cannizaro's reaction is given by addenodes which have no hydrogen atom on

the alpha carbon, and all the given aldelydes are only of this kind.

- 30. (c) With NaHCO₃ both Ca²⁺ and Mg²⁺ form Ca(HCO₃)₂ or Mg(HCO₃)₂. These are soluble in water and, so, no change is observed. On boiling, these decompose to CaCO₃ or MgCO₃ respectively which being white insoluble substance, cause milkiness.
- 31. (b) Anhydrous AlCl₃ produces an electrophile which facilitates substitution.
- 32. (d) Starch molecule is built up of a large number of α-glucose rings joined (frough oxygen atoms. The ultimate product of its hydrollysis is glucose.
- 33. (b) This test is based on the formation of NaCN for which C and N are both provided by the organic compound. Among the given compounds, only hydrazine, N₂H₄, does not contain earbord it is not an organic compound). So, it does not give the test under reference although it contains nitrogen.
- 34. (The group reagent for group III is NH₄Cl Pollowed by NH₄OH. The purpose of adding NH₄Cl is to suppress the ionization of NH₄OH (NH₄OH → NH⁴⁺ + OH) by

common-ion effect so as to decrease the OH -

ion concentration. At the reduced OH⁻ concentration, the ion products of the group IV metal hydroxides do not exceed their solubility products and, so their precipitation is prevented.

- (c) DDT is dichloro-diphenyl-trichloroethane, (C₆H₄Cl)₂ · CH.CCl₃, made by the condensation of chlorobenzene, C₆H₅Cl, and chloral, CCl₃ · CH(OH)₂.
- 36.(a) 37. (b) Graphite burns to give CO₂. So, standard enthalpy of formation of CO₂ and the heat of combustion when one mole of graphite burns are identical
- 38. (c) Aldehydes, being reducing agents, reduce Tollen's reagent (am.AgNO₃) to produce a mirror of free silver. Ketones are not reducing agents and do not react with Tollen's reagent. With the reagents (a) and (b) both a dehydes and ketones react to give insoluble crystalline

derivatives. With (d) neither the aldehydes nor the ketones react.

- (a) n Heptane contains 7 carbon atoms. Its cyclisation will yield a 7-carbon aromatic hydrocarbon which toluene is.
- 40. (c) On exposure to sunlight and air, CHCl₃ is slowly oxidized to highly poisonous carbonyl chloride, COCl₂, and HCl rendering it unfit for use as anaesthetic. The presence of HCl is tested with AgNO₃ solution
- 41. (b) The protons and neutrons undergo interconversions inside the nucleus through the exchange of positively and negatively charged mesons, π^+ and π^- . The exchange of a π^+ between the proton (p) and neutron (n) in a ${}_1^2$ H nucleus may be represented as

$$p_1 + n_2 \xleftarrow{} n_1 + \pi^+ + n_2 \xleftarrow{} n_1 + p_2$$

Similarly, the exchange of a $\{\pi^- \text{ may be represented as}\}$

 $p_1 + n_2 \leftarrow p_1 + \pi + P_2 \leftarrow n_1 + p_2$.

42. (b) The purity of gold is 100 per cent is 24-carat gold.
 Hence, 18-carat gold is (¹⁸/₂₄) × 100 = 75%

pure. $(-924) \times 100 = 73\%$

- 43. (c) on burning liq H₂ will produce only H₂O(g)
- (a) is incorrect as liq. H_2 is very costly since liquefaction of H_2 (g) involves high operational costs. (b) is irrelevant. (d) is not correct as higher fuels with higher caloritic value are available.
- 44. (d) 45.(a) 46. (c) The rotation about carbon-carbon bond is least hindered when it is a single bond. Etherle has a double bond and ethyne a triple bond. Only, ethane and hexachloroethane have a carbon-carbon single bond. However, the large chlorine atom in hexachloroethane present steric hindrance in contrast to the much smaller hydrogen atoms in ethape
- 47. (d) For nth order reaction, units of $k = concn.^{(n-1)} Time^{-1}$

For zero order rate equation n = o;

.: units are

 $concn.^{-1} Time^{-1} = mol L^{-1} sec^{-1}.$

- 48. (d) This linkage is called the peptide linkage.
- 49. (d) 50. (c) Isoelectronic ions have the same electron configurations and, therefore, the same number of electrons. The atomic number of B, C, N, O, and S are 5, 6, 1.8 and 16 respectively. The number of electrons in $SO_3^{2^-}$ is 42; in other ions, 32.
- 51.(a) 12g. of C contains 6.023×10^{23} atoms and 27g of Al also contains 6.023×10^{23} atoms. These two are grain atomic masses of carbon and aluminium respectively, hence, reason is a correct explanation for assertion.
- 52.(d) Sucrose $(C_{12}H_{12}O_{11})$, is not the sweetest in taste, hence, assertion is not correct.
- 53.(c) it is true that potassium cannot be obtained by the electrolysis of fused KCl in molten CaCl. But the reason is incorrect because it has nothing to doe with solvation of K in CaOl₂, it is due to the fact that the standard electrode potential of these elements.
- 54.(a) Violet or blue light have maximum energy in visible ray. If from element first, ejection of electrons are possible even with other colour of light then it can eject electrons in lower energy of light also. But for second element it can eject its photoelectron in violet light means it requires high energy (high threshold energy)
- 55.(a) It is true that cyclo butane is less stable than cyclopentane because in cyclobutane the bond angle is less i.e., 90° whereas in cyclopentane bond angle is 108°. Due to this fact cyclobutane face more internal strain as compared to cyclopentane. Generally speaking, if bond angle is less internal strain is more, hence, stability is less.
- 56.(d) (C₆H₅—CH₂Cl), Benzoyl chloride cannot be used in the preparation of tertiary amine. For the preparation of tertiary amine aniline is required

$$C_6H_5NH_2 \longrightarrow C_6H_5NHCH_3$$

-HCl

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57.(c) Since HCHO contains double bond



Meaning one sigma bond and one π -bond. Therefore, the hybridization of carbon here is sp^2 . Hence, reason is incorrect.

58.(d) There is no difference in energy level between $2p_x$ and $2p_y$, therefore, no spectral lines will form. Hence, assertion is incorrect.

BIOLOGY (ANSWERS WITH EXPLANATIONS)

- (d) The gray matter of the spinal cord is divided into two (2) components : motor and receptor. The motor part is comprised of the ventral and intermediolateral columns and gives rise to the ventral roots. Ventral horn cells supply voluntary muscles; intermediolateral cells give rise to preganglionic sympathetic fibers of the thoraco-lumbar system. The receptor portion is located in the dorsal horn. The white matter of the spinal cord is composed of nerve fibers in a network of connective tissue.
- 2. (d) Development in animals results from the cleavage divisions of the zygote. The zygote divides first into two cells, then these divide into four, and so on, until it befores a cell mass called the morula. Through more divisions the morula becomes a hollow ball of cells which is called the blasula
- 3. (a) A backcross consists of crossing a dominant phenotype with a pure homozygous recessive. In this manner the breeder determines if the phenotype is heterozygous or homozygous.
- 4. (a) This is the general body plan, a slight modification as found in the annelids
- 5. (b) Mesoderm is the middle layer of the three primary germ layers. The following are considered to be of mesodermal origin :
 - 1. connective tissue, cartilage, and bone
 - 2. striated and smooth muscle
 - 3. blood and lymph cells

- 59.(c) Vinyl group i.e. --CH == CH₂ is electron deficient in nature that is why it cannot donate electrons, on contrast it can withdraw electron. Hence, reason is incorrect.
- 60.(b) Both assertion and reason are correct, but the correct explanation for assertion is

the Pauli's exclusion principle which states that "No two electrons in an atom can have all the four sets of quantum numbers identical" If 2s³ electronic configuration is existing then two electron will show all the four set of quantum number identical which is impossible and violates Pauli's exclusion principle.

AS WITH EAFLANNA DUDAS

- 4. walls of the circulatory system
- 5. genito-uninary system
- 6. spleen
- 6. (d) Epithelium is a group of cells forming a tissize Epithelium lines the gut, the respiratory system, the genito-urinary system and forms the epidermis. It, therefore, can protect, seciete, and absorb.
 - (Va) A contractile vacuole is found in freshwater protozoa; it periodically expels water to the outside. In this manner excess water leaves the cell. Due to its osmotic relationship with its environment, water is entering and the cell must maintain the water level of its protoplasm.
- 8. (d) Use your basic genetic knowledge
 - 1. 100 % aa 2. 25 % AA, 50 % Aa, 25 % aa
 - 3. 100 Aa 4. 50 % Aa, 50 % aa.
- 9. (b) The class Cyclostomata of the phylum Chordata and sub-phylum Craniata are jawless, finless, without scales or bony plates, have a sucking mouth and possess 6-14 gill slits in the adult. The cyclostomes are the lampreys and hag-fishes.
- 10. (b) The medulla is a part of the brain stem and connects to the spinal cord at the foramen magnum. The following cranial nerves are associated with the medulla: a, XII- hypoglossal nerve; b, XI-- spinal accessory nerve; c, X-- vagus nerve; d, IX --- glossopharyngeal

nerve; e, VIII -- stato-acoustic nerve; and f, portions of the facial nerve (VII). The vagus nerve (X) is the most important parasympathetic nerve. Stimulation of vagal fibers slows the heart rate: constricts the smooth muscles of the bronchial tree: stimulates secretion by the bronchial mucosa; and promotes peristalsis, gastric, and pancreatic secretions. Blood pressure control also involves aortic body, carotid sinus, and carotid body receptor modulation by the glossopharyngeal (IX) and vagus (X) nerves.

- 11. (d) Alternating periods of light and darkness and the proportion thereof is extremely important to the functioning (cycles) of plant and animal life observed
- 12. (b) At the time of puberty usually an increase in sex drive, beard growth, and development of a deeper voice are experienced. The external genitalia is part of the organism and will develop and grow as the organism does. It is genetically determined and is a primary characteristic of the male
- 13. (b) Reception via afferent (sensory) receptors, conduction via sensory fibers to the central. nervous system (spinal cord), and propagation of the impulses to the efferent (motor) system will then result in appropriate action. Usually most reflex arcs include one association neuron in the spinal cord between their afferent and efferent fibers. The medula is not a part of the spinal cord; it is a part) of the brain, and usually reflex arcs do not utilize higher centers.
- 14. (a) The peculiar features of renal circulation -- such as the renal arteries originating directly from the aorta, the glomerulo-capillary arrangement, and differences in calibres of the afferent and efferent vessels--indicate that blood pressure is of great functional significance for the production of urine. The vascular component probably plays an important role in the filtration process
- 15. (c) Directly underlying epithelium is found a homogenous, noncellular material, composed of reticular fibers and protein polysaccharides which serves to bind down the tissue; this structure is the basement membrane

- 16. (d) This is a definition and should be memorized
- 17. (d) The percentage of white blood cells varies as listed

20-25 %

or less.

3-8 %

Agranular cells :

- lymphocytes
- 2. monocutes
- Granular cells:
- 1. neutrophils
- eosinophils
- 3. basophils
- 18. (d) An anticoagulant is a substance that prevents or retards coagulation of blood. Heparin is an acid mucopolysaccharide; it occurs most abundantly in the liver. Aspirin (acetylsalicylic acid) is an analgesic, antipyretic, antirheumatic compound that DOSSESSES anticoagulant properties, Dicumarol is a trademark for bishydroxycoumarin an excellent anticoagulant.
- 19. d dull teeth D sharp teeth - d dark-brown - T
 - albino t

chocolate - Tt

- The male is TtDd; the female Ttdd; we want ttdd offspring; what is the proportion ? The male provides us with the following TD, Td, tD, td. The female provides us with the following Td, Td, td, td. Therefore, 2/16 of the offspring will be ttdd.
- 20. (c) Salivary secretions come readily into contact with the host when bitten by an insect and parasites can be transmitted via this mode
- 21. (a) Multiple alleles determine the human blood types. The common blood types are : A, B, AB, and O. Red blood cells of a person classified as "Type A" contain " Agglutinogen A" and their serum contains "Agglutinin b." Type AB contains agglutinogens A and B but no agglutinins. Type O possesses no agglutinogens but the serum carries a + b agglutinins. Rhesus (Rh) agglutinogen is present in humans and is represented by a dominant gene R. The agglutinogen of an Rh positive fetus passes across the placenta, enters the maternal blood stream and elicits the production of an agglutinin (antibody) by the mother. The agglutinin passes into the circula-

tion of the fetus and if present in sufficient concentration can produce agglutination, at times fatal to the developing fetus.

- 22. (c) The reproductive cycle is under hormonal regulation; gonadotropic hormones of the pituitary (anterior lobe) stimulate the ovaries to produce a mature egg. The pituitary and ovaries have a reciprocal effect upon each other. FSH (follicle stimulating hormone) from the pituitary elicits estrogen production from the developing follicle. When estrogen concentration reaches a certain blood level, it inhibits FSH production. At that time the egg is discharged and the cells lining the follicle come under the influence of another gonadotropin LH (luteinizing hormone) which influences the development of the corpus luteum. The corpus luteum produces the hormone progesterone which influences the wall of the uterus in preparation for implantation. As the concentration of progesterone rises, LH production is checked. If fertilization has occurred, the production of FSH is curtailed throughout the period of gestation through the production of estrogen by the placenta and ovary. If fertilization does not occur, the cycle begins anew.
- 23. (d) Many activities are attributed to the hypothalamus. Lesions of this area may produce diabetes insipidus, obesity, sexual distrophy, and loss of temperature control
- 24. (a) The mystery of the origin of life still eludes us. Two basic concepts are proposed: I. Vitalistic - a vital force created life; 2 Mechanistic forces of nature were instrumental. Oparin suggested that the primitive atmosphere was made up of gases like methane, ammonia, hydrogen, and water vapor. Miller discharged electricity through the above environment and found after a week, a variety of organic compounds, including amino acids were produced. Combinations of these then could theoretically have led to the build-up of complex molecules and eventually protoplasm.
- 25. (c) Kangerhans described the beta cells (within the islets of Langerhans) of the pancreas which produce insulin that affects the metabolism of glucose directly. Fat and protein are indirectly affected. After a meal the

level of blood sugar rises eliciting the production of insulin which stimulates the absorption of glucose by the cells and helps in its conversion to glycogen. Insulin deficiency leads to high blood sugar levels and the disease called diabetes mellitus.

- 26. (c) The cause of muscle fatigue is said to be the accumulated anaerobically produced lactic acid. Lactic acid may later⁰ be broken down into carbon dioxide and water for elimination, or it may be converted into glycogen and stored for future use
- 27. (b) This is a disease which results from eating poorly cooked pork which contains *Trichinella* spiralis. Ecsinophilia, hausea, fever, diarrhea stiffness, and painful swelling of muscles are characteristic.
- 28. (a) Tonus refers to muscular activity in which a shortened condition is maintained for a prolonged period. Visceral muscle is the outstanding example. The word tonus can be applied to any sustained process which is the result of probable regularly repeated excitation.
- (a) Anterior-posterior diameters of eyeballs vary. A long eye is considered near-sighted or myopic; light rays come to focus before they reach the retina; therefore, a concave lens if needed for correction. A short eye results in far-sightness or hypermetropia; light rays would come to focus in back of the retina and, therefore, a convex lens is needed for correction.
- 30. (c) Blood pressure is usually measured by placing the sphygmomanometer cuff around the arm compressing the brachial artery and vein. Maximum blood pressure is obtained during ventricular contraction (systole); in our case 160. Minimum blood pressure indicates ventricular rest (diastole); in our case 90
- 31. (a) If more than two stimuli are given to a muscle in rapid succession, a partial fusion of all contractions results. The contractions occur before relaxation can take place or is completed. If a contraction is steadily maintained and no relaxation occurs between separate stimuli, the contraction is known as tetanus.

- 32. (a) A niche is defined as the position or status that an organism occupies with respect to the other organisms with which it associates.
- 33. (a) Bile is secreted by the liver, stored and concentrated in the gall bladder and poured into the duodenum. It contains bile salts, cholesterol, lecithin, fat, pigments, and mucin. It aids in the emulsification, digestion, and absorption of fat. It contributes to the alkalinization of the intestines.
- 34. (d) The autonomic nervous system innervates all smooth muscle, and glands. The autonomic nervous system is divided into a sympathetic (flight and fight) component and parasympathetic (maintains homeostasis) component. It exerts important influences on the intrinsic eye musculature; skin glands; and the cardiovascular, respiratory, endocrine, and reproductive systems. Fear, rage, pain, etc., evoke sympathetic activity which mobilizes the resources of the body. Gastrointestinal activity is curtailed; heart rate and blood pressure increase; and coronary arteries and bronchioles dilate.
- 35. (a) In a parfocal optical microscope the objective lenses are so constructed or mounted that one may change from one to another and the image remains focused; the lenses have focal points in the same plane
- 36. (d) The cell bodies of the motor (efferent) system are located in the ventral horos (gray matter) of the spinal cord and their fibers leave the cord via ventral (anterior) roots which join with the dorsal (sensory) roots to form a spinal nerve. If a spinal nerve were sectioned, loss of both sensation and motor activity would be experienced. In this case only motor functions were interrupted
- 37. (b) The cell membrane is semipermeable, can be resolved by the electron microscope, is about 75 Å wide and appears on electron micrographs as two (2) dark lines with a light space between them. Evidence indicates that the two bordening dark lines are composed of proteins while the middle (light) layer contains lipids
- 38. (c) See also question 22. FSH stimulates the production of estrogen by the developing fol-

licle. LH stimulates the production of progesterone by the corpus luteum.

- 39. (d) Nitrogen comprises 78 % of the atmosphere. Denitrification by bacteria results in NO₃ being broken down into nitrogen and oxygen. Combustion and volcanic activity also play a part in the release of nitrogen to the atmosphere. Nitrogen as No in the air is, however, of no use to plants. Plants require ions of ammonia (NH₃), nitrites (NO₂) or the nitrates (NO₃) discussed above.
- The answers to questions (40 42) are self explanatory.
- 40.(d) 41.(a) 42.(a)
- 43. (a) In order for the breeder to determine if a line is genotypically pure a backcross is used. A backcross consists of crossing a dominant phenotype with a pure homozygous recessive (in our case bb)
- 44. (d) To produce all black cows (BB or Bb, 3 out of 4) we)must multiply

$$\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} = \frac{81}{256},$$

45, te) To produce all gray cows (bb, 1 out of 4) Wwe must multiply

$$\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times = \frac{1}{256}.$$

- 46.(b) 47.(a) 48.(c). The staircase phenomenon or treppe is due to a gradual increase in the extent of muscle contraction; a limit will be reached after rapid repeated stimuli. Fatigue is the decreased response of the nerve to stimulation.
- (c) Mesoderm is the germ layer of origin of the skeletal system
- 50. (c) Ribosomes can be free floating or they may be attached to the endoplasmic reticulum which is then called rough endoplasmic reticulum (RER) 51 (b) 52 (c) 53 (c) 54 (c) 55 (d) 56 (d) 57 (b)

51.(b) 52.(c) 53.(c) 54.(c) 55.(d) 56.(d) 57.(b) 58.(a) 59.(b) 60.(a)

General Knowledge

1.(a) 2.(c) 3.(b) 4.(b) 5.(b) 6.(a) 7.(d) 8.(a) 9.(a) 10.(b) 11.(b) 12.(a) 13.(b) 14.(c) 15.(a) 16.(a) 17.(a) 18.(a) 19.(a) 20.(b) Max. Time : $3\frac{1}{2}$

PART A. PHYSICS

- 1. Car A is moving with a speed of 36 km h⁻¹ on a two - lane roads. Two cars B and C, each moving with a speed of 54 km h⁻¹ in opposite directions on the other lane are approaching car A. At a certain instant when the distance AB = distance AC = 1 km, the driver of car B decides to overtake A before C does. What must be the minimum acceleration of car B so as to avoid in accident?
 - (1) 4 ms^{-2} (2) 3 ms^{-2} (3) 2 ms^{-2} (4) 1 ms^{-2}
- 2. The momentum of a body increases by 20%. What is the percentage increase in its kinetic energy?

(1) 60 (2) 52 (3) 44 (4) 36

- 3. blocks Two of equal mass $m_1 = m_2 = 3 \text{ kg}$, connected by a light string, are placed on a horizontal surface which is not frictionless. If a force) of 20 N is applied in the horizontal direction on a block, the acceleration of each block is 0.5 ms^{-2} . Assuming that the frictional forces on the two blocks are equal, the tension in the string will be
 - (1) 60 N (3) 20 N

1000

4. A man P of mass 80 kg runs up a staircase in 12 seconds. Another man Q of mass 60 kg runs up the same staircase in 11 seconds. What is the ratio of the power developed by P to that by Q?

(1) 11/9 (2) 49/33 (3) 12/11 (4) 4/3

5. A molecule consists of two atoms, each of mass m, separated by a distance a. The moment of inertia of the molecule about its centre of mass is

Max. Marks 20

- (1) $\frac{1}{4}$ ma² (3) 2 ma²
- 6. An earth satellite is kept moving in orbit by the centrinetal force provided by
 - (1) the gravitational attraction f the earth
 - (2) the gravitational attraction of the sun
 - (3) the ejection of hot gases from its exhaust
 - (4) the burning of fuel in its engine
- 7. A boat carrying a number of large stones is floating in a water tank. What will happen to the water level if the stones are unloaded into the water? The water levels
 - (4) rise till half the number of stones are unloaded and then begins to fall.
- 8. A capillary tube or radius r is immersed in water and water rises in it to a height. The mass of water in the capillary tube is 5g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is

(1) 10 g (2) 20 g (3) 5.0 g (D) 2.5 g

9. Two wires A and B of the same material have their lengths in the ratio of 1 : 2 and their diameters in the ratio of 2 : 1. If they are stretched with the same force, the ratio of the increase in the length of A to that of B will be

(1) 1 : 4	(2) 1 : 8
(3) 4 . 1	(4) 1 . 2

10. If there are no heat losses, the heat released by the condensation of x grams of steam at 100°C. The ratio y/x is nearly

(1)4(2)3(3)2(4)1

11. Which one of the following is the correct relationship between pressure P and volume V of an ideal gas undergoing an adiabatic expansion (y is the ratio of the two specific heats)?

(1)
$$PV^{l/\gamma} = constant$$
 (2) $PV^{\gamma/\gamma - 1} = constant$

(3) $PV^{\gamma} = constant$ (4) $PV^{\gamma - 1} = constant$

12. A spring of of force constant k is cut into three equal pieces. If these three pieces are connected in parallel, the force constant of the combination will be

- 13. If the Young's modulus of the material of a rod is 2×10^{11} N m⁻² and is density is 8000 kg m⁻³, the time taken by a sound wave to traverse 1 m of the rod will be
 - $(1) 2 \times 10^{-2} s$ (2) $10^{-2} s$ (3) 10^{-4} s (4) 2×10^{-4} s
- 14. The electric potentials V (in volt) varies with x (in metre) according to the) relation $V + 5 + 4x^2$. The force experienced by a negative charge of 2×10^{-6} C located at x = 0.5 m is

(1) 8×10^{-6} N (2) 2×10^{-6} N (3) 4×10^{-6} N (4) 6×10^{-6} N **15. A uniform copper wire of length 1 m** and cross -sectional area $5 \times 10^{-7} \text{ m}^2$ carries a current of 1 A. Assuming that there are 8×10^{28} free electrons per m³ in copper, how long will en electron takes to drift from one end of the wire to the other ?

 $(2)3.2 \times 10^3$ s (1) 6.4 10 $(4)0.8 \times 10^3$ s 1.6×10

16. The maximum power rating of a 20 Ω resistor is 1 kW. If the integral resistance of the dc source is negligible .

then this resistor can be safely used across a

- (1) 150 V dc source (2) 200 V dc source
- (3) 50 V dc source (4) None of these
- 17. A string of length L = 1m is fixed at one end and carries a mass of 100g at the other end. the string makes $\sqrt{5}/\pi$ revolutions per second about vertical axis passing through its second end. The tension in the string is (

18. A proton (mass = 1.7×10^{-27} kg) moves with speed of 5×10^5 ms⁻¹ in a direction perpendicular to a magnetic field of 0.17 T. The acceleration of the proton is

(2) 4×10^{12} ms⁻² (1) 8×10^{12} $(3) 2 \times 10^{12} \text{ ms}^{-2}$ (4) zero

19. The wire shown in figure (below) carries a current of 40 A. If r = 3.14 cm, the magnetic field at point P will be



20. In Young's double - slit experiment, the intensity of light at a point on the screen where the path difference is λ is K units. What is the intensity of light at a point where the path difference is $\lambda/3$; λ being the wavelength of light used?

(1) K (2) K/2

21. What is the luminous intensity of a lamp which produces an illuminance of 12 lux at a distance of 5.0 m from it?

(3) K/3

(4) K/4

(1) 300 cd	(2) 400 cd	
(3) 100 cd	(4) 200 cd	

22. A monoenergetic electron beam with electron speed of 5.28×10^6 ms⁻¹ is subjected to a magnetic field of 2×10^{-4} T normal to the back velocity. What is the radius of the circular path traced by the beam ? Given *e/m* for electron = 1.76×10^{11} C kg⁻¹.

(1) 20 cm (2) 15 cm (3) 10 cm (4) 5 cm

23. The energy of a photon corresponding to the visible light of maximum wavelength is approximately equal to

(1) 2.0 eV	(2) 2.5 eV
------------	------------

- (3) 1.0 eV (4) 1.5 eV
- 24. A light signal (photon) cannot escape from the surface of a
 - (1) neutron star (2) black hole
 - (3) red giant (4) white dwarf
- 25. On increasing the reverse bias to a large value in a pn junction diode, the current
 - (1) remains fixed (2) suddenly increased

(2) 1

(4) both 0 and 1/

(2) calcite

(4) both (1)&(3

- (3) decreases slowly (4) Increased slowly
- 26. In Boolena algebra $\overline{1} + \overline{1}$ equals
 - (1)2
 - (3)0
- 27. Which of the following crystals have a hexagonal structure ?
 - (1) zinc
 - (3) quartz.
- 28. When a β -particle is emitted from a nucleus, the neutron-proton ratio
 - (1) is increased (2) is decreased
 - (3) remains the same
 - (4) first decreases they increases
- 29. If the end A of a wire is irradiated with alpha rays and the end B is irradiated with beta rays, then
 - (1) a current will flow from B to A
 - (2) a current will flow from A to B
 - (3) there will be no current in the wire

(4) a curbent will flow from each end to the mid point of the wire

- 30. If A, Z and N denote the mass number , the atomic number and the neutron number for a given nucleus, then which of the following statement is incorrect?
 - (1) isobar have the same A but different Z and N
 - (2)isotopes have the same Z but different N and A
 - (3) isotones have the same but different A and Z
 - (4) N = Z + A
- 31. Moving with the same velocity, which of the following has the longest de Broglie wavelength P
 - (1) neutron (()) proton

(3) β - particle (3) α - particle

- 32. A concave lens of focal length 20 cm placed in centact with a plane mirror acts as a
 - (1) Concave mirror of focal length 10 cm
 - () one we mirror of focal length 60 cm
 - 3 concave mirror of focal length 40 cm
- (4) convex mirror of focal length 10 cm

33. If a graph is plotted between 1/v and 1/u, which one of the graphs shown in figure is approximately correct ?



34. A particle of mass m and q is released from rest in a uniform electric field E. The kinetic energy attained by the particle, after moving a distance x is

(1) $q^2 Ex$	(2) q Ex	
(3) q $E^2 x$	(4) q Ex^2	

35. A proton and an alpha particle enter a uniform magnetic field with the same

velocity. The period of rotation of the alpha particle will be

- the same as that of proton
- (2) three times that of proton
- (3) two times that of proton
- (4) four times that of proton
- 36. A battery of emf 10 V is connected to resistances as shown in the figure. The potential difference between points A and B is



37. A uniform wire of resistance 4 Ω is bent into the form of a circle of radius r. A specimen of the same wire is connected along the diameter of the circle. What is the equivalent resistance across the ends of this wire ?

(1)
$$\frac{1}{(1+\pi)} \Omega$$
 (2) $\frac{2}{(2+\pi)} \Omega$
(3) $\frac{4}{(4+\pi)} \Omega$ (4) $\frac{3}{(3+\pi)} \Omega$

38. Two waves are represented by the following equations :

$$-y_1 = 5 \sin 2\pi (10(t-0.1 x))$$

and
$$y_2 = 10 \sin 2\pi ((2012 + 0.2) x)$$

The ratio of intensities $1_2 \mathcal{O}_1$ will be 000 (1) 1) 1

- 39. The wavelength of light of a particular wavelength received from a galaxy is measured one earth and is found to be 5% more that its wavelength. It follows that the galaxy is
 - (1) going away from the earth with a speed $1.5 \times 10^7 \, ms^{-1}$
 - (2) approaching the earth with a speed $1.5 \times 10^7 \, ms^{-1}$

- (3) going away from the earth with a speed $3 \times 10^7 \, ms^{-1}$
- (4) approaching the earth with a speed $3 \times 10^7 \, ms^{-1}$
- 40. Two rods of the same length and material transfer a given amount of heat in 12 seconds when they are joined end to end. But when they are joined lengthwise, they will transfer the same amount of heat, in the same conditions, in

(3) 245 (1) 1.5s (2) 48s (4) 3s

41. A soap bubble is vacuum has a radius of 3 cm and another soap bubble in vac-uum has a radius of 4 cm. If the two bubcoalesce bles under isothermal conditionals the radius of the new bubble will be

(4) 2.3 cm

42. A concrete sphere of radius R has a cavity of radius r which is packed with sawdust. The relative densities of congrete and sawdust are 2.4 and 0.3 respectively. For this sphere to float with its entire volume submerged under water, the ratio of the mass of concrete to the mass of sawdust will be



A body of mass m = 1 kg is dropped from a height h = 40 cm on a horizontal platform fixed to one end of an elastic spring, the other being fixed to a base,

as shown in figure. As a result the spring is compressed by an amount x = 10 cm. What is the force constant of the spring. Take g = 10 ms⁻².

(1) 1200 Nm^{-1} (2) 1000 Nm^{-1}

(3) 800 Nm^{-1} (4) 600 Nm^{-1}

- 44. Choose the correct statement(s) from the following :
 - The relative velocity of two bodies in a head - on collision remains unchanged in magnitude and direction
 - (2) The general form of Newton's second law of motion is F_{ext} = ma
 - (3) A body can have energy and yet no momentum
 - (4) None of the above.
- 45. A body of mass 0.5 kg is whirled in a vertical circle at an angular frequency of 10 rad s⁻¹. If the radius of the circle is 0.5 m, what is the tension in the string when the body is at the top of the circle ? Take $g = 10 \text{ ms}^{-2}$.
 - (1) 40 N (2) 30 N (3) 20 N (4) 10 N
- 46. A body thrown along a frictionless inclined plane of angle of inclination 30° covers a distance of 40 m along the plane. If the body is projected with the same speed at angle of 30° with the ground, it will have a range of (take $g = 10 \text{ ms}^{-2}$)
 - (1) 40 m (3) 20 √3 m
- (4) 20 √2 m
- 47. Which one of the following relations is dimensionally consistent? A liquid of coefficient of viscosity η is flowing

steadily through a capillary tube of radius r and length 1. If is the volume of the liquid flowing per second, the pressure difference pat the ends of the tube is given by



- 48. The electric current passing thorough a metallic wire produces heat because of
 - (1) Collisions of the conduction electrons with the atoms of the metallic wire
 - (2) The energy released in the ionization of the atoms of the metal
 - (3) Coffisions of conduction electrons with each other

(4) Collisions of the atoms of the metal with Deach other.

49. Two parallel wires in free space are 10 om apart and each carries a current of 10 A in the same direction. The force one wire exerts on the other per metre of length is

- (1) 2×10^{-7} N, repulsive
- (2) 2×10^{-7} N, attractive
- (3) 2×10^{-4} N, repulsive
- $(4)2 \times 10^{-4}$ N, attractive
- 50. Vector C is the sum of two vector A and B and vector D is the cross product of vectors A and B. What is the angle between vectors C and D?
 - (1) 180° (2) 90° (3) 60° (4) zero
- § Directions : Q.No 51 to 60 consists of two statements, one labelled the 'Assertion (A)' and the other labelled the 'Reason (R)'. Examine these statements carefully and decide if

(1) If both assertion and reason are true statements and the reason is a correct explanation of the assertion

- (\$1.) Both assertion and reason are true statements but reason is not a correct explanation of the assertion
- (3) If the assertion is true but the reason is a false statement
- (4) If both assertion and reason are false statements

51. Assertion (A): Soft magnetic materials (e.g., Reason (R): Hard magnetic materials (e.g. iron) have a high coercivity and do not demagnetise easily

(1)(2)(3)

- 52. Assertion (A) : Dielectric loss is the energy transformation which occurs in a dielectric in an alternating electric field
 - (1)(2)(3)
- 53. Assertion (A) : In Thomson's experiment all the positive ions with the same value of specific charge are focused on the same parabola irrespective of their velocities.
 - (3)(1)(2)
- 54. Assertion (A): The velocity of an electron in an orbit is inversely proportional tot he square of the radius of the orbit
 - (1)(2)(3)
- 55. Assertion (A): Reciprocal of resistivity is called the specific conductance.
 - (1)(3)(2)
- 56. Assertion (A) : Germanium is a very god conductor of electricity
 - (2)(1)
- 57. Assertion (A) : Illuminance is the luminous flux per unit surface area, when the area is held normal to the beam of light
- (1)(2)58. Assertion (A) : Pressure cooker at high mountains

(1)

(1)

59. Assertion (A) : The Pasched series in the spectrum of hydrogen lies in the ultraviolet region

(2)

(1)

60. Assertion (A) : Many solids have a molar heat capacity close to 25 linol 1 k-1

(3)

(3)

(3)

(3)

steel) have a low coercivity and become temporary magnets

(4)Reason (R) : The alternating displace has a cooling effect.

Reason (R) : The ions of same velocities arrive at different points on the same parabola

(4)

Reason (R) : The angular velocity of the electron is proportional to the radius of the orbit.

Reason (R) : Reciprocal of resistance is called the thermal conductivity

(4)

Reason (R) : The number of density of free electrons for germanium is $8 \times 10^{28} \text{ m}^{-3}$.

Reason (R) : The luminous intensity of the radiant flux per unit angle in that direction.

(4)

(4)

Reason (R) : due to low atmospheric pressure on high mountains the water boils at above 100°C

(4)

Reason (R) : The Paschen series is born of transitions of electrons onto the second orbit from higher orbits

(4)

Reason (R) : The molar heat capacity is the heat capacity per mole

(4)

ANSWERS WITH HINTS & EXPLANATIONS

1. Ans. (4) Let us suppose that cars A and B are moving in the positive x-direction. Then car C is moving in the negative x-direction. Therefore . $v_{A} = +36 \text{ km h}^{-1} = +10 \text{ ms}^{-1}$ $v_{R} = +54 \text{ km h}^{-1} = +15 \text{ ms}^{-1}$ $v_{\rm C} = -54 \, \rm km \, Km \, h^{-1} = 15 \, \rm m s^{-1}$ and The relative velocity B with respect to A is $v_{BA} = v_B - v_A = 15 - 10 = 5 \text{ ms}^{-1}$ The relative velocity of C with respect to A is $v_{CA} = v_C - v_A = -15 - 10 = -25 \text{ ms}^{-1}$ At time t = 0, the distance between A and B = distance between A and C = 1 km = 1000 m. The car C will cover a distance AC = 1000 m and just each car A at a time t given by $t = \frac{AC}{|VCA|} = \frac{1000 \text{ m}}{25 \text{ ms}^{-1}} = 40 \text{ s}$ Car B will overtake car A just before car C does and avoid an accident, if it acquires a minimum acceleration a such or that it covers a distance s = AB = 1000 m in time t = 40 s, travelling at a relative speed u $u = v_{BA} = 5 \text{ ms}^{-1}$. Putting these values in relation $s = ut + \frac{1}{2}at^2$ $1000 = 5 \times 40^{+} \times (40)^{2}$ We get which gives $a = 1 \text{ ms}^{1}$ which in choice (4) 2. Ans. (3) Momentum my increases by 20% if velocity v increases 1.2 v. No, kinetic energy $K = \frac{1}{2}m_0^2$ Increase in KE = $\frac{1}{2}$ m $(1.2v)^2 - \frac{1}{2}$ mv² = $\frac{1}{2}$ mv² (1.44 - 1)

 $= 0.44 \times \frac{1}{2} \text{ mv}^2 = 0.44 \text{ K}.$.: Percentage increase in $KE = \frac{0.44 \text{ K}}{V} \times 100 = 44\%$ Hence the correct choice is (3) 3. Ans. (4) String Refer to the figure, Let f be the frictional force on eachblock Equations (i) and (ii) are modified to and $m_1 = a = T - f - - - - - (i)$ $m_2a = F - T - f - - - - - (ii)$ Subtracting the two equations, we have $(m_1 - m_2) a = 2T - F$ Since $m_1 = m_2$ 0 = 2T - Fwe get $T = \frac{F}{2} = \frac{20}{2} = 10 N$ Hence, the correct choice is (4).

 Ans. (1) Let h be the vertical height of the staircase. Work done by P is

 $W_1 = m_1 gh = 80 gh$

Therefore power developed by P is

 $P_1 = \frac{W_1}{t_1} = \frac{80 \text{ gh}}{12}$

Similarly, power developed by Q is

$$P_2 = \frac{W_2}{t_2} = \frac{60 \text{ gh}}{11}$$

which give $P_1/P_2 = 11/9$. Hence the correct choice is (1)

5. Ans. (2) Since the two atoms have the same mass, the centre of mass is at a distance of a/2 from each atom. Therefore, the moment of inertial of the molecule about its centre of mass is

$$l = m\left(\frac{a}{2}\right)^2 + m\left(\frac{a}{2}\right)2 = \frac{ma^2}{2}$$

Hence the correct choices is (2).

- Ans. (1) The centripetal force is provided by the gravitational attraction of the earth. Hence the correct choice is (1).
- 7. Ans. (2) When stones are unloaded into the water in the tank, the volume of water displaced is equal to the volume of the stones. This is less than the volume of water having weight equal to the weight of stones because the density of stones is greater than that of water. Hence the water level falls, which is choice (2)
- 8. Ans. (1) Mass of water in first tube is

$$m = \pi r^2 h \rho$$

Now, surface tension

$$\sigma = \frac{h\rho gr}{2} = \frac{h\rho gr'}{2}$$

where h' is the height to which water rises in the second tube and r' its radius. Since r' = 2r, h' = h/2

Therefore, the mass of water in the second capillary tube is

m' =
$$\pi r^2 h' \rho = \pi (2r)^2 \frac{h}{2} \rho$$

= $2\pi r^2 h \rho = 2m = 2 \times 5 \approx 10$ g
Hence the correct choice is (1)
9. Ans. (2) Here $l_1 = \frac{FL_1}{\pi r_1^2 Y}$
and $l_2 = \frac{FL_2}{\pi r^2 2Y}$
Therefore, $l_1 = \frac{L_1}{L_2} \times \left(\frac{r_2}{r_1}\right)^2$
Given $L_2 = 2L_2$ and $r_2 = \frac{r_1}{2}$

10. Ans. (2) The latent heat of vaporization of water is very nearly 540 calories per gram. Therefore 'heat released in the condensation

 $k^2 (2)^2$

of x gram of steam = 540 x calories. The latent heat of fusion of ice is very nearly 80 calories. Therefore, heat required to convert

y gram of ice at 0°C to water at

$$100^{\circ}C = 80 + y + 100 y$$

= 180y calories
180 y = 540x

Thus 180 y =

or

Hence the correct choice is (2)

11. Ans. (3) PV^Y = constant

 $\frac{y}{x} = 3$

12. Ans. (2) If a force K is applied to a spring of force constant k and the spring extends by an amount x, then (F + kx)

The extension x preduced in a spring is proportional to its length. Thus, if the spring is cut into three equal pieces, the same force F will produce an extension x/3 in a piece. If k'is the is the force constant of the piece, we

have) Therefore

F = k' x/3 $\frac{k'}{3} = k$ k' = 3k

Thus, the force e constant of each piece is 3k. When springs are connected in parallel, the force constant of the combination is equal to the sum of the individual force constants of the springs so connected. Therefore, the force constant of the combination = 3k + 3k + 3k= 9k. Hence correct choice is (2).

 Ans. (4) The speed of sound wave in the rod is

$$v = \sqrt{\frac{2 \times 10^{11}}{8000}} = 5000 \text{ ms}^{-1}$$

 $\therefore \qquad \text{Time taken is} = 1/5000 = 2 \times 10^{-4} \text{ s.}$ Hence the correct answer is (4)

14. Ans. (1) Electric field

$$E = -\frac{dV}{dx} = -\frac{d}{dx}(5+4x^2) = -8x$$

Force on charge (-q) = -q E = + 8q xAt x = 0.5 m, force $= 8 \times 2 \times 10^{-6} \times 0.5$ $= 8 \times 10^{-6} N$ 15. Ans. (1)

The drift speed of electrons is given by

$$v_d = \frac{1}{enA}$$

If I is the length of the wire, the taken is

$$t = \frac{l}{v_d} = \frac{l e n A}{l}$$

= $\frac{1 \times 1.6 \times 10^{-19} \times 8 \times 10^{28} \times 5 \times 10^{-7}}{1}$
= $6.4 \times 10^3 s$

16. Ans. (3) The maximum power rating of a resistance is the maximum power it can dissipate without melting. If a 20 Ω resistor is connected to a 50 V dc source, the power dissipated as heat is

$$P = \frac{V^2}{R} = \frac{50 \times 50}{20^6} = 125 \text{ W}$$

which is less than 1 kW. Hence the resistor can be safely used across a 50 V source. For 150 V and 200 V dc sources, the powers dissipated respectively are 1.125 kW and 2 kW. Now 1.125 kW and 2 kW are more than the maximum power rating of the resistor. Hence the correct choices are (3).

17. Ans. (2) T =
$$m\omega^2 = 0.1 \times 4\pi^2 \times \frac{5}{\pi^2} = 2N$$

18. Ans. (2) Force F = qvB
 \therefore Acceleration = $\frac{F}{m} = \frac{qvB}{m}$
 $= \frac{1.6 \times 10^{-19} \times 0.10^3 \times 0.17}{10^{-27}}$
 $= 8 \times 10^{12}$ ms. 2



19. Ans. (2) The straight partions of the wire do not contribute because the point P is along them. The field at P is due to 3/4th of the lope of radius r. Then

$$B = \frac{3}{4} \left(\frac{\mu_0 l}{2r}\right) = \frac{3}{4} \times \frac{4\pi \times 10^{-7} \times 40}{3.14 \times 10^{-2}}$$

= 4.8 × 10⁻³ T
Arrs. (4) Path difference $\Delta = \lambda$.

Therefore, phase difference $\phi = \frac{2\pi}{\lambda} \Delta = 2\pi$. Hence intensity at a point where $\Delta = \lambda$ or $\phi = 2\pi$ is $I = I_1 + I_2 + \sqrt{I_1 I_2} \cos \phi$ $= I_1 + I_2 + 2\sqrt{I_1 I_2} \cos 2\pi$ $= I_1 + I_2 + 2\sqrt{I_1 I_2}$ = I + I + 2I = 4I = K units ($\therefore I_1 = I_2 = I$) i.e. $I = I\sqrt{4}$.

The intensity at a point where the path difference is



 \Box Ans). (1) E = 12 lux and r = 0.5 m. Luminous intensity *l* is related to E as

$$E = \frac{1}{r^2}$$

I = Er² = 12 × (5.0)² = 300 cd

22. Ans. (2)The radius of the circular path is

or

$$r = \frac{mv}{eB} = \frac{v}{B (e/m)}$$
$$= \frac{5.28 \times 10^{6}}{2 \times 10^{-4} \times 1.76 \times 10^{11}}$$
$$= 0.15 \text{ m} = 15 \text{ cm}$$

 Ans. (4) The maximum wavelength of visible light is about 800 Å (the red end of the visible spectrum).

The energy of a photon of wavelength

$$\lambda = 8000 \text{ Å} = 8 \times 10^{-7} \text{ m is}$$

$$E = hv = \frac{hc}{\lambda} = \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{8 \times 10^{-7}}$$

$$= 2.5 \times 10^{-19} \text{ J} = 1.5 \text{ eV}$$

- 24. Ans. (2) A black hole has a very small size but enormous surface gravity, so much so that even light signal (photon) cannot escape from its surface. Hence the correct choice is (2)
- 25. Ans. (2) When the reverse bias voltage is increased, a stage is reached when the charge carriers (electrons and holes) are accelerated by the reverse bias voltage and acquire kinetic energy so as to break the covalent bonds in the semiconductor by collisions. The free electrons can do the same and a rapidly increasing number of energetic electrons are produced. Consequently, the reverse current increases very rapidly. Hence the correct answer is (2).
- 26. Ans . (3) $\overline{1} + \overline{1} = 0 + 0 = 0$.
- 27. Ans. (4)
- 28. Ans. (2) β particle is an electron. When a β particle is emitted from a nucleus, the charge number increases by unity, i.e. the number of protons increases by unity. Also the number of neutrons decreases. Hence the neutron proton ratio decreases
- 29. Ans. (2) Alpha rays are positively charged helium nuclei and beta rays are negatively charged electrons.
- 30. Ans. (4) Statement (4) is incorrect. In fact A = Z + N. Statements (1), (2) and (3) are correct, they are the definitions of isobars, isotopes and isotones.
- 31. Ans. (3) β particle is an electron. Since electron has the smallest mass, its de Broglie wavelength is the longest as the velocity of all particles is the same.
- 32. Ans. (4) A concave lens in contact with a plane mirror behaves like a convex mirror because the combination forms only virtual image for any position of the object. The focal length F of the equivalent convex mirror is given by

$$\prod_{\mathbf{f}} \frac{1}{\mathbf{f}} = \frac{2}{\mathbf{f}} + \frac{1}{\mathbf{f}_{\mathbf{m}}} = \frac{2}{\mathbf{f}} \quad (\cdot, \cdot, \mathbf{f}_{\mathbf{m}} = \infty)$$

or
$$F = \frac{f}{2} = \frac{20}{2} = 10 \text{ cm}$$

Hence the correct choir

33. Ans. (4) Since $\frac{1}{v} = -\frac{1}{u} + \frac{1}{f}$, the graph of $\frac{1}{v}$ against $\frac{1}{u}$ is a straight line with a negative

slope. Hence the correct choice is (4)

- 34. Ans. (2) Initial kinetic energy of the particle is zero. The gain in kinetic energy in distance x = decrease in potential energy = work done by the electric field to move the particle through a distance x = force × distance = qEx. Hence the correct answer is (2).
- 35. Ans. (3) The time period of a particle of mass m, charge g moving in a circular path in a magnetic field B is given by

For proton
$$T = \frac{2\pi m}{qB}$$

For proton $T_p = \frac{2\pi m_p}{q_p B}$
For a - particle $T_a = \frac{2\pi m_a}{q_a B}$
 $\therefore \qquad \frac{T_a}{T_p} = \frac{m_a}{m_p} \times \frac{q_p}{q_a}$

Now
$$q_n \alpha = 2q_p$$
 and $m_c = 4m_p$
Hence $T_{\alpha}/T_p = 2$

Hence the correct choice is (3)

 Ans. (1) The total resistance of the circuit t is given by

$$\frac{1}{R} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

which gives $R = 2\Omega$. Therefore , the current in the circuit is

$$I = \frac{V}{R} = \frac{10}{2} = 5 A$$

37. Ans. (3) Circumference of the circle $= 2\pi r$. Therefore, the resistance per unit length of the wire $= R/2\pi r$, where $R = 4\Omega$ is the resistance of the wire. Now, the length of the specimen connected along the diameter = 2r. Therefore, the resistance of this specimen is

$$R_1 = \frac{R}{2\pi r} \times 2r = \frac{R}{\pi}$$

Also, the resistance of each semicircle is

$$R_2 = \frac{R}{2}$$

.: Equivalent resistance R' across the specimen is given by

> $\frac{1}{R'} = \frac{2}{R} + \frac{\pi}{R} = \frac{4+\pi}{R}$ $R' = \frac{R}{4+\pi} = \frac{4}{4+\pi} \Omega$

38. Ans. (1) The intensity of wave is given by

$$I = \frac{1}{2} \rho v A^2 \omega^2$$
$$\frac{I_1}{I_2} = \frac{A_1^2 \omega_1^2}{A_2^2 \omega_2^2}$$

Here

...

...

or

$$A_1 = -5$$
 units, $A_2 = 10$ 10 units
 $\omega_1 = 2\pi$ (10) and $\omega_2 = 2\pi$ (20)

$$\frac{l_1}{l_2} = \left(\frac{-5 \times 10 \pi}{10 \times 4\pi}\right)^2 = \frac{1}{16}$$

Hence the correct choice is (1)

39. Ans. (1) If a source emitting light of wave length λ goes away from the earth, the appar ent wavelength λ' of the light reaching earth is given by

$$\frac{\lambda'}{\lambda} = 1 + \frac{v}{c}$$

where v is the speed of the source of light and c the speed of light. The increase in wavelength $\Delta \lambda = \lambda' - \lambda$ is given



40. Ans. (2) Let Q be the heat transferred. If k is the thermal conductivity of each rod, their equivalent conductivity, when they are joined in series (end to end) is 2k. If t is time of transfer of heat, then

$$Q_1 = \frac{(2k) A \Delta \theta t_1}{l}$$

If the rods are joined in pacallel (length wise) the equivalent conductivity is k/20



41. Ans. (3) In vacuum, there is no atmospheric pressure. The pressure in only due to surface tension. Now, total volume of the two bubbles volume of the big bubble. If r₁ and r₂ are the radii of the two bubbles and R that of the big bubble, then

$$\frac{4\pi}{3} R^3 = \frac{4\pi}{3} r_1^3 + \frac{4\pi}{3} r_2^3$$

or $R^3 = r_1^3 + r_2^3 = (3)^3 + (4)^3 = 91 \text{ cm}^3$
which gives $R = 4.5 \text{ cm}$. Hence the c

0%

 Ans. (3) Let m be the mass of concrete and p its density and let m' be the mass of sawdust and p' its density. Then

$$m = \frac{4\pi}{3} (R^3 - r^3) \rho$$
$$m' = \frac{4\pi}{3} r^3 \rho'$$

and

or

$$\frac{m}{m'} = \frac{R^3 - r^3}{r^3} \cdot \frac{\rho}{\rho'}$$

Since the entire volume $V = \frac{4\pi}{3} R^3$ of the sphere is submerged under water, we have from the principle of flotation,

Weight of concrete + weight of sawdust = weight of volume V of water displaced

or $mg + m'g = V\rho_0 g$

or $m + m' = V \rho_0$

where ρ_0 is the density of water.

Thus

or

$$\frac{4\pi}{3} (R^3 - r^3) \rho + \frac{4\pi}{3} r^3 \rho' = \frac{4\pi}{3} R^3 \rho_0$$

(R³ - r³) d + r³ d' = R³.

where $d = \rho / \rho_0$ are the relative densities of concrete and sawdust respectively. Equation (ii), on simplification, gives

$$\frac{R^{3}}{r^{3}} = \frac{(d-d')}{(d-1)}$$
$$\frac{R^{3}}{r^{3}} - 1 = \frac{(d-d')}{(d-1)} - \frac{R^{3} - r^{3}}{r^{3}} = \frac{(1-d')}{(d-1)}$$

or

or

Using (iii) in (i) and noting that $\frac{\rho}{\rho'} = \frac{d}{d'}$, we have

1

$$\frac{m}{m'} = \frac{(1-d')}{(d-1)} \times \frac{d}{d'} = \frac{(1-0.3)}{(2.4-1)} \times \frac{2.4}{0.3} =$$

Hence the correct choice is (3)

43. Ans. (2) Since the platform is depressed by an amount x, the toward work done on the spring is mg (h + x). This work is stored in the spring n the form of potential energy 1 - 2

 $\frac{1}{2}$ kx². Equating the two we have $\frac{1}{2}$ kx² (mg (h + x)) or k $\frac{2mg(h + x)}{x^2}$ Given, n = 0.4m, m = 1 kg and g = 10 ms⁻². Substituting these values, we get k = 1000 Nm⁻¹. Hence the correct choice is (2). Ans. (3) The general form of Newton's second law is

$$F_{ext} = \frac{dp}{dt} = \frac{d}{dt} (mv) = \frac{mdv}{dt} + v \frac{dm}{dt}$$

The form $F_{ext} = ma$ is valid only if $\frac{dm}{dt} = 0$,

i.e. if mass does not change with time. Hence choice (2) is incorrect. Choice (3) is correct because body at rest may have potential energy and yet no momentum. Choice (1) Is incorrect because the relative velocity remains unchanged in magnitude and gets reserved in direction : $(v_2 - v_1) = -4v_2 - u_1$.

45. Ans. (3) It is clear from below figure , what when the body at the top point A of the circles, its weight no and tension T_1 in the stirring act downwards towards the centre O of the circle and the sum of the two provides the necessary centripetal force. Thus

$$T_{1} + mg = mR\omega^{2}$$

$$T_{1} = m (R\omega^{2} - g)$$

$$A$$

$$T_{1}$$

$$T_{1}$$

$$T_{1}$$

$$T_{1}$$

$$T_{2}$$

 $= 0.5 \times (0.5 \times 10^2 - 10) = 20 \text{ N}$

Thus, the correct choice is (3).

46. Ans . (3) Let u be the initial speed with which the body is thrown along the incline plane.



As shown in figure, the effective deceleration is given by

$$a = g \sin \theta = g \sin 30^{\circ} = \frac{g}{2} = 5 \text{ ms}^{-2}$$

The body stops after converting a distance, say, s along the plane, which is given by

$$-2as=0-u^2$$

or

 $u = \sqrt{2as} = \sqrt{2 \times 5 \times 40} = 20 \text{ ms}^{-1}$

A projectile projected at angle $\theta = 30^{o}$ with this speed will have a angle of

$$R = \frac{u^2 \sin 2\theta}{g}$$
$$= \frac{20 \times 20 \times \sin 60^\circ}{10} = 20\sqrt{3} \,\mathrm{m}$$

Hence the correct is (3)

- Ans. (1) Using the dimensions of all quantities involved it is easy to check that the correct choice is (1).
- Ans. (1) Colliding electrons lose their kinetic energy as heat.
- 49. Ans. (4) $F = \frac{\mu_0 2 i_{1i_2}}{4\pi r} = 10^{-7} \times \frac{2 \times 10 \times 10}{0.1}$ = 2 × 10⁻⁴ N

Direction of current is same, so force is a tractive.

- 50. Ans. (2) Vector C lies in the plane containing vectors A and B, an vector D is perpendicular to both A and B. Hence D must be perpendicular to C. Hence the correct choice is (2).
- 51. Ans. (4) Soft magnetic materials (e.g. iron) have a low coercivity and demognetise easily. Hart magnetic materials (e.g., steel) have a high coercity

and become permanent magnets 52. Ans. (3) The alternating displacement causes thermal motion; it has a heating effect. 53. Ans. (3) Ions of different velocities arrive at different points on the parabola. 54. Ans. (4) The velocity of electron $n = 2\pi r_n$ \Rightarrow $v_n o \propto \frac{1}{r_n}$ The angular velocity of electron nh $w_n \propto \pi m r_n^2$

55. Ans. (3) Specific conductance

specific resistance or resistivity

56. Ans. (4) Germaniumisasemiconductor.

 10^{28} m⁻³ is the number density of free electrons for copper and not for germanium.

7 Ans. (3) Luminous intensity of a source in a given direction is defined as the luminous flux per unit solid angle (not angle) in that direction.

- 58. Ans. (3) Due to low atmospheric pressure on the mountains the water boils at below 100°C
- 59. Ans. (4) Paschen series is formed when an atom comes down from higher energy levels to the third energy level. The series is found in the infra-red region of the spectrum

60. Ans. (2)

AIIMS-2001 (Part B. Chemistry)

1. Among the following gases which one has the lowest root mean square velocity at 25°C :

(1) Cl_2 (2) O_2 (3) N_2 $(4) SO_2$

2. The molecules of a gas A travel four times faster than the molecules of gas B at the same temperature. The ratio of

molecular weights $\left(\frac{M_A}{M_B}\right)$ will be : (1)4(2) 16(3) 1/4 (4) 1/16

- 3. The first energy level that can have d orbitals is :
 - (1)3(2)2
 - (3)4(4) All are correct.
- 4. ¹⁴₆C in the upper atmosphere is formed by the action of neutrons on :

 $(1)^{18}_{8}O$ $(2)_{6}^{12}C$

- $(3)^{17}_{8}O$ $(4)^{\frac{1}{2}4}N$
- 5. The relative abundance of two isotopes of atomic weight 85 and 87 is 75% and 25% respectively. The average atomic weight element is :
 - (1)86.0 (2)40.0
 - (3)85.5 (4)75.5

6. The bond energies F2, Cl2, Br2 and l2 are 37, 58, 46 and 36 kcal respectively. The strongest bond is :

(1) Br₂

- $(3) Cl_2$
- 7. Which possesses the largest ionic radius :

(1) Fe³⁺ (2) Fe (3) Fe^{2+} (4) Fe

8. The time required to decrease the rate of decay to half of its value for a reaction, if Tran 2 hr is :

	(2) 3 hr
(3) 2 br	(4) 1 hr

9. Approximate atomic weight of an element is 26.89. If its equivalent weight is 8.9 the exact atomic weight of element would be :

(2) 26.7

(1) 17.8

(3) 26.89

(4) 8.9

- 10. The reaction $2C + O_2 \rightarrow 2CO_2$ is carries out by taking 24 g carbon and 96 g O2. Which one is limiting reagent :
 - $(1) CO_2$ $(3) O_2$
 - 41 None
- 11. Equivalent weight of NH₃ in the change is :



(4) 17/6

- 12. An ion is reduced to the element when it absorbs 6×10^{20} electrons. The number of equivalents of the ion is :
 - (1) 0.01 (2) 0.10(3) 0.0001
 - (4) 0.001
- 13. 100 ml of 0.2 M H₂SO₄ is added to 100 ml of 0.2 M NaOH. The resulting solution will be
 - (1) Neutral (2) Slightly basic

(3) Acidic d) Basic

- 14. Molal depression of freezing point of water is 1.86° per 1000 g of water. 0.02 mole of urea dissolved in 100 g of water will produce a lowering of temperature of :
 - $(1) 3.72^{\circ}$ $(2) 1.86^{\circ}$ $(3) 0.372^{\circ}$ (4) 0.186°
- 15. If n1, n2 are moles of solute and solvent respectively. Raoult's law can be expressed as :

(1)
$$\frac{P_o - P_s}{P_o} = \frac{n_2}{n_1 + n_2}$$
 (2) $\frac{P_o}{P_s} = \frac{n_2}{n_1 + n_2}$
(3) $P_s / P_o = \frac{n_2}{n_1 + n_2}$ (4) none

- 16. Which oxide of nitrogen is the most stable :
 - (1) $2N_2O(g) \leftarrow \rightarrow 2N_2(g) + O_2(g);$ $K = 3.5 \times 10^{33} \text{ mol litre}^{-1}$
 - (2) $2N_2O_5(g) \leftarrow 2N_2(g) + 5O_2(g);$ $K = 1.2 \times 10^{34} \text{ mol}^{-5} \text{ litre}^{-5}$

3)
$$2NO_2(g) \leftrightarrow N_2(g) + 2O(g);$$

 $K = 6.7 \times 10^{16} \text{ mollitre}^{-1}$

(4) 2NO (g)
$$\leftarrow \rightarrow N_2$$
 (g) + O₂ (g);
K = 2.2 × 10³⁰ mol litre⁻¹

17. HI was heated in a sealed tube at 440°C till the equilibrium was reached, HI was fond to be 22% decomposed. The equilibrium constant for dissociation is :

(1) 1.99	(2) 0.0199
(3) 0 0796	(4) 2 282

18. Which species does not act as Lewis acid :

(1) Cl^{-} (2) SnF_4 (3) $SiCl_4$ (4) $AlCl_3$

19. Some salts although containing two different metallic elements give test for only one of them in solution. Such salts are :

(2) Double salts

 $(2) 0.66 \text{ cm}^{-1}$

 $(4) 0.96 \text{ cm}^{-1}$

(1) Complex salts

- (4) Normal salts (4) None (
- 20. When K₂O is added to water, the solution is basic because it contains a significant concentration of :
 - $(1) O_2^2$
 - (3) OH-
- 21. A conductivity cell has two platinum electrodes of 1.2 cm² area, separated by a distance of 0.8 cm. The cell constant is :
 - (1) 1.5 cm 11 0
 - (3) 0, 66 cm
- 22. In an adiabatic process :

WThere is perfect heart insulation

- (2) The gas is isothermally expanded
- (3) The system exchanges heat surroundings
- (4) Pressure is maintained constant.

23. If, $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l) - 68.4$ kcal. Thus when 1 mole of H_2O is formed from hydrogen and oxygen then 68.4 kcals of heat is :

- (1) Needed for initiating the reaction
- (2) Absorbed (3) Evolved
- (4) None
- 24. Acetic acid is a weak acid because it is :
 - (1) Slightly ionised (2) Unstable
 - (3) An organic acid (4) None
- 25. When metal sulphide has maximum solubility in water :



26 The phenomenon in which white transparent crystal changes into white powder is known as :

- (1) Deliquescence (2) Efflorescence
- (3) Allotropy (4) Sublimation
- 27. The percentage by weight of hydrogen in H₂O₂ is :
 - (1) 5.88 (2) 6.25
 - (3) 25 (4) 50
- 28. On heating quicklime with coke in an electric furnace, we get :
 - (1) Ca and CO_2 (2) CaCO₃
 - (3) CaO (4) CaC₂
- 29. A metallic oxide which imparts purple colour to pottery is :
 - (1) Manganese dioxide
 - (2) Sodium oxide (3) Copper oxide
 - (4) Lead oxide
- 30. The component present in greater proportion in water gas is :

16. Which oxide of nitrogen is the most stable :	(2) The gas is isothermally expanded (3) The system exchanges heat surroundings
(1) $2N_{1}O_{1}(z) \rightarrow 2N_{2}(z) + O_{2}(z)$	(4) Pressure is maintained constant.
$(1) 2N_2O(g) \leftarrow 2N_2(g) + O_2(g);$	
$K = 3.5 \times 10^{50}$ mollitre	23. If, $H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(f) + \frac{1}{2} O_2(g)$
(2) $2N_2O_5(g) \leftarrow 2N_2(g) + 5O_2(g);$	kcal. Thus when 1 mole of H2O is
$K = 1.2 \times 10^{34} \text{ mol}^{-5} \text{ litre}^{-5}$	formed from hydrogen and oxygen then
(3) $2NO_2(g) \leftarrow \rightarrow N_2(g) + 2O(g);$	(1) Needed for initiating the reaction
$K = 6.7 \times 10^{16}$ mollitre ⁻¹	(2) Absorbed (3) Avoived
(4) 2NO (7) \rightarrow N ₁ (7) \rightarrow O ₂ (7)	(4) None
(4) $2 \text{NO}(\text{g}) \leftarrow \text{N}_2(\text{g}) + \text{O}_2(\text{g});$	24. Acetic acid is a weak acid because it
$K = 2.2 \times 10^{50} \text{ mol litre}^{-1}$	15: (1) Slightly Apple (1) Unstable
17. HI was heated in a sealed tube at 440° C will the emploit it is sealed tube at	(3) An onyagic acid (4) None
HI was fond to be 22% decomposed.	25. When metal sulphide has maximum
The equilibrium constant for dissocia-	solubility in water :
tion is :	K _{sp}
(1) 1.99 (2) 0.0199	(D) HgS 10 ⁻⁵⁴
(3) 0.0796 (4) 2.282	(2) cas 10^{-30}
18. Which species does not act as Lewis	$7 = 10^{-20}$
	$(4) 7 nS$ 10^{-22}
(1) Cl (2) SnF ₄ (3) SiCl ₄ (4) AlCl ₃	26. The phenomenon in which white
19. Some salts although containing two different metallic elements give test for	transparent crystal changes into white
only one of them in solution. Such salts	powder is known as :
are :	(1) Deliquescence (2) Efflorescence
(1) Complex salts (2) Double salts	(3) Allotropy (4) Sublimation
(4) Normal salts (4) None	27. The percentage by weight of hydrogen
20. When K_2O is added to water, the solu-	(1) 5 99 (2) 6 25
tion is basic because it contains a sig-	(1) 5.88 (2) 6.25
	28. On heating quicklime with coke in an
	electric furnace, we get :
(3) OH ⁻	(1) Ca and CO_2 (2) CaCO ₃
21. A conductivity cell has two platinum	(3) CaO (4) CaC ₂
a distance of 0.8 cm. The cell constant	29. A metallic oxide which imparts purple
is:	colour to pottery is :
	(1) Manganosa diovida
(1) 1.5 cm^{+1} (2) 0.66 cm ⁻¹	 Manganese dioxide Sodium oxide Conner oxide
(1) 15 cm^{-1} (2) 0.66 cm $^{-1}$ (3) 0.96 cm (4) 0.96 cm $^{-1}$	 (1) Manganese dioxide (2) Sodium oxide (3) Copper oxide (4) Lead oxide
(1) 15 cm ⁻¹ (2) 0.66 cm ⁻¹ (3) 0-66 cm (4) 0.96 cm ⁻¹ 22. In an adiabatic process :	 (1) Manganese dioxide (2) Sodium oxide (3) Copper oxide (4) Lead oxide 30. The component present in greater pro-

nt present in greater pror gas is : FOUNDER OF A.I.M.S. DARE TO SUCCESS TALLAPU REDDY, VENKATA KRISHNA REDDY, M.SC [MATHEMATICS] [CELL: 944 0 345 996]

(1) CH₄ (2) CO₂ 40. Acetylene on reacting with HBr gives : (1) Ethylidene dibromide (3) CO $(4) H_2$ (2) Ethylene bromide 31. A process for making ammonia at high (3) Ethyl bromide temperature and pressure in the pres-(4) Methyl bromide ence of a catalyst is known as : 41. Acrolein is obtained when glycerol (1) Synthesis (2) Gasification hydrated with : (3) Fractional crystallization (1) P2O5 (2) KHSO4 (4) Destructive distillation 32. PCI5 does not react with : (3) Conc. H₂SO₄ (4) All are correct. (2) C6H5OH 42. Acetaldehyde is the rearrangement (1) C₂H₅NH₂ product of : (4) CH₃COOH (3) H₂SO₄ 2 AN alcohol (1) Methyl alcohol 33. Which substance chars when warmed (4) Ethyl alcohol (3) Vinyl alcohol with conc. H₂SO₄: 43. Indicate the organic structure for (1) Carbohydrate (2) Hydrocarbon product expected when 2 - methyl (3) Fat (4) Protein propene is heated with acetyl chloride in presence of anhydrous ZnCl2 : 34. Treatment of CS₂ with excess of Cl₂ gives : (1)CH=C=CH $_2$ C₂H₅Cl (2) CCl₄ O CH3 (3) CHCl₃ (4) Carbon black 35. The blue complex ion formed on addi-CH₃ tion of conc. NH4OH solution to a Cu²⁺ salt solution is : $CH_3 - C - O - C - CH_3$ (1) $[Cu(NH_4)_2]^{2+}$ (2) $[Cu(NH_3)_4]^{2+}$ 0 CH₃ (3) [Cu(NH₃)₂]²⁺ (4) [Cu (NH₄)₄] CH₃ 36. The number of ions formed on dis (3)CH3 - C - CH2 - COCH3 molecule one ing FeSO4 (NH4)2SO4 · 6H2O is A CI (4)4(2)3(3)5(1)637. Homolytic fission of Q Q bond in eth-H ane gives an intermediate in which carb-(4) CH3 - C - CH2 - CO - CH3 on is hybridised : (1) sp²d CH₃ 4) sp³ $(3) sp^2$ 44. C₂H₅OH can be distinguished from 38. Hydrocarbon liquid at STP is : CH₃OH : (1) Pentane (2) Butane (1) By NH3 (2) By HCl (3) Propane (4) Ethane (4) By iodoform test. (3) By solubilities 39. Which of the following is weakly acidic 45. Salicylic acid when treated with zinc dust gives : $C \equiv C - CH_3$ (1) Benzoic acid (2) Benzene $C \equiv CH$ (3) $CH_2 = CH_2$ (3) Salicylaldehyde (4) Phenol



(1)

(3)

 Assertion (A) : Stannous chloride gives grey precipitate with mercuric chloride, but stannic chloride does not do so.

(2)

(1) (3)

 Assertion (A) : Transition metal, Mn atom loses ns electrons first during ionization as compared to (n-1)d electrons.

(1) (2) (3)

Assertion (A) : Technetium-99 is the most common nucleide used in medicine.

(1) (2) (3)

60. Assertion (A) : The rate equation for a general chemical reaction,

$$aA + bB \leftarrow \rightarrow cC + dD$$

can be expressed as
Rate = $k[A_{1}^{*}[B]^{y}$
(1) (2)

(4)

Reason (R) : Stannous chloride is a powerful oxidising agent which oxidises mercuric chloride to metallic mercury.

(4)

(4)

Reason (R) : The effective nuclear charge experienced by (n-1)d electrons is greater than that by ns electrons.

Reason (R) : Tc-99 is a breakdown product of Mo-99

Reason (R) : The exponents x and y in rate equation are necessarily equal to coefficients a and b respectively.

(4)

ANSWERS WITH HINTS & EXPLANATIONS

(3)

1. Ans. (1) . r
$$\propto \sqrt{\left[\frac{1}{M}\right]}$$

2. Ans. (4) $u_1/u_2 = \sqrt{\left[\frac{M_2}{M_1}\right]}$

3. Ans. (1) The 3rd shell as well as all higher shells have d - subshells.

4. Ans. (4)
$$_7N^{14} + _0n^1 \rightarrow _6C^{14} + _1H^4$$

- 5. Ans. (3) Av. atomic weights = $\frac{85 \times 75 + 87 \times 25}{100}$ 85.5
- 6. Ans. (3) Greater the bond energy, stronger is bond.
- 7. Ans. (4) Cations are always smaller in size than their parent atom
- 8. Ans. (3) Rate $\propto n_0$. $N_0 = N/2$

Rate = Grate /2
9. Ans. (21) Valence =
$$\frac{26.89}{8.9} = 3$$

Exact at. wt. =
$$8.9 \times 3 = 26.7$$

10. Ans (2) Limiting reagent is one which is completely consumed in reaction.

11 Ans. (1) 6e + N₂⁰ → 2N^{3 -} 12. Ans. (4) 6 × 10²³ electron = 1 eq. 13. Ans. (3) Meq. of acid = 100 × 0.2 × 2 = 40 Meq. of Alkali = 100 × 0.2 = 20; ∴ Meq. of acid left = 40 - 20 = 20 14. Ans. (3) $\Delta T_f = \frac{1000 × 1.86 × 0.02}{100} = 0.372$ C

- 15. Ans. (3) $P_s = P_o \times$ Mole fraction of solvent
- **16**. Ans. (3) Lower is the value of K, lesser will be the tendency to show forward reaction.

17. Ans .(2)
$$2H \leftarrow H_2 + I_2$$

$$K_{c} = \frac{\alpha^{2}}{4 (1 - \alpha)^{2}};$$

Where α is degree of dissociation,

Also
$$\alpha = \frac{22}{100}$$

$$K_c = 0.0199$$

18. Ans. (1) Cl⁻ cannot accept lone pair of electron due to complete octet.

- 19. Ans. (1) e.g., K₄Fe(CN)₆ does not give test for Fe³⁺ ions.
- **20**. Ans. (3) $K_2O + H_2O \rightarrow 2KOH$
- 21. Ans. (2)

Cell constants $= \frac{l}{a} = \frac{0.8}{1.2} = 0.66 \text{ cm}^{-1}$

- 22. Ans. (1)No exchange of heat in between system and surroundings.
- 23. Ans. (3) ΔH = ve and thus heat is given out.
- Ans. (1) Acetic acid shows dissociation equilibrium,

 $CH_3COOH \leftarrow \rightarrow CH_3COO^- + H^+$

- Ans. (3) Higher is K_{sp}, more is solubility of salt.
- Ans. (2) The phenomenon of efflorescence involves spontaneous loss of water molecules from a crystal.
- 27. Ans. (1) 34 g H₂O₂ has 2 g H₂.
- **28.** Ans. (4) $2CaO + 5C \rightarrow 2CaC_2 + CO_2$
- Ans. (1) MnO₂ imparts puple colour to glass.
- **30.** Ans. (4) H_2 is about 50 volume in water gas along with 40 volume CO and 5 volume CO₂ and N₂ each.
- **31.** Ans. (1) $N_2 + 3H_2 \longrightarrow 2NH_3$ (Plaber's synthesis for NH_4

Fe

- **32.** Ans. (1) An important reaction of PCl₅ is to replace OH gp. by Cl.
- **33.** Ans. (1) $C_{12}H_{22}$ \longrightarrow $12C + 11H_2O$
- 34. Ans. (2) CS8 + POR + CCl4 + 25
- **35.** Ans. (2) The blue coloured complex ion is, [Cu(NH₃)4]²
- 36. Ans. (2) Re², 2SO4²⁻, 2NH4¹⁺
- 37. Aps ALCH3 is sp³ hybridized.

38. (And W) B.pt. increases with increase in mol.

39 Ans. (2) Terminal alkynes have acidic hydrogen.

- **40**. Ans. (1) $CH \equiv CH + HBr \rightarrow CH_2 = CHBr$ HBr \rightarrow CH₃ - CHBr₂ 41. Ans. (4) All are dehydrating agents **42**. Ans. (3) $CH_2 = CH \cdot OH \leftarrow \rightarrow CH_3$ OHO/ 43. Ans. (3) Addition according to Markownikoff rule. 44. Ans. (4) C2H5OH gives jodolorn test. 45. Ans. (1) OH COOH COOH Zn dust +ZnO46. Ans. (4) Water soluble vitamins are B and C. 47. Ans. (2) WColligative property $(1 - \alpha + x\alpha + y\alpha)$; higher is $\Delta T_{b} = \langle \langle \nabla T_{b} \rangle$ ∆Tt(more will be b.pt. 48. (ns. (2) CO2 is linear molecule. Ans. (4) Use, t = $\frac{2.303}{\kappa} \log \frac{N_0}{N}$
- 59 Ans. (4) Each has sp³ hybridization.
- 51. Ans. (1) When two or more orbitals of same energy are available for filling each will be singly occupied first according to Hund's rule of maximum multiplicity because to force two electrons is the same orbital needs extra energy as both the electrons are similarly charged.
- **52**. Ans. (1) The van der Waals forces between non-polar molecules (as in mineral oil and hexane) are very weak and such molecules can dissolve into each other with relative case. The H-bonding in C₂H₅OH or H₂O is relatively strong and non-polar molecules cannot overcome them. Thus 'like dissolves like' is applied here too.

53. Ans. (1) Ni atom has the configulartion as :



Thus Ni(CO)₄ complex is tetrahedral with no unpaired electrons. The oxidation number of Ni in this compound is zero.

54. Ans. (3) Chlorine bleaches by oxidation while SO₂ by reduction.

The product bleached by SO₂ will be further oxidised by air and will come in its original colour. Hence, bleaching by SO₂ is temporary.

55. Ans. (1) Alkyl free radical is stabilised by resonance as :

 $CH_2=CH-CH_2 \cdot \rightleftharpoons \cdot CH_2-CH=CH_2$

where such resonance stabilisation is not possible in the case of simple alkyl radicals.

- 56. Ans. (3) Acetylation reduces the basic character of amino group of aniline. Hence, electron density on benzene ring will be reduced as a result of acetylation.
- 57. Ans. (3) SnCl₂ is a strong reducing agent and it reduces HgCl₂ to grey mass of metallic mercury

58. Ans. (1) Z_{eff} felt by 3d = 25 - (0.35 × 4 + 1.0 × 18) = 5.60 Z_{eff} felt by 4s

 $= 25 - (1 \times 0.35 + 13 \times 0.85 + 10 \times 10) = 3.60$ Evidently attraction between nucleus and 4s electrons is less than that between 3d and nucleus. Hence removal of 4s electrons will be easier.

59. Ans. (2)
$$42Me^{99} + 37e^{99} + -1e^{0}$$

60. Ans. (3) The exponents 'x' and 'y' are experimentally determined and are not necessarily equal to coefficient 'a' and 'b' respectively. The exponents may be integers, fractions or even zero.

AIIMS-2001. Part C. Biology

1. The scientist who cut the tail of mouse in many generations but found that it is	10. Phylogenetically, the sponges have evolved from:
not inherited:	(1) Choanoflagellates
(1) Bateson (2) Lamarck	(2) Phytoflagellates (3) Both
(3) Weismann (4) Darwin	(4) None
2. Which of the following is not a pentose sugar?	11. Which of the following is a worm but not flatworm?
(1) Xylulose (2) Mannose	(1) Echinococcus
(3) Xylose (4) Arabinose	(2) Enterobius (3) Toeria
3. Which of the following is the smallest	(4) Dugesia
cell?	12. Famous Indian Zoologist who wrote a
(1) Virus	memoir upon Pheretima posthuma:
(2) Chlamydomonas	(1) Beni Prasad (2) Bahl K.N.
(3) Acetabularia	(3) Bhatia M.L. (4) J.C. Bose
(4) Pleuropneumonia	13. A definite number of body segments is
4. The functional unit of Golgi apparatus	found in:
is:	(1) Slug (2) Leech
(1) thylakoids (2) oxysomes	(3) Tapeworm (4) Earthworm
(3) cisternae (4) cristae	14. Complete metamorphosis occurs in:
5. Haploid cells can be obtained from:	(1) Silverfish (2) Bedbug
(1) Leaf (2) Anther	(3) Moths and mosquitoes
(3) Seed (4) Stem	(4) Grasshopper
6. Lipase breaks the :	15. Which of the following is not a class of
(1) glycosidic bond (2) hydrogen bond	arthropods?
(3) peptide bond (4) ester bond	(1) Myriapoda (2) Onychophora
7. Chemiosmotic mechanism is related	(3) Polychaeta (4) Insecta
with:	16. In which class of Echinodermata, a
(1) Glycolysis	pluteus larva is formed?
(2) Electron transport chain	(1) Holothuroidea (2) Asteroidea
(3) Kreb's cycle (4) All of these	(3) Echinoidea (4) Crinoidea
8. Protozoans are considered animals be-	17. Which of the following fish is famous
cause they are:	for migration:
(1) Herbivorous (2) Carnivorous	(1) Ribbonfish (2) Carp
(3) Autotrophic (4) Heterotrophic	(3) Shark (4) Salmon
9. Quinine, the remedy for malaria, is ex-	18. Milk glands are characteristic of:
tracted from:	(1) Only primates and ruminants
(1) Leaves of Ocimum	(2) Only placental mammals
(2) Stern of Hevea	(3) All mammals (4) All vertebrates
(3) Bark of Cinnamon	19. During extreme aridity, desert rat:
(4) Bark of Cinchong	(1) does not use water
Man	

[SRI GANESHA] FINGERTIPS REVISION FOR EVERY ENTRA	NCE EXAM EXEMPLAR EXPLORER [FREEEE] BOOK [72 of 182]
(2) uses metabolic water	(4) 4 teeth in one ring
(3) saves water (4) stores water	29. Which one of the following pairs is not
20. Identify the correctly matched pair:	correctly matched ?
(1) Melghat- Tiger	(1) Myeloma - Antibody producing turnor
(2) Kaziranga- Hangul	cells
(3) Dachigam- Musk deer	(2) Cosmid - A vector for carrying large DNA
(4) Velavadar- Avifauna	fragments into host cells
21. Which cells have the shape of signe	t (3) Interferon - An enzyme that interferes
ring?	(1) Plannid Small air Cont
(1) Mast cells (2) Adipocytes	(4) Plasmid – Small piece of extrachromoso-
(3) Melanocytes (4) Osteoblasts	30 Bar of Sanio are the
22. In albinism, the absence of the follow	(1) Modullary rou colt with har like orients
ing pigment makes the skin and hai	tion in Ephedra
very light coloured:	(2) Rings around the tonus of all gumposperm
(1) haemoglobin (2) carotene	wood
(3) melanin (4) chlorophyll	(3) Thickened boundaries between bordered
23. Appendicular skeleton includes all ex	pits of pine wood
cept:	(4) Unthickened cellulose walls between bor-
(1) Pectoral and pelvic girdles	dered pits of pine wood
(2) Vertebrae (3) Forelimbs	31. Whe stomata are more on the under
(4) Hindlimbs	surface of the leaf than on upper, it
24. The vertebra which bears the whole	comes under-
weight of the skull is:	(1) Potamoge ton type
(1) Sacral (2) Cervical	(2) Potato type (3) Barley type
(3) Axis (4) Atlas	(4) Oat type
25. One of the following is an important	32. Orobanche plant is -
specific functions of the liver. Mark the	(1) lotal stem parasite
(1) Histolucia (2) Digestion	(2) Symbiont (3) Total root parasite
(2) Characteria (2) Digestion	(4) Partial parasite
(5) Glycogenolysis (4) Excledion	33. During adverse environmental condi-
can now be synthesized by using-	which is.
(1) Transgenic technology	(1) Dichloropheoxy acetic acid
(2) Hubridoma technology	(2) Benzene-amino nurine
(3) Tissue culture technology	(3) Ethylene (4) Abscissic acid
(4) Gene technology	34. In any given ecosystem, number of in
27. Which causes water pollution ?	dividuals in a species remains more o
(1) Aeroplanes (2) Automobiles exhaust	less constant over a period of time. Thi
(3) Smoke (4) 2, 4-D and pesticides	constancy of number is maintained by -
28. The peristome of Fungria has-	(1) Available food (2) Man
(1) 16 teeth in 2 rings	(3) Predators (4) Parasites
(2) to see thin one ring	35. Shikonin is a -
(3) 32 teeth in 2 rings	(1) Enzyme (2) Antibiotic
20.5	
	Ê.
---	--
(3) Dye (4) Alkaloid	(1) Amphibious hydrophytes
36. Pasteurised milk is-	(2) Short day plant (3) Drought escaping
(1) Not free from bacteria	(4) Mangroves
(2) Free from pathogenic bacteria	44. Cotton is a -
(3) Sterile and will not turn sour under any	(1) Stem fibre (2) Bast fibre
condition	(3) Hard fibre (4) Surface fibre
(4) None of the above	45. A typical anther wall has-
37. Two wings in Pinus seed originate from-	(1) Exothecium and tapeture
(1) Cone axis (2) Bract scale	(2) Exothecium, endothecium and tapetum
(3) Adaxial surface of ovuliferous scale	(3) Endothecium and tapetum
(4) Integument	(4) Exothecium and endothecium
38. The Scutellum of the grass embryo is a	46. The secondary wood of Pinus is charac-
(1) Vestigial organ (2) Absorptive organ	terised by -
(3) Reserve food storage organ	(1) Presence of vessels
(4) Photosynthetic organ	(2) Absence of resin ducts
39. Which one of the following is the earli-	(3) Presence of resin ducts
est land plant?	(4) Presence of resin canals
(1) Cooksonia (2) Cordaites	47. Phytotron is a facility to -
(3) Homea (4) Khynia	(1) Ginserve endangered plants
40. Left handed DNA is known as-	2 Micropropagate plants
(1) Z-DNA (2) B-DNA	(3) Grow plants under controlled conditions
(3) Both are similar (4) None of the above	(4) Grow disease free plants.
41. The source of oxygen liberated in pho-	48. The number of male prothallial cells in
(1) Cathan diquida	Selaginella are-
(1) Carbon dioxide	(1) Nil (2) Four (3) Iwo (4) One
(2) A photosynuhetic enzyme	49. What is the action spectrum of transpi-
(d) Carbobudrata almadu nmetan in leaf	(1) Blue and md (2) Blue and far md
42 Molubdonum plaus a large role in -	(1) Dide and red (2) Dide and red (3) Orange and red (4) Green and ultraviolet
(1) Carbon fixation (2) Net Agent fixation	50 Major source of liquid hydrocathon is
(1) Caroon fixation (2) Chromosome condensation	(1) Solonum tuborogum
(A) Promoting flowering	(1) Solanam tuberosum (2) Europorbia anticumbilitica
43 A plant that some lite life cucle	(2) Cocos pusifora
before the onset of dry conditions fall	(3) Colotronis gigantag
into which of the following categories ?	(4) Calouopis giganiea

§ Directions : Q.No 51 to 60 consists of two statements, one labelled the 'Assertion (1)' and the other labelled the 'Reason (R)'. Examine these statements carefully and decide if

(1) If both assertion and reason are true statements and the reason is a correct explanation of the assertion (2) If both assertion and reason are true statements but reason is not a correct explanation of the assertion (3) If the assertion is true but the reason is a false statement (4) If both assertion and reason are false statements Reason (R) : Spongy bones have Haversian ca-51. Assertion (1): Each Haversian canal contains blood vessels and nerves nals (1)(2)(4)52. Assertion (1): In orthotropous ovule, the mi-Reason (R) : The chromatin structure, in electron microscope does not resemble beads on a cropyle, chalaza and funicle lie in single straight line string. (2)(3)(1)Reason (R) auxins, gibberellins and cytokinins 53. Assertion (1): Every tissue and organ has its can not be added in the medium special requirements for optimal growth. (1)(2)(3)(4) 54. Assertion (1): Yeasts are multicellular but most Reason (R). The ascospores in ascomycetes of the ascomycetes are composed of aseptate are produced in thin walled sac-like, spore producing units called asci. hyphae. (1)(3)(2)(4)55. Assertion (1): Testosterone is produced by the Reason (R): The production is stimulated by GH. testes of mature males. (1)(3) (2)(4)Reason (R) : The mode of entry of contact in-56. Assertion (1): DDT and aldrin are contact in-) secticides and their fat-solubility (often needed secticides to the body is via the cuticle rather to penetrate waxy epicuticle) resulting in accuthan the gut. mulation in fat reserves of animals in higher trophic levels. (3)(4)(1)57. Assertion (1) : Preparation (1) recombinant Reason (R) : Because restriction enzyme is not DNA (r-DNA) requires restriction enzyme. used to cleave plasmid DNA (1)(3)(4)58. Assertion (1) : During sexual process of Reason (R) : The basidium does not assume basidiospore formation, a basidium begins with the shape characteristic of that species. one nucleus from each parent (1)(3)(4)Reason (R) : Because in this organisms growth 59. Assertion (1); Aquaspirilla are helical or vibroid organisms occurs in the presence of 3% NaCl without flagella (3)(1) (2)(4)60. Assertion (1) : Tendrils of Smilax are homolo-Reason (R) : The first-formed elements of phloem are called protophloem. gous to leaflets (1)(2)(3)(4)

ANSWERS WITH EXPLANATIONS

1.(3) 2.(2) 3.(4) 4.(3) 5.(2) 6.(4) 7.(2) 8.(4) 9.(4) 10.(1) 11.(2) 12.(2) 13.(2) 14.(3) 15.(3) 16.(3) 17.(4) 18.(3) 19.(2) 20.(1) 21.(2) 22.(3) 23.(2) 24.(4) 25.(3) 26.(2) 27.(4) 28.(1) 29.(3) 30.(3) 31.(2) 32.(3) 33.(4) 34.(1) 35.(3) 36.(2) 37.(3) 38.(1) 39.(4) 40.(1) 41.(3) 42.(2) 43.(3) 44.(4) 45.(2) 46.(4) 47.(3) 48.(4) 49.(1) 50.(2) 51.(3) 52.(3) 53.(3) 54.(3) 55.(3) 56.(1) 57.(3) 58.(3) 59.(4) 60.(4)

- 1. (3) August Weismann (1885) formulated the famous 'Theory of continuity of germplasm'.
- 2. (2) Mannose is a hexose sugar.
- (4) Pleurophumonia like organisms (PPLO) discovered by Nocard and Roux (1898) consists of Mycoplasma and Acholeplasma, and measure about 0.125 to 0.150µmin diameter.
- 4. (3) Cisternae are found associated with both Golgi complex and endoplasmic reticulum.
- (2) Meiosis occurs in the microspore mother cells within anther of angiosperms.
- (4) Lipids contain ester bonds between fatty, acids and glycerol.
- The chemiosmotic coupling hypothesis explaining electron transfer during phosphorylation of ADP was proposed by P. Mitchell in 1961 (Nobel Prize in 1978).
- 8. (4) All animals are heterotrophic.
- 9. (4) Quinine is a white, bitter crystalline alkaloid extracted from the bark of cinchona, used in antimalarial medications
- 10. (1) The sponges closely resemble colonial choanoflagellates belonging to the phylum Protozoa. Both possess collared and amoeboid cells.
- 11. (2) Enteropois is a nematode, not a flatworm.
- 12. (2) Prof. Karm Narayan Bahl of Lucknow University published a memoir on Indian earthworm Pheretima in 1926. He was awarded Joy Gobind Law Memorial Gold Medal in 1942 "for notable researches in Asiatic Zoology".

- 13. (2) Unlike other annelids there is a fixed number of segments (83) in a leech.
- 14. (3) Complete metamorphosis occurs in the insects belonging to the division Endopterygota or Holometabola.
- 15. (3) Polychaeta is a class of phylum Annelida.
- 16. (3) A plateus larva is formed in echinoderms belonging to the classes Ophiuroidea and Echinoidea.
- (4) Atlantic salmon and Pacific salmon are the best examples of fishes showing anadromous migration.
- 18. (3) Mammary glands are present in all mammals.
- Metabolic water is formed during the respiration of carbohydrates.
- (1) Melghat National Park, Ghaurilagarh, Maharashtra is associated with the conservation of tiger.
- 21. (2) Owing to the presence of fat globule, the cytoplasm is pushed to periphery in adipocytes, giving it the shape of a signet ring.
- 22. (3) Albinism is a genetic disease; a recessive autosomal mutant gene results in the deficiency of the enzyme tyrosinase required for the production of melanin.
- (2) Vertebral column is a part of axial skeleton.
- 24. (4) According to Greek mythology, Atlas is the Titan who bore the heavens on his shoulders. If the skull can be considered as the heavens, the first vertebra which bears the

whole weight of the skull can be regarded as Atlas,

- (3) Liver is the centre of cabohydrate metabolism.
- 26.(2) The monoclonal antibodies, identical molecules specific for one type of antigen, are made outside the body by hybrid cell culture. The technique is known as hybridoma technology.
- 27.(4) The term pesticide includes insecticides, fungicides, nematicides, herbicides, weedicides, biocides. These substances are used to kill pests but being broad spectrum in action, other organisms also get affected. Pesticides also enter the body of plant and animal through water. These substances than interfere with metabolic activities of plant and animals.
- 28.(1) In Funaria peristome consists of two rings of flat curved and conical teeth called peristomial teeth. These are simply plate of cuticle and do not have cells. In each ring there are 16 teeth.
- 29.(3) Interferons, which were discovered for the first time in 1957 by two British scientist (Alick Isaacs and Jean Lindermann) are proteinaceous substances (mol.wt. 18000 to 100,000) produced inside the body for defence against virus infection. They are also produced in response to many non-antigenic chemicals including polysaccharides, endotoxins, double stranded DNA, RNA etc.
- 30.(3) Thickened boundaries between bordered pits of pine wood.
- 31.(2) Potato type stomata occur on both the leaf surfaces, being more on the lower surface than on the upper.
- 32.(3) Total parasites never posseess chlorophyll, hence, they always obtained their food from the host. They may be attached to branches, stem or roots of host plants. Orobanche is a total root parasite.
- 33.(4) During adverse condition plant develop abscissic acid. It helps in closing of stomata by causing potassium ions to leave the guard cells (Thus reducing their turgidity) during the

periods of water shortage or drought and hence, is also known as Stress hormone.

- 34.(1) Available food.
- 35.(3) 'Shikonin' is an important red dye which can be obtained by tissue culture.
- 36.(2) The pasteurisation was developed by Louis Pasteur in 1860s. The process for milk was adopted in 1895. Primary object of this process is to eliminate disease causing bacteria from milk, though the total number of bacteria is also very much reduced during this process. It reduces the chances of milkspoilage.
- 37.(3) In Pinus as the embryo matures a thin layer of the ovuliferous scale fuses with the testa of the seed forming wings.
- 38.(1) In monocotyledonous plants only one cotyledon is present. It is shield shaped and situated above the coleoptile. It is termed as scutellum which is a vestigial organ.
- 39.(4) Physica is considered to be the earliest (and plant.
- 40. Weft handed DNA is known as Z-DNA.
- 41.(3) Water.
- 42.(2) A proper amount of minerals like molybdenum, iron and calcium in the soil is essential for nitrogen fixing microorganisms. They require molybdenum for their activity.
- 43.(3) Plants that completes its life cycle before dry conditions are termed as 'Drought escaping' such as Argemone mexicana, Cassia tora, Solanum xanthocarpum etc. Most of them are ephemeral annuals.
- 44.(4) Surface fibre.
- 45.(2) A typical anther wall has four layers : (i) Epidermis (ii) Endothecium (iii) Middle layer and (iv) Tapetum. Among given options (2) is more appropriate answer.
- 46.(4) In Pinus the resin canals are present both in primary and secondary wood. Each resin canal is surrounded by the epithelial cells, which secrete turpentine. The turpentine acts as an antiseptic in healing the wounds caused by fungi or bacteria. The turpentine is oxidized to solid resin when exposed to air. This

solid resin covers the wound until new bark is replaced.

- 47.(3) Grow plants under controlled conditions.
- 48.(4) When the male gametophyte is shed from the microsporangium, it has 13 cells -4 primary androgonial cells which are located at the centre. 8 peripheral jacket cells which surround the primary androgonial cells and a prothallial cell.
- 49.(1) The opening of stomata in the light is most common phenomenon. Stomata begin to open shortly after exposure to light. The blue and red wavelengths of light are most effective, similar to the action spectrum of photosynthesis.
- 50.(2) Euphorbia antisyphilitica.
- 51. (3) Spongy bones do not have Haversian canals
- 52. (3) Under electron microscope, the chromatin structure resembles beads on a string. These beads are formed of octamer of histone protein and DNA base pairs
- 53. (3) Most of the media contain inorganic salts, vitamins and sucrose. Sometimes, for tissue

culture growth regulators such as auxins, gibberellins and cytokinins may also be added to the basal medium

- 54. (3) Yeasts are unicellular but most of the ascomycetes are composed of septate hyphae. The cross wall have each a minute and simple pore.
- 55. (3) The production is stimulated by AH.
- 56. (1)
- 57. (3) Preparation of r-DNA requires restriction enzyme, which is used to cleave plasmid DNA and to cleave foreign DNA
- 58. (3) The basidium assumes the shape characteristic of that species and generally produces four tapering projections, the sterigmata.
- 59. (4) Aquaspinita are helical or vibrioid organisms that upically possess bipolar tuffs of flagella. No growth occurs in the presence of 3% NaCl or seawater.
- 60. (4) The tendrils of Smilax are homologous to stipules. The first formed elements of phloem are called medullary rays.

PART D. GENERAL KNOWLEDGE

1. 'Vande Matram' national song w adopted by

- (1) 1896 session of Indian National Congress
- (2) 1886 session of Indian National Congress
- (3) 1889 session of Indian National Congress
- (4) 1892 session of Indian (National Congress
- 2. "Jan Gan Man" National anthem was adopted by
 - (1) Constitution satina in 24 Jan. 1950
 - (2) Constitution sabha in 25 Jan. 1950
 - (3) Constitution sabha in 26 Jan. 1950
 - (4) Constitution sabha in 15 Aug. 1950
- 3. 2004 Olympics will be held in
 - (1) Paris (2) Athens
 - (3) Brossels (4) Beijing
- 4. Highest peak of India
 - (1) Kg (2) Kanchanjunga
 - (3) Mount Everest (4) Lhotse

5. Which is not correctly matched?

- (1) Subroto cup ---Football
- (2) Santosh trophy Badminton
- (3) Aga Khan cup Hockey
- (4) Durand cup --Football
- 6. Which of the following is not related?
 - (1) Pandit Jasraj -- Vocalist
 - (2) Gopi Kishan Kathak
 - (3) Dr Bhatnagar award— Science
 - (4) Dr Kasturi Rangan Medicine
- 7. In year 2000 Miss Universe was held in
 - (1) London
 - (2) Paris
 - (3) Nicosia (Cyprus) (4) Pretoria
- 8. In year 2000 Miss World was held in
 - (1) London (2) Manila
 - 3) Caracas (4) Havana
- 9. Tehalka.com inquiry is undertaken by



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Max. Time : $3\frac{1}{2}$ hrs.

GENERAL KNOWLEDGE

- 1. Euthanasia (mercy killing) was first legalized in :
 - (1) Switzerland (2) Netherland
 - (3) France (4) Italy
- 2. Positron emission tomography (PET) is one of the best methods for functional imaging because :
 - (1) Isotopes of basic body elements are used for imaging
 - (2) Isotopes with long half-lives are used
 - (3) Isotopes with short half-lives are used
 - (4) Positrons are directly involved used in imaging

3. Magnetic Resonance (MR) images are derived from the proton-bearing species present principally from water and :

- (1) Long alkane chain protons of the fatty acid moieties
- (2) Short alkane chain protons of the fatty acid moieties
- (3) Long alkene chain protons of the fatty acid moieties
- (4) Short alkene chain protons of the fatt acid moieties
- 4. The following separation technique depends on the molecular size of the protein :
 - (1) Chromatography on a carboxymethyl (CM) cellulose column
 - (2) Iso-electric focusing
 - (3) Gel filtration chromatography
 - (4) Chromatography on a diethylaminoethyl (DEAE) cellulose column

5. The approximate number of genes contained in the genome of Kalpana Chawla was :

- Max. Marks: 200
- (1) 40,000(2) 30.000(3) 80,000
 - (4) 1.00.000
- 6. In internet what does 'http' mean
 - (1) High Transfer Text Protocol
 - (2) Highest Transfer Text Protocol
 - (3) Hyper Text Transfer Protocol.
 - (4) Hyper Transfer Text Protocol
- 7. The India-born US physicist who was awarded the Noble prize in Physics for his work on astrophysics is :
 - (1) H.G. Khorana
 - (2) Subrahmanyam Ghandrasekhar
 - (3) Sivaramakrishna Chandrasekhar
 - (4) C.V. Raman
- 8. Which German physicist invented the electron microscope which won him the **1986 Noble Prize in Physics ?**
 - WEinst Ruska
 - (2) Van't Hoff
 - (3) J.H.D. Jensen (4) Eugene P Wigner
- 9. Who was the first Indian to be awarded the World Food Prize in 1987?
 - (1) M.S. Swaminathan
 - (2) Sunderlal Bahuguna
 - (3) Anna Hazare
 - (4) B.R. Barwale
- 10. Thanatology is the science that deals with :
 - Dealt in all its aspects
 - (2) Solving paternity of child
 - (3) Identification of living
 - (4) Detection of lie
- 11. What is the disease, Tetanus also known as ?
 - (1) Gangrene (2) Shingles
 - (4) Whooping Cough (3) Lockjaw

EEEEE] BOOK [80 of 182]

SRI GANESHAJ FINGERTIPS REVISION FOR EVERY ENTRANCE	EXAM EXEMPLAR EXPLORER [FREEEE] BOOK [80 01 182]
12. When seen from earth, which of the	(2) Electrocardiography
following planet eclipsed (crossed a	(3) Magnetoencephalography
cross) of the sun on May 7 ,2003 ?	(4) Sonography
(1) Mercury (2) Uranus	22. Which one of the following is a match-
(3) Saturn (4) Jupiter	ing pair of a certain body feature and its
13. Israel's Prime Minister Yitzhak Rabin	value count in a normal human adult ?
won the Noble Prize for	(1) Urea-5-10 mg /100 ml of blood)
(1) Peace (2) Literature	(2) Blood sugar (fasting) -70-100-mg/100ml
(3) Chemistry (4) Economics	(3) Total blood volume -3 A littles
14. Who was the world's first space tour- ist?	(4) ESR in Wintrobe method -9-15 mm in males and 20-34 mm in females
(1) Desmond Rickett	23. Which one of the following pairs of
(2) Dennis Tito (3) Igor Kajelnikov	term/ names mean one and the same
(4) Li Wang	thing?
15. Which city was gifted to Charles II by	(1) Gene pool -genome
the Portuguese when the married the sis-	(2) Codon-gene (3) Cistron-triplet
ter of the King of Portugal in 1662?	(4) DNA fingerprinting –DNA profiling
(1) Mumbai (2) Paris	24. Which one of the following is a match-
(3) Lisbon (4) Castile	ing pair 3
16. How many "World Cultural Heritage Sites" are there in India ?	th Lubb-Sharp closure of AV valves at the beginning of ventricular systole
(1) 10 (2) 17 (3) 14 (4) 15	(2) Dup-Sudden opening of semilunar valves
17. Who is the mother of Bharat in the	at the beginning of ventricular diastole
epic Ramayana ?	(3) Pulsation of the radial artery-Valves in the
(1) Kaushalya (2) Sumitra	blood vessels
(3) Urmila (4) Kaikayee	(4) Initiation of the heart beat –Purkinje fibres
18. Which of the 'Nawab of Bengal' is	25. Mr.X is eating curd/yoghurt .For this
supposed to be responsible for Black	food intake in a food chain he should be
Hole ' of Calcutta (Kolkatta)	(1) First teachin level
(1) Mir Jafer (2) Sirjuddaula	(1) First trophic level
(3) Alivardi Khan (4) Sarfaraj Khan	(2) Third traphic level
19. In which country the DOGS' were once	(3) I hird trophic level
worshiped as 'GODS'?	(4) Fourth trophic level
(1) Egypt (2) Greece	20. July 11 is observed as :
(3) Italy	(1) World Population Day
20. From which of the following places the	(2) No Tobacco Day
international dateline crosses :	(3) World Environment Day
(1) Atlantic ocean) (2) Pacific ocean	(4) World Health Day
(3) Greenwich (4) Cape of Good Hope	27. Biological Oxygen Demand(BOD) is a
BIOLOGY	(1) Industrial wastes poured into water bodies
21. The crystal of lead zirconate is a key	(2) Extent to which water is polluted with or-
component of :	ganic compounds
(1) Electroencephalography	

- (3) Amount of carbon monoxide inseparably combined with haemoglobin
- (4) Amount of oxygen needed by green plants during night
- 28. Which one of the following is a sesamoid bone ?
 - (1) Pelvis
- (2) Patella
- (3) Pterygoid (4) Pectoral girdle
- 29. Both corpus luteum and macula lutea are :
 - (1) Found in human ovaries
 - (2) A source of hormones
 - (3) Characterized by a yellow colour
 - (4) Contributory in maintaining pregnancy
- 30. Photorespiration in C₃ plants starts from :
 - (1) Phosphoglycerate
 - (2) Phosphoglycolate
 - (3) Glycerate (4) Glycine
- 31. Just as Xenopsylla is to Yersenia pestis so is :
 - (1) Glossian palpalis to Wuchereria bancrofti
 - (2) Culex to Plasmodium falcipacrum
 - (3) Homo sapiens to Taenia solium
 - (4) Phlebotomus to Leishmania donovani
- 32. Continued consumption of a diet rich in butter, red meat and eggs for a long period may lead to :
 - (1) Vitamin A toxicity
 - (2) Kidney stones
 - (3) Hypercholesterolemia
 - (4) Urine laden with ketone bodes
- 33. Drinking of mineral water with very low levels of pesticides (about 0.02 ppm) for long periods may :
 - (1) Produce immunity against mosquito
 - (2) Cause lenkentia (blood cancer) in most people
 - (3) Cause cancer of the intestine
 - (4) Lead to accumulation of pesticide residues in body vat
- 34. A person passes much urine and drinks much water but blood glucose

level is normal . This condition may be the result of :

- (1) A reduction in insulin secretin from pancreas
- (2) A reduction in vasopression secretion from posterior pituitary
- (3) A fall in the glucose concentration) in urine
- (4) An increase in secretion of glucagon

35. What is true about tRIVA?

- (1) It binds with an amino acid at 3 end
- (2) It has five double stranded regions
- (3) It has a codor at one end which recognizes the anticodor on messenger RNA
- (4) It looks like clover leaf in the three dimensional structure
- 36. An example of competitive inhibitions of an enzyme is the inhibition of :
 - (1) Succinic dehydrogenase by malonic acid
 - (2) Cytochrome oxidase by cyanide
 - (3) Nexekinase by glucose -6 phosphate
 - (4) Carbonic anhydrase by carbon dioxide
- 37. Which one of the following is a matching pair of certain organism (s) and the kind of association ?
 - (1) Shark and sucker fish -commensalism
 - (2) Algae and fungi in lichens -mutualism
 - (3) Orchids growing on trees -parasitism
 - (4) Cuscuta (dodder) growing on other flowering plants -epiphytism
- Photochemical smog formed in congested metropolitan cities mainly consists of
 - (1) Ozone peroxyacetyl nitrate and NO_x
 - (2) Smoke, peroxyacetyl nitrate and SO2
 - (3) Hydrocarbons SO2 and CO2
 - (4) Hydrocarbons ozone and SO_x
- 39. In almost all Indian metropolitan cities like Delhi. the major atmospheric pollutant (s) is/are :
 - (1) Suspended particulate matter(SPM)
 - (2) Oxides of sulphur
 - (3) Carbon dioxide and carbon monoxide
 - (4) Oxides of nitrogen

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40. Excessive stimulation of vagus nerve in humans may lead to :

- (1) Hoarse voice
- (2) Peptic ulcers
- (3) Efficient digestion of proteins
- (4) Irregular contractions of diaphragm

41 Restriction enzymes:

- (1) Are endonucleases which cleave DNA at specific sites
- (2) Make DNA complementary to an existing DNA or RNA
- (3) Cut or join DNA fragments
- (4) Are required in vectorless direct gene transfer
- 42. Which one of the following correctly represents the manner of replication of DNA ?



codes for the same information as UGC?

(1) UGU (2) UGA (3)UAG

(4) UGG

44. The map given below indicates the former and the present distribution of an animal: Which animal could it be ?

(1) Wild ass	(2) Nilgai
--------------	------------

(3) Black buck (4) Lion



- 45. A person is wearing spectacles with concave lens for correcting vision. While not using the glasses, the image of a distant object in his case will be formed
 - (1) On the blind spot
 - (2) Behind the retina
 - (3) In front of the retina
 - (4) On the vellow spot
- 46. The early stage human embryo distinctly possesses :
 - (2) gill slits
 - (3) External ear (pinna)
 - (4) Eye brows

NN Gills

- 47. The phase of menstrual cycle in humans that lasts for 7-8 days, is:
 - (1) Follicular phase (2) Ovulatory phase
 - (3) Luteal phase (4) Menstruation
- 48. The source of somatostatin is same as that of :
 - (1) Thyroxine and calcitonin
 - (2) Insulin and glucagon
 - (3) Somatotropin and prolactin
 - (4) Vasopresin and oxytocin
- 49. People recovering from long illness are often advised to include the alga Spirulina in their diet because it .
 - (1) Makes the food easy to digest
 - (2) Is rich in proteins
 - (3) Has antibiotic properties
 - (4) Restores the intestinal microflora
- 50. Viroids have :
 - (1) Single stranded RNA not enclosed by protein coat

- (2) Single stranded DNA not enclosed by protein coat
- (3)Double stranded DNA enclosed by protein coat
- (4) Double stranded RNA enclosed by protein coat
- 51. In a dicotyledonous stem, the sequence of tissues from the outside to the inside is :
 - (1) Phellem-Pericycle-Endodermis-Phloem
 - (2) Phellem-Phloem-Endodermis-Pericycle
 - (3) Phellem-Endodermis-Pericycle-Phloem
 - (4) Pericycle Phellem-Endodermis-Phloem

52. Hill reaction occurs in :

- (1) High altitude plants
- (2) Total darkness (3) Absence of water
- (4) Presence of ferricyanide
- Which one of the following pairs is correctly matched
 - Rhizobium Parasite in the roots of leguminous plants.
 - 2. Mycorrhizae- Mineral uptake from soil
 - 3. Yeast -Production of biogas
 - Myxomycetes The disease ring worm
- 54. Pollen grains are able to withstand extremes of temperature and desiccation because their exine is composed of .

(2) Suberin

- (1) Cutin
- (3) Sporopollenin (4) Callose
- 55. One of the genes present exclusively on the X-chromosome in humans is concerned with :
 - (1) Baldness
 - (2) Red-green colour blindness
 - (3) Facial hair, mustaches in males
 - (4) Night blindness
- 56. Which one of the following statements with regard to embryonic development in humans is correct?
 - (1) Cleavage divisions bring about considerable increase in the mass of protoplasm
 - (b) In the second cleavage division, one of the two blastomers usually divides a little sooner than the second

- (3). With more cleavage divisions, the resultant blastomeres become larger and larger
- (4) . Cleavage division results in a hotov ball of cells called morula
- 57. Plasmodesmata connections help in :
 - Cytoplasmic streaming
 - (2) Synchronous mitotic divisions
 - (3) Locomotion of unicellular organisms
 - (4) Movement of substances between cells
- 58. The quiescent centre in root meristem serves as a
 - (1) Site for storage of food which is utilized during maturation
 - (2) Reservoir of growth hormones
 - (3) Reserve for replenishment of damaged cells of the meristem
 - (4) Region for absorption of water
- 59. Azolla is used as a biofertilizer because it
 - Multiplies very fast to produce massive
 - (2) Has association of nitrogen -fixing Rhizobium
 - (3) Has association of nitrogen –fixing Cyanobacteria
 - (4) Has association of mycorrhiza
- 60. The plant part which consists of two generations one within the other is :
 - (1) Germinated pollen grain
 - (2) Embryo (3) Unfertilized ovule
 - (4) Seed

CHEMISTRY

61. The paramagnetic species is :

(1) KO_2	(2) SiO ₂
(3) TiOo	(4) BaOn

- 62. The reagent commonly used to determine hardness of water titrimetrically is:
 - (1) Oxalic acid
 - (2) Disodium slat of EDTA
 - (3) Sodium citrate
 - (4) Sodium thiosulphate
- 63. The true statement for the acids of phosphorus.



 (3) Formaldehyde (4) Methanol 78. The ortho/para directing group among the following is : (1) COOH (2) CN 	86. Propan -1-ol can be prepared from propene by (1) H ₂ O/H ₂ SO ₄ (2) H ₂ (OAc) /H ₂ O followed by NaBH.
(3) COCH ₃ (4) NHCOCH ₃	(2) Fig (OAC)2/ Fig O followed of tabling
79. The treatment of benzene with is-	(4) CH ₃ CO ₂ H/H ₂ SO ₄
 obutene in the presence of sulphuric acid gives : (1) Isobutyl benzene (2) Tert-butyl benzene (3) n-Butyl benzene (4) No reaction 80. The most reactive nucleophile among the following is : 	 87. Which of the following are arranged in the decreasing order of dipole moment ? (1) CH₃ Cl, CH₃ Br, CH₃ F (2) CH₃ Cl, CH₃ F, CH₃ Br (3) CH₃ Br, CH₃ Cl, CH₃ F
(1) $CH_3 O^-$ (2) $C_6 H_5 O^-$	(4) CH3Br, CH3E, CH3 Cl
(3) (CH ₃) ₂ CHO ⁻ (4) (CH ₃) ₃ CO ⁻	88. What is the coordination number of so-
81. The absolute configuration of the fol-	dium in Naz U r
lowing compound is :	
CH ₃	89. Which of the following compounds
HCl	possesses the C-H bond with the lowest
nCi	bond dissociation energy ?
CI3H	() Toluene
	(2) Benzene (3) n-Pentane
C ₂ H ₅	(4) 2, 2-Dimethyl propane
(1) 2 S, 3 R (2) 2 S, 3 S	composed in a bomb calorimeter. The
(3) 2 R, 3 S (4) 2 R, 3 R	temperature of the calorimeter increases
62. Subunits present in naemogioon are :	by 6.12 K. The heat capacity of the sys-
(1) 2 (2) 3 (3) 4 (4) 5	tem is 1.23 kJ/g/deg. What is the molar
83. At higher temperature, jodoform reac-	(1) - 7.52 k 1/mol (2) - 308.1 k1/mol
tion is given by :	(1) = 7.53 kJ/mol $(2) = 556.1 kJ/mol(3) = 16.1 kJ/mol$ $(4) = 602 kJ/mol$
(1) CH ₃ CO ₂ CH ₃ (2) CH ₃ CO ₂ C ₂ H ₅	91. Which one of the statements given be-
(3) C ₆ H ₅ CO ₂ CH ₃ (4) CH ₃ CO ₂ C ₆ H ₅	low concerning properties of solutions
84. Among the following the achiral amino	describes a colligative effect ?
acid is :	(1) Boiling point of pure water decreases by
(1) 2-Envialanine	(2) Vanour pressure of pure water decreases
(3) 2-Hudrowmethul sering	by the addition of nitric acid
(4) Troptophan	(3) Vapour pressure of pure benzene de-
85. Nitrobenzene gives N-phenylhydroxy-	creases by the additions of naphthalene
lamine by :	(4) Boiling point of pure benzene increases by the addition of toluene
(1) Sn/HCl (2) $H_2/Pd - C$	92. Which of the following reactions is
(3) Zn/NaOH (4) Zn/NH ₄ Cl	used to make a fuel cell ?
FOUNDER OF A.I.M.S. DARE TO SUCCESS TALLAPU REDDY. VENKAT	A KRISHNA REDDY. M.SC [MATHEMATICS] [CELL: 944 0 345 996]

(1) Cd (s) + 2 Ni (OH)₃ (s) \rightarrow CdO(s) + 2 Ni(OH)₂ (s) + H₂ O (l) (2) Pb (s) + PbO₂ (s) + $2H_2$ SO₄ (aq) \rightarrow 2 PbSO₄ (s) + 2H₂ O (l) (3) $2H_2(q) + O_2(q) \longrightarrow 2H_2O(1)$ (4) 2Fe (s) + $O_2(q)$ + $4H^+(aq)$ $\rightarrow 2 \operatorname{Fe}^{2+}(\operatorname{ag}) + 2\operatorname{H}_2 O(\mathbb{I})$ 93. Which one of the following is NOT a buffer solution ? (1) 0.8M H₂ S + 0.8M KHS (2) 2M C₆ H₅ NH₂ + 2M C₆ H₅ NH₃ Br (3) 3 M H₂ CO₂ + 3 M KHCO₃ (4) 0.05M KCIO4 + 0.05 M HCIO4 94. Which one of the following has ΔS° greater than zero ? (1) CaO (s) + CO₂ (g) \leftarrow CaCO₂ (s) (2) NaCl (aq) → NaCl(s) (3) NaNO₃ (s) \leftarrow Na⁺ (aq) + NO₃ (aq) (4) N₂ (g) + $3H_2$ (g) $\rightarrow 2NH_3$ (g) 95. The quantum number 'm' of a free gaseous atom is associated with : (1) The effective volume of the orbital (2) the shape of the orbital (3) The spatial orientation of the orbital (4) The energy of the orbital in the absence of a magnetic filed 96. Which one of the following is not a surfactant? (1) CH3 - (CH2)15 N - CH3 Br o CH3 (2) CH3 - (CH2)14 - CH2 - NH2 (3) CH2 (CH2)16 - CH2 OSO2 Na+ (4) QHC+ (CH2)14 - CH2 - COO Na+ 97. Time required to deposit one millimole of aluminum metal by the passage of



(1) Energy (2) Linear momentum

(3) Angular momentum

(4) Mass

- 103. A laser beam is used for carrying out surgery because it :
 - (1) Is highly monochromatic
 - (2) Is highly coherent
 - (3) Is highly directional
 - (4) Can be sharply focused
- 104. A wire of length L is drawn such that its diameter is reduced to half of its original diameter. If the initial resistance of the wire 10Ω , its new resistance would be :

(1) 40 Ω (2) 80 Ω (3) 120 Ω (4) 160 Ω

- 105. A proton is about 1840 times heavier than an electron. When it is accelerated by potential difference of 1 kV, its kinetic energy will be :
 - (1) 1840 ke V (2) 1./1840 ke V
 - (3) 1 ke V (4) 920 ke V
- 106. An electric dipole placed in a nonuniform electric field experiences :
 - (1) Both a torque and a net force
 - (2) Only a force but no torque
 - (3) Only a torque but no net force
 - (4) No torque and no net force
- 107. In an ideal parallel LC circuit, the capacitor is charged by connecting it to a dc source which is then disconnected. The current in the circuit :
 - (1) Becomes zero instantaneously
 - (2) Grows monotonically
 - (3) Decays monotonically
 - (4) Oscillates instantaneously
- 108. To a germanium sample, traces of gallium are added as an impurity. The resultant sample would behave like :

(1) A conductor

- (2) A p-type semiconductor
- (3) An network semiconductor
- (4) An insulator
- 109. A radioactive substance decays to 1<10th of its initial activity in 40 days.

The half-life of the radioactive substance expressed in days is :

- (1) 2.5 (2) 5 (3) 10 (4) 20
- 110. A neutron makes a head on elastic collision with a stationary deuteron. The fractional energy loss of the neutron in the collision is

(1) 16/81 (2) 8/9 (3) 8/27 (4) 2/3

111. The motion of planets in the solar system is an example of the conservation of :

(2) Linear momentum

(1) Mass

(1)

(3)

- (3) Angular momentum
- (4) Energy
- 112. Two small drops of mercury each of radius R. coalesce to form a single large drop. The ratio of the total surface energies before and after the change is :

$$(2) 2^{1/3} : 1$$

(4) 1 : 2

113 A black body, at a temperature of 227°C, radiates heat at a rate of 20 cal m² s⁻¹. When its temperature is raised to 727°C, the heat radiated by it in cal $m^{-2} s^{-1}$ will be closest to :

- (1) 40 (2) 160 (3) 320 (4) 640
- 114. Two springs of force constants k and 2k are connected to a mass as shown below:



The frequency of oscillation of the mass is:

- (1) $(1/2\pi) \sqrt{(k/m)}$ (2) $(1/2\pi) \sqrt{(2k/m)}$
- (3) $(1/2\pi) \sqrt{(3k/m)}$ (4) $(1/2\pi) \sqrt{(m/k)}$
- 115. When a beam of light is used to determine the position of an object, the maximum accuracy is achieved if the light is :

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- (1) Polarized
- (2) Of longer wavelength
- (3) Of shorter wavelength
- (4) Of high intensity
- 116. A double slit experiment is performed with light of wavelength 500 nm. A thin film of thickness 2 μ m an refractive index 1.5 is introduced in the path of the upper beam. The location of the central maximum will :
 - (1) Remain unshifted
 - (2) Shift downward by nearly two fringes
 - (3) Shift upwards by nearly two fringes
 - (4) Shift downward by 10 fringes
- 117. If an electron and a photon propagate in the form of waves having the same wavelength , it implies that they have the same :
 - (1) Energy (2) Momentum
 - (3) Velocity (4) Angular momentum
- 118. Characteristic X-rays are produced due to :
 - (1) Transfer of momentum in collision of electrons with target atoms
 - (2) Transition of electrons from higher to lower electronic orbits in an atom
 - (3) Heating of the target
 - (4) Transfer of energy in collision of electrons with atoms in the target
- 119. Three charges are placed at the vertices of an equilateral triangle of side 'a' as shown in the following figure. The force experienced by the charge placed at the vertex A in the direction normal to BC is :



1)
$$Q^2/(4 \pi \epsilon_0 a^2)$$
 (2) - $Q^2/(4 \pi \epsilon_0 a^2)$

(3) Zero

(4) $Q^2/(2\pi \in \{a^2\})$

- 120. A capacitor of capacitance 2 µF is connected in the tank circuit of an oscillator oscillating with a frequency of 1 kHz. If the current flowing in the circuit is 2 mA, the voltage across the capacitor will be :
 - (1) 0.16V (3) 79.5V
- 121032V
- (4) 159V
- 121. The earth's magnetic field at a given point is 0.5 × 10 ⁵ Wb m⁻³. This field is to be annulled by magnetic induction at the centre of a circular conducting loop of radius 5.0 cm. The current required to be flowm in the loop is nearly :

122 A) frog can be levitated in a magnetic field produced by a current in a vertical solenoid placed below the frog. This is possible because the body of the frog behaves as :

- (1) Paramagnetic (2) Diamagnetic
- (3) Ferromagnetic (4) Antiferromagnetic
- 123. Shown below are the black body radiation curves at temperatures T_1 and T_2 ($T_2 > T_1$). Which of the following plots is correct?



124. Shown below is a distribution of charges. The flux of electric field due to the these charges through the surface S is:



125. In an experiment to find the focal length of a concave mirror a graph is drawn between the magnitudes of u and v. The graph looks like :



126. Nuclear fusion is possible

- (1) Only between light nuclei
- (2) Only between heavy nuclei
- (3) Between both light and heavy nuclei
- (4) Only between nuclei which are stable against β decay
- 127. An electron is travelling along the xdirection . It encounters a magnetic field in the y-direction . Its subsequent motion will be
 - (1) Straight line along the x-direction
 - (2) A circle in the xz-plane
 - (3) A circle in the yz-plane
 - 4) A circle in the xy-plane

- 128. The difference in the lengths of a mean solar day and a sidereal day is about :
 - (1) 1min

(2) 4min

(3) 15min

(4) 56 min

129. A body starting from rest moves along a straight line with a constant acceleration. The variation of speed (v) with distance (s) represented by the graph:



130. A rectangular loop carrying a current i₁ is situated near a long straight wire carrying a steady current i₂. The wire is parallel one one of the sides of the loop and is in the plane of the loop as shown in the figure. Then the current loop will:



- (1) Move away from the wire
- (2) Move towards the wire
- (3) Remain stationary
- (4) Rotate about an axis parallel to the wire
- 131. A ball is thrown vertically upwards. Which of the following plots represents the speed-time graph of the ball during its flight if the air resistance is not ignored?



- 132. Radioactive nuclei that are injected into a patient collect at certain sites within its body, undergoing radioactive decay and emitting electromagnetic radiation. These radiations can then the recorded by detector. This procedure provides an important diagnostic tool called:
 - (1) Gamma camera
 - (2) CAT scan
 - (3) Radiotracer technique
 - (4) Gamma ray spectroscopy
- 133. In a material medium, when a positron meets an electron both the particles annihilate leading to the emission of two gamma ray photons. This process forms the basis of an important diagnostic procedure called :

(2) PET <

(1) MRI (3) CAT

(4) SPECT

- 134. An astronaut is looking down on earth's surface from a space shuttle at an altitude of 400 km. Assuming that the astronaut's pupil diameter is 5 mm and the wavelength of visible light is 500 nm, the astronaut will be able to resolve linear objects of the size of about :
 - (1) 0.5 m (2) 5 m

(3) 50 m (4) 500 m

135. An earthquake generates both transverse (S) and longitudinal (P) sound waves in the earth . The speed of S waves is about 4.5 km/s and that of P waves is about 8.0 km/s. A seismograph records P and S waves from an earthquake. The first P wave arrives 4.0 min before the first S wave. The epicenter of the earthquake is located at a distance of about

(1) 25 km	(2) 250 km
(3) 2500km	(4) 500km

136. A lead shot of 1 mm diameter falls through a long column of slucerine. The variation of its velocity v with distance covered is represented



- 137. The maximum distance upto which TV transmission from a TV tower of height h can be received is proportional to:
 - (1) $h^{1/2}$ (2) h (3) $h^{3/2}$ (4) h^2
- 138. In short wave communication waves of which of the following frequencies will be reflected back by the ionospheric layer having electron density 10¹¹ per m⁻³?

(1) 2 MHz	(2) 10 MHz
(3) 12 MHz	(4) 18 MHz

139. In the following common emitter configuration an npn transistor with current gain $\beta = 100$ is used. The output voltage of the amplifier will be :



150. Old age in not an illness . It is a continuation of life with decreasing capacity for adaptation

Cessation of mitosis is a normal genetically programmed event

- 151. A cell membrane shows fluid behaviour
- 152. In plant tissue culture. somatic embryos can be induced from any plant cell
- Rhoeo leaves contains anthocyanin pigments in epidermal cells
- 154. Water and mineral uptake by root hairs from the soil occurs through apoplast until it reaches endodermis
- 155. Long distance flow of photo assimilates in plants occurs through sieve tubes
- 156. Many visitors to the hills suffer from skin and respiratory allergy problems
- Yeasts such as Saccharomyces cerevisiae are used in baking industry.
- 158. In a food chain members of successive higher levels are fewer in number
- 159. Tropical rain forests are disappearing fast, from developing countries such as India
- 160. Leaf butterfly and stick insect show minicry to dodge their enemies
- 161. Solution of Na₂CrO₄ in water is intensely coloured
- 162. NF3 is a weaker ligand than N (CH3)3
- 163. Pbl4 is a stable compound
- 164. $\frac{22}{11}$ Na emits a positron siving $\frac{22}{12}$ Mg
- 165. Barium is not required for normal biological function in human
- 166. Haemoglobin is an oxygen carrier
- 167. Glycosidescare hydrolyzed in acidic conditions
- 168. Benzyl bromide when kept in acetone water

169. Activity of an enzyme is pH -dependent

A membrane is a mosaic or composite of diverse lipids and proteins

Any viable plant cell can differentiate into somatic embryos

Anthocyanins are accessory photosynthetic pigments

Casparian strips in endodermis are suberized

Mature sieve tubes have parietal cytoplasm and perforated sieve plates

Conifer tress produce a large quantity of windborne pollen grains

Carbon dioxide produced during fermentation causes bread dough to rise by thermal expansion

Number of organisms at any trophic level depends upon the availability of organism which sere as food at the lower level

No value is attached to these forests because these are poor in biodiversity

Mimicry is a method to acquire body colour blending with the surroundings

Oxidation state of Cr in Na₂ CrO₄ is +VI

NF3 ionizes to give F⁻ ions in aqueous solution

lodide stabilizes higher oxidation state .

In β^+ emission neutron is transformed into proton

Barium does not show variable oxidation state

Oxygen binds as O^{2-} to Fe of hemoglobin Glycosides are acetals

The reaction follows SN2 mechanism

Change in pH affects the solubility of the enzyme in water

[SRI GANESHA] FINGERTIPS REVISION FOR EVERY ENTRANCE EXAM EXEMPLAR EXPLORER [FREEEE] BOOK [93 of 182]

- 170. Alkyl benzene is not prepared by Friedel Crafts alkylation of benzene
- Hydroxyketones are not directly used in Grignard reaction
- Trans-2-butene on reaction with Br₂ gives meso-2, 3-dibromobutane
- Cis-1, 3-dihydroxy cyclohexane exists in boat conformation.
- 174. The increase in internal energy (ΔE) for the vapourization of one mole of water at 1 atm and 373 K is zero
- 175. BaCO₃ is more soluble in HNO₃ than in plain water
- 176. ΔH and ΔE are almost the same for the reaction, N₂ (g) + O₂ (g) $\leftarrow \rightarrow 2 \text{ NO}(g)$
- Photo chemical smog is produced by nitrogen oxides
- 178. Increasing pressure on pure water decrease its freezing point.
- 179. The micelle formed by sodium stearate in water has -COO groups at the surface
- The O -O bond length in H₂ O₂ is shorter than that of O₂ F₂.
- 181. Temperatures near the sea coast are moderate
- 182. The earth is slowing down and as a result the moon is coming nearer to it.
- 183. A tube light emits white light
- 184. Radioactive nuclei ernit & particles
- 185. The resistivity of a serviconductor increase with temperature
- 186. The Coulomb force is the dominating force in the universe
- 187. The length of the day is slowly increasing

Alkyl halides are less reactive than acyl halides

Grignard reagents react with hydroxyl group

The reaction involves syn -addition of bromine

In the chair form, there will not be hydrogen bonding between the two hydroxy groups

For all isothermal processes $\Delta E =$

Carbonate is a weak base and reacts with the H⁺ from the strong acid, causing the barium salt to dissociate

All reactants and products are gases

Vehicular pollution is a major source of nitrogen oxides

Density of water is maximum at 273 K

Surface tension of water is reduced by the addition of stearate

H₂ O₂ is an ionic compound

Water has a high thermal conductivity .

The angular momentum of the earth moon system is not conserved

Emission of light in a tube takes place at a very high temperature .

Electrons exist inside the nucleus

The atoms of a semiconductor vibrate with larger amplitude at higher temperatures thereby increasing its resistivity.

The Coulomb force is weaker than the gravitational force

The dominant effect causing a slowdown in the rotation of the earth is the gravitational pull of other planets in the solar system

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- 188. Bohr had to postulate that the electrons in stationary orbits around the nucleus to not radiate
- 189. The possibility of an electric bulb fusing is higher at the time of switching ON and OFF
- 190. The stars twinkle while the planets do not .
- 191. A beam of charged particles is employed in the treatment of cancer
- 192. When a beetle moves along the sand within a few tens of centimeters of a sand scorpion, the scorpion immediately turns towards the beetle and dashed towards it.
- 193. When a bottle of cold carbonated drink is opened, a slight fog forms around the opening
- 194. The size of a hydrogen balloon increase as it rises in air
- 195. Owls can move freely during night
- 196. It is hotter over the top of a fire than at the same distance on the sides
- 197. The amplitude of an oscillating pendulum decreases gradually with time
- 198. Microwave communication is preferred over optical communication
- 199. Neutrons penetrate matter more readily as compared to protons
- 200. In high latitudes one sees colourful curtains of light hanging down from high altitudes

According to classical physics all moving electrons radiate .

Inductive effects produce a surge at the time of switch-off and switch-on

The stars are much bigger in size than the planets

Charged particles on passing through a material medium lose their energy by causing ionization of the atoms along their path

When a beetle disturbs the sand, it sends pulses along the sand's surface. One set of pulses is longitudinal while the other set is transverse

Adiabatic expansion of the gas causes lowering of temperature and condensation of water va-

The material of the balloon can be easily stretched

They have large number of rods on their retina

Air surrounding the fire conducts more heat upwards

The frequency of the pendulum decrease with time

Microwaves provide large umber of channels and band width compared to optical signals

Neutrons are slightly more massive than protons

The high energy charged particles from the sun are deflected to polar regions by the magnetic field of the earth .

ANSWERS

1.(2) 2.(3) 3.(1) 4.(3) 5.(2) 6.(3) 7.(2) 8.(1) 9.(1) 10.(1) 11.(3) 12.(2)13.(1) 14.(2) 15.(1) 16.(2) 17.(4) 18.(2) 19.(1) 20.(2) 21.(2) 22.(2) 23.(4) 24.(4) 25.(2) 26.(1) 27.(2) 28.(2) 29.(3) 30.(2) 31.(4) 32.(3)34.(2) 35.(1) 36.(1) 37.(1, 2) 38.(1) 39.(1) 40.(2) 41.(1) 42.(1) 43.(4)44.(1) 45.(3) 46.(2) 47.(2) 48.(4) 49.(2) 50.(1) 51.(3) 52.(4) 53.(2) 54.(3) 55.(2) 56.(4) 57.(4) 58.(3) 59.(3) 60.(4) 61.(1) 62.(2) 63.(4)64.(3) 65.(2) 66.(3) 67.(1) 68.(4) 69.(2) 70.(4) 71.(1)72.(1) 73.(1) 74.(2) 75.(3) 76.(1) 77.(2) 78.(4) 79.(2) 80.(4) 81.(2) 82.(3) 83.(4) 84.(3) 85.(4) 86.(3) 87.(2) 88.(2) 89.(1) 90.(4) 91.(3) 92.(3) 93.(4) 94.(3) 95.(3) 96.(2) 97.(2) 98.(2) 99.(4) 100(3) 101.(2) 102.(1) 103.(4) 104.(4) 105.(3) 106.(4) 107.(1) 108.(2) 109.(3)110.(4) 111.(3) 112.(1) 113.(3) 114.(3) 15.(2) 116.(3) 117.(2) 118.(2)119.(1) 120.(1) 121.(2) 122.(3) 123,73 124.(4) 125.(4) 126.(1) 127.(2) 128.(2) 129.(3) 130.(2) 131.(4) 132 (3) 133.(2) 134.(3) 135.(3) 136.(1) 137.(1) 138.(1) 139.(3) 140.(3) 141.(1) 142.(2) 143.(3) 144.(2) 145.(2) 146.(3) 147.(3) 148.(2) 149.(3) 150.(3) 151.(1) 152.(1) 153.(3) 154.(2) 155.(1) 156.(2) 157.(1) 158.(4) 159.(3) 160.(1) 161.(1) 162.(1) 163.(?)164.(?) 165.(2) 166,(3) 167.(4) 168.(1) 169.(2) 170.(2) 171.(1) 172.(3) 173.(4) 174.(1) 175.(1) 176.(2) 177.(2) 178.(3) 179.(2) 180.(4) 181.(1) 182.(4) 183.(1) 184 (3) 185.(2) 186.(3) 187 (9) 188.(1) 189.(1) 190.(2) 191.(1) 192.(1) (193.(2) 194.(3) 195.(1) 196.(1) 197.(4) 198.(4) 199.(2) 200.(2)

FOUNDER OF A.I.M.S. DARE TO SUCCESS TALLAPU REDDY. VENKATA KRISHNA REDDY. M.SC [MATHEMATICS] [CELL: 944 0 345 996]

EXPLANATIONS

- 21. The crystal of lead zirconate is a key component of electrocardiography. It is a piezoelectric material (the material which has a net dipole moment and which can produce electricity when subjected to pressure or stress), ceramic or crystal in nature. Thickness of this material is the critical factor which allow proper vibrational frequency.
- 22. During fasting the sugar is digested from the reserve of thus sugar level goes down.
- 23.DNA fingerprinting is technically called DNA profiling or DNA typing or genetic finger printing. A technique invented by Sir Alec Jeffry of U.K. (1985) is used to identify a person on the basis of DNA specificity.
- 24. Increased contraction of ventricular muscles during systole first causes the closure of atriventricular, bicuspid and tricuspid valve producing low pitch 'LUBB' sound. At the end of ventricular systole, semilunar valves shut producing second short and sharp sound, the 'DUPP'.
- Plants are first trophic level, herbivores (or dairy breeds) are second and Mr X is in third trophic level.
- 26. Word health day April 7 No tabacco day - May 31

World environment day - June 5

- 27. By measuring the level of oxygen pollution in water is measured. When larger amount of sewage is dumped into water, the BOD will increase.
- 28. Sesamoid bones are formed by ossification of tendon at joints
- 29. The empty follicle during obgeneses develops into corpus luteum. The cytoplasm of the corpus luteum is not in a yellow pigment called lutein and hence known as yellow spot.

Macula lutea is the yellowish spot present at the posterior pole of eye. Lutein, zeaxanthin, α -carotene and β -cryptoxanthin are responsible of its yellow colouration.

30. During photorespiration O_2 is taken by RuBp carboxylase and thus inhibits CO_2 fixation during C_3 pathway. The phosphogylcolate is converted into glycolate

- 31. One is a vector and other is pathogen. Leishmania donovani is pathogen rausing kala-azar and sand fly is a vector of this pathogen. Similarly Rat flea or Xenopsylla is a vector whereas Yersinai pest is a pathogen causing plague.
- 32. Because these are saturated fat rich substance which accumulate in the arteries and cause hyper cholestroternia)
- 33. Highest amount of DBT can be detected in Indians due to its prolonged use.
- 34. Vasopressin regulates the amount of urine and thus it low secretion will lead to passage of much urine. Vasopressin has not effect on glucose metabolism.
- 35. tRNA has four recognition sites among these one is the amino acid attachment site with 3' terminal CCA sequence.

36 Competitive inhibition is the process by which 2 substrates compete the active site on enzyme and the alternate substrate inhibits the reaction.

- Mutualsim Both organism benefit commensalism - one organism gains other is unharmed
- 38. Photo chemical smog was reported in Los Angeles. These oxidizing type of pollution is characterised by the presence of large concentration of ozone, oxides of nitrogen and various hydrocarbons.

Nitric oxide (NO) is formed by reaction between oxygen and nitrogen.

NO reacts with air forming NO2.

NO₂ absorbs light and nitric oxide and nascent oxygen [O] are formed.

Nascent oxygen combines with molecular oxygen to form ozone

Ozone reacts with unburnt hydrocarbons to give aldehydes and ketone

Nitrogen oxides, oxygen and ketone gives rise to PAN

39. Major pollutants like SO₂, NO₂ and particular matter in which the SPM {suspended particulate matter) in Delhi's air exceed the permitted levels.

- 40. Increased stimulation of vagus leads to increase peristalsis resulting in excess secretion of HCl and pepsin in stomach. This leads to erosion of mucus and muscularis mucosa into the submucosa which leads to peptic ulcer.
- 41. Restriction enzymes or restriction endonucleases cleave DNA to specific sites when nucleotides of the two strands form inverted base sequence and are symmetrical around a given point. They are originally extracted from bacterium E.coli.
- 42. Wild ass is confined to Runn of Kutch (Gujrat). It is an endangered species.
- 43. Proposed by Watson and Crick. Also known as semi-conservative replication because each new double helix retains one strand of original DNA. Both new strands are synthesized in 5'-3' direction. Thus one strand is synthesized forward and other backward.
- 44. UGA and UAG are non-sense codons and UGG codes for tryptophan.
- 45. Concave lens is used for correcting myopia or shortsightedness. In myopia the eye ball is elongated and image is formed in front of retina.
- Early embryos of different vertebrates resembles in possessing similar structures like noto chord, tail, gill slits etc.
- 47. During ovulatory phase production of FSH decreases, while that of LH increases which leads to ovulation of about 14 day. Leutal?? phase lasts from 15-28 days Menstrual phase lasts for 3 5 days
- 48. Somatostatin is secreted by delta cells of islets of langerhans, hypothalamils and some cells of digestive tract. They are stored and released from posterior pituitary gland.
- 49. Spirulina platensis contain 40 to 50% crude protein and its protein has balance composition containing all essential amino acids. During illness the proteins serve as nutrition and are thus disintegrated therefore protein rich diet is recommend
- 50. Virbids are discovered by T.O Dienea (1971). They consists of a single stranded linear or

circular DNA molecule and are not enclosed by protein coat. its replication requires host's encoded RNA polymerase.

- 52. Ferricyanide acts as electron receptor which is required for Hill reaction. Other requirement is illumination
- 53. Mycorrhiza is an example of mutulism. The higher plants provide the fungi with carbohydrates and in return the fungi helps the plant in absorption of water, dissolution and absorption of inorganic mutuent locked in organic matter (especially nitrogen and phosphorus) which plant cannot absorb from soil.
- 54. Exine the outer layer of pollen grain is a acetolyis resistant layer. It is made up of hghly resistance fatty substance called sproropollenin. Sporopollenin is a protein which is impervious and this maintains the water in the body
- 55. Red-green colour blindness is a recessive sex linked trait. The normal gene and its recessive affete are carried by X-chromosome. In male a single recessive gene (X^oY) will cause the
- disease whereas in female both the sex chromosomes carrying recessive gene (X^oX^o) will be affected.
- 56. Morula is a solid mass of 32 cells formed from zygote after successive mitotic division (after third division of cleavage)
- 57. Plasmodesmata are found in between the cells and act as channels by which the substance passes.
- Quiescent centre is zone of no activity and this region has low concentration of DNA, RNA and protein
- 59. Leaves of Azolla (a pteridophyte) are associated with blue green algae (Anabaena azollae) having capacity to fix atmospheric nitrogen and make it available to Azolla.
- 60. Seed is diploid (2n) generation, is capable to r produce new plant and also contains diploid (2n) embryo. The seed is attached with (2n) mother plant, hence attached with parent generation to itself and capable to produce F2 generation for future.
- 61.(1) When a substance is placed in a magnetic field it causes greater concentration of the

lines of magnetic force within it self than in the surrounding magnetic field, it is said to exhibit paramagnetism. It is associated with the presence of unpaired electrons in an ion or molecule . K O₂ is paramagnetic molecule because it contains unpaired electron

i.e., [K⁺(:Ö==:Ö:)]

- 62. (2) The multidentate ligand , EDTA forms complexes of high stability with various metal ions. This is used in the estimation of hardness of water by a simple titration method. We know that hardness of water is caused by the presence of Ca²⁺ and Mg²⁺ ions. The difference in satbility constant values, for example, the K value for Ca²⁺ and Mg²⁺ in EDTA complexes are 10^{10.7} and 10^{8.70} respectively which permits the selective estimation of different ions
- 63.(4) In the case of of oxyacids of phosphorus like H₃ PO₂, H₃ PO₃ and H₃ PO₄ the central atom has sp³ hybridisation and therefore, surrounded by neighbouring atom tetrahedrally. Phosphorus occupy the central position and oxygen or -OH group occupies edges of tetrahedron in all cases



64.(3). Copper in Cu (NHa), ²⁺ is dsp² hybridized and due to this reason it has square planar structure

65.(2). An anticancer agent destroys the cancer cells. There are so many anti cancer agent are present but most common is cisplatin. Its chemical formula is Cis – [Pt Cl₂ (NH₃)₂]. It is a complet compound of Pt.

66.(3). Among [V (H₂ O)₆] SO₄ . H₂ O , Na₃VO₄, VOSO₄ and VCl₃ only Na₃ VO₄ is colourless species rest are coloured 67.(1). In aqueous medium MnO_4^{2-} reacts as

$$3 \operatorname{Mn} \operatorname{O_4^{-}} + 2\operatorname{H_2} O \longrightarrow \operatorname{MnO_2} + 2\operatorname{Mn} \operatorname{O_4^{-}} + 4\operatorname{OH^{-}}$$

If we take only one molecule of MnO₄
then , MnO₄²⁻ + $\frac{2}{3}$ H₂ O
 $\longrightarrow \frac{1}{3}$ MnO₂ + $\frac{2}{3}$ MnO₄ + $\frac{4}{3}$ OH⁻

- 68.(4). The oxidation state (III) is most common in lanthanides, but some lanthanides contains two or three oxidation states. For example, Eu have (11) and +(III) oxidation state which is very common.
- 69.(2). The mixture of conc. HCl and HNO₃ in 3 : 1 ratio is commonly known as aqua regia. It is so called because it can dissolve all the noble metals. In this mixture of aqua regia it contains NOCI

 $3HCI + HNO_3 - \rightarrow 2H_2 O + NOCI + 2 CI$

10.(4) Sodium metal dissolves in liquid NH₃ which gives blue solution. Which contain Na⁺ ion in solution as solvated state and solvated electrons. It can conduct electricity

71.(1). Ligands such as CO, CN and NO+

have empty π – orbitals with the correct symmetry to overlap with metal t_{2g} orbitals, forming π orbitals. This is often described as back bonding. These ligands are known as π – acceptors or π – acids

- 72.(1) For the gravimetric estimation of copper (II), the compound thiocyanide is used and that compounds Cu₂ (SCN₂)
- 73.(1) The ore of copper is copper pyrite (CuFeS₂) from which copper metal is mainly extracted. The reaction involves oxidation of Cu₂ S and then reduction of Cu₂ O to copper metal

 $Cu_2 O + FeS \longrightarrow FeO + Cu_2 S$ $3O_2$ $2 Cu_2 S \longrightarrow 2 Cu_2 O + 2 SO_2$ $2 Cu_2 O + Cu_2 S \longrightarrow 6 Cu + SO_2$

74.(2) The strongest acid among all given acid is benzoic acid , C_6 H₅ COOH . It is due to the fact that



is resonance stabilised, or in other words, $C_6 H_5$ – group is electron withdrawing in nature which withdraw the electron from – COOH group H atom moves from this as H⁺ ion and gives its electron to ring system along with carboxylate ion . In the case of $CH_3 - COOH$, CH_3 — group is electron pumping in nature which increases the electron density over –COOH group and removal of H⁺ ion becomes difficult . Again in



-OCH3 group is electron pumping in nature which again increases electron density over COOH group hence, acid strength decreases

75.(3). All the given compound contains one electron withdrawing group. C₆ H₅ - CH₂ NH CH₃

contains one electron withdrawing group $(C_6 H_5)$ but it has two electron pumping group also. That is why this amine will behave as strongest base. $-NO_2$ group is electron with drawing group in $O_2 N - CH_2 - NH_2$ and it does not have electron pumping group . It is primary amine also that is why it will behave as weakest base



The IUPAC name is 3-methyl cyclohexene-1-enol or 3-methyl cyclohexene

77. (2) Hydrogen bonding is strongest when the bonded structure is stabilized by resonance. The compound of aromatic ring posses resonance, like in phenol . That is why hydrogen bonding in phenol is strongest

- 78.(4). The group —COOH, -CN, COCH3 are meta directing. — NHCOCH3 group is ortho/ para directing group
- 79.(2). C₆ H₆ reacts in the presence of H₂ SO₄ with isobutene as follows



The tertian carbonium ion (carbocation) reacts with benzene ($C_6 H_6$) and given tert-buty benzene



80.(4) The most reactive nucleophile among the given compounds is (CH₃)₃ CO⁻ because 3° alkyl group is strongest electron pumping group . It will pump electron cloud over

 \rightarrow CO⁻ and it will behave as strongest nucleophile

- 81.(2). According to R-S configuration priority rule position 2 is anticlock wise and position 3 is also anticlockwise. Therefore the absolute configuration of the compound is 2s, 3s.
- 82. (3) One molecule of haemoglobin has four haem groups. Each haem group can co-ordinate with one oxygen molecule (O₂). So one haemoglabin can hold four oxygen molecule and becomes oxyhaemoglobin as

$$Hb + 4 O_2 \longrightarrow Hb (O_2)_4$$

haemoglobin oxyhaemoglobin

83. (4). At higher temperature $CH_3 CO_2 C_6 H_5$ will give iodoform reaction. It is due to the

fact that $CH_3 - C$ —group gives this test. $C_6 H_5 - O$ - will behave as $C_6 H_5 = O$. O|| It will release - C CH₃ group easily from

$$CH_3 - C - O - C_6 H_2$$

84.(3). 2-Hydroxymethyl serine is an a chiral aminoacid .For chirality all the group attached to carbon atom should be different. But in this case of 2-hydroxymethyl serine, the second carbon atom contain two - CH₂ - OH group. hence, achiral . For example



85.(4) Nitrobenzene with Zn dust and aqueous NH₄ Cl gives 62 -68% yield of N-phenyl by





87.(2). The dipole moment of larger halogen with same alkyl group is minimum and with smaller halogen it is maximum. Only exception is fluorine because its electron affinity is less than that of chlorine. So the order of decreasing strength of dipole moment is

 $CH_3 Cl > CH_3 F > CH_3 Br > CH_3 I$

- 88.(2) In Na₂ O compound the crystal structure contain CCP in which all tetrahedral site is occupied by Na⁺ ion. Since there are two tetrahedral site per atom, and all the sites are occupied by Na⁺ ions for each O^{2^-} ion. This structure is known as antifluorite structure. Now, one Na⁺ is surrounded by four O^{2^-} ion, whereas each O^{2^-} ions surrounded by 8 Na⁺ ion. Hence, co-ordination number of Na⁺ is 4
- 89. Due to resonance and electron withdrawing effect of ring, methyl group pumps electron towards ring and hyperconjugation can be seen in coluene. For example



That is why the bond dissociation energy of C-H is lowest in toluene

90.(4). $\Delta E = m S \Delta T$

where , m = 1 g , $\Delta T = 6.12$ K heat capacity of system (S) = 1.23 kJ/g/degree

Now, Heat of decomposition

= 1 × 6.12 × 1.23= 7.5276 kJ

NH₄ NO₃ = 7.5276 × 80

(since mol.wt of NH₄ NO₃ = 80) = 602.2 kJ/mol

91. (3). Colligative property is a democratic property meaning it depends upon concentration of solute particles. Depression in vapour pressure due to the presence of no volatile solute is also colligative property .Naphthalene is a non -volatile solid, hence its addition in benzene decreases its vapour pressure

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92.(3). In the fuel cell chemical energy is directly converted in to electrical energy. Basically fuel cell is a galvanic cell, in which combination of hydrogen and oxygen takes place (combustion) and it produces water or the net reaction is the same as burning of hydrogen and oxygen to form water. The reaction takes place as

At anode

 $2\left[H_2\left(g\right)+2\;OH^-\left(aq\right)\longrightarrow\;2H_2\;O\left(l\right)\;2e^-\right]$

At cathode

overall

 $\frac{O_2 (g) + 2 H_2 O (l)6+ 4\overline{e} \rightarrow 4 OH^- (aq)}{2H_2 (g) + O_2 (g) \rightarrow 2 H_2 O (l)}$

- **93.(4).** The salt solution of weak acid and free acid mixture or solution formed by mixing a weak base with its salt of strong acid are called buffer solution. But HClO₄ is strong acid with its salt KClO₄ it will not behave as buffer solution
- 94.(3). Standard entropy change ΔS° is greater than zero in such cases where number of products are more than the number of reaction tants for example,

Na NO₃ (s) \leftarrow Na⁺ (aq) + NO₃⁻ (aq)

- 95.(3). The magnetic quantum number (in) deals with the orientation of electron in three dimensional space. i.e., spatial prioritation of the orbital
- 96.(2). The molecule
 - CH₃ (CH₂)₁₄ CH₂ NH₂ has both polar - NH₂ and non polar - CH₃ end so it is a surfactant.
- 97.(2) Form Faraday law of electrolysis

 $Q \notin i$ $1 = 9.65 \text{ A} \cdot (\text{given})$ For deposition of 1 millimole of Al,

$$Q = \frac{96500}{1000} = 96.5 \text{ Coulumb}$$

So, $t = \frac{Q}{1} = \frac{96.5}{9.65} = 10 \text{ sec}$

- 98.(2). If the resulting solution is basic at equivalence point then the pH of solution will be greater than 8. It is only possible when weak acid is titrated with strong base. For example. CH₃ COOH when titrated by NaOK.
- 99.(4). Among the given list oxygen is not a green house gas



For forward reaction, activation energy is (2) and for backward reaction the value of activation energy is (1)

Therefore, $\Delta H = b - a = c$

101.(2). The K.E of the Projectile

$$=\frac{1}{2}mv^{2}$$

And P.E Of the Projectile in the earth's gravitational field = $\frac{GM_e}{R}$

where m= mass of the projectile

 $M_e = mass of the earth$

V= Velocity of the projectile

For escape velocity

 $= \frac{1}{2} \text{mv}^2 = \frac{\text{GM}_{e}\text{m}}{\text{R}_{e}}$ $v^2 = \frac{2\text{GM}_{e}}{\text{R}_{e}}$ $= \frac{2\text{GM}_{e}}{\text{R}_{e}} \times \frac{\text{R}_{e}}{\text{R}_{e}}$ $= 2\left(\frac{\text{GM}_{e}}{\text{R}_{e}^2}\right) \times R_{e}$

 $= 2 \times q \times R_{\star}$ $g = \left(\frac{GM_e}{R_e}\right)$ Where $V = \sqrt{2qR_o}$

Here we see that the velocity of the particle does not depend on the mass of the projectile.

102. (1). The Bernoulli's equation is based on the work-energy theorem of the stream line flow of an ideal fluid. Its statement is as" the total energy per unit volume of a flowing liguid is a constant"

The statement in equation form is as

$$P + \rho gh + \frac{1}{2}\rho V^2 = constant$$

Where

-

P- Pressure on the fluid ρ = Density of fluid V=Velocity of fluid H=Height of the liquid column

103. (4). Because it can be highly focused

Since in surgery be need some very sharply focused beam . So we use laser beam

104 (4) Since we know that

$$R = \rho \frac{1}{A}$$
resistivity of

Where p= of the wire I=length of the wire A= Cross section Area of the wire

=

Since volume of the wire remained constant

= constar

(1)

$$\therefore \qquad A_1 \times I_1 = A_2 I_2$$
And
$$A_1 = \pi \left(\frac{d}{2}\right)^2 = \pi \frac{d^2}{4}$$

$$A_2 = \pi \left(\frac{d}{4}\right)^2 = \pi \frac{d^2}{16}$$

 $\pi \frac{d^2}{4} \times l_1 = \pi \frac{d^2}{16} l_2$ given that $l_1 = L$ $\pi \frac{d^2}{4} L = \frac{\pi d^2}{16} l_2$ b = 4L - - - - (2)Now putting the values of In and I And 16 × R. $16 \times 10 = 160 \Omega$ 105(73) Since the energy of the charged particle = P.D. x charge $=\frac{1}{4\pi\epsilon_{-}}\frac{Q}{r}$ And P.D. And energy = $\frac{1}{4\pi\epsilon_0} \frac{Qq}{r}$ ⇒ The energy (here K.E.) is independent of mass of the charged particle 106 (1) Since the dipole has its torque in an electric field is as $\tau = a \times d \times E$ andforceexperiencedbythechargedparticle is F=q.E Where q = charge of the particle E = electric field d=sepertion between the two charges Here we see that torque and force both will the experienced by the particle 107. (1)For capacitor, impedance is .

$$Zc = \frac{1}{wc}$$

And for D.C , we know that

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$$w = 0$$
$$Zc = \frac{1}{0 \times c} = c$$

Hence capacitor blocks the D.C. current. Hence the current in the circuit becomes instantaneously zero.

108. (2) Gallium has 3 valence electrons So it will form the p-type semiconductor

109 (3) Since N = No $e^{-\lambda t}$ N = $\frac{1}{16}$ No $\Rightarrow \qquad \frac{1}{16}$ No = No $e^{-\lambda t}$ $\Rightarrow \qquad \frac{1}{16} = e^{-\lambda t}$ $= e^{\frac{-\ln 2}{T_{1/2}}t}$

taking loge on both sides

 $\log_{e} 1 - \log_{e}^{16} = \frac{-\log^{2}}{T_{1/2}} \times t \times \log^{e}$ $O-2.77 = -\frac{0.693 \times 40}{T_{1/2}}$

(Because t=40)

$$T_{\frac{1}{2}} = \frac{0.693 \times 40}{2.77} = \frac{27.72}{2.77}$$

= 10 days

110 Let the K.E of neutron = $\frac{1}{2}$ m_n × V²

Deuteron has one proton and one neutron . So this energy will the distributed among all the three particles as one coming neutron and two deuterons constituent particles. So the K.E. of the coming neutron has now



$$= \frac{3m_{n}V^{2} - m_{n}V^{2}}{6}$$
$$= \frac{2m_{n}V^{2}}{6} = \frac{1}{2}mv^{2}$$

Here let m_n =m_r ∴ Fraction loss of K.E. is..

 $=\frac{\frac{1}{3}mv^{2}}{\frac{1}{2}mv^{2}}$ $=\frac{1}{3}mv^{2}\times\frac{2}{3}$ So the answer will we 3

111. The motion of planetary motion is based on the Kepler's laws of planetary motion.

And the Keplers laws of planetary motion is based on the conservation of angular momentum

12.(1) Since we know that surface energy due to the surface tension

= Surface tension x surface area

 $E_1 = s_1 \times T$

$$E_2 = s_2 \times T$$

{ Because of the surface tension of the same liquid in same}

$$\frac{E_1}{E_2} = \frac{s_1 \times T}{s_2 \times T} = \frac{S_1}{S_2}$$
$$\frac{E_1}{E_2} = \frac{1}{(2)^{\frac{1}{3}}} = 1.2^{\frac{1}{3}}$$

113. (3) From the Stefan's formula we know that the heat radiated = $\sigma \times T_4$

 $\Rightarrow \qquad u_1 = \sigma(T_1)^4 \\ u_2 = \sigma(T_2)^4 \\ T_1 = 227 + 273 = 500 \\ T_2 = 273 + 727 = 1000 \\ \therefore \qquad \frac{u_1}{u_2} = \frac{\sigma \times (500^4}{\sigma \times (1000)^4} = \frac{1}{16} \\ But \qquad u_1 = 20 \text{ calm}^{-2} \text{ s}^{-1} \end{cases}$

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4

 $u_2 = 16 \times 4$ $= n \times 500 \times 10^{-9}$... $=16x 20 = 320 \text{ calm}^{-2} \text{s}^{-1}$ $0.5 \times 2 \times 10^{-6} = n \times 500 \times 10^{-9}$ $n = \frac{0.5 \times 2 \times 10^{-6}}{500 \times 10^{-9}}$ 114. (3) The effective spring constant K = K + 2K + 3KSince the time period of oscillation $=\frac{1}{500}\times 10^{-6+9}$ $T=2\pi\sqrt{\frac{M}{\nu}}$ $=\frac{1}{500} \times 10^{3}$ $T = \frac{1}{2}$ And $=\frac{1000}{500}$ Where f = frequency of oscillation . $\frac{1}{f} = 2\pi \sqrt{\frac{M}{K}}$ So the central maxima will shift upward by two fringes $f = \frac{1}{2\pi} \sqrt{\frac{K}{M}}$ ۰. 117(2) $f = \frac{1}{2\pi} \sqrt{\frac{3K}{M}}$ Since ⇒ $f = \frac{1}{2\pi} \sqrt{\frac{3k}{m}}$ 2. the de- Broglie wavelength changes according to the momentum and vice- versa. 115.(2) Since $X \times p_x = \text{ constant}$ From the de- Broglie hypothesis (18(2) Since the X-ray is produced due to the transition of electrons from higher electronic $P = \frac{n}{2}$ orbit to the lower electronic orbit. $X \times \frac{h}{h} = \text{constant}$ 119(1) = $\frac{X}{\lambda} = \frac{\text{constant}}{h} = \text{constant}$ +Q = $x = \lambda \times constant$ x co l -So for the maximum accuracy the value of λ sin60°DFsin60 should we longer Net force along AD 116 (3) The shift is $=F \sin 60^{\circ} - F \sin 60^{\circ} = 0$ $(\mu-1)$ λ And the shift of maxima is $n\lambda$ 120(1). C= $2\mu F = 2 \times 10^{-6} F$ $(\mu - 1) \times N = n\lambda$ ⇒ $f = 1KHz = 1 \times 10^{3}Hz$ = retractive index of thin film Where $l = 2mA = 2 \times 11^{-3}A$ + thickness of thin film Impedance wavelength of the light $Zc = \frac{1}{\omega c} = \frac{1}{2\pi f \times C}$ $\mu = 1.5 t = 2\mu m = 2 \times 10^{-6}$ here $\lambda = 500 \text{nm} = 500 \times 10^{-9} \text{m}$ $=\frac{1}{2\pi \times 10^3 \times 2 \times 10^{-6}}$ $(1.5-1) \times 2 \times 10^{-6}$

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Now

$$V = I \times R$$

= 2 × 10⁻³ × 79.57 ≈ 0.16V

70 57

121. (2) Since we know that the magnetic induction of the centre of a circular conducting loop of radius r is

$$B = \mu \frac{n.i}{2r}$$

In this case. $n = 1, r = 5 \times 10^{-2m}$
$$\mu_0 = 4\pi \times 10^{-7}$$
$$B = 0.5 \times 10^{-5} \text{ W b/m^2}$$
$$\therefore \qquad i = \frac{B \times 2r}{\mu \times n}$$
$$= \frac{0.5 \times 10^{-5} \times 2 \times 5 \times 10^{-2}}{4\pi \times 10^{-7} \times 1}$$
$$\approx 0.39 \approx 0.4 \text{ A}$$

122. (3) Due to the ferromagnetic material

Actually the dipoles are getting polarised. So it gets some net dipole moment. And due to the net dipole moment the magnetic field induces: And this causes the deflection in the electric field

123(3) From the Weins displacement law we know that $\lambda_{max}T = constant$.

So the plot between I and λ should be symmetrical But due to the catastrophe of the black radiation, if temperature increases wavelength having maximum intensity shifts towards left.

124 (4) From Gausses law

ds=

Here

...

125. (4) Since we know that

 $\phi = \int \vec{E} ds$

So as y increases u decreases continuously

126 (1) Whappens only between the two light nuclii Actually in heavy nuclii, the nucleus can not come close and contact.

127. (2) From Loretz force law we know that $F = e(\vec{v} \times \vec{B})$

= e v.B., (K) So the place is in x-Z plane,

And we know that in the magnetic field, the charge particles makes circular motion.

 $F = e[v_x \hat{i} \times Bv \hat{i}]$

 $\vec{v} = \hat{i} v_x \times \vec{B} = By \hat{i}$

128 (2) 4 min.
129 (3)
$$v_2 = u^2 + 2as$$

 $= 0 + 2as$
 $\Rightarrow v \neq vs$

v is increasing as s is increasing

130 (2) The loop is attracted towards the i2 Actually the direction of currant i, which is near to the wire in parallel . And parallel current attracts.

Again the currant i1 is also flowing in opposite direction to i2 but it in far away from i2 . So this force is less in camparison to that force.

So that the loop is attached towards the ip

131. (4) In going upwards the velocity decreases because v = u - qt

Again in coming downward, the vel increases because V = u + qt

so the curve should like (3) But due to the air resistance it not the sharp

- 132. (3) The radio active nuclei that are injected into a patient collects a certain sites with in its body and after radioactive decay it emits e.m. radiations. The e.m. radiations are detected by the detector. The process of diagnostic is called rediotracer techniques
- 133. (2) P.E.T.

It is called Pair Emission Technique when the electron and positron combine together to liberate energy as a r-ray, then that form of diagnostic process is called Pair Emission Technique

134.(3) Since R = 1.22
$$\frac{\lambda \times D}{a}$$

...

Where
$$R = resolution$$

 $\lambda = usual enginessite (Theorem 1)
 $\lambda = 500 \text{ mm} = 5 \times 10^{-3} \text{ m}$
 $a = 500 \text{ mm} = 5 \times 10^{-3} \text{ m}$
 $b = 400 \text{ Km} = 400 \times 10^{9} \text{ m}$
 $a = 50 \text{ m} = 50 \text{ m}$
 $122 \times \frac{500 \times 10^{-9} \times 400 \times 10^{3}}{5 \times 10^{-3}}$
 $= 48. \text{ Sm} = 50 \text{ m}$
 $135 (3) \text{ Since, the time difference}$
 $a = 4 \text{ min} = 4 \times 60 = 240 \text{ sec}$
 $\therefore \text{ se v xt} = 4.5 \times 14$
Again $S = 8 \times (1-240)$
 $\therefore \text{ t} = \frac{8 \times 240}{3.5} = 548 \text{ sec}$
Since the min velocity and becomes the will cover in
 $4.5 \times t = 4.5 \times 548 \text{ km}$
 $= 2466 \text{ km} \approx 2500 \text{ km}$
 $136. (1) \text{ Glycerine is a liquid}$
so when the lead goes inside (Then's Has
some velocity. After some time of the adjust of eact H = 8t_{E}$
 $and \text{ radius of eact H = 8t_{E}$
 $A = \text{ top point of tower}$
 $A = \text{ top point of tower}$

142. Indian soils are found deficient in nutrients like nitrogen, phosphorus and potash. Maximum yield can be achieved by using fertilizer rich in these nutrients.

Water is an essential component of vital activities in plant.

So both fertilizer and irrigation are important for high yield

143. BMR or Basic Metabolic Rate is inversely related to weight and volume of an organism i.e. small the organism higher is BMR

Heart rate of a six month old baby is 110 to 112 beats/min. Whereas old aged person may have max. heart rate of 160 beats/min.

- 144. Four chambered heart is also present in some reptiles. Bats and whales though have 4 chambered heart but also posses other mammalian characters like milk gland, pinnae, hairs on the body, presence of diaphragm etc.
- 145. SARS was first reported (WHO) in China. The high population in China is not directly responsible for the origin of SARS

The killer pneumonia virus (a type of corona virus) is responsible for SARS origin.

146. Organochlorides are organic compounds that have been chlorinated and have very low biodegradation and gets accumulated in environment. e.g. DDT, BHC etc.

Fenitrothion is organicophosphale pesticide which are organic easter of phosphoric acid and its derivative. Though they are toxic but are biodegradable.

147. In eggs of Amphioxus and eutherian mammals including rabbit and man holoblastic cleavage takes place. The holoblastic cleavage produces blastomeres of equal size.

Centrolecithal eggs are found in insects and in some hydrozog Meroblastic cleavage occurs in them.

- 148. Noise level up o 60 dB (decibel) is well tolerated. Whereas jet sounds up to 150–160 dB. But jet aeroplanes normally donot land in common apports without an emergency.
- 149. Keel and cuckoo need not build nest because they use nest of other birds and incubate their eggs and nuture hatchlings of these birds (Crows). In this way they are nest para-

sites. Tailor bird is a garden bird which makes its nest by sewing and has no relations (Effect) with koel or cuckoo.

- 150. As a result of ageing or senescence there is a progressive deterioration in structure and function of body tissue and organs. Immune system is no more effective and chances of illness increases. Cessation by mitosis is not a genetically programmed event
- 151. Fluid mosaic model was given by S. J. Singer and G. L. Nicelson (1970). Proteins float in a bilipid layer according to bilipid membrane model.
- 152. Embryoids or somatic embryo has the ability to form full fledged plant. (Cellular totipotency)
- 153. Antheganin rigment are present in cell sap of vacuate. These are colouring pigment of certain higher plants that impart reddish and greenish colour. It is no a photosynthetic pigment.
- 1.4. Apoplastic movement : Pertaining to the movement of water in free space of tissue; free space includes cell walls and intercellular space. Through root hair to endodermis water moves through apoplasts. But in the case of endoderms which has suberised and partially cutinised wall obstructing the passage of water to xylem vessels. From here water moves by synplasm.

156. Some trees like oak, elm, mountain cedar etc. produces allergic pollen grains which may cause sneezing, itching in eyes and nose etc.

Conifers produce large quantity of wind born pollen grains because many pollen grains are destroyed in the process of pollination by wind.

- 157. Fermentation is used in baking therefore yeasts the agent of fermentation are used in baking industries
- 158. Number of organisms at any trophic level depends upon the availability of food. In grassland ecosystem the maximum number of organism are found in lower trophic level but in forest ecosystem and parasitic food chain it is reverse.
- Tropical rain forests are very rich in bio diversity

- 160. By adopting mimicry butterflies blend with the surroundings and protect themselves from enemies
- 161. (1) Due to the oxidation state of chromium (+6) in Na₂ CrO₄ it is intensely coloured
- 162.(3). NF3 is weak ligand than

because fluorine is strong electronegative element which withdraws the electron cloud of nitrogen atom and hence, its tendency to coordinate its lone pair of electron decrease, whereas (CH₃)₃ N is strong ligand because it has three electron pumping group i.e., - CH₃ group, which increases the electron cloud over nitrogen and makes this molecule **to** strong ligand as it can easily co-ordinate its lone pair of electrons



- 163. Pbl4 is not a stable compound because Pb shown (II) oxidation state more frequently only some times due to inert pair effect it shows +(IV) oxidation state. Secondly iodine cannot stabilize higher oxidation state
- 164. Due to one β particle emission this change happens

Again proton emission convert proton in to neutron

 $1p^1 \longrightarrow qn^1 + qn^2$

165.(2). Barium is not required for normal biological functions is true statement, again, barium shows only +2 oxidation state not variable oxidation state is also true. But this explanation for the no requirement of barium in normal biological function is not true

- 166.(3). The heamoglobin is oxygen carrier as in oxyhaemoglobin Hb (O₂)₄ is true but O₂ does not binds as O₂ with Fe. Most appropriately we can say oxygen binds as O₂ to the of heme part
- 167.(4). Glycosides can be prepared by treating glucose with CH₃ Oth in the presence of dry HCl gas. They can not be hydrolysed in acidic medium. They are hemiacetals and not acetals.

168.(1) Benzyl bronziele when kept in acetone water it produces benzyl alcohol is true

169.(2) Activity of enzyme is pH dependent, it is true. The change in pH affects the solubility of the enzyme in water is also true but this is not the correct explanation of activity of enzyme based on pH

- 170.(2). It is true that alkyl benzene can not be prepared by Friedel crafts alkylation of benzene. It is due to the fact that monoalkyl product formed undergo alkylation to form poly alkylated benzene. Reason is true that alkyl halide is less reactive than acyl halides but this is no the explanation of assertion
- 171. (1) Both the assertion and reason are true and explain each other because Grignard reagents reacts with hydroxyl group of hydroxyketone that is why hydroxy ketone are not used directly in Grignard reagent
- 172.(3). It is true that trans-2-butene on reaction with Br₂ gives meso -2, 3- dibromobutane. But this reaction does not involves syn-addition of bromine
- 173.(4). cis-1, 3-dihydroxy cyclo hexane exist in chair form of conformation


There is hydrogen bonding between the two hydroxyl group

- 174.(1) For all isothermal process internal energy, $\Delta E = O$, it is true. That is why ΔE for vaporisation of one mole of water at 1 atm. and 373 K is zero
- 175.(1) BaCO₃ + 2 HNO₃ \rightarrow

Ba $(NO_3)_2 + CO_2 + H_2O$

Because BaCO3 is weak base and reacts with

 H^+ ion of nitric acid and due to this its salt (BaCO₃) dissociated in HNO₃. Where as

water does not have such type of strong H⁺ ions.

- 176.(2). For the reaction
- $N_2(g) + O_2(g) \leftarrow \xrightarrow{\rightarrow} 2NO_2(g)$

 ΔH and ΔE are almost same, it is true. It is also true that all products and reactants are gases but its not correct explanation

- 177.(2). Photo chemical smog is produced by ne trogen oxide, it is true. But it is natural phenomenon, however, it has been accelerated by vehicular pollution but it is not correct explanation of photo chemical smog.
- 178.(3). Freezing point decreases a high pressure on pure water is true. But the density of water is maximum at 4° C i.e., 873 + 4 = 277 K
- 179.(2). Micelle formed by Na-Stearate in water has - COO group at the surface is true. It is also true that surface tension of water is reduced by the addition of stearate but it is not correct explanation of micelle formation. Micelle is formed if molecules with polar and non polar and assemble in bulk to give nonpolar interior and polar exterior
- 180.(4) In $F_2 O_2$, O O bond length is shorter as compare to O–O bond length of

 $H_2 O_2 \cdot H_2 O_2$ is non ionic compound . Both the assertion and reason in this question is wrong.

- 181(1) Temperature near the sea coast is moderate . Because the water heats up and cools down very slowly. So the thermal conductivity generally does not take place.
- 182.(4) According to classical calculations, the earth is not slowing down. It moves with constant velocity. Again the angular momentum is also conserve. because $R = r \cdot p$. So both the statements are wrong.
- 183.(1) The tube emits white light due to the fluorescence. and this phenomenon takes place at very fow pressure at 0.01 mm Hg. But not at high temperature

184.(3) The β particles emitted by the radio nuclii. The β emission tales place due to the conversion of neutron into proton. It does not take place due to the presence of electron inside the nucleus.

- (85.42) The resisitivity of the semiconductor decreases with increase of temp. the atoms of a semiconductor vibrate with larger amplitudes at higher temp. there by increasing its conductivity not resistivity.
- 186.(3) The gravitational force is more dominent in the nature. This the the cause of the stability of the planatary motion.
- 187 The earth is not slowing down due to conservation of angular momentum.
- 188.(1) These are the Bohrs postulates
- 189.(1) This happens due to the induction produced in the wire.

since $E = L\frac{dI}{dt}$, so if $\frac{dI}{dt}$ changes, E changes and it causes the fusing.

190.(2) This happens due to the variation of density of the different layers of the air. Again the intensity of light on our eye is very small in comparison to the planets. So this happens But the size of star giving no affect at all.

- 191.(1) It is really used in the treatment
- 192.(1) Both the statement are true.

When a beetle distrubs the sand, it sends pulses of along the sand surface one set of pulses is fast longitudinal and the other will he slower transverse.

- 193.(2) This happens due to the fact that the pressure inside the bottle is large in comparison to the outside. So the adiabatic expansion tales place And due to the lowering of temperature the gas condenses and vapour forms.
- 194.(3) This happens due to the reduction of the pressure

Again the material of the balloon can we easily stretched

195.(1) Owls can move freely during night because it has a large no of rods on their retina 196.(1) Due to the thermal radiation light moves up. So the temperature at the upper part is more than the temperature at lower point.

197.(4) Since, $f = \frac{1}{2\pi} \sqrt{\frac{q}{q}}$

So the f does not depend on time and remaining constant

- 198.(4) As we know that the information carrying capacity is directly proportional to the band width . So that wider the band width greater the information carrying capacity.
- 199.(2) Neutron (can perjetrate easily in to the matter because it does not has the charge. So the Coulomb repulsion does not take place Again its size is slightly large
- 200.(2) This happens due to the fact that the earth is a magnet. So the deflection of the charged particle at the polar region takes place.

Max. Time : $3\frac{1}{2}$ hrs.	Max. Marks : 200
Useful Constants	$= 9.1 \times 10^{-31} \text{ kg}$
Boltzmann constant (k) = $1.38 \times 10^{-23} \text{ J K}^{-1}$	1 (unified) atomic mass unit (u)
Avogadro's number (Na) = 6.02×10^{23} mol ⁻¹	- 166 × 10 ⁻²⁷ kg
Planck's constant (b) $= 6.63 \times 10^{-34}$ LS	1eV
Speed of light in vacuum (c)	
$-2 \times 10^8 \text{ ms} \text{ ms} = 1$	
$= 5 \times 10 \text{ ms su} - 1$	Charge of Electron (e) = 10×10^{-17} C
nest mass of electron (me)	Gas constant (R)
CENER IL VIOUN EDGE	
GENERAL KNOWLEDGE	6. Which one of the following organisa-
1. Birbal Sahni was a :	use charcoal as a source of power, to
(1) Zoologist	start with, but later switched over to
(2) Founder of Central Drug Research Insti-	hydroelectricity?
tute (CDRI)	(1) The Tata fron and Steel Company
(3) Omithologist.	(2) the Indian Iron and Steel Company
(4) Paleobolanist.	(3) Nysore Iron and Steel Limited.
2. In the year (2003) the chemistry Nobel	14) (1) Idustan Steel Limited.
work:	P. Rishikesh is famous for the production
(1) Aquaporins (2) Na ⁺⁺ channels	(2) Heavy electricals
(3) Ca ** channels (4) Methyl chavicol	(3) Fertilizers (4) Transistorized radios.
3. It lives underwater for up to three water	8. Ravon fibre is manufactured from
as 'nymph' before emerging as a flying	(1) Petroleum (2) Wood and pulp
insect. Fossils of this insect dating back	(3) Chemicals (4) Naphtha
about 300 million years have been	9. Nepanagar is famous for :
(1) Scorpion fly (2) Stone fly	(1) Paper board industries
(3) Caddis fly (4) May IV	(2) Craft paper industries
4. A man - made tunnel (in India transfers	(3) Carbon paper industries
water from which one river to another?	(4). Newsprint paper industries.
(1) Narmada to Tapti	10. Since the Britishers wanted India to
(2) Betwa to Stone	produce and supply raw materials to
(3) Beas to Sutle	policy that encouraged cultivation of :
5 The great Fisher Bank in situated off :	(1) Jute (2) Indigo
(1) The coast of New Foundland	(3) Cotton (4 Commercial corp.
(2) The Chilean coast	11. Primary sector refer to :
(J) The opportion coast	(1) Industry (2) Agriculture
(4) The coast of Great Britain	
$\langle \psi \rangle$	

(3) Trada	(A) Banks	
(5) Hade	(4) Daliks	20. Who of the following was a medical
12. Recently there	was a report on adverse	(1) Samuel Taulor Coleridae
may cause :	neek ne. tight neek ne	(2) John Webster
(1) Glaucoma	(2) Hypertension	(3) Somerset Maugham
(3) Hoarseness of	voice	(4) Thomas Gray
(4) Hyperthyroidis	m	
13. The noise pro mally at the level	duced in office is nor-	BIOLOGY
(1) 20 db	(2) 30 db	21. Cultivation of Bt Cotton has been
(3) 40 db	(4) 60 db	much in the news the prefix "Bt"
14. In the year 20	003 in an eco-maratho	(1) "Barium -rested" Notton seeds
contest in Hiros	hima the 'Fancy Carol'	(2) "Bigger thread" variety of cotton with bet-
recorded the mil	eage of distance per	ter textsile strength
(1) 306 lum (litro	(2) 026 lum (litro	(3) Produced by "biotechnology" using re-
(1) 390 km/ litre	(4) 2062 los (lites	striction enzymes and ligases
(3) 1902 km/ litre	(4) 5902 km/ litre	(4) Carrying an endotoxin gene from Bacillus
15. Dravida Munn	etra Kazhakam (DMK)	Thungensis
(1) M.G. Ramacha	ndran	22 Which one feature is common to leech,
(2) C N Annadura	i //	Coextroach and scorpionr
(3) Kumar Swami I	Kamrai	(2) Ventral nerve colu
(4) Lalithambika A	ntharianam.	
16. All of the foll	owing won the title of	Impulse through nerve fibre is due to the
'Miss World' exce	ept:	fact that :
(1) Lara Dutta	(2) Aishwarya Rai	(1) Nerve fibre is insulated by a medullary
(3) Yukta Mukhi	(4) Priyanka Choora.	sheath.
17. Where is 'Indra Akadimi' situated	Gandhi Rashtriya Uran d?	(2) Sodium pump starts operating only at the cyton and then continues into the nerve fi- bre.
(1) Dehradum	(2) Raepareti	(3) Neurotransmitters are released by den-
(3) Allahabad	(4) Mussorrie	drites and not by axon endings
18. All of the follo 'Media Lab' exce	pt	(4) Neurotransmitters are released by the axon endings and not by dendrites.
The third media	a lab is situated in India	24. The total number of nitrogenous bases
(2) It is supported t	y government funding	in human genome is estimated to be
(3) It is interdiscip	inary i.e. involves sociolo-	about :
gists econoriousts	s, computer sciences etc.	(1) 3.5 million (2) 3.5 thousand
(4). Il piande to proc	iuce wearable computer.	(3) 35 million (4) 3.1 billion
19. In the year 200	03 which of the follow-	25. The Great Barrier Reef along the east
Bresident Bush f	or his research in auto-	(1) Deputation (2) Community
motive technolog	y?	(1) Population (2) Community (3) Econstant (4) Biome
Hiren Gandhi	(2) Sabeer Bhatia	(5) Ecosystem (4) Diome
(2) Comi Destant	12	20. Which one of the following is a pair of

- (3) Guraj Deshpande
- (4) Vinod Khosla

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endangered species?

- Garden lizard and Mexican poppy
- (2) Rhesus monkey and Sal tree
- (3) Indian peacock and carrot grass
- (4) Hornbill and Indian Aconite

27. Which one of the following is a matching pair of a drug and hits category?

- (1) Amphetamines Stimulant
- (2) Lysergic acid Dimethyl amide Narcotic
- (3) Heroin Psychotropic
- (4) Benzodiazepines Pain killer
- 28. In which one of the following pairs the two items mean one and the same thing?
 - (1) Malleus anvil
 - (2) SA node pacemaker
 - (3) Leucocytes lymphocytes
 - (4) Haemophilia blood cancer
- 29. Which one of the following categories of organisms do not evolve oxygen during photosynthesis?
 - (1) Red algae
 - (2) Photosynthetic bacteria
 - (3) C4 plants with Kranz anatomy
 - (4) Blue green algae
- 30. A baby has been born with a small tail. It is a case exhibiting :
 - (1) Retrogressive evolution
 - (2) Mutation (3) Atavism
 - (4) Metamorphosis
- 31. Which one of the following a correctly matched regarding an institute and its location?
 - (1) National Institute of Vinology Pune
 - (2) National Institute of Communicable Diseases - Lucknow
 - (3) Central Drug Research Institute Kasauli
 - (4) National Institute of Nutrition Mumbai

32. Electron beam therapy is a kind of radiation therapy to treat :

- (1) Enlarged prostate gland
- (2) Gall Gladder stones by breaking them
- (3) Certain types of cancer
- (4) Kidney stones
- 33. Severe Acute Respiratory Syndrome (SARS) :

- Is caused by a variant of Pneumococcus pneumoniae
- (2) Is caused by a variant of the common sold virus (corona virus)
- (3) Is an acute form of asthma
- (4) Affects non-vegetarians faster than the vegetarians.
- 34. Cattle fed with spoilt hay of weet clover which contains dicumand :0
 - (1) Are healthier due to a good diet
 - (2) Catch infections easily
 - (3) May suffer vitamin K deficiency and prolonged bleeding
 - (4) May suffer form Beri Beri due to deficiency of B vitamos
- 35. If the Bengal Viger becomes extinct :
 - (1) Hyenas and wolves will become scarce
 - (2) The wild areas will be safe for man and domestic animals
 - (3) Its gene pool will be lost for ever
 - (4) The populations of beautiful animals like deeps will get stabilized.

36 Nitrogen oxides produced from the emission of automobiles and power plants, are the source of fine air borne particles which lead to :

- (1) Photochemical smog
- (2) Dry acid deposition
- (3) Industrial smog (4) Wet acid deposition
- 37. A lake with an inflow of domestic sewage rich in organic waste may result in :
 - Drying of the lake very soon to algal bloom
 - (2) An increased production of fish due to lot of nutrients
 - (3) Death of fish due to lack of oxygen
 - (4) Increased population of aquatic food web organisms.
- 38. Minamata disease was caused due to the consumption of :
 - (1) Sea food containing lot of cadmium
 - (2) Fish contaminated with mercury
 - (3) Oysters with lot of pesticide
 - (4) Sea food contaminated with selenium.
- 39. An artificial pacemaker is implanted subcutanously and connected to the heart in patients :

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- Having 90% blockage of the three main coronary arteries
- (2) Having a very high blood pressure
- (3) With iregularity in the heart rhythm
- (4) Suffering from arteriosclerosis.

40. An example of gene therapy is :

- Production of injectable Hepatitis B vaccine
- (2) Production of vaccines in food crops like potatoes which can be eaten
- (3) Introduction of gene for adenosine deaminase in persons suffering form Severe Combined Immuno- deficiency (SCID).
- (4) Production of test tube babies by artificial insemination and implantation of fertilized eggs.
- 41. The pollen tube usually enters the embryo sac :
 - (1) Through one of the synergids
 - (2) By directly penetrating the egg
 - (3) Between one synergid and central cell
 - (4) By knocking off the antipodal cells.
- 42. What is the first step in the Southern Blot technique?
 - Denaturation of DNA on the gel for hubridization with specific probe.
 - (2) Production of a group of genetically identical cells.
 - (3) Digestion of DNA by restriction enzyme
 - (4) Isolation of DNA from a nucleated cell such as the one from the scene of otime.
- 43. Women who consumed the drug thalidomide for relief from wormiting during early months of pregnancy give birth to children with :
 - (1) No spleen
 - (2) Hare-lip
 - (3) Extra fingers and toes
 - (4) Underdeveloped limbs.
- 44. Given below is a pedigree chart of a family with five children. It shows the inheritance of attached ear-lobes as opposed in the free ones. The squares represent the male individuals and circles the female individuals : Which one of the following conclusions drawn is correct.



(3) The parents are homozygous dominant (4. The parents are heterzygous.

45 Given below is the representation of a kind of chromosomal mutation : What is the kind of mutation represented?



- (1) Deletion
- (2) Duplication (3) Inversion
- (4) Reciprocal translocation.
- 46. Which one of the following pairs is correctly matched with regard to the codon and the amino acid coded by it?
 - (1) UUA Valine (2) AAA Lysine
 - (3) AUG Cysteine (d) CCG Alanine.
- 47. The treatment of snake-bite by antivenom is an example of :
 - (1) Artificially acquired active immunity
 - (2) Artificially acquired passive immunity
 - (3) Naturally acquired passive immunity
 - (4) Specific natural immunity.
- 48. The bacteria Pseudomonas is useful because of its ability to :
 - (1) Transfer genes from one plant to another

 (2) Decompose a variety of organic compounds (3) Fix atmospheric nitrogen in the soil (4) Produce a wide variety of antibiotics. 	56. In the high altitude birds become rare or extinct, the plants which may disap- pear along with them are : (1) Pine (2) Oak
 49. DNA is present in : (1) Chromosomes and dictyosomes (2) Chloroplasts and lysosomes (3) Mitochondria and chloroplasts (4) Mitochondria and endoplasmic reticulum. 	57. Companion cells in plants are associ- ated with : (1) Vessels (2) Sperms (3) Sieve elements (4) Guard cells
 50. Pruning of plants promotes branching because the axillary buds get sensitized to: (1) Ethylene (2) Gibberellin (3) Cytokinin (4) Indole acetic acid 51. The sugarcane plant has: (1) Dumb -bell shaped guard cells. (2) Pentamerous flowers (3) Reticulate venation 	 58. Mosses and ferme are found in moist and shady places because both : Require presence of water for fertilization Do not need surfact for photosynthesis Depend for their nutrition on microorganisms which can survive only at low temperature. Cannot compare with sun-loving plants. 59. Core combium results in the formation of cork a bick becomes impermetable to be a survive on the survey of the s
 (4) Capsular fruits 52. Potato and sweet potato (1) Have edible parts which are homologous organs (2) Have edible parts which are analogous or gans (3) Have been introduced in India from the same place (4) Are two species of the same genus 53 In Ulothrix meiosis takes place in the same place 	60. How many different types of gametes can be formed by F ₁ progeny, resulting from the following cross : AA BB CC x aa bb cc (1) 3 (2) 8 (3) 27 (4) 64 CHEMISTRY
(1) Cells of the filament (2) Holdfast (3) Zygote (4) Zoospores	61. Which of the following is only acidic in nature?(1) Be(OH)2(2) Mg(OH)2(3) B(OH)3(4) Al(OH)3
 54. In a plant organ which is covered by periderm and in which the stomata are absent, some gaseous exchange still takes place through: (1) Aerenchyma (2) Trichomes (3) Pneumatophores (4) Lenticels 55. Somaclonal variation can be obtained by: (1) Application of colchicine (2) Insciention with gamma rays (3) Issue culture (4) Hybridization 	 62. Which one of the following froms with an excess of CN⁻ (Cyanide) a complex having coordination number two? (1) Cu⁺ (2) Ag⁺ (3) ni²⁺ 4) Fe²⁺ 63. Which of the following is not considered as an organometallic compound? (1) Cis -platin (2) Ferrocene (3) Zeise's salt (4) Grignard reagent 64. Dimethyl glyoxime gives a red precipitate with Ni²⁺, which is used for its detection. To get this precipitate readily the best pH range is :

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 $Ka_1 = 4.5 \times 10^{-3}$ and $Ka_2 = 1.7 \times 10^{10}a$ t 298 K : (1)3.0(2) 10.0 (3) 6.1(4)72

- 96. Of the following which change will shift the reaction forwards the product? $l_2 \rightleftharpoons 2l(g), \Delta H^\circ, (298 \text{ K}) = +150 \text{ kJ}$
 - Increase in concentration of I
 - (2) Decrease in concentration of l₂
 - (3) Increase in temperature
 - (4) Increase in total pressure.
- 97. Which of the following statements in TRUE for the electrochemical Daniel cell :
 - (1) Electrons flow from copper electrode to zinc electrode
 - (2) Current flows from zinc electrode to copper electrode
 - (3) Cations move towards copper electrode
 - (4) Cations move toward zinc electrode.
- 98. Which of the following is a biodegradable polymer?
 - (1) Cellulose (2) polytene
 - (3) Polyvanyl chloride (4) Nylon -6
- 99. The rate constant, k, for the reaction

 $N_2O_5(g) \longrightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ is $2.3 \times 10^{-2} \text{ s}^{-1}$. Which equation given below describes the change of [N2O5] with time? [N2O5], and [N2O5] correspond to concentration of N2O5 initially and at time, t :

- (1) $[N_2O_5]_t = [N_2O_5]_0 + kt$
- (2) $[N_2O_5]_o = [N_2O_5]_t e^{it}$
- (3) $\log_{10} [N_2O_5]_t = [O_{310}]_2O_5]_0 kt$ (4) In [N2O5].

$$\lim_{n \to \infty} \frac{1}{[N_2O_5]_1} = kt$$

100. Ozone in stratosphere is depleted by



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(2) C₇F₁₆

101. The waves produced by a motorboat sailing in water are :

(1) Transverse (2) Longitudinal

- (3) Longitudinal and transverse
- (4) Stationary
- 102. In an orbital motion, the angular momentum vector is :
 - (1) Along the radius vector
 - (2) Parallel to the linear momentum
 - (3) In the orbital plane
 - (4) Perpendicular to the orbital plane.
- 103. A nucleus of mass number A, originally at rest, emits an a particles with speed v. The daughter nucleus recoils with a speed :

(1)
$$2v/(A + 4)$$
 (2) $4v/(A + 4)$

(3)
$$4v/(A - 4)$$
 (A - 4)

104. When an electron positron pair annihilates, the energy released is about :

(1)
$$0.8 \times 10^{-13}$$
 J (2) 1.6×10^{-13} J
(3) 3.2×10^{-13} J (4) 4.8×10^{-13} J

- 105. A sphere of mass M and radius R is failing in a viscous fluid. The terminal velocity attained by the falling object will be proportional to :
- $(1) R^2$ $(3) 1/R 4) 1/R^2$ (2) R
- 106. Two springs are connected to a block of mass M placed on a frictionless surface as shown below. If both the springs have a spring constant k, the frequency of oscillation of the block is :



107. A proton of energy 4 eV is incident on a metal surface whose work function is 2 eV. The minimum reverse potential to be applied for stopping the emission of electrons is :

108. A photon and an α - particle, moving with the same velocity, enter into a uniform magnetic field, acting normal to the plane of their motion. The ratio of the radii of the circular paths described by the proton and α - particle is :

(1) 1:2 (2) 1:4 (3) 1:16 (4) 4:1

- 109. Two parallel beams of positrons moving in the same direction will :
 - (1) Repel each other
 - (2) Will not interact with each other
 - (3) Attract each other
 - (4) Be deflected normal to the plane containing the two beams.
- 110. The electric field due to a uniformly charged sphere of radius R as a functions of the distance from its center is represented graphically by :



- 111. Equipotential surface associated with an electric field which is increasing in magnitude along the x-direction are :
 - (1) Planes parallel to yz plane
 - (2) Planes parallel to xy plane
 - (3) Planes parallel to xz-plane
 - (4) Coaxial cylinders of increasing radii around the x-axis
- 112. Suppose the sun expands so that its radius becomes 100 times its present radius and its surface temperature becomes half of its present value. The total energy emitted by it then will increase by a factor of :

(1) 10⁴⁽²⁾ (2) 625

- (3) 256 (4) 16
- 113. The temperature (T) dependence of resistivity (ρ) of a semiconductor is represented by :



- 114. In old age arteries carrying blood in the human body become narrow resulting in an increase in the blood pressure. This follows from :
 - (1) Rascal's law (2) Stokes' law
 - (3) Bernoulli's principle
 - (4) Archimedes principle

15. A circular coil of radius R carries an electric current. The magnetic field due the coil at a point on the axis of the coil located at a distance r from the centre of the coil, such that r >> R, varies as :

- (1) 1/r (2) $1/r^{3/2}$ (3) $1/r^2$ (4) $1/r^3$
- 116. The direction of the angular velocity vector is along :
 - The tangent to the circular path.
 - (2) The inward radius
 - (3) The outward radius
 - (4) The axis of rotation
- 117. Sodium lamps are used in foggy conditions because :
 - Yellow light is scattered less by the fog particles
 - (2) Yellow light is scattered more by the fog particles
 - (3) Yellow light is unaffected during its passage through the fog.
 - (4) Wavelength of yellow light is the mean of the visible part of the spectrum.

118. The magnetic field due to a straight conductor of uniform cross section of radius a and carrying a steady current is represented by :



119. Which of the following velocity-time graphs shows a realistic situation for a body in motion?



120. A bomb of mass 3.0 kg explodes in air into two pieces of masses 2.0 kg and 1.0 kg. The smaller mass goes at a speed of 50 m/s. The total energy imparted to the two fragments is :

1) 207 2	(2) 2.14 kJ
\$12 A B	(4) 4.8 kJ

121. A monochromatic beam of light is used for the formation of fringes on the screen by illuminating the two slits in the Young's double slit interference experiment. When a thin film of mica is interposed in the path of one of the interfering beams then :

- The fringe width increases
- (2) The fringe width decreases
- (3) The fringe width remains the same but the pattern shifts.
- (4) The fringe pattern disappears.
- 122. An object is immersed in a fluid. In order that the object becomes invisible, it should
 - (1) Behave as a perfect reflector
 - (2) Absorb all high falling on its
 - (3) Have retractive index one
 - (4) Have refractive index exactly matching with that of the surrounding fluid.
- 123. An organ pipe closed at one end has furdamental frequency of 1500 Hz. The maximum number of overtones generated by this pipe which a normal person can hear is :

(1) 14 (2) 13 (3) 6 (4) 9

124. The Magnetic Resonance Imaging (MRI) is based on the phenomenon of :

- Nuclear magnetic resonance
- (2) Electron spin resonance
- (3) Electron paramagnetic resonance
- (4) Diamagnetism of human tissues.
- 125. Carbon dating is best suited for determining the age of fossils if their age in years is of the order of :

(1) 10^3 (2) 10^4 (3) 10^5 (4) 10^6

- 126. A 40 μ F capacitor in a defibrillator is charged to 3000 V. The energy stored in the capacitor is sent through the patient during a pulse of duration 2 ms. The power delivered to the patient is :
 - (1) 45 kW (2) 90 kW (3) 180 kW (4) 360 kW
- 127. Eels are able to generate current with biological cells called electroplaques. the electroplaques in an eel are arranged in 100 rows, each row stretching horizontally along the body of the fish containing 5000 electroplaques. The *r*

rangement is suggestively shown below. Each electroplaques has an emf of 0.15 V and internal resistance of 0.25 Ω . The water surrounding the eel completes circuit between the head and its tail. If the water surrounding it has a resistance of 500 Ω , the current an eel can produce in water is about :



- (1) 1.5 A (2) 3.0 A (3) 15 A (4) 30 A
- 128. N moles of a monoatomic gas is carried round the reversible rectangular cycle ABCDA as shown in the diagram. The temperature as A is T_o. The thermodynamic efficiency of the cycle is :



- 129. Liquid oxygen remains suspended between two pole faces of a magnet because it is :
 - (1) Diamagnetic () 2) Paramagnetic

(3) Ferromagnetic (4) Antiferromagnetic

130. An endowrope is employed by a physician to view the internal parts of a body organ. It is based on the principle of :

(1) Reflection (2) Reflection

(3) Total internal reflection

(4) Dispersion.

- 131. We wish to see inside an atom, Assuming the atom to have a diameter of 100 pm, this means that one must be able to resolve a width of say 10 pm. If an electron microscope is used, the minimum electron energy required is about :
 - (1) 1.5 keV (3) 150 kev
- (2) 15 keV (4) 1. 5 MeV
- 132. When a compact disc is illuminated by a source of while light, coloured 'lones' are observed. This is due to :
 - (1) Dispersion
 - (3) Interference
- 133. In the basic Cs CI crystal structure, Cs * and C ions are arranged in a bcc configuration as shown below. The net electrostatic force exerted by the eight Cs * long on the Cl - Ion is :



- 134. The magnetic moment of a current (I) carrying circular coil of radius (r) and number of turns (n) varies as
 - (1) $1/r^2$ (2) 1/r (3) r (4) r^2
- 135. The cyclotron frequency of an electron gyrating in a magnetic field of 1T is approximately :

(1) 28 MHz	(2) 280 MHz
(3) 2 8 GHz	(4) 28 GHz

136. The dependence of binding energy per nucleon, B_N on the mass number. A, is represented by :



137. Which logic gate is represented by the following combination of logic gates?



- (1) Or (2) NAND (3) AND (4) NOR
- 138. A Ge specimen is doped with Al. The concentration of acceptor atoms

 $1 \sim 10^{21}$ atoms/m³. Given that the intrinsic concentration of electron hole pairs is DD~ 10^{19} /m³, the concentration of electrons in the specimenter:

 $(2) 10^{15} / m^3$

(4) $10^2/m^3$



139. V_{ms}, V_{am} and V_{mp} are root mean square, average and most probable speeds of molecules of a gas obeying Maxwellian velocity distribution. Which of the following statements is correct :

(1)
$$V_{ms} < V_{av} < V_{mp}$$

(2) $V_{ms} > V_{av} < V_{mp}$

140. Using mass (M), length (L), time (T) and current (A) as fundamental quantities (the d)mension of permitivity is :



Asserstion and Reasoning

§ the following question (141-200), statement of assertion (1) is followed by a statement of reason (R)

If both Assertion & Reason are true and the reason is the correct explanation of the assertion then mark 1.

If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark 2

If Assertion is true statement but reason is false, then mark 3

If both Assertion & Reason are false statements, then mark 4

BIOLOGY

- 141 A. Agricultural output increased several times after introduction of ODT.
- 142 A. Diabetes insidius is marked by excessive urination and too much thirst for water.
- 143 A. Coacetvates are believed to be the precursors to Me.
- 144 A Tapeworm, roundworm and pinworm are endoparasites of human intestine.

R DDT was the first insecticide used on a wide scale

R Anti- diuretic hormone (ADH) is secreted by the posterior lobe of pituitary gland.

R Coacervates were self -duplicating aggregates of proteins surrounded by lipid molecules.

R. Improperly cooked food is the source of all intestinal infections.

- 145 A. Fish meal is a rich source of protein for cattle and poultry.
- 146 A. Animals adopt different strategies to survive in hostile environment.
- 147. A. Among the primates, chimpanzee is the closest relative of the present day humans.
- 148 A. Dope test is used to estimate the level of blood alcohol by analyzing the breath of persons drinking alcohol.
- 149 A. The honey bee queen copulates only once in her life time.
- 150 A. From evolutionary point of view, human gestation period is believed to be shortening
- 151 A. Natural selection is the outcome of differences in survival and reproduction among individuals that show variation in one or more traits.
- 152 A. Ginger has a postrate- growing rhizome.
- 153 A. Photomodulation of flowering is a phytochrome - regulated process.
- 154 A. Cyclic pathway of photosynthesis first appeared in some eubacterial species.
- 155 A. Nitrogen fixing bacteria in legune root nodules survive in oxygen - depleted cells of nodules.
- 156 A. Red algae contribute in producing coral reefs.
- 157. A Insects visit flowers to gather honey.
- 158 A. Coconut tree is distributed in coastal areas over a large part of the world.
- 159 A. Deficiency of sulphur causes chlorosis in plants.
- 160 A. Cattle breeds can be improved by superovulation and embryo transplantation.

R Fish meal is produced from non-edible parts of fishes like fins, tail etc.

R. Praying mantis is green in colour which merges with plant foliage.

R The banding pattern in the autasome numbers 3 and 6 of man and chimpanzee is remarkably similar.

R A drunken person usually teels tense and is less talkative.

R The honey bee gueen can lay fertilized as well as unfertilized eggs

R One major evolutionary trend in humans has been the larger head undergoing relatively faster growth rate in the foetal stage.

R Adaptive forms of a given trait tend to become more common; less adaptive ones become less common or disappear.



R. Shoot growth is not effected by gravity.

R Active form of phytochrome (Pfr) directly induces floral induction in shoot buds.

R Oxygen started accumulating in the atmosphere after the non -cyclic pathway of photosynthesis evolved.

R Leghemoglobin completely removes oxygen from the nodule cells.

R. Some red algae secreted and deposit calcium carbonate over their walls.

R. Attraction to flowers prevents the insects from damaging other parts of the plant.

R. Coconut fruit can float and get dispersed over thousands of kilometers before losing viability.

R Sulphur is a constituent of chlorophyll proteins and nucleic acids.

R. Superovulation in high milk -yielding cows is induced by hormonal injection.

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- 161 A. HClO₄ is a stronger acid than HClO₃.
- 162 A. The free gaseous Cr atom has six unpaired electrons.
- 163 A. The [Ni(en)₃] Cl₂ (en=ethylene diamine) has lower stability than [Ni(NH₃)₆] Cl₂.
- 164 A. Sb (III) is not precipitated as sulphide when in its alkaline solution H₂S is passed.
- 165 A. Nuclear binding energy per nucleon is in the order ⁹₄Be > ⁷₃Li > ⁴₂He
- 166 A. Mg is not present in enamel of human teeth.
- 167 A. Carboxypeptidase is an exopepcidase.
- 168 A. Sucrose is an non- reducing sugar.
- 169 A. Isobutanal does not give iodoform test.
- 170 A. Styrene in reaction with HBr gives 2bromo-2- phenyl-ethane.
- 171 A. The pka of acetic acid is lower than that of phenol.
- 172 A. 2- Bromobutane on reaction with sodium ethoxide in ethanol gives 1-butene as a major product.
- 173 A. The major products formed by heating C₆H₅CH₂OCH₃ with HI are C₆H₅CH₂I and CH₃OH
- 174 A. Molar entropy of vaportation of water is different from ethanol
- 175 A. Aqueous gold sotto)tal solution is red in colour.
- 176 A. Copper metal gets readily corroded in an acidic aqueous polution.
- 177. A. Addition of silver ions to a mixture of aqueore roctium chloride and sodium bromide solution will first precipitate AgBr rather than AgC
- 178 Alcohols are dehydrated to hydrocarbons in the presence of acidic zeolites.

R Oxidation state of Cl in $HCIO_4$ is + VII and in $HCIO_3$ + V.

R. Half filled 's' orbital has greater stability.

R. In [Ni(en)₃] Cl₂ geometry of Ni is trigonal bipyramidal.

R. The concentration of Station in alkaline medium is inadequate for precipitation.

R. Binding energy per nuclear increases linearly with difference in number of neutrons and protons.

R. Mg is an essential element for biological functions of human .

R. It cleaves the N -terminal bond.

R. It has glyscosidic linkage.

B It does not have α - hydrogen.

Benzyl radical is more stable than alkyl radical.

R. Phenoxide ion is more resonance stabilized.

R. 1- Butene is more stable than 2-butene.

R Benzyl cation is more stable than methyl cation.

R. Water is more polar than ethanol.

R. The colour arises due to scattering of light by colloidal gold particles.

R. Free energy change for this process is positive.

R. Ksp of AgCl < Ksp of AgBr.

R. Zeolites are porous catalysts.

- 179 A. All F -S-F angle in SF₄ greater than 90° but less than 180°
- 180 A. Effusion rate of oxygen is smaller than nitrogen.

R The lone pair-bond pair repulsion is weaker than bond pair-bond pair repulsion.

R Molecular size of nitrogen is smaller than oxygen.

PHYSICS

- 181 A. A larger dry cell has higher emf.
- 182 A. A red object appears dark in the yellow light
- 183 A. In a pressure cooker the water is brought to boil. The cooker is then removed from the stove. Now on removing the lid of the pressure cooker, the water starts boiling again.
- 184 A. The true geographic north direction is found by using a compass needle.
- 185 A. There are very small sporadic changes in the period of rotation of the earth.
- 186 A. In a transistor the base is made thin.
- 187. A. ⁹⁰Sr from the radioactive fall out from nuclear bomb ends up in the bones of human beings through the milk consumed by frem. It causes impairment of the production of the blood cells.
- 188 A. At the first glance, the top surface of the Morpho butterfly's wing appears a beautiful blue- green. If the wing moves, the colour changes.
- 189 A. A famous painting was painted by not using brush strokes in the usual manner, but rather a myriad of small colour dots. In this painting the colour you see at any given place on the painting changes as you move away.
- 190 A. A disc shaped magnet is levitated above a super conducting material that has been cooled by light nitrogen.
- 191 A Energy is released in nuclear fission.

R. The emf of a dry cell is proportional to its size.

R. The red colour is scattered less

R. The impurities in water bring down its boiling point.

R. The magnetic meridian of the earth is along the axis of rotation of the earth.

R Shifting ellarge air masses in the earth's atmorphere produce a change in the moment of inertia of the earth causing its period of rotation to change.

R A thin base makes the transistor stable.

R. The energetic β -particles emitted in the decay of ⁹⁰Sr damage the bone marrow.

R. Different pigments in the wing reflect light at different angles.

R. The angular separation of adjacent dots changes with the distance from the painting.

R. Superconductors repel a magnet.

R Total binding energy of the fission fragments is larger than the total binding energy of the parent nucleus.

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- **192 A.** Smaller drops of liquid resist deforming forces better than the larger drops.
- 193 A. The melting point of ice decreases with increase or pressure.
- 194 A. Heavy water is preferred over ordinary water as a moderator in reactors.
- 195 A. The driver in a vehicle moving with a constant speed on a straight road is in a non inertial frame of reference.
- 196 A. In He Ne laser, population inversion takes place between energy levels of Neon atoms.
- 197. A. A transistor amplifier in common emitter configuration has a low input impedance.
- 198 A. Thermodynamic processes in nature are irreversible.
- 199 A. Crystalline solids can cause X- rays to diffract.
- 200 A. Photoelectric effect demonstrates the wave nature of light.

R Excess pressure inside drop is directly proportional to its surface area.

R. Ice contracts on melting.

R Heavy, water, used for slowing down the neutrons, has lesser absorption probability of neutrons than ordinary water.

R. A reference frame in which Newton's laws of motion are applicable is non-inertial.

R. Helium atoms have a meta-stable energy level.

R. The base to emitter region is forward biased.

R. Dissipative effects can not be eliminated.

R Interationic distance is crystalline solids is of the order of 0.1 nm.

R De number of photo electron is proportional to the frequency of light.

ANSWERS WITH EXPLANATIONS

G. K.

1.(4) 2.(1) 3.(4) 4.(3) 5.(1) 6.(3) 7.(1) 8 (2) 9 (4) 10.(2) 11.(2) 12.(1) 13.(3) 15.(2) 16 (1) 17.(2) 18.(3) 19.(1) 20.(2)

BIOLOGY

21. Ans. (4) The prefix "Bt" in Br-cotton means Bacillus thuringensis. Bt-cotton is a genetically modified cotton plant which carries cry gene from Bacillus thuringensis bacteria. The cry gene of B thuringensis produces a protein which forms crystalline inclusions in the bacterial spores. These crystal proteins are responsible for the insecticidal activities of the bacterial strains.

Since on gene is present in the plant itself, it produces cry proteins. When these proteins are ingested by insects, along with the parts of plant, they are dissolved in the alkaline juices present in the midgut lumen. The gut proteases process them hydrolytically to release the core toxic fragments. As a result the brush border membranes develop pores which causes their swelling and eventual lysis due to the influx of ions and water into the epithelial cells. The insects or caterpillars which consume the plant dies. Thus an effective way of controlling the pest.

- 22. Ans (2) Ventral nerve cord is present in leech, cockroach and scorpion. Nephridia is the excretory organ of leech. In cockroach and scorpion the excretory organ is malphigian tubules.
- 23. Ans. (4) Unidirectional transmission of a nerve impulse through nerve fibre is due to the fact that neurotransmitters are released by the axon endings. When an impulse reaches the end of an axon, it causes the release of chemical neurotransmitter molecules at most

synapse. These molecules diffuse across the synaptic cleft, bind to receptor proteins in the postsynaptic membrane and induces changes in the postsynaptic cell. Excitatory neurotransmitters open chemically gated channels that allow Na⁺ and K⁺ to diffuse through them, depolarising the postsynaptic cell.

- 24. Ans. (4) The human genome is 3 billion base pairs long and contains 50-100 000 genes arranged on 23 chromosomes. The genes account for 25 % of the DNA. The rest is extragenic DNA.
- 25. Ans (4) The Great Barrier Reef along the east coast of Australia can be categorized as Biome. Biome is a broad, regional type of ecosystem characterized by distinctive climate and soil conditions and a distinctive kind of biological community adapted to those conditions.
- Ans (4) Hornbill and Indian Aconite is a pair of endangered species.
- 27. Ans. (1) Amphetamines are stimulant. It stimulates nervous system, makes a person more wakeful, increase alertness and activity, produce excitement. LSD is hallucinogen, heroin is narcotic and benzodiazepine is a depressant.
- 28. Ans. (2) The sinoatrial (SA) note in mammals and birds, is the site where each heart-beat originates. It is a vestige of the sinus venosus of the fish heart. SA serves as the pacemaker, the site of origin of the heartbeat.
- 29. Ans. (2) In photosynthetic bacteria the abrorption of a photon of light by the photosynthetic unit results in the transmission of an energetic electron from the pigment P to ferredoxin. The electron then leaves ferredoxin, passing along an electron transport chain and eventually combining with a proton to form a hydrogen alon. In the sulfur bacteria, the proton in extracted from hydrogen sulfide, leaving elemental sulphur as a by-product.
- Are (3) Atavism is a phenomenon in which some of the ancestral characters are expressed all of a sudden. Presence of tail, body

hairs all over the body, etc. are some of the characters which our ancestors had. During the course of evolution these characters were masked and new ones are expressed

- 31. Ans (1) National Institute of Virology is situated in Pune.
- 32. Ans (3) Electron beam therapy is a kind of radiation therapy to treat certain types of cancer. In this radiation therapy, the cancerous cells are exposed to radiation to kill the cells and prevent growth a the umour.
- 33. Ans. (2). Severe acute respiratory syndrome (SARS) is a viral respiratory illness caused by a coronavirus called SARS-associated coronavirus (SARS) OoV). It was first reported in Asia in Nebruary 2003. During the SARS outbreak of February-July 2003, a total of 8,437 people wordwide became sick with SARS; of these, 813 died. Symptoms of SARS are high fever (above 38° C) and cough or breathing sufficiently. SARS seems to spread by close person-to-person contact. It is most readily transruitted by respiratory droplets when an infected person coughs or sneezes
- 34. Ans (3) Cattle fed with spoilt hay of sweet clover which contains dicumarol may suffer vitamin k deficiency and prolonged bleeding.
- 35. Ans. (3) Tigers play an important role in an ecosystem. If the population of tigers are less or if it becomes extinct, there will be an ecological imbalance. The numbers of herbivores will increase so much and consequently they will die due to the scarcity of food. Soil erosion, enundation, flood and destruction of habitats are some of the consequences if tigers are removed or if it becomes extinct from the ecosystem. And the gene pool will be lost forever.
- 36. Ans. (1) Nitrogen oxides are highly reactive gases formed when nitrogen in fuel or combustion air is heated to temperatures above 650° C (1200° F) in the presence of oxygen. The initial product, nitric oxide (NO), oxidizes further in the atmosphere to nitrogen dioxide (NO₂), a reddish brown gas that gives photo-

chemical smog its distinctive colour. Nitrogen oxides combine with water to make nitric acid (NHO₃), which is also a major component of atmospheric acidification.

- 37. Ans (3) The addition of certain organic materials, such as sewage paper pulp, or food processing wastes, to water stimulates oxygen consumption by decomposers. The impact of these materials on water quality can be expressed in terms of biological oxygen demand (BOD): a standard test of the amount of dissolved oxygen consumed by aquatic microorganisms over a five day, period. Oxygen levels begin to fall as decomposers metabolize waste material. Death of fish will occur due to lack of oxugen. Rough fish such as carp bullheads, and gar, are able to survive in this oxygen poor environment where they eat both decomposed organisms and the waste itself. Due to the large influx of organic waste, the growth of algae and aquatic plant increase in lake. And also the deposition of silt organic sediments caused by cultural eutrophication can accelerate the "aging" of the water body.
- 38. Ans. (2) Many metals such as mercury, lead, cadmium, and nickel are highly toxic. Levels in the parts per million range can be fatal. Min namata disease was caused due to mercury poisoning in Japan in the 1950s. Many with defects and permanent brain damaged children were born by mothers who consumed mercury contaminated seafood while pregnant.
- 39. Ans. (3) Artificial pacemaker is used in patients with irregularity of the heart beat. It transmit repetitive electrical impulse to the heart in such a manner that the heart rate is maintained at a suitable level.
- 40. Ans. (3) Gene therapy is the introduction of a normal functional gene into cells that contain the defective *allele* of the gene. Severe combined furnition deficiency (SCID) are more common in males than female infants. This is because 50% of SCID cases are caused by gene on the X-chromosome. The remaining cases of SCID are due to recessive genes on

other chromosome; of these, half have a genetic deficiency of adenosine deaminase (ADA) or purine nucleoside phosphorylase (PNP). Deficiency of these purine degradation enzymes results in the accumulation of metabolites that are toxic to lymphoid stem cells namely dATP and dGTP. These metabolites inhibit the enzyme ribonucleotide reductase which is required for DNA synthesis, and therefore for cell replication.

- 41. Ans. (1) During fertilization in plants, the pollen tube enters the oxule through the micropyle, the tube nucleus degenerates and the tip of the tube bursts, releasing the male gametes in the victime of the embryo sac which they enter. One nucleus fuses with the female gamete, forming a diploid zygote, and the other fuses with the two polar nuclei (or diploid (nucleus) forming a triploid nucleus known as the primary endosperm nucleus.
- 42 (Ass. (B) Southern blot is a procedure used from the source being tested is cut into fragments with restriction enzymes and seperated by gel electrophoresis, denaturation into single strands then blotted onto a sheet of nitrocellulose and probed with purified, labeled single-stranded DNA corresponding to a specific gene; if the DNA matching the specific probe is present in the source DNA, it is visible as a band by radioactive label on the sheet.
- 43. Ans. (4) Thalidomide is a sedative which was most widely used in sleeping pill in the 1960s. When used by pregnant woman, it caused abnormal fetal development resulting in phocomelia (meaning seal-like limbs), in which there is a hand or foot, but no arm or leg. There is evidence that taking a single thalidomide pill in the first weeks of pregnancy is sufficient to cause these tragic birth-defects. Ironically, thalidomide has positive as well as negative features. The drug has been found to be effective in treating leprosy and is being tested against AIDS, cancer, retinal degeneration, and tissue rejection in organ transplants.

- 44. Ans. (4) Inheritance of attached ear-lobes is an autosomal recessive character. In the pedigree chart given, the parents are heterozygous for the gene. Since attached ear-lobes is an autosomal recessive, it can be expressed only in homozygous recessive condition. So the progeny with attached ear-lobes are homozygous recessive and the others are heterozygous normal and homozygous normal.
- 45. Ans. (3) In Inversion, a segment of the chromosome is inverted so the the sequence of gene is altered. In pericentric inversion, centromere is involved and in paracentric inversion, inversion of segment takes place on either arm of the chromosome.
- Ans. (2) The codon AAA codes for amino acid lysine. UUA codes for leucine ; AUG for methionine and CCG for proline.
- 47. Ans. (2) Antivenom is specific immunoglobulins against snake poison. Treatment of snakebite by antivenom is an artificially acquired passive immunity. Artificially acquired passive immunity is produced by the injection of appropriate levels of specific immunoglobulins.
- 48. Ans (2) The Pseudomonas are a group of bacteria noted for their ability to break town esoteric compounds that most microbes shull. In particular various strains of Pseudonomas can consume hydrocarbons, which constitute the bulk of oil and petrol. However, each individual strain can utilize only one or a few of the many different types of hydrocarbons. The genes that code for the enzymes which attack hydrocarbons are not found on the main chromosome, but on plasmids. Many species of Pseudonomos are pathogenic and are the opportunistic pathogen of humans. And some species of Pseudomonas helps in denitrifying of soil rutrate.
- 49. Ans. (3) CIVIE is present in mitochondria and chloroptate. These organelles contain their own CIVIE on which are located several genes that produced some of the proteins essential for their own metabolism. But the genes which specify mitochondrial division is in the nucleus. Likewise, the genes that specify chlo-

roplast components are located in the nucleus.

- 50. Ans. (3) Auxin is synthesized in apict meristems of shoots. It diffuses down string and suppress the growth of lateral buds ander the influence of auxin. The ethylene is turn inhibits growth of the lateral buds. In contrast to auxins, cytokinins stimulate growth of lateral branches. Cytokinins are produced in the roots and transported throughout the plants. So prunning of plants reduces auxins which are synthesized in shoots thus axillary buds are sensitized to cytokinins.
- 51. Ans. (1) Supercape is a monocot piant. In monocots the guard cells are dumb-bell shaped and the leaves shows parallel venation.
- 52. An (2) Botato and sweet potato are analogaus organs which are edible parts of the
- 5. Ans. (3) In Ulothrix the sexual reproduction is sogamous. The species may be homothallic or heterothallic. In homothallic species, the isogametes taking part comes from the two different cells of the same filaments, whereas in heterothallic species they come from two different filaments. The gametes fuse to from the zygote. The zygote after a short resting period undergoes meioses and 4 to 16 aplanospores or zoospores are produced.
- 54. Ans. (4) Gas exchange through the periderm is necessary for the metabolic activities of the living cells of the phelloderm and vascular cambium beneath. This exchange takes place through lenticels areas, of loosely organised cork cells, which often are easily identifiable on the outer surface of bark.
- 55. Ans. (3) The genetic variability present among cultured cells, plants derived from such cells or progeny of such plants is called somaclonal variation. Generally the term is used for plants or cells obtained from cells obtained in vitro. Plants regenerated from tissue

and cell cultures show heritable variation for both qualitative and quantitative traits.

- 56. Ans (2) In the high altitude birds become rare or extinct, the tree which may disappear along with them is Oak.
- 57. Ans. (3) Sieve-tube elements are intimately associated with specialized parenchyma cells known as companion cells. Companion cells apparently carry out some of the metabolic functions that are needed to maintain the associated eunucleated sieve-tube members. Companion cells have all of the components of normal parenchyma cells.
- Ans. (1) Mosses and ferns are found in moist and shady places because they require presence of water for fertilization.
- 59. Ans. (2) Cork cambium, a second kind of lateral cambium, normally develops first in the pericycle while the vascular cambium is becoming established. Later cork cambia develops in patches from the parenchyma of secondary phloem. The cells that the cork cambium produces outwardly are mainly radial rows of densely packed cork cells. The inner layers contain large amounts of a fature substance, suberin, which makes the layers of cork nearly impermeable to water.
- 60. Ans. (2) A cross of the genotype AABBCC and aabbcc will produce the beterozygote progeny AaBaCc in F₁ generation. The different type of gemetes of F₁ (mogeny will be 8, that is, each gene has two alleles and there are three genes (2³).

CHEMISTRY

61. Ans. (3) Hydroxide of alkaline earth metals are basic that is why Be(OH)₂ and Mg (OH)₂ is basic. The member of Boron family hydroxides shows a gradual change on moving down the group i.e., from acidic character to basic (baracter via amphoteric character. For example, B (OH)₃ (orthoboric acid) is acidic. AVO(1)₃ is amphoteric, Ga (OH)₃ is also amphoteric and In (OH)₃ is distinctly base.

 Ans.(2) Ag⁺ ion with CN⁻ ion (in excess) gives a complex compound having co-ordination number two.

Ag CI + Na CN ----→ Na Ag N

Complex with co-ordination number two

63. Ans. (1) Organo metallic combounds contains one or more metal corbon bonds. They can be sigma bonded on r-bonded organo metallics. Grignard reactor is an example of former one where as Zet' salt and Ferrocene are the example of later one. Cis-platin is an anti- cancer agent and it is an example of coordination on the compound. It is clear from the incitive that cis-platin does not contain on wretal-carbon bond.



- 64. Ans. (4) Dimethyl glyoxime,
 - CH3 . C : NOH

, reacts with Ni salt in the

CH3 . C : NOH

presence of NH₄ OH to give red precipitate of nickel dimethyl glyoxime. NH₄ OH is basic, so, best pH range will be 9-11.

65. Ans. (1) Nitrogen forms oxide in all oxidation state from +1 to +V. These compounds are
*1 *2 *3 *4 *5
N₂ O, NO, N₂ O₃, NO₂, N₂ O₅

It is clear from chemical equation that 2 moles of KMnO4 requires 5 moles of H2O2. So, 1 mole of KMnO₄ will require $\frac{5}{2}$ moles of H₂ O₂.

- 67. Ans. (2) Azide ion (N3) is linear ion. With CS₂ it gives azidocarbon disulphide (SCS N₂) it is a pseudohalogen. The formal oxidation state of nitrogen in azide ion (N_3) is + 0.33.
- 68. Ans. (1) The molecule which do not have plane of symmetry exhibit optical isomerism. But Co (NH3)3 Cl3 is symmetrical in structure, hence, does not show optical isomer





69. Ans. (1) Due to smaller size of fluorine and As charge density it inhibits the incoming electron hence it required some energy to purch one electron inside. So the order of electron affinity is

CI> Br> F>H

in kJ/ mol 348 340 333 297

70. Ans. (2) The O2 F2 molecule has the same shape as that of H2 O2 though the dihedral angle is 87°, is rather smaller. The structure of H₂ O₂ and O₂ F₂ are



- 71. Ans. (1) In general, solid metals expands or acquire more volume after melting and liquid metals (which exist in liquid state naturally) expands on solidification.
- 72. Ans. (3) Mercurous chloride (Hg-Clores ins uble in water. It is also known as calomel, it forms a white solid precipitate. $HgCl_2 + Hg \rightarrow Hg_2Cl_2$

insoluble ppt

- 73. Ans. (1) B (OMe)3 is obtained on heating borates with methanol and come. H2 SO4. This compound burns with green edged flame.
- 74. Ans. (4) If central atom contains lone pair of electrons, it repels bend pair therefore, the bond angle (0, N-0) decreases. The compound NO2 does not contains any lone pair on central atom and due to this reason its bond angle will be maximum.
- 75. Ans. (4) Ionic compound dissociates rapidly in aqueous solution and the value of dissociation constant is higher. The compound CH₃ NH₃ Cl is ionic compound and its dissociation constant value will be highest

among the given list.



- Ĥ is 2° amine 76. Ans. (3) The compound hence strong base though it is cyclic but it is saturated system. Rest are 1° and 2° unsaturated structure.
- 77. Ans. (184)

Isobutene contains only primary carbon atom. It is clear from structure. H₃C-C-CH₃ CH₂

Propyne $(H - C \equiv C - CH_3)$ contains primary hydrogen atom.

78. Ans. (1) The compound which follows (4n + 2) Huckel rule and which has conjugated system (alternate double and single bond) are aromatic. Compound (2) is 4 n system. compound (3) is also 4*n*-system compound (4) is not conjugated system. Compound $\stackrel{\checkmark}{\downarrow}$ is conjugated and it has two π electrons.

79. Ans. (3) The maximum value of dipole moment is shown by that molecule which are asymmetrical in structure. Both side of the molecule if contains different groups and these groups shows electron pumping and electron withdrawing effect then molecule will show maximum dipole moment.



Acetophenone contains C_6H_5 group (electron withdrawing) and CH_3 (electron pumping) group. That is why dipole moment for acetophenone is maximum.



- 80. Ans. (4) The compound with show Cis-trans geometrical isomerism. This is due to the fact that on the both side of doubte bond there is bulky group present i.e., menyl and Cl— group.
- 81. Ans. (1) Most of the aldehydes and methyl ketones reacts with NaHSO to from sodium bisulphite addition products



This build hate addition product are crystalline solids hence used for purification of aldenyce and methyl ketone(not for aromatic ketope).

 Ans. (4) Primary bulky alkyl halides are easily dehydrohalogenated in the presence of alcoholic KOH



- 83. Ans. (3) p-methoxybenzyl bromide will react with ethanol easily. It is because ning will resonance stabilize with long pair of electron of
 - O CH₃ group and hence CH₂ Br

group will not face any electron withdrawing effect from the nos



84 Ans. (1) Thymine is a pyrimidine (a nitrogenous base of nucleic acid) having two possible binding site. It is clear from the structure





 Aromatic nitrile can not be prepared by ArX + KCN. Only aliphatic nitrile can be prepared by this method [SRI GANESHA] FINGERTIPS REVISION FOR EVERY ENTRANCE EXAM EXEMPLAR EXPLORER [FREEEEE] BOOK [133 of 182]

$$R - X + KCN \xrightarrow{C_2 H_2 OH H_2 O} R - C \equiv N + KX$$

$$Major product$$

Rest all process is useful to prepare aromatic nitrile

- 87. Ans. (3) Primary amides are highly polar compounds. The inter molecular attractive force in primary amides are maximum that is why all the amides except formamide are solid, therefore, melting point of amides are maximum.
- Pyridinium chlorochromate 88. Ans. (4)

(C6 H5 NH Cr O3 C/) abbreviated as PCC, is a milder reagents which oxidizes primary alcohol to aldehydes. It prevents the formation of carboxylic acid.

$$PCC_{(CH_2 CI_2)}$$

R CH₂ OH \longrightarrow R CHO

89. Ans. (4) The enthalpy of vaporisation of the following compound are in increasing order

$$PH_3 < AsH_3 < NH_3$$

their boiling points are as follows.

PH3 (- 88° C), AsH3 (-55° C), NH2 (- 33.5° C)

90. Ans. (2) For principal quantum number n 4; there will be s, p, d and f- orbitals. The azimuthal quantum number i.e, I = 3, means forbitals. There are seven different orientation in a f-sub-shell. These are

To calculate total number of orbitals in the sub-shells = 21 + 1.72× \$+1 27

91. Ans. (1) Given, Osmotic pressure of blood = 7.8 bar = 7.72 atm. Temperature = 273 + 37 = 310 K. NaCl will dissociate in to two ions i.e., Na and C

so, i = 2 (vaut Hoff's foctor) Osmotic pressure, (P) = i C R T.

 $\frac{7.72}{2 \times 0.0821 \times 310} \approx 0.16 \text{ mol/L}$ 92.Ans. (3) For the reaction. $C_8 H_{18} + \frac{25}{2} O_2 \longrightarrow 8 CO_2 + 9 H_2O_2$ $C + O_2 \longrightarrow CO_2 _{(g)}; \quad \Delta H_1^0 = 490 \text{ J/mol.}$ $2 H + \frac{1}{2} O_2 \longrightarrow H_2O_{(g)}; \quad \Delta H_2^0 = 240 \text{ J/mol.}$ $8 C + 9 H_2 \longrightarrow C_8 H_{18}$ $(4^\circ) + 160 J/mo$ Heat evolved during the combustion of one 160 J/mol mole of C₈ H₁₈ $= (-490 \times 8) + (-240) \times 9) - (+160)$ = - 6080 + 166 - 920 J for 6 moles + 35520 J = - 35.5 kJ 93. Ans. (1) Withe process is in equilibrium as in

Concentration of aqueous NaCl

the problem

H₂ O₍₁₎ H₂ O (g) at 1 a/m ; 298 K.

The standard free energy change is equal zero (409 =0).

- 94. In the crystal system when the axial rotations are $a = b \neq c$ and the axial angles are $\alpha + \beta = 90^{\circ}$, $\gamma = 120^{\circ}$; then the crystal system is hexagonal and unit cell or Bravais lattice is simple.
- 95.Ans. (3) Glucine is N-4 hudroxyphenulalucine are slightly acidic compound.

pH of the solution of glycine can be calculated as

$$Ka_1 = 4.5 \times 10^{-3}$$

and $Ka_2 = 1.7 \times 10^{-10}$ at STP

So, relative strength =
$$\sqrt{\frac{Ka_1}{Ka_2}}$$

or, The pH of solution ≈ 6.1

96. Ans. (3) For the following change

 $I_{2(q)} \rightleftharpoons 2I_{(q)}; \Delta H_{f298\,k}^{o} = + 150 \text{kJ}$

This is endothermic process, so it require to increase the temperature of the system to shift the reaction towards the product.

97. Ans. (3) In the Daniel cell electrons moves from zinc electrode to copper electrode, therefore, by convension current moves from cop-

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per electrode to zinc electrode because the direction of current is opposite to the direction of flow of electrion of electron.But from the salt bridge positive or cations move towards copper electrode.



- Ans. (1) Cellulose is a natural polymer, a major constituent of plant life. It is a biodegradable polymer.
- 99. Ans. (4) For the reaction

$$N_2 O_{5(g)} \longrightarrow 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$$

It is first order reaction. For a first order reaction involving the dissociation of a reactant. From the expression of rate constant

$$k = \frac{1}{t} \ln \frac{[N_2 O_5]_0}{[N_2 O_5]_t} \text{ or, } \ln \frac{[N_2 O_5]_0}{[N_2 O_5]_t}$$

100. Ans. (1) Ozone layer in stratosphere is sepleted by chlorofluoro carbon of Feron i.e., CCl₂ F₂.



PHYSICS

- 101. Ans. (3) The motor boat produces two types of disturbances in water as:-
 - (i) During sailing in water, it disturbs the surface of water, which causes the transverse waves in water.
 - (ii) Again the boat produces sound which also propagates through the water. And we know that the sound water is water is longitudinal.

So, it produces both the longitudinal as well as the transverse wave in water.

102. Ans. (2) The angular momentum is as



p = Linear Momentum Vector

The direction of angular momentum \vec{L} is perpendicutar to the plane formed by \vec{r} and \vec{p} which means that \vec{L} is not parallel to ω as shown in the following figure:-



Explanation of figure:-

A particle of mass m is rotating with velocity

v in a circle of radius 'a' about the z-axis of an intertial frame of reference, then the direction of angular momentum vector is as shown in the above figure.

When we see the formula it looks like that L is parallel to the linear momentum. But this is not the exact fact. Always, for the orbital mo-

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tion, the angular momentum is perpendicular to the orbital plane.

103. Ans. (3) The mass of nucleus

$$m = A(a.m.u.)$$

The momentum of the nucleus before emission of α -particle is zero.

Now the mass of a-particle

$$= m_{\alpha} = 4 (a.m.u)$$

So, p_{α} = momentum of α -particle.

Now presidual = momentum of residual

nucleus

$$= m_{\text{residual}} \times V$$

= (A - 4). V
[because m. = A - 4 (a. m. u.)

According to the conservation of momentum, both moves in opposite direction. So,

-

...

4v - (A - 4). V = 0(A - 4). V = 4 v $V = \frac{4v}{(A - 4)}.$

104. Ans. (2) The energy equivalent of mass of the electron and positron is 0.51 MeV.

So, the total energy released

=
$$0.51 \text{ Mev} \times 2$$

= 1.02 MeV
= $1.02 \times 10^{6} \text{ eV}$
= $1.02 \times 10^{6} \times 16 \times 10^{-19} \text{ J}$
= $1.63 \times 10^{-13} \text{ J}$

105. Ans. (1) The terminal velocity is the maximum constant velocity acquired by the body while falling freel() in a viscous medium If the body is a sphere, then the terminal ve-

locity of that sphere in the viscous liquid is

$$2, R^2 (p - p_0). g$$

wher. R + Radius of the body (sphere here)

 $\rho_o = \text{density of the liquid}$ M_o

 $\eta = coefficient of viscosity$

So from the above formula

 $v \propto \mathbf{R}^2$

106. Ans. (3) Since we know that the frequency of vibration of the mass attached with the spring is

$$v = \frac{1}{2\pi} \sqrt{K} M$$

where K = Spring constant.

And in the case of spring if there are two springs, then their spring constants can be added to from the total spring constant of the system as

$$K = K_1 + K_2 + \dots + K_n = 2 K$$

So, the frequency is now

$$v = \frac{1}{2\pi} \sqrt{2K/M}$$

107 Ans According to the Einstein's photoelec-

Energy of coming photon

= work function of the substance

+ K. E. of photoelectron.

Here the incident photon having energy 4 eV and the work function 2 eV. So the K.E. acquired by the photoelectron is

$$KE = 4eV - 2eV$$

= 2 eV

But according to the question our task is to stop the emission of electron. i.e. there should not be K. E. acquired by the photoelectrons. So, to stop the electron, we have to apply some reverse potential. And as we know the potential corresponding to 2 eV is 2V. So, the reverse potential of 2V is applied to stop the emission of photo electrons having energy of 2 eV.

108. Ans. (1) In magnetic field, the Lorentz law gives, F = Bq. v

where B = magnetic field

q = charge on the particle

v = velocity of the particle. The another force on the particle is centrifugal force = $\frac{mv^2}{r}$

where $\mathbf{r} = \mathbf{r}$ adjus of the circular path.

For the stability of the system, both the forces will balance each other i.e.

$$\frac{mv^2}{r} = Bqv$$

$$\Rightarrow r = \frac{mv}{Bq} - \dots (1)$$

Now the radius of circular path formed by αparticle is

$$r_{\alpha} = \frac{m_{\alpha} \cdot v}{B \cdot q_{\alpha}}$$
$$= \frac{4 \times m_{p} \times v}{B \times 2 q_{n}} - \dots (2)$$

where

-

 q_{α} = charge on α - particle = 2 × q_p (where q_p = charge on proton) m_{α} = mass of α -particle = 4 × m_p (where m_p = mass of proton) = radius of circular path for

Similarly, r_p = radius of circular path formed by proton is

 $= \frac{m_{p.} v}{B q_{p}}$ From equation (2) and (3)

$$\frac{r_p}{r_a} = \frac{1}{1}$$

109. Ans. (1) the positrons are positive electrons i.e. having the mass of equal to electron and unit +ve charge.

 $r_{p}: r_{a} = 1:2$

Now, when the two beams of the positron are coming together and separated by a small distance, then the to the same charge on the beam they repell each other.

When we place one magnet, in that case, the beam will deflect normal to the plane containing the two beams.

110 Ans. (2) Actually $E \propto r$ for the region r < R



111. Ans. (1) If we draw a surface in such a way that the electric potential is the same at all the points bring on the surface, it is called an equipotential surface. The component of electric field parallel to an equipotential surface is pero because the potential does not change in this direction. Thus the electric field is perpenencular to the equipotential surface.

In our question, the equipotential surface is increasing in the x-direction. So, the electric field is in the perpendicular direction of axis i.e. parallel to YZ-plane

 Ans. (2) According to the Stefan -Boltzmann formula of thermal radiation, we know that

$$u = \sigma T^4 \cdot A$$
$$= \sigma T^4 \cdot (\pi r^2)$$

where $\sigma =$ Stefans constant

T = temperature of the body

r = radius of the spherical body.

According to the question

$$u_{1} = \sigma T^{4} \cdot \pi r^{2}$$

$$u_{2} = \sigma \left(\frac{T}{2}\right)^{4} \times \pi \times (100 r)^{2}$$

$$= \frac{\sigma T^{4}}{16} \times \pi \times 10000 \times r^{2}$$

$$\cdot \frac{u_{2}}{u_{1}} = \frac{\sigma T^{4} \times \pi \times 10000 \times r^{2}}{16} \times \frac{1}{\sigma T^{4} \cdot \pi r^{2}}$$

$$= \frac{10000}{16}$$

 $\frac{u_2}{u_1} = 625$

113. Ans. (2) Generally in metal if the temperature increases, the resistance of the metal increases and conductivity decreases and vise-versa

But the opposite happens in the semiconductor i.e. as the temperature increases the resistance decreases and conductivity increases and vise-versa

This relation between temperature and resistivity of semiconductor is linear in nature so, the graph is simply decreasing graph

114. Ans. (3) According to the continuity equation, the total mass of fluid going into the tube through any cross-section is equal to the total mass coming out the same tube from other cross section in the same time i.e.

 $A_1 v_1 = A_2 v_2 = \text{constant}$

v= Velocity of the fluid.

In our problem, we need the relation between Pressure and Velocity based on the continuity equation. Bernoulls principle is true for that as it relates

 $P + \rho gh + \frac{1}{2} \rho v^2 = constant$

so, the relation is followed by Bernorati's prin-

115. Ans. (4) From the Biot-Savert law, we know

that the magnetic field \vec{B} along the axis of the circular wire is

$$B = \frac{\mu_0}{2 R^2 + 2 r^3/2}$$

where R = Radius of the circular wire r= distance of the point of reference along the axis of the circular wire, when r > > R then

$$\Rightarrow B \propto \frac{\mu_0 \cdot iR^2}{2r^3}$$

$$\Rightarrow B \propto \frac{1}{r^3} \text{ as } \frac{\mu_0 \cdot iR^2}{2} = \text{ constant}$$

116. Ans. (4) If a single particle of mass 'm' moves with velocity v in a circle about the z-axis, of an intertial frame of reference, then the direction of angular velocity ω lies on the Z-axis and points upward as shown in the figure



117: Ans) (1) Actually in foggy weather, the light can not travell more. So, we need a light which can travell less distance in foggy weather. For that we need one light which can scatter less by the fog particle so that we can get the illuminisance at a far distance also. And the nature of yellow light is that, it can scatter less by the fog particle and gives illuminance at a far distance also.

So, we are preffering sodium lamp which gives yellow light in foggy weather.

118. Ans. (1) From the Biote-Savert law, we know that the magnetic field:-

For inside i.e. r < a, is

$$B = \frac{\mu_o}{4\pi} \frac{21.r}{R^2}$$

Again for outside i.e. r > a

$$B = \frac{\mu_o}{4\pi} \times \frac{2}{r}$$
$$B \propto \frac{1}{r}$$

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- Ans. (2) All the V t graphs except (2) shows the reverse time i.e.-ve time, which is not possible.
- 120. Ans (4)Momentum before collision =0

According to the conservation of momentum. The total momentum before collision.

= total momentum after collision

 $1 \times 80 - 2 \times v = 0$

where velocity is -ve because both the fragments will move in opposite direction.

⇒ 80 = 2v

=

 \Rightarrow v = 40 m/sec.

Again the total energy impact is the sum of their Kinetic Energies i.e.

K.E₁ + K.E₂
=
$$\frac{1}{2} \times m_1 \times v_1^2 + \frac{1}{2}m_2 \times v_2^2$$

= $\frac{1}{2} \times 1 \times (80)^2 + \frac{1}{2} \times 2 \times (40)^2$
= $80 \times 40 + 40 \times 40$
= $3200 + 1600$
= $4800J$
= $48KJ$

- 121. Ans. (3) When the monochromatic tight is passed through the thin film of mixe, the light remains monochromatic. So that the tringes formed due to the interference of the monochromatic light will remain the same. But due to the thin mica sheet, the wavelength of the monochromatic light will thange. So the fringe pattern will obviously shift either upward direction or downward direction. But the width of the pattern will remain the same.
- Note:- when the monochromatic light looses its monochromatic character, in that case the fringe pattern dicappears.

122. Ans. (4)

When the two mediums are coming in contact and one becomes invisible, it means that their remactive index are matching

123 Ans. (2) Fundamental frequency
=
$$v_0 = 1500$$
 Hz.

And the maximum audible frequency = 20000 Hz

n = 6.5

So number of overtones

 $= 2n = \frac{1}{v_0}$ $= \frac{40}{3} \approx 13$

so the maximum number of overtones generated equals to 6.

124. Ans. (1) Magnetic Resonance Imaging :-The magnetic resonance imaging is related to the nuclear magnetic resonance. Actually the image show the effect of that body on the surroundings. Que to the magnetic resonance imaging we can find out the nuclear size, the r-cascading elc.

Note the electron spin resonance, we can have the wave nature of the electron

Electron paramagnetic resonance gives the magnetic properties of material

25) Ans. (2) The carbon having half life as 5600 years. So the range of the half life of the carbon is in the range of 10^3 years to 10^4 years. The best performance of the exact calculations of the age limit is in the range of the just above of their half life period. i.e. the range of the carbon dating which is best suited for determining the age of fossils having in the order of 10^4 years.

126. Ans. (3) According to the question

C = capacitance
= 40
$$\mu$$
 F = 40 × 10⁻⁶ F
V = 3000 V
t= 2 m sec
= 2 × 10⁻³ sec.
E = $\frac{1}{2}$ Q . C
E = $\frac{1}{2}$ × V²C
= $\frac{1}{2}$ × (3000) × 40 × 10⁻⁶
= $\frac{1}{2}$ × 9 × 40 = 180

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power =
$$\frac{E}{t}$$

= $\frac{180}{2 \times 10^3}$
= 90 × 10³ = 90 KW

127. Ans. (1) This is the case of mixed circuits i.e. cells having internal resistances and the outer resistance is connected in rows and columns. For that circuit, the total current I flows

$$= I = \frac{m. n. E}{nr + mR}$$

where

m = number of cells in parallel rows = 100 n = number of cells in a single row = 5000 E = e.m.f of each cell = 0.15 Vr = 100 resistance of each cell = 0.25 Ω R = outer resistance i.e. resistance of the parallel cell = 500 Ω $100 \times 5000 \times 0.15$ $\therefore I = \frac{1}{5000 \times 0.25 + 100 \times 500}$ 500000 (× 0.15) = 500 (10 × 0.25 + 100) $=\frac{150}{2.5+100}$ $=\frac{150}{1025}=1.5$ A 128. Ans. (2) According to the reversible the equation of state is PV = n RTSo, At the position A, we have $P_n V_0 = n R T_n -$ Again at the position B, (((2 P.) . V. AR 2 (P, V,)= RT $2 \times n R T_0 \Rightarrow n R T_1$ (because PoV Now the efficiency of the cycle is $\eta = 1 - \frac{T_0}{T_1} = 1 - \frac{T_0}{2T_0}$ $= 1 - \frac{1}{2} = 0.5$

129. Ans. (3) Actually the liquid oxygen having the ferromagnetic behaviour. The ferromagnetic substances caused by a domain structure. Such type of substance has a light susceptibility. It shows the hysterisis cycle.

The paramagnetic substance is having small susceptibility. The paramagnetic behaviour is due to the unpaired electron spins.

The diamagnetic substance having the -ve susceptibility. The diamagnetism is a weaker effect than paramagnetism and ferromagnetism.

In these materials, the materials having two or more types of atoms with magnetic moments. The magnetic moment of one type can align antiparallel with those of the other type.

In antiferrom agnetism, the susceptibility increases with temperature upto a certain point. Above this temperature the material becomes paramagnetic

Note:- Kertimagnetism is a particular form of an-

30. Ans. (3)

131. Ans. (2) According to the question it is given that

 $\lambda = 100 \text{ pm} = 10 \times 10^{-12} \text{ m}.$

The energy E = hv

$$= \frac{h.C}{\lambda}$$
 (because $v = \frac{C}{\lambda}$)

where h = Planck's constant
=
$$6.6 \times 10^{-34}$$
J.sec
= $\frac{6.6 \times 10^{-34} \times 3 \times 10^8}{10 \times 10^{-12}}$ J
= 1.98×10^{-14} J
= $\frac{1.98 \times 10^{-14}}{1.6 \times 10^{-19}}$ eV
= 1.23×10^5 eV
= 123×10^3 eV = 123 keV
= 12.3 keV \approx app. 15

132. Ans. (3) The colours we are seeing after reflection is generally a phenomenon of Inter-

So the % efficiency = 50 %

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ference except the colours shown by the prism which is a dispersion phenomenon.

Actually the disc contains so many layers. When the white light gets reflected from these different layers, then they interfere with each other. Due to these interference we see the colours

133. Ans. (4) Here all the diagonal charges with Cl⁻ having opposite directions. So they cancel each other.

Let us see this in details. (take one face)



The direction of force of CI^- with Cs^+ (1) is opposite to the direction of force of CI^- with Cs^+ (3). So these forces cancel each other. Again in similar way, the direction of force between Cs^+ (2) and CI^- is opposite to the direction of force between Cs^+ (4) and CI^- so, they cancel each other.

Similar thing happens for all the Cs⁺ ions. And the net electrostatic force coerted by the eight Cs⁺ ions on Cl⁻ ion become zero.

ough it

134. Ans. (4) We know that the magnetic moment of current is

 $M = N. I. A_{\odot}$

where

N= number of hum's of the coil

$$A = cross sectional area = \pi r^2$$

It shows that M or r2

- It shows shat M of T
- 135. Ans (4) Cyclotron is a device for accelerating charged particles to high energies. In this device, the particles are injected near the centre of an evaccuated space between two D -

shaped boxes placed between the poles of a strong permanent magnet. Within these dec, the particles describe a semicircular orbit. The frequency of that revolving charged particle is



- 136. Are: (1) The experiments shows that due to the increase of the mass number. the binding energy increases at a particular value of 56 nucleons. After that when we increases the nucleon number the binding energy of the nucleons starts decreasing. This is a topic of research; why it so happens.
- 137. gate: gate is basically a circuit that has one or more inputs but only one output. It can also be understand that the signal that enables a circuit to function. It gives output proportional to the input.

There are basically three fundamental gates

- (1) OR gate
- (2) AND gate
- (3) NOT gate

The OR gate having the AND operation.
 If we have two inputs as A and B, then, the output is as in following table.

INP	UT	OUTPUT
Α	В	Y
0	0	0
1	0	1
0	1	1
1	1	1

This table is called truth table The symbol of OR gate is,

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(2) The AND gate having the or operation. If we have two inputs as A and B, the output is as in the following table.

Input		Output
A	в	m
0	0	0
0	1	0
1	0	0
1	1	1

This is called the truth table of AND gate. Symbol of AND gate is





Input	Output
0	1 41
1	0

Symbol of NOT gate is

The other gates are the ninced gates like NOR, NAND etc.

The NOR having OR and NOT operation simultaneously.

NAND having AND and NOT operation simultaneously

Now from the agure given in question we see

that we have the symbol which resents NOT gate

and which represents OR
gate. So, in combined the OR gate and NOT
gate constitutes NOR gate.
138. Ans. (1) In semiconductor

$$n_i = \sqrt{n \cdot p}$$

where $n = number of electron concentration
 $p = number of hole concentration
 $n_i = intrinsic concentration
given that $n_i = 10^{19}$
and $p = 10^{21}$
 $\Rightarrow \sqrt{n \times 10^4} = 10^{19}$
 $\Rightarrow n \times 10^{12} = 10^{17}$ /m³
139. Ans. (2) Since
Root Mean square Velocity
 $V_{ms} = \sqrt{\frac{3KT}{M}}$
Note Phobable Velocity
 $V_{mp} = \sqrt{\frac{2KT}{M}}$
everage Velocity
 $V_{AV} = \sqrt{\frac{8KT}{\pi M}}$
when we compare these velocities we con-
clude that
 $V_{ms} > V_{AV} > V_{mp}$
140. Ans. (2) From the coulomb's law of force,
we know that
 $F = \frac{1}{4\pi \epsilon_0} \frac{q_1 \cdot q_2}{r^2}$
where q_1 and q_2 = charge on the body
which come in electric field
 $r =$ seperation between them.
 $\Rightarrow \epsilon_0 = \frac{q_1 \cdot q_2}{4\pi \cdot F r^2}$$$$$$$$

4 π is a dimension less quantity q₁ and q₂ having dimension of Amp × Time = A.T. Force having dimension = $M L T^{-2}$ So, $\epsilon = \frac{[AT]^2}{[MLT^{-2}] \times [L^2]}$

ASSERTION AND REASONING

BIOLOGY

141. Ans (1) The Insecticidal properties of DDT (Dichloro-Diphenyl -Trichloroethane) was discovered in 1934 by Swiss chemist Paul Muller. It was used to control potato beetles in Switzerland in 1939 and commercial production began in 1943. DDT seemed like a wonderful discovery. It is cheap, stable, soluble in oil, and easily spread over a wide area. It is highly toxic to insects but relatively non toxic to mammals. Where other control processes act slowly and must be started before a crop is planted, DDT can save a crop even when pests already are well established. Its high toxicity for target organisms make DDT very effective. DDT seemed like the magic bullet for which science had been searching. It was spraved on crops and houses, dusted on people and livestock, and used to combat insects all over the world.

DDT has been spread so widely that fitty of the sixty malaria carrying mosquitoes are now resistant to it and the environmental side effects outweighs its benefits. Before DDD was introduced in 1949, cotton yields were about 500 kg per ha. By 1952 yields has risen to nearly 750 kg per ha, but DDT resistant boll weevils also had appeared and it became ineffective. Even worms *Heliothis worm* which had not previously been a problem began increasing rapidly. Be 1955, cotton yields were down to 330 kg per ha, one- third less than before pesticides were used.

142. Ans (2) Anticitysetic hormone (ADH, also known as vasopressin) is secreted by the posterior lobe of the pituitary gland. It stimulates water retension by the kidneys and thus conserve water. In diabetic insipidus, ADH is not produced by the pituitary. The kidneys do not netwin water and excessive quantities of urine are produced. 143. Ans (1) Oparin considered that protein molecules were crucial to the transformation from inanimate to animate coacervates are spherical aggregation of lipid molecules in water, held together by hydrophobic forces. These colloid- rich coacevates may have been able to exchange substances with their environment and selectively concentrate compounds within them particularly crystalloids It is suggested that substances within the coacervates may have undergone further chemical reactions and, by absorbing metal ions into the coacervates. Pre-existing molecules capable of self replication may have incorporated into it and produced a primitive type of cell. It increases in size and produced a primitive self-replicating heterotrophic organisms feeding on an organic-rich primedial SOUD.

= $A^2 T^2 \times M^{-1} \times L^{-1} \times T^2 \times L^{-2}$

 $= M^{-1} L^{-3} T^4 A^2$

- 344. Ans (3) Tapeworm, roundworm and pinworm are endoparasites of human intestine. The source of these intestinal parasitic worms are due to intake of improperly cook food and ingestion of cyst along with contaminated vegetables, etc. But the source of all intestinal infections are not due to improperly cooked food.
- 145. Ans (2) Fish meal has been widely used as a supplemented protein source for many years primarily for monogastric animals. Fish meal can be classified as two basic types; (1) fishery waste associated with the processing of fish for human consumption and (2) fish that are only used for the production of fish meal. The composition of fish meal can vary considerable depending upon the composition (whole fish, fish scraps, etc.) of the substrate that is used to prepare the fish meal. Specific fishes like herring, menhaden pollack, etc, are harvested just for the purpose to produce fish meal. Fish meal is the primary supplemented protein source that is feed to livestocks. The

lipids associated are highly unsaturated and highly susceptible to be oxidized. Amino acid quality of fish is excellent, but excessive heating during the drying process can reduce digestibility. Fish meal is often used as a bypass protein source for feeding applications for lactating dairy cattle.

- 146. Ans (2) To adapt in different environmental conditions, animals adapt different strategies. Those animals that cannot adapt properly are eliminated in the course of time. And those that are adapted are favoured by natural selection and continue from generation to generation. Many animals shows mimicry to protect themselves from the predator. Praying mantis is green in colour and merges with green foliage to hide from predators.
- 147. Ans (1) Each human cell contains 46 chromosomes however, in Orangutan, chimpanzee and gorilla the chromosome number is 48. A difference of 2 chromosomes makes what we are from these great apes. Chimpanzees are considered as the closest relative of the present day humans because chimpanzees have a high IQ and anatomical similarity. The banding patterns of human chromosomes is very much similar and identical to the banding patterns of apparently homologous chromosomes in great apes. This can be seen in banding pattern of chromosome 3 and 6 of men and chimpanzee respectively.
- 148. Ans (4) Dope test is used to estimate the level of certain drugs present in urine and blood. Breath tests for alcohol are an indirect yet most practical way of estimating alcohol intoxication. In 1938, Dr. R.N. Harger developed the first testing instrument, called the Drunkometer, which was followed in 1941 by the Intoximeter, developed by Glenn Forester, and the Alcometer, developed by Prof. Leon Greenberg. All of these machines were designed to take a deep air sample (breath from the alveolar accs, the site of gas exchange in the lungs) and calculate the rate or proportion of alcohol in blood to alcohol in breath. This proportion is known as the partition rate, and since 1938, it has been generally accepted

that the ratio is approximately 1 to 2,100. The estimated alcohol in-blood using this proportion became referred to as BAC (blood alcohol concentration), the percent weight by volume, or % w/v, based upon grams of alcohol per cubic centimeter of blood or 210 times of breath). Alcohol is absorbed in stomach and it increases the flow of blood.

- 149. Ans (2) Honey bee queens (ly only once, during their famous nuptial dights taken shortly after they emerge as adults. During this flight, they mate and aquire sperm that they must store in the reproductive tract to last a lifetime. Queens lead a mostly seden-tary life within the hive where they are led and cared by workers , I can lay fertilized as well as unfertilized eggs. Unfertilized eggs developed into males whereas fertilizes eggs develop into females. A queen or a worker may arise from the same egg, depending on the amount and type of food given to the larva by the purse bees. Larvae destined to become queens receive large meals that stimulate the secretion of juvenile hormone. When this hormone is not present at a critical time in development, the larva's ovaries degenerate and the bee develops into a sterile, but genetically female, worker.
- 150. Ans (2) Human gestation period is considered to be 38 weeks (from conception), or 40 weeks from the onset of the last menstrual period. Variation from this (two weeks prior or after) is considered normal. More than that is "premature, or postmature". Most of the critical events in human development occur in the first month of pregnancy. Cleavage occurs during the first week, gastrulation during the second week, neurulation during the third week, and organogenesis during the fourth week. The second and third months of human development are devoted to morphogenesis and to the elaboration of the nervous system and sensory organs. By the end of this period the development of the embryo is essentially complete. During the last six months before birth, the human fetus grows considerably, and the brain produces large numbers of

neurons and establishes major nerve tracts. Most of the weight of fetus is added in the final three months. Allometric growth occurs when an organ grows at a different rate from the rest of the body. This produces a change in size of the organism which is accompanied by a change in shape of the organism. Most vertebrates, including mammals develop in this way. For instance in humans, there is changing proportions of the human body during fetal development. There is disproportionately large head in the embryo at 2 months, and the more rapid growth of trunk, arms and legs thereafter.

- 151. Ans (1) Natural selection can only operates if there is 'variation'. Variation is largely due to a reshuffling of the genes when the genetic instructions from the two parents come together. Natural selection acts on variation by favouring some animals over others. Animals survive in the world by being able to obtain sufficient food for their needs, as well as water, adequate shelter and so on. Furthermore, to produce offsprings, they must successfully engage in mating, giving birth, and caring for the young. It is in this aspect of life. that the selection process operates, for all individuals produce more offsprings than will) eventully survive. Because of variation it follows that some individuals are likely to be more capable than others. It is these, the 'fittest', who survive, who thrive, and who leave most offsprings of their own behind them.
- 152. Ans (3) Ginger has a prostrate growing rhizome. Tropism is a movement of parts of a plant in response to and directed by, an external stimulus. The movement is almost always a growth movement. Shoots and coleoptiles are responsely geotropic, roots are positively geotropic, that is, it grow downwards, and shoots are negatively geotropic; it grows upward. Gravity is the stimulus responsible for geotropism. Opposite responses of roots are whoots are due to different sensitivities to apxin. High auxin concentration stimulater growth on lower side so shoot grows upwards.

153. Ans (1) Protoperiodism is defined as the response of a plant to the relative length of light and dark periods. The pigment responsible for absorbing light involved in photopenodic phenomena of plants is the phytochrome. This pigment is also involved in the perception of photoperiodic stimuli controlling flowseed germination and other ering. morphological phenomena Phytochrome is a protein with a chromophore pigment coloured protein) prosthetic group (e.g., chromoprotein) that resembles. In basic structure the open chain tetrapymphe chromophore of the algal pigment 6- playcocyanin. There are two forms of phytochrome : the phytochrome red absorbing (ovm) (Pr) and the phytochrome far-red absorbing form (pfr). Pfr form is the physiologically active form. The two forms are photochemically inter-convertible. Pfr below a critical level will promote flowering in a short day plant. Pfr is required for flowering in both long and short day plants.

14. Ans (2) In chloroplast and all but the most permitive bacteria, light is captured by a pholosystem, a network of chlorophyll molecules held within a protein matrix on the surface of the photosynthetic membrane. In cyclic photophorylation, electrons ejected from the pigment by light travel a circular path driving a proton pump and then returning to the photocenter where they originated. For every three electrons, the energy yield is one ATP molecule. Cyclic photophosphorylation is seen in most primitive bacteria and in sulfur bacteria.

Plants and algae use a two-stage photocenter. First a photon is absorbed by photosystem II, which passes an electron to photosystem I and this energized electron drives a proton pump and generates a molecule of ATP Then, a proton is absorbed by photosystem I, energizing an electron that is used to provide reducing power in the form of NADPH. The electrons and associated protons that oxygen forming photosynthesis employs to form energy rich reduced organic molecules are obtained from water. The residual oxygen atom
of the water molecules combine to form oxygen gas.

155. Ans (1) The legumes, obtained fixed nitrogen through a symbiotic association with soil bacteria of the genus Rhizobium. The symbiotic relationship between legumes and Rhizobium seems to be species- specific. The actual site of nitrogen fixation is in the nodules formed in the roots of the legume plant as a result of penetration of rhizobia. The bacteria either penetrate the relatively soft root hair tip or invade damaged or broken root hair and progress in as infection thread through the cortex tissue to the immediate area of the endodermis and pericycle. Through nodulation, the microorganisms provide the host plant with fixed nitrogen, and the host plant provides the microorganisms with soluble carbohudrates.

Root nodules shows the presence of red pigment called leghemoglobin. Leghemoglobin is an oxygen carrier, the oxygen (O_2) is necessary for the electron transport chain of the rhizobium bacteroid. Because of its very high affinity for oxygen, leghemoglobin provides oxygen to the root nodules bacteria quickly, even at very low levels of free oxygen. Leghemoglobin keeps levels of molecular oxygen low in the bacteriod. This function is particularly important because nitrogenase is sensitive to O_2 and loses activit(in its presence.

156. Ans (1) Red algae are important members of coral reefs. Red algae are unusual among the algae because they can include in their cell walls calcium carbonate which makes the plants hard and resistant to wear. Red algae that grow this way are referred to as " coralline" algae, because they are hard like corals. In addition to the common upright forms of coralline algae some species can grow in a thin mat over tocks and other hard structures. are called crustose when growing in this form. The upright and crustose forms of red algae bind and infill coral skeletons to form massive sedimentary structures which are strong enough to resist wave action and erosion.

- 157. Ans (4) Honey is the chemically altered form of nectar. The crop or honey sac of bees changed nectar into honey by losing a certain amount of water and becoming chemically altered. The salivary enzyme converts the complex sugar of nectar into the simple sugar of honey. Insects visit flowers mostly to gather nectar. Most insects locate source of flood initially by odor, then orient themselves on flower or group of flowers by its shape, colour and texture. Some bees collect nectar which is used as a source of food for adult bees and occasionally for larva. Most of the approxi-mately 20,000 species of bees visit flowers to obtain pollen, collen is used to provision cells in which bee larvae complete their development.
- 158. Ans (2) Coconut tree is distributed in coastal areas over a large part of the world. In India, coconut is seen in many places. It is cultivated mostly in Kerala, Tamil Nadu and Karnataka. Cot is the term applied to the short coarse, rough fibres which make up the greater part of the husk of the fruits of the coconut palm. The coconut fibres are very light, elastic and highly resistant to water. So coconut can float and get dispersed over thousands of kilometers before losing viability.
- 159. Ans (3) Sulfur deficient plants show chlorosis of the younger leaves first, followed by the production of anthocyamin pigments in some species. Under sever conditions, however, all of the leaves may undergo some loss of green colour. Sulfur deficiency also resulted in a marked decrease of stroma lamellae and an increase in grana stacking. Chlorosis is also seen due to the deficiency of nitrogen. The symptom in nitrogen deficiency first seen in more mature leaves and last in the upper, more actively growing leaves. It appears in the vounger leaves last because of the high mobility of nitrogen in plants. Sulphur is present in protein structure in the form of the sulfur bearing amino acids cystine, cysteine, and methionine. Sulfur is taken up by plants as sulfate ion SO²⁻. Sulphur is not a component of nucleic acid.

160. Ans (2) In embryo transfer in cattle, a genetically superior and high productivity female serves as donor of embryos to be transferred. The donor females are treated with appropriate doses of the selected gonadotrophin. e.g., follicle stimulating hormone (FSH) or luteinising hormone (LH), to increase the number of ova released at the time of ovulation; this is called superovulation. A single female can provide 15 embryos at a single cycle. When the donor female is in heat (oesters), it is artificially inseminated using semen from a genetically superior bull of top pedigree. Fertilized eggs/voung embryos are collected by flushing the uterus of superior donor females with a special nutrient solution; this is done 7 days after the insemination. Selected embryos are incubated in a special nutrient medium at 37° C and then transfer into inferior surrogate mothers. Single embryo is transferred into the uterus of each surrogate mother. Progeny obtained by embryo transfer are of superior genotype since the maternal and paternal genes are from superior dongs females and superior males respectively.

CHEMISTRY

- 161. Ans. (1) It is true that HC/O₄ is stronger acid than HC/O₃. Any element tends to acquire maximum stable state therefore + VIII O. S can not be stable hence more reactive.
- 162. Ans. (1) The electronic nonsuration of ₂₄ Cr atom is 3d⁵ 4s¹ (ence it has six unpaired electrons are present. It is true that half filled s-orbital has greater ability.
- 163. Ans. (4) Stability complex depends up on the basic strength of ligands and formation of chelate ring. Nie ligand en (ethylene diamine) is stronger ligand than NH₃ and en forms charate rings. Due to this reason [Ni (ent); Cl₂ has high stability.
- 164. Ans (3) Sb (III) comes under II group. The group reagent for this group is H₂ S in HCI. These radicals are precipitated as their sulphide where as sulphide of other metals remain in the solution because of their high

solubility product. HCl acts as a source of H^{*} ion and thus decreases the concentration of S^{2-} ion (common ion effect). So the decreased concentration of S^{2-} is controlled to precipitate the II group metals doe to their low Ksp value.

165. Ans. (4) The magic number nuclei are most stable hence the order of stability as well as binding energy per nucleons are

He > Be > Li Binding energy has nothing to do with the difference neutron and proton. It is related with packing fraction. Lower the packing fraction ingher the value of binding energy bet succeons. The second most important thing is n/p ratio. The n/p ratio of these nuclei are 2 > 2.25 > 2.33. Lower the value of non ratio binding energy per nucleone increases.

$$Be) : p = 2.25
 Un : p = 2.33
 Hen : p = 2
 He > Be > Li$$

- 266. Ans. (2) It is true that Mg is not present in enamel of human teeth. Mg is an essential element for biological function like muscle contraction and blood coagulation.
- 167. Ans. (3) It is true that carboxypeptidase is an exopeptidase, there are a class of peptide cleaving enzymes which act on the terminal amino-acid residues. Carboxy peptidase acts on carboxyl end, and amino peptidase acts an amino end of the peptide.
- 168. Ans. (2) It is true that sucrose is non reducing sugar. It also contains glycosidic linkage. But it does not show reducing property due to absence of free or potential carbonyl group.
- 169. Ans. (3) It is true that isobutanal does not give iodoform test, It is due to absence of O

 $CH_3 - \ddot{C}$ - group. Isobutanal contains one α -Hydrogen atom.

170 Ans. (3)



This reaction takes place as Markovnikovs addition. Alkyl radical is more stable than benzyl radical.

171. Ans. (3) The pKa value of acetic acid is less than phenol because acetic acid is stronger acid than phenol. Carboxylitate ion is more resonance stabilized than phenoxide ion.

H H Br H | | | | |H - C - C - C - C - H + CH₃ CH₂ O Na | | | |H H H H \longrightarrow CH₃ - CH = CH - CH₃ 2 - butene.

According to Saytzeff rule, the major product is the most highly substituted alkene.



Benzyl cation is more stable than methyl cation because methyl cation does not contain any electron withdrawing group but benzyl cation is resonance stabilized

- 174. Ans. (1) It is true that molar entropy of vaporization of water is greater than that of ethanol. It is due to the fact that water is more polar than ethanol.
- 175. Ans. (1) It is true that aqueous gold in protective colloid is red in colour and this colour arises due to scattering of light by colloidal gold particle
- 176. Ans. (3) If corrosion of Cu is taking place in acidic aqueous solution, it means electrochemical reaction taking place. The electrical work done means decrease in free energy.

The value of free energy change will be negative.

- 177. Ans (4) AgCl will precipitate first because the ionic product of Ag Cl is greater than ionic product of Ag Br
- 178. Ans. (1) Molecular sieves are widely used as drying agents and as catalyst. Zeolites are capable for dehydrating alcohols because it is porous catalyst and easily accommodates hydrocarbons.
- 179. Ans. (3) All F-S-F bond is greater than 90° but less than (80° is true and clear from the structure.



Lone pair-bond repulsion is stronger than bond pair-bond pair repulsion.

180. Ans. (3) The rate of effusion is proportional to the area of the orifice and mean velocity of the molecule and hence reciprocal of square root of the molecular weight of the gas. So the rate of oxygen will be smaller than nitrogen. The rate of effusion has nothing to do with the size of the molecule.

PHYSICS

181. Ans. (4) In dry cell a carbon and a zinc electrode is used. The solutions NH₄ Cl and MnO₂ are prepared in the form of a paste. These paste is contained in a zinc container which works as the negative electrode. The carbon rod works as a the terminal. When the current is passed through the cell Cl⁻ ions combine with zinc and the NH⁴₄ ion move towards the carbon electrode. Again NH⁴₄ ion get separated into NH₃ and H⁺. This H⁺ reacts with Mn O₂ and forms Mn₂O₃ and H₂O.

Since, the Electro Motive Force which is a force depends upon the rate of formation of the ions. It does not depend on the amount of material used. So, the e.m.f of a cry cell does not depends on its size. It depends only on the rate of formation of ions. So both the given assertion and reason is wrong.

 Ans. (2) Actually there are three primary colours as Red, Green and Blue.

All the other colours are formed due to the combination of these primary colours and is called secondary colours. These colours are formed as follows :--

Red + Green = Yellow Red + Blue = Magenta Green +Blue = Cyan

Now according our assertion, the Red and Yellow is means Red + (Red + green). So the red becomes highly concentrated. So, it becomes dark.

Though the red colour scatters less, but it is not the reason of assertion.

183. Ans. (2) When pressure becomes low, the boiling point of water decreases.

In our case, the water of cooker was boiling and the pressure inside the cooker is greater than the atmospheric pressure. When we take out the vapour suddenly, then pressure inside the cooker decrases suddenly. And so the water starts boiling below the boiling point (i.e. below 100° C).

This is also true that the boiling point of water at atmospheric temperature which is 100° C decreases when we add some impurities in the pure water.

So, we can conclude that assertion and reason both are correct but reason is not the current explanation of assertion.

184. Ans. (4) The role geographic north direction is same angle right to the actual compass needle.

The magnetic meridian of the earth is along the perpendicular to the axis of rotation of the earth.

So both assertion and reason are incorrect.

185.Ans (1)

186. Ans. (1) In a transistor there are three terminals :-

(i) Base (ii) Emitter (iii) Collector

The base should be thin to make the transistor stable. But it does not mean that the base should be very thin. If it becomes very thin, then a very small fluctuation of current can damage the transistor. In a stable transistor, the output current is continuous.

187. Ans. (1) The β- particle (a) hot penetrate in our body. So it can not damage strong part of our body.

⁹⁰Sr can go to she human begins body through milk once can make harmful to the production of red ploce corpuscules.

188. Ans. Why general, the different colours which we are seeing except the dispersion of light is due to the interference of light waves.

Now in case of morpho-butterfly, its wing naving different pigments which reflects light different angles. After the reflection of the light, it interferes and forms different beautiful colours.

- 199. Ans. (1) The small colour dots can have different shapes. So the angular separation of adjacent dots changes with the distance from the painting. So when we move the painting colour changes.
- 190. Ans.(1) If the superconductor is placed in a magnetic field its super conducting behaviour disappears. There is nothing like the superconductor repels or attracts the magnet.

The superconductivity has been shown at very low temperature only.

191. Ans. (3) The fission is a process in which a heavy atom breaks into two or more parts. The mass of the parent nucleus is larger than the daughter nuclii. This difference in mass is converted into energy. So during a fission process some amount of energy is liberated

The energy released in this process is due to the mass defect, not due to the binding energy of parent and daughter nuclei.

So, assertion is true and reason is wrong.

192. Ans (4) Since the pressure inside the drop is larger by an amount

in ger oy	GIT GUTTO GITE
	$\Delta P = \frac{2S}{R}$
Where	S= surface tension
	R = radius of drop.
Again	$P = \frac{Force}{Area} = \frac{F}{A}$
	F = P.A
	$=\frac{2S}{R} \times A$
	$= \frac{2S}{R} \times 4\pi R^2$
	$F = 8\pi S.R$
So,	F∝R
Again ∆ P	$P = \frac{2S}{R} = \frac{2S \times 4\pi R}{4\pi R^2}$
	$=\frac{8\pi R}{A}$
where A	= $4\pi R^2$ = Surface Area of sphere
⇒	$\Delta \mathbf{P} \propto \frac{1}{\mathbf{A}}$

Thus we see that the deforming force is proportional to the radius of the drop and excess pressure inside the drop is inversely proportional to the surface area.

Both are wrong.

- 193. Ans. (2) Due to the increase of pressure the Boiling Point of liquid increases and the melting point decreases.
- Again the density of Ice is more than the water, that why the ice is floating on the surface of water. This happens due to the open structure of the ice crystal. So that after melting the ice, it contracts in volume

But the reason is not the exact explanation of assertion. Both the facts are independent facts.

194. Ans. (1) Heavy water is deuteron. Deuteron having one proton, one neutron in nucleus and an electron revolving round the nucleus. It is an isotope of hydrogen. Deuteron can slow down the fast moving particles when the particles passed through it. So it is used in the reactor as a moderator.

195. Ans. (4) There are two types of mechanical system (or frame of reference)

(1) Inertial Frame of Reference :-

When we study about a system moving with some uniform velocity or non-uniform velocity with respect to a fixed object is called inertial frame of reference. In inertial frame of reference, the Newton's laws of motion holds good.

(2) Non. Inertial Frame of Reference :-

In this frame of reference, we are having two bodies accelerating with each other. For an example let us see that a body is moving with an acceleration of a w. r. t the fixed poles and trees besides the noad. Again one another particle is just find from that moving body having acceleration of 'a' with respect to that moving body. This type of system in which two fodies are moving with an acceleration with respect to each other is an example of non-inertial frame. The Newton's laws of motion does not hold good for non-inertial frame.

So that both the statements are wrong.

196. Ans. (1) LASER :- Light Amplification by Stimulated Emission of Radiation.

The laser beam is monochromatic, coherent and intense beam. He-Ne is a laser in which He is present in large amount and Ne in less. So the population inversion i.e. having metastable state is dominated by He.

Note:- Metastable State :-

The state of a system or body in which it appears to be in state equilibrium but if it disturbed can settle into a lower energy state.

197. Ans. (1) In common emitter configuration means the emitter is common in both the input and output. In this configuration the impedance is low as well as the emitter region is forward biased always.

Note:- Impedance is just like resistance.

198. Ans. (1) Any thermodynamical process can not retrace its path. This happens due to the fact that during the thermodynamical process, some of its energy wastes. When we retrace this process we can not get this wastage of energy. So in nature the thermodynamical process is irreversible due to dissipation effect.

So both the assertion and reason are correct and reason is correct explanation of assertion.

Note:- Dissipation means that the wastage of energy during the change of energy from one system to another .e.g heating of wire during flow of current, production of sound waves by a machine.

199. Ans. (1) When a ray having the wavelength in the range of the interatomic distance of the crystal. then the diffraction takes place by that ray. Generally, the interatomic distance in the crystal is of the order of 0.1 nm. And the wavelength of x-rays is 0.1 to 10 nm. So, the x-ray is giving diffraction pattern of crystalline solid 200. Ans. (4) Photoelectric effect is a phenomenon in which the photon comes on the surface of a metal and ejects the electrons. This ejected electron is called photoelectrons.

In this process we can easily say that a packet of energy is incident called photon having energy *hu*/ falls on the surface of the metal and gives that energy to the electron. This electron gets excited and then it it gets sufficient energy it comes out from the surface. So, photoelectron emission shows the particle nature of photon.

nature of photon. The number of photoelectrons depend upon the intensity of light not on the frequency of incident light So both are wrong. Max. Time : $3\frac{1}{2}$ hrs.

PHYSICS

1. For skywave propagation of a 10 MHz signal. what should be the minimum electron density in ionosphere ?

 $(1) \approx 10^{22} \text{ m}^{-3}$ $(2) \approx 10^{14} \text{ m}^{-3}$ (1) $\approx 10^{47} \text{ m}^{-3}$ (3) $\approx 10^{6} \text{ m}^{-3}$ (4) $\approx 1.2 \times 10^{12} \text{ m}^{-3}$

- 2. Which of the following logic gates is an universal gate ?
 - (1) NAND (2) AND (3) OR (4) NOT
- 3. What should be the maximum acceptance angle at the air core interface of an optical fibre if n1 and n2 are the refractive indices of the core and the cladding, respectively ?

$$(1) \begin{bmatrix} \tan^{-1} & n_1 \\ n_2 \end{bmatrix}$$
 (2) $\sin^{-1} (n_2 \cdot n_1)$
(3) $\cdot \sin^{-1} \sqrt{n_1^2 - n_2^2}$ (4) $\begin{bmatrix} \tan^{-1} & \frac{n_2}{n_1} \end{bmatrix}$

4. A conducting ring of radius 1 metre is placed in an uniform magnetic field B of 0.01 tesla oscillating with frequency 100 Hz with its plane at right angle to B. What will be the induced electric field ? (2) 62 volts/pf

(1) π volts/m (3) 2 volts/m

(4) 10 voltsm

5. Consider an n-p-n transistor amplifier in common emitter configuration The current gain of the transistor is POQ. If the collector current changes by 1 mA, what will be the change in emitter current ?

6. A telescope has an objective lens of focal length 200 cm and an eye piece with focal length 2 cm, If this telescope is used to see a 50 metre call building at a distance of 2 km, what is the height of the image of the building formed by the objective lens ?

(1) 2 cm (2) 5 cm (3) 10 cm (4) 1 cm

7. The ground state energy of hydrogen atom is - 13.6 eV. What is the potential energy of the electron in this state ?

Max. Marks

(2) - 27 & eV (1) 0 eV

- (4) 1 eV (3) 2 eV
- 8. Solid targets of different elements are bombarded by highly energetic electrons beams. The frequency (f) of the characteristic X-rays emitted from different targets varies with atomic number Z as

(1)
$$f \propto \sqrt{2}$$

(3) $f \propto Z$
(4) $f \propto Z^2$

9. Two infinitely long parallel conducting plates having surface charge densities $+\sigma$ and $-\sigma$ respectively, are separated by a small distance. The medium between the plates is vaccum. If it is the dielectric permitivity of vacuum, then the electric field in the region between the plates is

(1)
$$\sigma 2 t_0$$
 volt/metre (2) σ / t_0 volt/metre

2 2 . Eo volt/metre (4) 0 volt/metre

NQ. In a semiconducting material the mobilities of electrons and holes are µ, and µ, respectively. Which of the following is true

(1) $\mu_{e} > \mu_{u}$	(2) $\mu_{e} < 0$: $\mu_{e} > 0$
(3) $\mu_e < \mu_{e}$	(4) $\mu_{e} = \mu_{e}$

11. The magnetic moment (µ) of a revolving electron around the nucleus varies with principal quantum number n as

(1) µ ∝ n	(2) $\mu \propto n^2$
(3) $\mu \propto 1/n$	(4) $\mu \propto 1/n^2$

12. A radioactive material has a half-life of 10 days. What fraction of the material would remain after 30 days ?

(1) 0.125(2) 0.33(4) 0.25 (4) 0.5

13. According to Hubble's law, the red shift (Z) of a receding galaxy and its distance r from earth are related as

. (2) Z x r³ 2 (1) Z x r (3) Z = 1-r² (4) Z x 1/r

14. When exposed to sunlight, thin films of oil on water often exhibit brilliant colours due to the phenomenon of

 interference. 	(2) polarization
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- (3) diffraction (4) dispersion
- 15. "Parsec" is the unit of

- (1) time (2) frequency joule/meter during its travel-thom x = 20 metre to x = 30 motre. He finalit (3) distance (4) angular acceleration etic energy will be 16. The voltage gain of the following amplifier (1) 250 joule (2) 475 joule 100 k Ω (3) 450 joule (4) 275 joule 21. Energy required to break one bond in DNA is approximately 1kQ (2) = 0.01 el (1) = 21 eV $(3) \approx 1 \text{ eV}$ (4)= 01e 22. The condition for a uniform)spherical mass m of radius r to be a black hole is IG = 10 k Ω v. gravitational constant and g = acceleration due to gravity 2 Gm (1) 10(2) 9.9(3) 100(4)100017. A 50 Hz a c. source of 20 volts is connected across R and C as shown in figure. C (3) 23. Which of the following is an amorphous solid? t suga (2) salt 3 ghass (4) diamond 24. For a constant hydraulic stress on an ob-The voltage across R is 12 volt. The voltage ject, the fractional change in the object's across C is (volume ($\Delta V/V$) and its bulk modules (B) are (1) 10 V (2) 8 V (3) 16 V related as (4) not possible to determine unless values of R (1) $\frac{\Delta V}{V} \propto B^{-2}$ (2) $\frac{\Delta V}{V} \propto B^2$ and C are given 18. The pressure exerted by an electromagnetic (3) $\frac{\Delta V}{V} \propto \frac{1}{B}$ (4) $\frac{\Delta V}{V} \propto B$ wave of intensity I (watt/m2) on a non reflecting surface is [c is the velocity of light]
 - 25. Which of the following functions represents a simple harmonic oscillation ?
 - (1) $\sin \omega t + \sin 2\omega t$ (2) $\sin^2 \omega t$
 - (3) $\sin \omega t \sin 2\omega t$ (4) $\sin \omega t \cos \omega t$
 - 26. In case of linearly polarized light, the magnitude of the electric field vector
 - (1) increases and decreases linearly with time
 - (2) is parallel to the direction of propagation
 - (3) does not change with time
 - (4) varies periodically with time
 - 27. The circuits shown below acts as





(2) 1/c2

impulse at t = 2 sec is

(1) Ic.

 $(3) lc^2$

19. In the figure given, the position-time graph

of a particle of mass 0,1 (kg is shown. The

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- (1) high pass filter
- (2) low pass filter
- (3) rectifier
- (4) tuned filter
- 28. For ensuring dissipation of same energy in all three resistors (R1 , R2 , R3) connected as shown in figure, their values must be related as



- (2) $R_2 = R_1$ and $R_1 = 1/4 R_2$
- (3) $R_1 = R_2 = R_3$

4)
$$R_2 = R_1$$
 and $R_1 = 4 R_2$

29. The apparent depth of water in cylindrical water tank of diameter 2R cm is reducing at the rate of x cm/minute when water is being drained out at a constant rate. The amount of water drained in c.c. per minute is (n1 = refractive index of air, n₂ = refractive index of water).

(1)
$$\pi R^2 x$$
 (2) $\frac{x \pi R}{n}$
(3) $\frac{x \pi R^2 n_1}{n_2}$ (4) $\frac{2 \pi R}{n_2}$

30. A candle of diameter d is floating on a liq uid in a cylindrical container of diameter D (D > > d) as shown in figure. If it is burning at the rate of 2 cm/hour then the top of the candle will



- (2) fail at the rate of 2 cm/hour
- Wernhin at the same height
- (4) fall at rate of 1 cm/hour
- 31. A given shaped glass tube having uniform cross section is filled with water and is mounted on a rotatable shaft as shown in fig-

ure. If the tube is rotated with a constant angular velocity of then



- (1) water level in section A goes up and that in B somes
- water levels remain same in both sections
- (3) water level in both sections A and B go up
- A water level in section A comes down and that in B it goes up
- 2. When a ball is thrown up vertically with velocity vo, it reaches a maximum height of h. If one wishes to triple the maximum height then the ball should be thrown with velocity

(1)
$$v_3 v_0$$
 (2) $3 2 v_0$
(3) $9 v_0$ (4) $3 v_0$

33. A solid sphere is rolling on a frictionless surface, shown in figure with a translational velocity v m/s. If it is to climb the inclined surface then v should be



- 34. A horizontal platform is rotating with uniform angular velocity around the vertical axis passing through its centre. At some instant of time a viscous fluid of mass m is dropped at the centre and is allowed to spread out and finally fall. The angular velocity during this period
 - (1) increases continuously
 - (2) remains unaltered
 - (3) decreases continuously
 - (4) decreases initially and increases again

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35. A ladder is leaned against a smooth wall and it is allowed to slip on a frictionless floor. Which figure represents trace of its centre of mass



36. A person is standing in an elevator. In which situation he finds his weight less ?

- (1) when the elevator moves upward with uniform velocity
- (2) when the elevator moves downward with uniform velocity
- (3) when the elevator moves upward with constant acceleration
- (4) when the elevator moves downward with constant acceleration
- 37. Two concentric conducting thin spherical shells A and B having radii r_A and r_B ($r_B > r_A$) are charged to Q_A and Q_B $|Q_B| > |Q_A|$). The electrical field along a line, (passing the product of the sector is)



38. A magnet is made to oscillate with a particular frequency, passing through a coil as shown in figure. The time variation of the magnitude of e. m. f. generated across the coil during one cycle is



- (1) ML⁻¹ L³ T³ A² (2) M L³ T⁻³ A⁻² (3) M L² T⁻³ A⁻¹ (4) M L² T⁻³ A⁻²
- 40. Four point + ve charges of same magnitude (Q) are placed at four corners of a rigid square frame as shown in figure. The plane of the frame is perpendicular to Z-axis. If a ve point charge is placed at a distance z away from the above frame (z < L) then
 - (1) it passes through the frame only once
 - (2) it moves away from the frame
 - (3) ve charge oscillates along the Z-axis
 - (4) it moves slowly towards the fragmade town

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- S Directions for questions 41 60 : In each of the following questions, a statement of Assertion (A) is given followed by a corresponding statements of Reason (R) just below it. Of the statements, mark the correct answer as
 - If both assertion and reason are true and reason is the correct explanation of assertion
 - (2) If both assertion and reason are true but reason is not the correct explanation of assertion
 - (3) If assertion is true but reason is false
 - (4) If both assertion and reason are false
- Assertion : Specific gravity of a fluid is a dimensionless quantity.

Reason : It is the ratio of density of fluid to the density of water

 Assertion : Frictional forces are conservative faces.

Reason : Potential energy can be associated with frictional forces

- 43 Assertion : By roughening the surface of a glass sheet its transparency can be reduced Reason : Glass sheet with rough surface absorbs more light.
- 44. Assertion : A diode lasers are used as optical sources in optical communication Reason : Diode lasers consume less energy
- 45. Assertion : Diamond glitters brilliantly Reason : Diamond does not absort sunlight
- 46. Assertion : The energy (E) and momentum (p) of a photon are related by p - E c.

Reason : The photon behaves like a particle

47. Assertion : The clouds in sky generally appear to be whitish

Reason : Diffraction due to clouds is efficient in equal measure at all wavelengths

- 48. Assertion : Television signals are received through sky-wave propagation Reason : The ionosphere reflects electromagnetic waves of frequencies greater than a certain critical frequency.
- 49. Assertion The logic NOT can be built us-

Reason. The output voltage and the input voltage of the diode have 180" phase differ-

50. Assertion : The resolving power of a telescope is more if the diameter of the objective lens is more Reason : Objective lens of large diameter collects more light.

- 51. Assertion : Reversible systems are difficult to find in real world Reason : Most processes are dissipative in nature
- 52. Assertion. For a system of particles under central force field, the total angular momentum is conserved.

Reason : The torque acting on such a system is zero.

53. Assertion : Air quickly leaking out of a balloon becomes cooler

Reason : The leaking air undergoes adiabatic expansion

54. Assertion : It is not possible to use ³⁵Cl as the fuel for fusion energy.

Reason The binding energy ³⁵C/ is too small

55. Assertion The number of electrons in a ptype silicon semiconductor is less than the number of electrons in a pure silicon semiconductor at room temperature.

Reason : It is due to law of mass action

56. Assertion : In a common emitter transistor emplifier the input current is much less than the output current.

Reason : The common emitter transistor amplifier has very high input impedance.

57. Assertion : A body that is a good radiator is also a good absorber of radiation at a given wavelength

Reason : According to Kirchoff's law the absorptivity of a body is equal to its emissivity at a given wavelength

58. Assertion : In pressure temperature (P - T) phase diagram of water, the slope of the melting curve is found to be negative

Reason : Ice contracts on melting to water

59. Assertion : For higher temperatures the peak emission wavelength of a black body shifts to lower wavelengths

Reason : Peak emission wavelengths of a blackbody is proportional to the fourth power of temperature

 Assertion : For Reynold number R, > 2000, the flow of fluid is turbulent

Reason : Inertial forces are dominant compared to the viscous forces at such high Reynold numbers. [SRI GANESHA] FINGERTIPS REVISION FOR EVERY ENTRANCE EXAM EXEMPLAR EXPLORER [FREEEEE] BOOK [156 of 182]

CHEMISTRY



79. The chemical reaction,

 $2 \operatorname{AgC} I_{(*)} + H_{2(g)} \longrightarrow 2 \operatorname{HC} I_{(eq)} + 2 \operatorname{Ag}_{(*)}$ taking place in a galvanic cell is represented by the rotation

(1) $Pt_{int} | H_{2.eq}$. 1 bar | 1 M HC $l_{intri} | AgCl_{int} | Ag_{int}$ (2) $Pt_{int} | H_{2.eq}$. 1 bar | 1 M HC l_{intri} |

1 M Ag., Ag.,

(4) Pt, |H219, 1 bar | 1 M KCI, | AgCI, |Ag.,

- 80. If Z is the number of atoms in the unit cell that represents the closest packing sequence ... A B C A B C ..., the number of tetrahedral voids in the unit cell is equal to (1) 7 (2) Z/4 (3) Z/2 (4) 2Z
- \Hⁿ_f (298 K) of methanol is given by the chemical equation

(1) C (diamond) +
$$\frac{1}{2}$$
 O_{2 tq1} + 2 H_{2 tq2} \rightarrow CH₂OH (*l*)
(2) CH_{4 tg1} + $\frac{1}{2}$ O_{2 tq2} \rightarrow CH₃OH_{tq1}
(3) CO_{tq1} + 2 H_{2 tq2} \rightarrow CH₃ OH_{tf1}
(4) C (graphite) + $\frac{1}{2}$ O_{2 tq2} + 2 H_{2 tg2} \rightarrow CH₃OH_{tf2}

82. An endothermic reaction with high activation energy for the forward reaction is given by the diagram



- 83. When 10 mill of 0.1 M acetic acid $(pK_s = 5.0)$ is diffrated against 10 ml of 0.1 M ammonia solution $(pK_b = 5.0)$, the equivalence point occurs at pH
 - (2)6.0 (3)5.0 (4)7.0
- 84. The most probable radius (in pm) for finding the electron in He is (1) 26.5 (2) 105.8 (3) 0.0 (4) 52.9

85. For the reaction of one mole of zinc dust with one mole of sulphuric acid in a bomb calorimeter, AU and w corresponds to

(1) $\Delta U > 0$, w > 0 (2) $\Delta U < 0$, w = 0(3) $\Delta U < 0$, w < 0 (4) $\Delta U > 0$, w (6)

86. For reaction aA → x P, wher [A] = 2.2 mM, the rate was found to be 2.4 mM s⁻¹. On reducing concentration of A to hall, the rate changes to 0.6 mM s⁻¹. The order of reaction with respect to A is

(1) 1.5 (2) 2.5 (2(3)) (4) 2.0

87. For reaction 2 NOC (g) 2 NO((g) + C I_{2} (g), K_C at 427° C is 3 × 10⁻⁹ L, mol⁻¹. The value of K_p is nearly

$$\begin{array}{c} (1) 1.75 \times 10 \\ (3) 2.50 \times 10^{-1} \\ \end{array}$$

88. For the chemical equilibrium,

CaCO₃ CaO₍₁₎ + CO_{2 (g)}.

AH, an be determined from which one of the following



89. Among the following the strongest nucleophile is

(1) CH ₃ NH ₂	(2) C_2H_5SH
(3) NCCH	(4) CH3COO

90. The major product formed in the following reaction is

$$\begin{array}{c} \mathsf{CH}_{3} \\ \mathsf{CH}_{3} - \overset{\mathsf{I}}{\mathsf{C}} - \mathsf{CH}_{2}\mathsf{Br} & \xrightarrow{\mathsf{CH}_{3}\mathsf{O}^{\mathsf{I}}} \\ & \overset{\mathsf{I}}{\overset{\mathsf{I}}{\mathsf{H}}} \\ & \mathsf{CH}_{3} & \overset{\mathsf{CH}_{3}}{\overset{\mathsf{CH}_{3}}{\mathsf{CH}_{3}}} \\ & (1) \mathsf{CH}_{3} - \overset{\mathsf{I}}{\mathsf{C}} - \mathsf{CH}_{3} \\ & (1) \mathsf{CH}_{3} - \overset{\mathsf{I}}{\mathsf{C}} - \mathsf{CH}_{3} \\ & \overset{\mathsf{I}}{\mathsf{O}\mathsf{CH}_{3}} \\ & \overset{\mathsf{I}}{\mathsf{O}\mathsf{CH}_{3}} \\ \end{array}$$

[SRI GANESHA] FINGERTIPS REVISION FOR EVERY ENTRANCE EXAM EXEMPLAR EXPLORER [FREEEEE] BOOK [158 of 182]

(3) CH - CH - CH, CH

OCH. CH

(4) CH. - C - CH

- The major product obtained on treatment of CH₃CH₂ CH(F) CH₃ and CH₃O⁻ CH₃OH is
 - (1) CH_CH_CH_CH_OCH
 - (2) CH, C11, CH(OCH) CH
 - (3) CH- CH CHCH, (4) CH CH, CH = CH₂
- 92. Among the following the most stable compound is
 - (1) trans- 1. 3 cuclohexanediol
 - (2) cis- 1, 2 cyclohexanediol
 - (3) trans 1, 2-cyclohexanediol
 - (4) cis 1.3-cyclohexenediol
- 3-Phenylpropene on reaction with HBr gives (as a major product)
 - (1) C.H.CH(BoCH CH,
 - (2) C.H.CH.CH(Br)CH1
 - (3) C.H.CH(BR) CH. CH.
 - 41 C.H.CH.CH.CH.B.
- 94. CH₃CO₂C₂H₅ on reaction with sodium ethoxide in ethanol gives A, which on heating in the presence of acid gives B. Compound B is



- 95. Among the following which one does not act as an intermediate in Hormann rearrangement?
 - (1) RNC

(S) RCON

A RCONHBr

12)RNCO

- 96. Pyridine is less basic than triethylamine because
 - (1) in pendine, long pair of nitrogen is delocalised
 - (2) punding the accordic system

 \land

- (3) pyrolog An aromatic character
- (4) mitalenth pundine is sp² hybridised
- 97. Which one of the following biomolecules is impoluble in water ?
- Hydonuclease (2) adenine
 - (3) haemoglobin (4) u-keratin

- 99. Which one of the following statements is true for protein synthesis (translation) ?
 - (1) only one codor codes for an amino acid
 - 2 amino acids an the man recognized by m-RNA
 - 13) the third back the codon is less specific
 - (4) every (RNA) molecule has more than one amino acid attachment
- 100. C. CONHCH₃ can be converted into C.H.CH₂NHCH₃ by

n-hig HCI

ATH

(2) NaBH₁

(4) H₂ - Pd C

Directions for questions 101 - 120 : In each of the following questions, a statement of Assertion (A) is given followed by a corresponding statements of Reason (R) just below it. Of the statements, mark the correct answer as

- If both assertion and reason are true and reason is the correct explanation of assertion
- (2) If both assertion and reason are true but reason is not the correct explanation of assertion
- (3) If assertion is true but reason is false
- (4) If both assertion and reason are false
- 101. Assertion : Reaction of SO₂ and H₂S in the presence of Fe₂O₃ catalyst gives elemental sulphur

Reason : SO₂ is a reducing agent.

102. SiF62- is known but SiCI82- is not.

Reason : Size of fluorine is small and its lone pair of electrons interacts with d-orbitals of Si strongly.

103. Assertion : Borax bead test is not suitable for Al(III)

Reason : Al₂O₃ is insoluble in water

104. Assertion : Ozone is a powerful oxidising agent in comparison to O₂. Reason : Ozone is diamagnetic but O₂ is paramagnetic.

105. Assertion : Potassium ferrocyanide is diamagnetic whereas potassium ferricyanide is paramagnetic

Reason : Crystal field splitting in ferricyanide ion is greater than that of ferricy-anide ion.

106. Assertion : Addition of NH₄OH to an aqueous solution of BaCl₂ in the presence of NH₄Cl (excess) precipitates Ba(OH)₂.

Reason : Ba(OH), is insoluble in water

 Assertion : SeCl₄ does not have a tetrahedral structure.

Reason : Se in SeCl₄ has two lone pairs

108. Assertion : The molecular weight of acetic acid determined by depression in freezing point method in benzene and water was found to be different

Reason : Water is polar and benzene is non polar.

109. Assertion : Compressibility factor for hydrogen varies with pressure with positive slope at all pressures.

Reason : Even at low pressures, repulsive forces dominate hydrogen gas.

- 110. Assertion : First ionisation energy for nitrogen is lower than oxygen Reason : Across a period effective nuclear charge decreases.
- 111. Assertion : B_2 molecule is diamagnetic Reason : The highest occupied molecular orbitals is of σ type
- 112. Assertion : Rate of hydrolysis of methyl chloride to methanol is higher in DMF than in water.

Reason : Hydrolysis of methyl chloride follows second order kinetics

- 113. Assertion : Galvanized iron does not tust. Reason : Zinc has a more negative electrode potential than iron.
- 114. Assertion : Extraction of iron metal from iron oxide ore is carried out by heating with coke.

Reason : The reaction

 $Fe_2O_{3(n)} \rightarrow Fe_{(n)} + 3 + 2 O_{3(g)}$ is a spontaneous process.

115. Assertion : Rates of mitration of benzene and hexadeuterobenzene are different

Reason : C - H bond is stronger than C - D bond.

116. Assertion t Busy methyl ether is not prepared by the reaction of t-butyl bromide with sodium methoxide

Reason (Sodium methoxide is a strong nucleophile.

- 117. Assertion : Maltose is a reducing sugar which gives two moles of D-glucose on hytronsis
 - Reason : Maltose has a 1,4-β-glycosidic linkage

Name Assertion : p- O₂N - C₆H₅COCH₃ is prepared by Friedel Crafts acylation of nitrobenzene.

Reason : Nitrobenzene easily undergoes electrophilic substitution reaction

 Assertion : Alkyl isocyanides in acidified water give alkyl formamides

Reason : In isocyanides, carbon first acts as a nucleophile and then as an electrophile

120. Assertion : Cyclopentadienyl anion is much more stable than allyl anion

Reason : Cyclopentadienyl anion is aromatic in character.

BIOLOGY

- 121. Based on cellular mechanisms there are two mayor types of regeneration found in the animate Which one of the following is the correct example of the type mentioned ?
 - Demorphosis Regeneration of crushed and filtered out pieces of a Planaria into as many new Planarians.
- (2) Morphallaxis Regeneration of two transversely cut equal pieces of a Hydra into two small Hydras
- (3) Epimorphosis Replacement of old and dead erythrocytes by the new ones.
- (4) Morphallaxis Healing up of a wound in the skin

		Secretion	Source	Target	Action
_	(1)	Gasmi	Stomach brung	Óxyntic Luis	Production of HCI
	(23	<i>listritur</i>	Sertoli cells	typothalan us	Inhibition of secretion of gonadotrop in releasing hormone
	134	Enterokinus e	Ducdenum	Galt bladder	Release of bile juice
	(4)	Atrial Natriaretic Factor (ANF)	Sinu atnal node (SAN)	Juxtaglome ruku apparatus (JGA)	Inhibition of release of renin

H22. Which one of the following four secretions is correctly matched with its source, target and nature of action ?

123. Which one of the following four glands is correctly matched with the accompanying description ?

- Pancreas Delta cells of the Islets of Langerhans secrete a hormone which stimulates glycolysis in liver.
- (2) Parathyroid Secretes parathormone which promotes movement of calcium ions from blood into bones during calcification
- (3) Thymus starts undergoing atrophy after publicity
- (4) Thyroid hyperactivity in young children causes cretinism
- 124. Given below is a pedigree chart showing the inheritance of a certain sex linked trait in humans.



- (1) 9 + 2 arrangement of microtubules only
- (2) mitochondria and 9 + 2 arrangement of microtubules
- (3) centriole, mitochondria and 9 + 2 arrangement of microtubules
- (4) centroile and mitochondria
- 126. Which one of the tollowing is a correct statement?
 - 11) The anticoagulant hirudin is being produced from transgenic Brassic nopus seeds
 - 12) "Flave Savar" varies of tomato has enhanced the production of enhanced which improves its taste
 - (3) "Bt" in "Bt-control indicates that it is a genetically modified organism produced through biotectivology
 - (4) Somatic hybridisation involves fusion of two complete phone cells sarrying desired genes
- 127. An insect bite may result in inflammation of that spot. This is triggered by the alarm chemical such as :
 - IN interferons and histones
 - (2) histamine and kinins
 - Mistamine and dopamine
 - (4) interferons and opsonin
- 128. Which one of the following pairs of geographical areas show maximum biodiversity in our country?
 - (1) Kerala and Punjab
 - (2) Sunderbans and Rann of Kutch
 - (3) Eastern Ghats and West Bengal
 - (4) Eastern Himalaya and Western Ghats
- 129. Genetic diversity in agricultural crops is threatened by :
 - (1) intensive use of biopesticides
 - (2) extensive intercropping
 - (3) intensive use of fertilizers
 - (4) introduction of high yielding varieties
- 130. One of the ex situ conservation methods for endangered species is
 - national parks
 cryopreservation
 - (3) wildlife sanctuaries (4) biosphere reserves
- Formation of non-functional methaemoglobin causes blue-baby syndrome. This is due to
 - (1) deficiency of iron in food
 - (2) excess of arsenic concentration in drinking water
 - (3) increased methane content in the atmosphere
 - (4) excess of nitrates in drinking water

- 132. Two of the body parts which do not appear in MRI may be :
 - (1) scapula and canines
 - (2) molar teeth and eve lens.
 - (3) tendons and premolars
 - 41 ligaments and ribs
- 133. A young drug addict used to show symptoms of depressed brain activity, feeling of calmness, relaxation and drowsiness. Possibly he was taking
 - (2) amphetamine manuana
 - (4) pethidine (3) valium
- 134. Antigen binding site in an antibody is found between
 - (1) two heavy chains
 - (2) one heavy and one light chain
 - (3) two light chains
 - (4) either between two light chains or between one heavy and one light chain depending upon the nature of antigen
- 135. Which one of the following events is correctly matched with the time period in a normal menstrual cycle ?
 - (1) endometrium secretes nutrients for implantation 11-18 days
 - (2) endometrium regenerates : 5 10 days
 - (3) release of egg : 5th day
 - (4) rise in progesterone level : 1 15 days
- 136. A tumor inducing plasmid widely used in the production of transgenic plants is that of
 - (1) Agrobacterium tumefociens
 - (3) Bacillus thuringiersis (2) Escherichia coli
 - (4) Staphylococcus aureus
- 137. Which one of the following statement pertaining to pollutants is correct?
 - (1) methylmercury in water may ause "Itai itai" disease.
 - drinking water causes (2) excess fluoride osteoporosis
 - [3] excess cadming in drinking water causes black foot disease
 - (4) DDT is a non-biodegradable pollutant
- 138. Which one of the following statements is correct with respect to salt water balance inside the body of living organisms ?
 - (1) Thinkindo fluids of fresh water animals are genwith Nepotonic to surrounding water.

2) Salmon fish excretes lot of stored salt through all membrane when in fresh water

(3) Paramecium discharge concentrated salt solution by contractile vacuoles

- (4) when water is not available camets do not produce urine but store urea in lissues.
- 139. The " cri du- chat" syndrome in caused by change in chromosome structure involving
 - (1) translocation 12) deletion
 - 14 inversion (3) duplication
- 140. The family containing mustard and ite main characters are
 - (1) Solanaceae Pentamerous Rowers. five stamens, bicarpellary gynoecium, beny type fruit
 - (2) Brassicaceae Tetramercity Nowers, six stamens, bicarpellary gyn vecium, siliqua type fruit
 - (3) Poaceae Trimerous flowers, three stamens, monocarpellary genoecilim carvopsis type of fruit.
 - (4) Brassicaceae (pentartelous flowers, many stamens. pentacopollare gynoecium, capsule type fruit
- 141. Grain colour in wheat is determined by three pairs of polygenes. Following the cross AABBCC (dark colour) x aabbcc (light colour), in F2 generation what proportion of the progeny is likely to resemble either parent ? 12 Main
 - (2) none
 - (3) less than 5 percent (4) one third
- 142. Which one of the following statements pertaining to plant structure is correct?
 - (1) sieve tube elements possess cytoplasm but no nuclei
 - (2) cork lacks stomata, but lenticels carry out transpiration
 - (3) the shoot apical menstern has a quiescent centre.
 - (4) passage cells help in transfer of food from cortex to phioem
- 143. When synapsis is complete all along the chromosome, the cell is said to have entered a stage called
 - (2) diplotene diakinesis
 - (4) pachytene (3) zygotene
- 144. Primary source of allelic variation is
 - (1) mutation
 - (2) recombination
 - (3) polyploidy
 - (4) independent assortment
- 145. Many cells function property and divide mitotically even though they do not have
 - (1) plasma membrane (2) plastids
 - (4) cvtoskeleton (3) mitochondria
- 146. Three of the following statements regarding cell organelles are correct while one is wrong. Which one is wrong ?

- Sphaerosomes are single membrane bound and are associated with synthesis and storage of lipids
- (2) Evisiones are double membraned vesicles budded off from Golgi apparatus and contain digestive enzymes.
- (3) Endoplasmic reticulum consists of a network of membranous tubules and helps in transport, synthesis and secretion.
- (4) Leucoplasts are bound by two membranes. lack pigment but contain their own DNA and protein synthesizing machinery.

147. In which one of the following would you expect to find glyoxysomes ?

- root hairs
 endosperm of wheat
- (3) palisade cells in leaf
- (4) endosperm castor
- 148. Which one of the following correctly represents an organism and its ecological niche?
 - (1) vultures and dense forest
 - (2) vallisneria and pond
 - (3) plant lice (aphids) and leat
 - (4) desert locust (schistocerca) and desert
- 149. Given below is one of the types of ecologi cal pyramids. This type represents



The given graph shows the effect of substrate concentration on the rate of reaction of the enzyme green gram-phosphatase. What does the graph indicate?

- ai higher substrate concentration the pH in creases
- (2) Formation of an enzyme-substrate concrex
- (3) The rate of enzyme reaction is directly proportional to the substrate concernation
- (4) Presence of an enzyme units of the reaction mixture
- 151. Which one of the following groups of structures/organs have similar function ?
 - 1) Incisors of rat, occard proventnculus) of cockroach and tube very starfish
 - (2) Nephridia in each worm. Malpighian tubules in cockmach and what's tubules in rat
 - [3] Antentyle Weckmach, tympanum of frog and clitellum st purthworm
 - (4) Typhlosophin earthworm, intestinal villi in rat

152. Given below is a diagram of the bones of the left human hindlimb as seen from front. It has certain mistakes in labeling. Two of the wrongly labelled bones are :



153. Electroporation procedure involves :

- purification of saline water with the help of a membrane system
- (2) making transient pores in the cell membrane to introduce gene constructs
- (3) fast passage of food through sieve pores in phloem elements with the help electric stimulation
- (4) opening of stomatal pores during night by attificial length

154. Somaclonal variation appears in

- organisms produced through somatic hybridisation
- (2) plants growing in highly polluted conditions
- (3) apomictic plants
- (4) tissues culture raised plants

155. In an experiment freshly hatched larvae of an insect (Khapra beetle) were reared on a basal diet (complete diet without cholesterol) with increasing amounts of cholesterol. Results obtained are shown in the graph given in the below. The graph given indicates that :



- growth of khapra beetle is inhibited when cholesterol concentration exceeds 5 µ g/g diet
- (2) cholesterol is an essential dietary requirement of khapra beetle
- (3) growth of khapra beetle is directly proportional to cholesterol concentration
- (4) cholesterol concentration of 2µ g/g diet is the optimum level

156. Which one of the following is correct matching of a plant, its habit and the forest type where it normally occurs ?

- (1) Acacia catechu, tree coniferous lorest
- (2) Shorea robusta, herb, tropical rain forest
 - (3) Prosopis, tree scrub
 - (4) Saccharum, grass forest
- 157. cDNA probes are copied from the messen ger RNA molecules with the help of
 - (1) DNA polymerase (2) restriction enzymes
 - (3) adenosine deaminase
 - (4) reverse transcriptase 🔿 (🔿
- 158. Gibberellins cab promote seed germination because of their influence on
 - (1) rate of cell division
 - (2) synthesis of abscisic acid
 - (3) production of hydrolyzing enzymes
 - (4) absorption of water through hard seed coat
- 159. Which one of the following features is common in silverfish, scorpion, dragonfly and prawn 3
 - (1) Cephakothorax and tracheae
 - (2) Johned appendages and chitinous exoskeleton
 - 3 Three pairs of legs and segmented body
 - A Chitinous cuticle and two pairs of antennae
- 160. Double fertilization involves
 - fertilisation of the egg and the central cell by two sperms brought by the same pollen tube

- (2) fertilization of two eggs in the same embryo sac by two sperms brought by one pollen tube
- (3) fertilization of the egg by two male gametes.
- (4) fertilization of the egg and the central cell by two sperms brought by different pollen tubes
- Directions for questions 161 180 : In each of the following questions, a statement of Assertion (A) is given followed by a corresponding statements of Reason (R) just below it. Of the statements, mark the correct answer as
 - (1) If both assertion and reason are true and reason is the correct explanation of assertion
 - (2) If both assertion and reason are true but reason is not the correct explanation of assertion
 - (3) If assertion is true but reason is false
 - (4) If both assertion and reason are false
- 161. Assertion : Senescence is the time when age associated defects are manifested.

Reason : Certain genes may be undergoing sequential switching on and off during one's life

162. Assertion : In recombinant DNA technology, human genes are often transferred into bacteria (prokaryotes) or yeast (eukaryote).

Reason : Both bacteria and yeast multiply very fast to form huge populations which express the desired gene.

163. Assertion : Methane component of green house gases contributing to global warming is about 20 percent.

Reason : Introduction of multi-point fuel injection engines in automobiles has decreased methane content in the exhausts.

164. Assertion : Suspended particulate matter (SPM) is an important pollutant released by diesel vehicles.

Reason : Catalytic converts greatly reduce pollution caused by automobiles

165. Assertion : Interferons are a type of antibodies produced by body cells infected by bacteria

Reason : Interferons stimulate inflammation at the site of injury

166. Assertion : Organ transplantation patients are given immunosuppressive drugs

Reason : Transplanted tissue has antigens which stimulate the specific immune response of the recipient 167. Assertion : Persons suffering from haemophilia fail to produce blood clotting factor VIII

Reason : Prothrombin producing platelets in such persons are found in very low concentration

168. Assertion : In humans, the gamete contributed by the male determines whether the child produced will be male or female

Reason : Sex in humans is a polyogenic trait depending upon a cumulative effect of some genes on X-chromosome and some Y-chromosome

169. Assertion : Mitochondria and chloroplasts are semiautonomous organelles

Reason : They are formed by division of preexisting organelles as well as contain DNA but lack protein synthesizing machinery.

170. Assertion : Replication and transcription occur in the nucleus but translation occurs in the cytoplasm

Reason : mRNA is transferred from the nucleus into the cytoplasm where ribosomes and amino acids are available for protein synthesis

171. Assertion : The fungi are widespread in distribution and they even live on or inside other plants and animals

Reason : Fungi are able to grow anywhere on land, water or on other organisms because they have a variety of pigments, including chlorophyll, carotenoids, fucooxanthia and phycoerythrin

172. Assertion : C4 photosynthetic pathway is more efficient than the C3 pathway

Reason : Photorespiration is suppressed in C. plants.

173. Assertion : Presently the global atmosphere is warming up.

Reason : The depletion of stratospheric ozone layer has resulted in increase in ultraviolet radiations reaching the earth.

174. Assertion : Human ancestors never used their tails and so the tail expressing gene has disappeared in them.

Reason : Lamarck's theory of evolution is popularly called theory continuity of germ plasm

175. Assertion : Comparative biochemistry provides a strong evidence in favour of common ancestry of living beings

Reason : Genetic code is universal

176. Assertion : Darwin's finches show a variety of beaks suited for eating large seeds, flying insects and cactus seeds

Reason : Ancestral seed- eating stock of Darwin's finches radiated out from South American mainland to different geographical areas of the Galapagos Islands, where they found competitor-free new habitats.

177. The atmospheric concentration of CO₂ at which photosynthesis just compensates for respiration is referred to as CO₂ compensation point.

Reason : The CO₂ compensation point is reached when the amount of CO₂ uptake is less than heat generated through respiration because the level of CO₂ in the atmosphere is more than that required for achieving CO₂ compensation point

178. Assertion : The age -sex structure of human population in countries like France and Germany gives a steep pyramid.

Reason : In countries like Sudan and India the population is increasing at a rapid rate.

- 179 Assertion : The duck-billed Platypus and the spiny ant-eater, both are egg-laying animals yet they are grouped under mammals.
 - Reason : Both of them have seven cervical vertebrae and 12 pairs of cranial nerves
- 80 Assertion : Agrobacterium tumefaciens is popular in genetic engineering because this bacterium is associated with the roots of all cereal and pulse crops

Reason : A gene incorporated in the bacterial chromosomal genome gets automatically transferred to the crop with which the bacterium is associated

General Knowledge

181. Metaphysics refers to :

- (1) Analysis of human body at atomic level
- (2) A branch of philosophy concerned with the rational query of reality
- (3) A branch of physics concerned with investigation of reality
- (4) Meta-analysis of physics for the purpose of theory of relativity

182. Who is called as numismatist ?

- (1) An expert on mathematics
- (2) An expert on numerology
- (3) A person who studies coins
- (4) A numerator

183. Anjali Bhagwat is related to which field :

- (1) Athletics
 - (2) Lawn tennis

1

eamt her in the night sinted without a model nodal was unmarried women hodal was the wie of client is the annual pilgrimage that every should make once in the lifetime? (2) Zaker (4) Sharres is the term rised is e-mail and on- words? (2) Fames y (4) Pictures is mote is 1 hear and I forget. I see member I do and I understand g Manue (2) Confucious Eschopenhauer Stinnet autobiography is 'Sunny Day's'? Shetty (2) Sunny Deol Gavaskar (4) Geofrey Boycott h age in Indias history is referred to folden Age'? nt (2) Mughal ra (4) Gupta a novel of Amitav Ghosh is called Orient in its Italian version? Circle of Reason Antique Lend hadow lines ng in Cambodia h of the following is President A. P. Kalam's autobiography? roads geriment with Truth i of Fire d Minds: Unleashing the Power i of the following units of measure- iot named after a person? (2) Barleycorn (4) Hertz		
ainted without a model nodal was unmarried women is the annual pilgrimage that every should make once is the lifetime ? (2) Zaher (4) Shorter is the term meet is e-mail and co- versations to convey mood along words ? (4) Flames y (4) Flames y (2) Confucious FSC Openhauer Stinnet autobiography is 'Sunny Day's"? Shetty (2) Sunny Deol Gavaskar (4) Geofrey Boycott h age in Indias history is referred to folden Age"? nt (2) Mughal ra (4) Gupta a novel of Amitav Ghosh is called Orient in its Italian version ? ircle of Reason Antique Lond hadow lines ng in Cambodia h of the following is President A. P. Kalam's autobiography? roads geriment with Truth i of Fire d Minds: Unleashing the Power i of the following units of measure- iot named after a person ? (2) Barleycorn (4) Hertz	(3) Badminton (4) Shooting	(1) He dreamt her in the night
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Antique Lond hodow lines ing in Cambodia h of the following is President A. P. Kalam's autobiography ? roads speriment with Truth of Fire d Minds: Unleashing the Power of the following units of measure- not named after a person ? (2) Barleycorn (4) Hertz	Oscar-winning film director ?	(1) The Circle of Reason
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s of Fire d Minds: Unleashing the Power of the following units of measure- not named after a person ? (2) Barleycorn (4) Hertz	(1) Palm	(2) My Experiment with Truth
d Minds: Unleashing the Power of the following units of measure- not named after a person ? (2) Barleycorn (4) Hertz	(3) Tea Leaves	(3) Wings of Fire
of the following units of measure- not named after a person ? (2) Barleycorn (4) Hertz	191 Where is the Tibetan government-in-exile	(4) Ignited Minds: Unleashing the Power
aot named after a person ? (2) Barleycorn (4) Hertz	based ?	200. Which of the following units of measure
(2) Barleycorn (4) Hertz	(1) London (2) Delhi	ment in not named after a person ?
(4) Hertz	(3) Dharappada (4) Phomohenh	(1) Apgar (2) Barleycorn
	192 What is the of Leonardo da Uncl's Mona	(3) Curie (4) Hertz
	Lisa A	
	based ? (1) London (3) Dharannada (4) Phomphenh 192. What is true of Leonardo da Vinci's Mona Lisa	200. Which of the following units of me ment in not named after a person ? (1) Apgar (2) Barleycorn (3) Curie (4) Hertz

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Answers

- 10.44

(4) 2.(1) 3.(3) 4.(3) 5.(2) 5.(2) 7.(2) 8.(4) 9.(2) 10.(1) 11.(1) 12.(1) 13.(1) 14.(1) (5)(3), 16.(3), 17.(3), 18.(4), 19.(3), 20.(2), 21.(3), 22.(3), 23.(3), 24.(3), 25.(4), 26.(4) 39.(4) 40.(3) 41.(1) 42.(4) 43.(3) 44.(2) 45.(2) 46.(1) 47.(3) 48.(4) 49.(4) 50.(1) .(4) 28.(2) 29.(2) 30.(4) 31.(3) 32.(1) 33.(4) 34.(4) 35.(4) 36.(4) 37.(4) 38.(4) 51.(1) 52.(1) 53.(1) 54.(3) 55.(1) 56.(3) 57.(1) 58.(1) 59.(2) 60.(1) N

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Hints and Explanations

PHYSICS

- **1.**(4) For sky wave propagation the critical frequency is given by $f_c = 9 (N_{max})^{1/2}$
 - Where N is the electron density / m3
 - So for $f_c = 10 \text{ M Hz}$

$$N_{\rm max} = \left(\frac{10 \times 10^6}{9}\right)^2 \approx 1.2 \times 10^{12} \,\mathrm{m}^{-3}$$

- NAND gate is the most preferred gate in logic gate circuits
- 3.(3) For the signal to remain inside the optical fibre, the minimum acceptance angle

$$\theta_{\min} = \sin^{-1} \sqrt{n_1^2 - n_2^2}$$

4.(3) Given the radius = 1 meter placed in a magnetic field of 0.01 tesla and frequency = 100Hz, then

the induced emf =
$$\frac{\text{change in flux}}{\text{time}}$$

or induced emf = $\frac{2 \overrightarrow{B} \cdot \overrightarrow{A}}{T} = 2 \text{ BA } \cos \theta$

$$= 2 \times 0.01 \times \pi \times 1 \times 1 \times 200$$

as $f = 200 \implies e = 4 \pi$ Volts

So the induced electric field

$$E = \frac{1}{2\pi r} \left(\pi r^2 \frac{dB}{dt} \right)$$
$$= \frac{r}{2\pi} \times e = \frac{4\pi}{2\pi} = 2 V/n$$

5.(2) The current gain for an n -p-n transistor in common emitter configuration is given by

$$\beta = \frac{\Delta I_C}{\Delta I_B} |_{I_x = \text{ const.}}$$

So $\Delta I_B = \frac{\Delta I_C}{\beta} = \frac{1 \times 10^{-3} \text{ Amp}}{100} = 1 \times 10^{-5} \text{ amp}$
So $\Delta I_E = \Delta I_C + \Delta I_B = 1 \times 10^{-3} + 0.01 \times 10^{-3} \text{ amp}$
= (1.01) = 10 amp

6.(2) The focal length of objective lens is 200 cm and focal length of ever piece = 2 cm.

So using
$$y = \frac{1}{v} + \frac{1}{u}$$
 we get

$$\frac{1}{v} = \frac{1}{f} \frac{1}{e^{0}v} = \frac{u - ff}{u}$$

$$= \frac{2 \times 10^{5} \times 200}{2 \times 10^{5} - 2 \times 10^{2}}$$

 $=\frac{2\times10^2\times2\times10^5}{2\times10^2\,(1000-1)}$ So magnification $m = \left| \frac{v}{u} \right| = \frac{2 \times 10^5}{999}$ So I≈5cm 7.(2) E₀ = - 13.6 e V So Total energy = Kinetic energy Potential energy Potential energy = Total energy Kinetic energy = Total energy + = 2 Total energy netic energy = - 2 × 13.6 et 8.(4) The frequency (M for X-rays varies as f x (Z where o is the screening constant and is small :

(2) The electric field due to
$$\sigma = \frac{1}{2 \in \mathbb{R}}$$

The electric field due to $-\sigma = \frac{-\sigma}{2\epsilon_0}$

So the net electric field mid way between σ and $-\sigma$ is

$$\frac{\sigma}{2\epsilon_0} - \left(\frac{-\sigma}{2\epsilon_0}\right) = \frac{\sigma}{\epsilon_0} \text{ volt/metre}$$

10.(1) In a semiconducting material, the effective mass of a hole is more than that of an electron so the mobility of electron is more as compared to that of a hole.

11.(1) The magnetic moment of revolving electron is

given by
$$\vec{\mu} = \frac{e}{2m} \vec{L}$$
 and $L = \frac{nh}{2\pi}$
So $\mu = \frac{enh}{4\pi m} = \frac{eh}{2m} \times \frac{n}{2\pi} = \mu g$

Where $\mu_g = Bohr magnetron$. Thus $\mu \propto n$

12.(1) The half life of a radioactive material

$$T_{1/2} = 10 \text{ days } = \frac{0.693}{\lambda}$$

and $T = 30 \text{ days } = n T_{1/2}$
So $n = \frac{30}{10} = 3$
Hence $\frac{N}{N_0} = \left(\frac{1}{2}\right)^n = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$

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Thus
$$N = \frac{N_0}{8}$$

So 1/8 of the initial mass would be left

- 13.(1) The red shift of a galaxy varies according to Hubble's law; Z = H₀ r so Z x r
- 14.(1) When exposed to sunlight soap films exhibit a vaniety of brilliant colours due to the phenomenon of interference of light beams various portions of the soap film.
- Parsec measures the distance between celestial bodies.
- 16.(3) The voltage gain of the amplifier is

$$A_{v} = \frac{V_{out}}{V_{in}} = \frac{R_{i}}{R_{in}} = \frac{100 \text{ k} \Omega}{1 \text{ k} \Omega} = 100$$

- 17.(3) f = 50 Hz, V = 20 v, $V_R = 12 \text{ V}$
 - Total voltage $V = \sqrt{V_R^2 + V_C^2}$ So, 400 = 144 + V_c^2 or $V_c^2 = 256$ So, $V_C = 16$
- 18.(4) The intensity is defined as energy per unit time per unit area and pressure is force per unit area.

So Intensity I =
$$\frac{F \cdot S}{At} = \frac{F c}{A} = Pc$$
 so P = I/c

19.(3) mass = 0.1 kg

-

impulse = Change in momentum

$$=\frac{m\Delta x}{\Delta t}=0.1\times\frac{4-0}{2-0}$$

20.(2) mass = 10 kg . speed = 10 m/sec F = -0.1 x joule/metre

Then the work energy theory state

$$w = \Delta K \cdot E \implies w = \frac{1}{2} r_{0} v_{2}^{2} - \frac{1}{2} m v_{1}^{2}$$

$$\int_{20 m}^{30} F \cdot dx = w = K \cdot E_{\text{final}} - \frac{1}{2} \times 10 \times 10^{2}$$
So $-0.1 \int_{-20}^{30} K \cdot E_{\text{final}} - \frac{1}{2} \times 10 \times 100$

$$\Rightarrow -8.1 \int_{-20}^{30} - K \cdot E_{\text{final}} - \frac{1}{2} \times 10 \times 100$$

$$\Rightarrow -8.1 \int_{-20}^{30} - K \cdot E_{\text{final}} - 500$$

$$= (900 - 400) = K \cdot E_{\text{final}} - 500$$

$$= -25 = K \cdot E_{\text{final}} - 500$$

K Et = 500 - 25 = 475 joules

21.(3)

22.(3) The given mass = m. radius = r for this star of mass m to be a block hole /

- 23.(3) Glass is an amorphous solid
- 24.(3) The bulk modulus is given by

25.(4) For a function y to represents a simple harmonic motion.
$$\frac{d^2 y}{d t} = 0$$
 for y = sin $\omega t - \cos \omega t$
$$\frac{dy}{dt} = \omega \cos \omega t + \omega \sin \omega t$$
$$\frac{d^2 y}{dt^2} = -\omega^2 \sin \omega t + \omega^2 \cos \omega t = -\omega^2 y$$

- Thus y represents a simple harmonic motion
- 26. At For a linearly polarised light, the magnitude of electric field vector varies in a periodic fashion with time.
- The circuit shown is a filter whose output curing the capacitance and inductance.
- 28.(2) R₂ and R₃ are parallel, so the voltage across then are equal, so for the dissipation of same energy in R₂ and R₃, R₂ = R₃. Now using Kirchoff's law, we get i²₁ R₂ t = i² R₁ t, where i₁ is the current through R₂ and t is the current through R₁.

and
$$i_1 = \frac{R_3}{R_2 + R_3} i = \frac{R_3}{R_3 + R_3} i = \frac{i}{2}$$

So we get $R_1 = \frac{R_2}{R_3}$

29.(2) Given that the apparent depth of water is decreasing form the tank of diameter 2R cm

Then
$$\frac{n_2}{n_1} = \frac{\text{real depth}}{\text{apparent depth}} = \frac{dr}{da}$$

or $\frac{n_2}{n_1} = \frac{d (dr)/dt}{d (da)/dt}$

So change in real depth

d

$$= \frac{n_2}{n_1} \times \text{change in apparent depth}$$

$$\frac{l(da)}{dt} = \frac{n_2}{n_1} \times x \text{ cm/min}$$

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2

So the amount of water drained in c. c per minute

$$= \frac{d(da)}{dt} \times \pi R^2 = x \pi R^2 \frac{n_2}{n_1}$$

30.(4) The weight of the liquid displaced would be equal to the weight of the candle

So $\rho_L \times$ volume of liquid displaced \times g

$$\Rightarrow \qquad p_{L} \times \frac{\pi d^{2}}{2} Lg = p_{c} \pi \left(\frac{d}{2}\right)^{2} 2 L$$
$$\Rightarrow \qquad \frac{p_{c}}{p_{L}} = \frac{1}{2}$$

When 2 cm of the candle is burnt, the total length decreases to 2 L-2 and $\rho_L (2 L - 2) = \rho_L (L - x)$

So x = 1 cm

Thus when the length of the candle decreases by 2 cm, both above the liquid and below the liquid, there is a decrease of 1 cm.

31.(3) When the complete set up shown is rotated with an angular velocity w then the net pressure acting

tube = atm pressure +
$$h_1 \rho g + \frac{A \rho \omega^2}{A}$$

and the net pressure at $B = atm pressure + h_2 \rho g$

So

on A

Sin w is same.

So $L_2 > L_1$, $h_2 > h_1$

So both of the heights will increase.

 $h_2 - h_1 = \frac{\omega^2 L^2}{2 c}$

32.(1) Given the velocity = v_0 , the ball reaches to so from $v^2 = u^2 + 2$ as, $u^2 \propto s = h$

and so $u'^2 \propto 3 s$: $u' = \sqrt{3} v_o$

33.(4) From the conservation of energy potential energy = translational kinetic energy + rotational kinetic energy



34.(4) When a viscous fluid of mass m is dropped at the centre and it starts spreading, its moment of inertia increases and thus angular velocity decreases. When it starts falling, then its moment of inertia starts to decrease again and its angular velocity increases.

- 35.(4) The C M falls vertically downwards
- 36.(4) When the elevation moves with an acceleration a = g downwards, he fells weightless.
- **37.**(4) On the boundary of shell A, potential is same, it decreases as $V_A \neq 1/s$ and then goes to -ve on the shell B.
- **38.**(4) When the north pole approaches current starts flowing in the coil in the anticlock wise direction and emf increases after passing the coil, the emf drops to zero. After the magnet comes towards the coil again, the emf starts to increase in the reverse direction but after a delay.
- 39.(4) The resistance is given by

$$\mathbf{R} = \mathbf{L}^2 \mathbf{T}^3 \mathbf{A}^2$$

- **40.**(3) The negative charged placed at a distance z away oscillates and the resulting force acts as a restar (ing) force and the displacement it makes is proportional to $\cos \theta$ and the displacement is always taxis
 - 1.(1) The relative density or specific gravity is the density of any substance divided by the density of water so the specific gravity
 - density of substance density of water = dimensionless quantity
- 42.(4) The loss due to frictional force cannot be recovered and hence this force is known as non conservative force
- 43.(3) The transparency of an optical substance is the ease with which the light can pass through the optical substance. If the surface is rough, its transparency will be less
- 44.(2) Diode lasers are used in optical communications to generate digital signals for transmission through optical fibre cables, they are used because they are easy to handle and consume less energy.
- 45.(2) The glittering property of diamond is due to the light which suffers multiple total internal reflecting and the light which enters once cannot go out of it and is trapped inside
- 46.(1) The energy E and momentum p are related for a photon by the De broglie relation

$$\lambda = \frac{\dot{h}}{\dot{p}}$$
, and $E = \frac{hc}{\lambda} = \frac{hc}{h}p = pc$
 $p = E/c$

So,

- 47.(3) The clouds in the sky consist of dust particle and water vapour which have size much larger than the wavelength the light which falls on them, since the difference in wavelength is larger, so there is no scattering and we receive white light
- 48.(4) The ionosphere reflects back the frequency which is less than the critical frequency (30 M Hz) but absorbs frequencies higher than 30 MHz. So television frequencies higher than 30 MHz won't come back to earth.
- 49.(4) A divide cannot be used to build a NOT gate as the output frequency of diode is in same phase with the input and hence NOT gate cannot be built.
- 50.(1) Resolving power of a telescope varies as R x D

where D is diameter (as $R = \frac{D}{1.22.7}$), thus more

the diameter more is the resolving power

- 51. (1) We cannot make any system which is free of all kinds of dissipative forces like where there is no loss due to friction or heat.
- 52.(1) The angular momentum is given by

 $L = I_{(0)} = constant$

Then $\mathbf{r} = \mathbf{I} \mathbf{u} = \mathbf{0}$, so the torque acting on the system is zero and hence the force is a central force as $\mathbf{F} \times \mathbf{r} = \mathbf{0}$

- 53.(1) Since the process occurs very quickly, this is an adiabatic process, so the leaking air becomes cooler.
- 54.(3) ³⁵Cl has a large binding energy and for the nuclear fusion to take place, the binding energy should be less.
- 55.(1) The no. of electrons in a p-type semiconductor is less as compared to that in pure silicon semiconductor because in pure flicon the no. of electrons

= no of holes \Rightarrow n = n, n_h (for p type). Since n_h > n_p in p type so n_i = $\frac{n}{n_h} < n$

- 56.(3) In common enulter amplifier, the input impedance is not very high, it is less than that of common base configuration
- 57.(1) Kirchoff's law states that absorbility of a material equation its emissivity i. e if a material is a good observer, its emissivity will also be high.
- 58 (1) the negative slope of the melting curve in a P-Typhase diagram is because liquids contract when they melt

- **59.**(2) The emission wavelength follows the Wien's displacement law given by $\lambda_m T = b = \text{const.}$ So when T is higher. λ will shift towards the lower side
- 60.(1) For R_e > 2000 the flow of fluid is turbulent because the ratio of inertia of the fluid in motion per unit area and force per unit area is very high so the inertial force dominates viscous force

CHEMISTRY

61.(4) All these three molecules

(i) XeO3 (ii) XeOF4 (iii) XeF6

have one lone pair of electroe. It is clear from the structure



- Here in this reaction $CoCl_2$ acts as weak Lewis acid which reacts with conc. HCl gives $[CoCl_4]^2$ ion. $CoCl_2$ generally used as indicator in water because anhydrous $CoCl_2$ is deep blue in colour but it turns magenta in colour when hydrated
- 63. (2) The complex [Co (en)₃] Cl₃.

cis [Co (en)2 Cl2] Cl will show optical isomerism



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64 .(1) CN⁻ is strong ligand which causes stronger splitting and leads to pairing up of electrons. Due to the pairing of all available electron of Ni²⁺ the complex compound shows diamagnetism.



But CF and F⁻ is weak ligand which is not capable to pair up all the unpaired electron of Ni^{2^+} and Co^{2^+} .

$$[Ni Cl_4]^2$$

$$[Co Cl_4]^2$$

$$(peramagnetic)$$

$$(co F_6)^2$$

$$(paramagnetic)$$

$$(paramagnetic)$$

$$(paramagnetic)$$

$$(paramagnetic)$$

$$(paramagnetic)$$

$$(paramagnetic)$$

$$(paramagnetic)$$

65.(1) 10_3^{-} + a Γ + b H⁻ --- > CH₂O + d l₂

or, 1 O3 + 51' +.6 H' ---+ 3 H2O+ 3 l2

Therefore, a, b, c and d are respectively 5, 6 and 3

- 66.(1) +.1 oxidation state of T/ is more stable that
 3 oxidation state of T/ and thus T/³⁺ converts in to
 T/^{*} ion causes oxidation to others condising agent).
 - $TI^{3} + 2e \longrightarrow TI'$ (in aqueous solution) More stable
- 67.(1) In the phosphrous perfoxide and phosphrous trioxide structure the number of P - O - P bridges are 6. 6 respectively. If can be seen in the structure



68.(2) The two bond angles of diborane are nearly 95° and 120°



69.(2) On the hydrolysis of magnesium carbide propyne can be obtained

$$Mg_2C_3 + 4 H_2O - H_3C \equiv CH + 2 Mg (OH)_2$$
Mag carbide

- 70.(4) The hydroxide of benlium and zinc are amphoteric in nature it can reacts with base as well as acids.
- 71.(2) Malachite is carbonate ore its formula is CuCO₆ Cu (OH)₂, pyrolusite is MnO₂, diaspore is Al₂O₃ H₂O and cassiterite is SnO₂.

72. (3)
$$_{92}O^{2/8} \xrightarrow[-6]{-6/8} _{92}X^{206}$$

NP ratio $=\frac{124}{82} = \frac{62}{41}$

.(2) The correct order for the wavelength of absorption in the visible region is

$$[Ni (NO_2)_6]^4 < [Ni (NH_3)_6]^2 < [Ni (H_2O)_6]^{2*}$$

The absorption of energy in co-ordination compounds depends on charge on complex ion and nature of ligand. Weak ligand associated with absorption of higher wavelength. H₂O is weaker ligand among the given complex and NO₂ is stronger ligand.

74.(2) K₂ MnF₆ + 2 SbF₅
$$\rightarrow$$
 2 K SbF₆ + MnF $\frac{1}{2}$ F₂

75 .(1) The No. of electrons in CIO2

$$= 7 + 6 + 6 + 1 = 20$$

The No. of electrons in $C/F_2^* = 7 + 7 + + 7 - 1 = 20$

76 .(4) Industrial method to prepare isocyanate is

77.(4) Zinc sulphide (ZnS) is a compound which have phosphorescence. When u - particle strikes on ZnS it illuminates and thus α - particle can be detected.

78.(2) The compound



is completely non polar and it will dispense in non polar benzene completely. Other compounds are partly or completely polar which cannot disperse in benzene as benzene is non-polar.

79.(2) For the reaction

 $2 \operatorname{AgCl}(s) + \operatorname{H}_2(g) \longrightarrow 2 \operatorname{HCl}(aq) + 2 \operatorname{Ag}(s)$

The cell representation will be

Pt (s) | H₂ (g), 1 bar |1 M HCl (aq) |

1 M Ag' (aq) | Ag (s)

80.(4) The number of tetrahedral void per unit cell is double of the number of the atom i. e., No. of tetrahedral void = 2 × No. of atoms

or, No. of tetrahedral void = $2 \times Z = 2Z$

81.(4) The standard enthalpy of formation, Δ Hf^e is heat of reaction when one mole of that substance formed from its element of most stable isotopes. Graphite is most stable isotope of carbon therefore, the ΔHf^e of CH₃OH will be

$$C_{\text{(graphile)}} + \frac{1}{2}O_2(g) + 2H_2(g) \longrightarrow CH_3OH$$

82.(4) If the energy of product is more than energy of reactant it is said to be endothermic reaction



84.(1) Most probable radius = $\frac{a_0}{7}$

 $\{\text{where, } a_0 = 52.9 \text{ pm}, Z = 2 \text{ (for helium ion)} \}$

$$r_{mp} = \frac{52.9}{2} = 26.45 \text{ pm}$$

85.(2) In a sealed bomb calorimeter no compression or expansion is possible because of fixed volume therefore, w = 0 and $\Delta U = q$ So, $\Delta U < 0$, w = 0

86 .(4) For the reaction

a A \longrightarrow x P Rate of the reaction = [A] Order of the reaction = [A] $[A]_1 = 2.2 \text{ m M} \cdot r_1 = 2.4 \text{ m} \text{ M} \cdot r_1 = ---(1)$ $[A]_2 = \frac{2.2}{2} \text{ m M} \cdot r_2 = 90 \text{ m M} \cdot s^{-1} = ---(2)$ If [A] is reflected to $\frac{1}{2}$, the rate of reaction decreased by $\frac{1}{9}$ times Rate or reaction = [A]² Order of reaction = 2 .(1) For the reaction 2 NOC/ (g) = 2 NO (g) + Cl₂ (g) $K_p = K_C (R T)^{\Delta m}$ $K_p = 3 \times 10^{-6} (0.0821 \times 700)$

$$= 172.41 \times 10^{-6}$$
 $= 1.72 \times 10^{-4}$

88.(1) For the reaction

$$CaCO_3 (s) \longrightarrow CaO (s) + CO_2 (g)$$

 $K_P = pCO_2$ and $K_C = [CO_2]$

(since $[CaCO_3] = 1$ and [CaO] = 1 for solids)

From Arrhenius equation

K = A e-AH/RT

On taking logarithm

$$\log K_p = \log A - \frac{\Delta H_r}{R T (2.303)}$$

Graphically



Equation for straight line ; Y = m x + C

Here
$$\log K_{\rm P} = -\frac{\Delta H_{\rm r}^{\rm o}}{2.303} \left(\frac{1}{\rm T}\right) + \log A$$

Y m x C

89.(2) C₂ H₅ S H is strong nucleophile among given choice. Nucleophile are those compounds or species which can donate a pair of electrons. Nucleophile can be neutral compound or negative ions and its strength depends upon its capacity to donate electron. Bulky alkyl group pumps electron more (+ 1 effect) than smaller alkyl group. That is why ethyl group is better nucleophile than methyl group.

90.(1)
$$CH_3 - \overset{I}{C} - CH_2Br \xrightarrow{CH_3O} CH_3 - \overset{I}{C} - CH_3$$

H OCH3

It carried out according to S_N^2 reaction through an intermediate. The most stable carbocation is 3° carbonium ion.



92.(1) The most stable compound among given choice is trans-1, 3-cyclohexanediol. It is due to the fact that the bulky group are apart and opposite side but in the cis-form bulky groups are at the same side which causes steric effect (repulsion) and hence less stable whereas in the trans - form this repulsion is absent

93.(1) Markovnikov's rule suggests that negative part of the addendum goes to that doubly bonded carbon atom which has less number of hydrogen atom. Therefore, Br – will attach to 2° carbon atom.



- $R C NH_2 + Br_2 + 4 \text{ KOH} \longrightarrow R NH_2 + 2 \text{ KBr}$ + $K_2CO_3 + 2 H_2O$
- 96.(1) Basic character of amine is due to availability of lone pair of electron. Triethyl amine contains lone pair of electrons as well as +1 effect. The lone pair of electron of pyridine is delocalised and not available for protonation that is why pyridine is less basic than triethyl amine.
- 97.(4) α Kiratin is major constituent of hair, nails and skins, it is insoluble in water but soluble in some organic solvent. Strong acid and base also can dissolve α - Kiratin.
- 98.(3) The correct configuration of the structure



is 1S. 2S because it obeys the 'Golden Rule' and the lowest priority group (H) present in the vertical position to the below of the Fisher projection

- 99.(3) All the amino acid except methionine and tryptophan are coded by more than 1 codon, for example, valine is specified by GUU, GUA, GUC, GUG. This shows that first two bases (G U) are common in all four codons coding for valine. But the third base can be changed
- 100.(1)



The above reaction is called Clemmenson reduction

101.(2) Sulphur dioxide have both oxidizing as well as reducing property. The reaction explained in assertion is only oxidizing property of sulphur dioxide

 $2 H_2S + SO_2 \longrightarrow 2 H_2O + 3S$

102.(1) Due to small size of fluorine SiF²₆ exist because of less steric repulsion. The interaction of

lone pairs of : F: with d-orbital of Si is strong

- 103.(2) Both assertion and reason are true but reason does not explains assertion. The correct reason for the fact that the AI (III) in both oxidizing as well as reducing flame is colourless therefore, not suitable for Borax bead test.
- 104.(2) Reason is not correct explanation or assertion of course it is independently correct. Ozone can liberate nascent oxygen easily therefore, acts as powerful oxidizing agent.

105.(3) The crystal field soluting in ferrocyanide ion is less than that of ferricyanide ion, so reason is false. Potassium ferrocyanide does not contain any unpaired electron hence diamagnetic whereas potassium ferricyande contains unpaired electron hence paramagentic



- 106.(4) Both assertion and reason are false, because Ba(OH)₂ is soluble in water and it will not give precipitate.
- 107.(3) It is true that SeCl₄ does not have retransdral structure, it possess see saw geometry. The shape can be regarded as a distorted bipyramidal structure, contains **one lone pair** of electron in basal position of the trigonal bipyramidal. According to this, the reason given in question is talse.
- 108.(1) Both assertion and reason are true and reason explains the assertion Deputsion in freezing point is democratic or colligative property which depends upon the number of particles. Acetic acid ionises in water because of its polar nature and give Van't Hoff factor i more than 1 whereas acetic acid does not ionises in benzene and will give Van't Hoff factor. Due to this fact in both the liquid molecular weight of acetic acid will be different.
- 109.(1) Both assertion and reason are true and explains. The compressibility factor increases with pressure in the case of H_2 . At 273 K, Z > 1 which indicates that it is difficult to compress the gas as compared to ideal gas. Here repulsive force dominates
- 10.(4) Both assertion and reason are false, because 1st ionization energy for nitrogen (14.5 eV) is greater than oxygen (13.6 eV). This is due to the stable configuration of nitrogen i. e., half filled 2porbital.
- 111.(4) Both assertion and reason are false because in B₂, total number of electrons = 10.

 B_2 : $\sigma 1s^2$, $\sigma^2 1s^2$, $\sigma 2s^2$, $\sigma^2 2s^2$, $\sigma 2p_x^1$, $\pi 2 p_y^1$

There are two unpaired electrons i. e., $\sigma 2 p_x^1$ and $\pi 2 p_y^1$ shows the paramagnetic character. The outer most orbital here is $\pi 2 p_y^1$ therefore, this is the highest occupied orbital

- 112.(1) Both assertion and reason are true and reason explains the assertion. The rate of hydrolysis of CH₃Cl to CH₃OH is higher in DMF than H₂O because hydrolysis of CH₃Cl follows second order kinetics
- 113.(1) It is true that galvanized iron does not rust, it is because Zn metal has a more negative electrode potential than Fe hence Zn corrodes first. When all the Zn will corrode out (oxidized) then Fe will get corrode.

114.(4) Both assertion and reason are false. Extraction of Fe metal from its oxide ore is done by heating with coke and flux (CaCO₃). Here flux acts as slag forming substance. Flux converts infusible impunities in to fusible slag. The reaction

 Fe_2O_3 (s) \longrightarrow Fe (s) + 3/2 O_2 (g) is not a spontaneous process because it needs continuous heat to produce Fe.

- 115.(4) Nitration depends upon the concentration of electrophile or in other words it depends on the availability of electrophile. That is why rates of nitration of benzene and hexadeutero benzene are same.
- 116.(2) If 3° alkyl halide is used in Williamson's synthesis ether will not form, it is because alkoxides are not only nucleophiles but also strong bases as well. They react with alkyl halide leads to formation of alkenes.

$$CH_3$$

$$CH_3 - C - Br + NaOCH_3 \longrightarrow CH_3 - C = CH_2 + NaBr$$

 $CH_3 \qquad CH_3$
 $2 - methyl propene$

- 117.(3) It is true that maltose is reducing sugar and it gives 2 moles of D-glucose on hydrolysis. The two glucose units are linked through α – glucosidic linkage between C – 1 of one glucose unit and C 4 of the other glucose unit.
- 118.(4) Both assertion and reason are false because - NO₂ group strongly deactivates the benzene ring towards electrophilic substitution C₁H₃ - NO₂ does not undergoes electrophilic substitution
- 119.(1) Both assertion and reason are true and ex-

plains. Electrophile attacks on $RN \ge C$ first then nucleophile attacks on it After this rearrangement takes place.

 $\vec{RN} \equiv \vec{C} + \vec{E}^{+} \longrightarrow \vec{RN} \equiv \vec{C} + \vec{H}_{2}O \longrightarrow \vec{RN} = C(\vec{N}\vec{u}) E$ $\vec{RN} \equiv \vec{C} + \vec{H}_{2}O \longrightarrow \vec{RN} = CHOH \longrightarrow \vec{R}NHCHO$

120.(1) Both assertion and reason are true and explains. Cyclopentadienyl anion is much more stable than ally anion because it follow Hückel rule

and hence promatic in nature. It is resonance stabi-

Cyclopentadienyl anion resonance structure

 $CH_2CH = CH_2 \leftrightarrow CH_2 = CH\overline{C}H_2$ (alkyl anion) Stability also depends upon number of resonance structure. If number of resonance structure is more it is more stable.

BIOLOGY

121. (2) In Morphallaxis regeneration occurs through the repatterning of existing tissues and there is little new growth.

In Hydra, the cells of the body are constantly in mitosis and the cells are eventually displaced to the extremities of the body from which they are shed. Thus each cell gets to play its several roles depending on how old it is. If the Hydra body column is cut into several pieces, each piece will regenerate a head at its original apical end and a foot at its original basal end. No cell division is required for this to happen and the result is a small Hydra.

Planarians possess a tremendous power of regencration. If cut across into two, three or more parts, each part regenerates into a complete and normal individual. It involves two complementary processes viz. epimorphosis. in which the missing parts are formed and morphallaxis, in which the original parts are fit to function with regenerated pars in the new individual.

122. (4) the atrial natriuretic factor (ANF) is a peptide released by the walls of the Atria of the Heart in response to an increase in blood volume and pressure. ANF inhibits the release of renin from Juxta glomerular Apparatus and thereby inhibits NaCl reabsorption by the collecting duct and reduces aldosterone release from adrenal gland

Gastrin is produced by G cells present in the pyloric glands of the stomach and in the first part of duodenum.

Inhibin is produced by sertoli cells in males and granulosa cells in females. It inhibits FSH of anterior pituitary by direct action.

Enterokinase is present in the tip of duodenal epithelium in the brush border. It convert trypsinogen (proenzyme) into trypsin (the active enzyme).

123.(3) Thymus also called the 'throne of immunity' releases thymosin hormone which has a stimulating effect on the entire immune system. It promotes proliferation and maturation of T-lymphocytes. The thymus reaches its maximum size at puberty and then atrophies

Cretinism is caused if severe hypothyroidism occurs in uteri or in infancy its symptoms being irreversible mental retardation and impaired growth

Parathyroid hormone stimulates the osteoclasts in the bone to dissolve the hydroxyapatite crystals of the bone matrix and release Ca²⁺ ions into the blood. The body sacrifices bone to keep blood Ca²⁺ levels within the limits necessary for proper functioning of muscle, nerve and endocrine tissue.

Delta cells synthesis somatatostatin which inhibits secretion of glycogen and insulin thereby decreases secretion, motility and absorption in the digestive tract.

- 124. (3) The trait passes from Generation 1 to generation 2 from father to his daughter but not sons thereby proving that it is an X linked trait Since the daughter gets another X chromosome from her mother who is unaffected, thus the trait is dominant X-linked. In third generation the only son who gets the trait is the one who inherits the dominant X-chromosome from mother whereas the other two sons who get the ressesive X from mother are unaffected.
- 125.(2) Within the mid piece of a human sperm are a centriole, which acts as a basal body for the tagellum, and mitochondria, which generate the energy needed for flagellar movement. The tail consists of a central core comprising the exist filament with 9+2 micro tubular arrangement continuing from the mid piece. The centriolet are housed in a short neck that connects the head and mid-piece.
- 126.(1) The gene encoding hindin was chemically synthesized and then transferred into the plant
- Brossica nopus where hirudin accumulates in seeds.

Bt stands for **Baselius thuringtensis** whose Bt-2 gene enclosing Bt toxin has been transferred into Bt-cotton for developing insect resistance.

Somethy hybridization involves only the fusion of protoplast of two cells.

In the transgenic tomato 'Flavr Savr' the production of polygalacturonase (which promotes fruit softening) was blocked hence giving tomatoes which remain fresh and retain their flavour much longer than do the fruits of normal tomato varieties

127.(2) Histamine, a chemical released by a variety of cells in response to tissue injury, binds to receptors on nearby capillaries and venules causing vasodilation and increased permeability.

Kinins are small peptides. normally present in blood plasma in an inactive form Resue injury activates these peptides which then cause vasodilation and increased permeability. A particular kinin called bradykinin, also trimulates pain receptors in skin, which normally cause an individual to protect the injured ages

128.(4) The western shats lies parallel to the Western coast of India (1600 Km). The silent valley and the new Amambalam reserve are the two main centres of diversity.

The eastern Himalaya Hot Spot extends to the North eastern India and Bhutan. Many deep and Isolated Valleys found in this region are exceptionally sich in endemic plant species.

129 4 Introduction of high yielding varieties will lead Jarmers to grow only high yielding crops as they will give more benefit. Hence over a period of time the existence low yielding but Genetically-diverse crops will be threatened

130.(2) Ex situ or off site conservation means maintaining individuals or their germ cells under artificial conditions. Examples for animals include zoos, gamepalms, aquaria, captive breeding programs and germplasm banks (where their eggs and sperms are cryopreserved in liquid Nitrogen). Plants are maintained in botanical gardens, arboreta and seed banks.

In situ conservation means protecting the species in its natural habitat such as wild life sanctuaries, national parks or reserves.

131. (4) Nitrate fertilizers used on soil enter our wells and ponds. When water is taken by us nitrates are converted into nitrites by microbial flora of Intestine. The nitrites combine with the haemoglobin of blood to form methemoglobin, which interferes with the O₂ carrying capacity of the blood. The disease caused is called Methaemoglobinaemia. This causes damage to respiratory and vascular system, blue colouration of skin and even cancer. Nitrate poisoning is frequent in Rajasthan due to hard and saline water.

- 132.(1) MRI (Magnetic Resonance Imaging) detects water because it focuses on the behaviour of Hydrogen in water molecules. This allows MRI to distinguish between water rich and water poor tissues. Hence canine teeth and scapula bone which are poor in water do not appear in MRI, whereas eyelens, ligaments and tendons are visible.
- 133.(3) Valium is a depressant under the class of drugs called Benzodiazepines which depress the brain activity and produces feelings of calmness, relaxation, drowsiness and deep sleep (high doses). Amphetamine is a stimulant, pethidine is an opiate narcotic that suppresses brain function and relieves physical and mental pain.

Marijuana is an hallucinogen that alters thought, feelings and perceptions.

134.(2) Each antibody molecule is composed of two identical light chains and two identical heavy chains.

The Antigen binding sites are formed by a complex of both heavy and light chains, but the stem region is formed by the heavy chains alone.

135.(2) Menstrual cycle is the set of recurring physiological changes in a females body that are under the control of reproductive hormones and are necessary for reproduction. The cycle is generally of 28 days

Release of the egg is known as ovulation and occurs at the 14th day of cycle Endometrium regenerates within 6-10 days (II secretes glycogen rich fluid for implantation for two weeks Implantation occurs within 5-7 days of ovulation.

After ovulation that is after the 14th day the progesterone level rises

136.(1) Agarobacterium tumefaciens is a remarkable species of soil dwelling bacteria that has ability to infect plant cells with a piece of DNA. When the bacterial DNA is integrated into a plant chromosome it effectively hijacks the plants cellular machiners and uses it to ensure the proliferation of bacterial population. 137.(4) Certain substance like DDT donot break down naturally and retain its form for an intended period of time.

Osteoporosis is a disease characterized by loss in bone density

Black foot disease is a severe form of peripheral vascular disease in which the blood vessel in the lower limbs are severely damaged resulting in progressive gangrene

Itai-Itai disease is caused doe to chronic cadmium poisoning.

- 138,(4) When deprived of drinking water the camels allow their body temp. to rise to limit amount of water lost by sweating it also does not produce urine but stores urea in the tissue.
- 139.(2) Cri du chat sundrome is caused by the deletion of information on chromosome 5. Between 1 in 20,000 to D in 50, 000 babies are affected. Infants with this syndrome have a distinctive cat like cry due to laryngeal deformities
- 140 (2) Mustard belongs to brassicaceae family characterized by 4 petals tetramerous 6 stamens (4 long 2 short) pistil that is partitioned length wise into 2 divisions, bicarpellary (both carpels fused at the base but free above), and siliqua fruit (2 chambered dry fruit)
- 141.(3) When a phenotype is influenced by more than one gene, we say that the phenotype is under the control of polygenes. Total number if progeny will be 64 out of which only 2 will be like either parents so percentage will be less than 5%. The phenotype ratio will be 1:6:15:20:15:6:1.
- 142.(1) The sieve tube elements are large cylindrical cells with large pores in the cell wall at either end. They are almost entirely dead and have no organelle including nucleus. All their functions are carried out by companion cells.
- 143.(4) All the chromosomes condense and pairing occurs in leptotene forming homologous dyads. The synaptonemal complex begins to form in zygotene. Synapsis is complete in pachytene. In diplotene the DNA recombination is complete and synaptonemal complex starts breaking. In diakinesis the chromosomes decondense.
- 144.(2) Recombination between existing chromosomes produces with their own sequences, unique

sequences and many new genetic variants of a character like body size were probably generated by recombination

- 145.(2) Plastids are large organelles found on plants and some protists but not in animal or fungi. Chloroplasts, leucoplasts are all plastids
- 146.(2) Lysosomes are roughly spherical bodies bounded by a single membrane. They are manufactured by the Glogi apparatus. They contain over 3 dozen different hydrolytic enzymes.
- 147.(4) Glyoxysomes are microbodies found in seeds and possess enzymes capable of mobilizing lipids, converting them into sugars to supply energy needed during germination. hence they are found in castor endosperm.
- 148. (3) Niche is a term describing the relation position of a species or population in an ecosystem. It includes how a population responds to the abundance of its resources and enemies. 'Abiotic' or physical environment is also part of the niche
- 149. (1) Pyramid of number in grassland is always upright as the herbivores and carnivores are less than the producer. Pyramid of energy is also up right because only 10% energy transfer takes place to next level
- 150.(4) Even though the substrate concentration is creases the velocity is decreasing thereby showing a presence of an inhibitor.
- 151.(2) Nephridia, malpighian tubules and urinary tubules are all excretory structures
- oules are all excisiony sinucial



153 (2) Dectroporation is a method of physically introducing DNA into a cell. In this procedure, a large electric pulse temporarily disturbs the phospholipid bilayer, allowing molecules like DNA to pass into cell.

- 154. (4) Somaclonal variation has provided a source for development of variant plant lines. This appears in tissue culture raised plants. Plant tissue cultures isolated from even a single cell can show variation after repeated sub-culture. Distinct line can then be selected with their pecultar morphology and physiology. This variation can be transmitted to plants regenerated from the tissue cultures
- 155. (2) The growth is not directly proportional as then the graph would be a straight line. Cholesterol is essential dietary requirement as it promotes growth.
- 156. (3) Prosopsis is a tree that grows on sandy, rocky, medium to fine textured soil in semi-arid and arid regions (scrub). Sugar cane belongs to genus Saccharum which is a grass that is cultivated for sugar production.

Shored is used as timber and is a tree belonging tropical rain forest.

Acacia is a tree particularly prevalent in arid and semi-arid and the dry sub tropical regions.

- 157.(4) Reverse transcriptase is a DNA polymerase that uses RNA as its template. Thus it is able to make genetic information flow in the reverse (RNA to DNA) direction instead of its normal direction (DNA → RNA)
- 158(3) Gibberilin promotes the production of α -amylase, a hydrolyzing enzyme. Germinating seed cannot produce its own energy as chloroplast have not yet differentiated. The stored energy is in the form of starch (endosperm) and must be converted into a usable form. α - amylase converts starch, into simple sugars that can be used by developing embryo.
- 159. (2) All four belong to the phylum Arthropoda which have a stiff cuticle made largely of chitin and proteins, forming an exoskeleton. The phylum takes its name from its distinctive jointed appendages, which may be modified in a number of ways to form antennae, mouth parts and reproductive organs.
- 160. (1) The germ cell in the Pollen grain divides and releases two sperm cells which move down the

same pollen tube. One sperm cell fuses with the egg. producing the zygote which later develops into next generation sporophyte. The second sperm fuses with the two polar bodies located in the centre of the embryo sac, producing the nutritive triploid endosperm tissue that will provide energy for the embryos growth and development.

161.(1) Senescence is the state or process of aging. Organismal aging is generally characterized by the declining ability to respond to stress, increasing homeostatic imbalance, and increased risk of disease.

The body regulation depends on changes in gene expression that affects the systems responsible for maintenance, repair and defense responses.

- 162.(1) Using recombinant technology, many human genes have been cloned in E-coli or in yeast. This has made it possible for the first time to produce unlimited amount of human proteins in vitro. Cultured cells (E-coli, yeast, mammalian cells) transformed with the human gene are being used to manufacture Insulin for diabetics, human growth hormone, erythropoietin (EPO) for treating snaemia. etc.
- 163.(2) Methane a powerful green house gas is derived from sources such a rice paddies, bovine excreta, bacteria in marshes, and lossil tuel production. Though the methane content in exhaust has been reduced by multi-point rue injection automobile exhaust does not have a major proportion in global methane.
- 164.(2) Particulate matter is a collective term used for small solid and /or liquid particles found in atmosphere. Particulate matter may be greated by natural processes (e. g. pollen bacteria, viruses, fungi, mold etc.) or through human activities including diesel trucks, power plants, wood stores and industrial processes.

Catalytic converters are designed to reduce the emission of harmful gases carbon monoxide (CO), Hydrocarbons or volatile organic compounds (VOC) and Nitrogen oxides (NO and NO₂ togetter called NOx). Three way catalytic converts control the emission of above three major harmful exhausts.

- 165.(4) Interferons are natural proteins that belong to family of cytokines (messenger proteins) that play a role in immune system. Interferons are secreted by infected cells and help protect other cells from infection. The three major classes are Alpha Beta, and Gamma. They stimulate both macrophages and NK cells. Interferon Gamma is in objed in the regulation of the Immune and inflammatory response.
- 166.(1) An organ transplant is the transfer of organ or tissue including bone marrow from a living person or a cadaver to another living person to replace his non-functioning organ immuno suppressants dampen the immune response or restore immune balance among immune system components. They are primarily used to prevent allograft rejection after organ transplantation. Foreign blood or tissue can tridger a blood transfusion reaction or transplan rejection. To help prevent this donor and recipient tissue is compared before transplantation, the match is usually not perfect. No two people (except identical twins) have identical tissue antigens. Suppressing the immune response can treat and prevent transplant rejection.
- 167.(3) Haemophilia is a blood clotting disorder caused by a mutation of factor VIII gene, leading to a deficiency of factor VIII. It is the most common Haemophilia. Inheritance is X linked hence, males are affected while females are carriers and very rarely display a mild phenotype. It is characterized by prolonged clotting time, decreased formation of thromboplastin and diminished conversion of prothrombin.

Prothrombin producing platelets are not affected in this disease.

168.(3) A humans*sex is determined by the sperm (male) gamete. The egg gamete mother cell is said to be homogametic, because all its cells possess the XX sex chromosomes. Sperm gametes are heterogametic because around half the them contain the X chromosome and others possess the Y chromosome to compliment the first X chromosome. In light of this there are two possibilities that can occur during fertilization between male and female gametes, XX and XY. Since sperm are the variable factor they can determine (i. e. which fertilizes the egg) they are responsible for determining sex. Thus sex in humans is not a polygenic trait but a monogenic. Polygenic traits are determined by more than one pair of genes.

- 169.(3) Mitochondria and chloroplast are unique among the constituents of eukaryotic cells as they are semiautonomous organelles that contain their own genetic machinery. As such they operate under the dual genetic control of nuclear DNA (nDNA) and mitochondria DNA. Both mitochondria and chloroplast have protein synthesising machinery.
- 170. (1) The DNA is situated in the nucleus, organized into chromosomes. Every cell must contain the genetic information and the DNA is therefore replicated before the cell divides. When proteins are needed, the corresponding genes are transcribed into RNA (transcription). The RNA is first processed so that non-coding parts are removed (processing) and is then transported out of the nucleus as mRNA in the cytoplasm where amino acids and protein synthesis machinery is present (Ribosomes) Proteins are build based upon the code in the RNA (translation).
- 171.(3) Fungi are a diverse group of eukaryotic organ isms which lack chloroplast and are unable to perform photosynthesis to produce their own otsanis molecules.

Thus fungi must obtain preformed organic molecules from the environment. Fungal (et) ways contain chitin a complex carbohydrate that is very resistant to degradation by other microorganisms. In addition, fungi secrete digestive enzymes into the environment to breakdown organic molecules, and then the fungi absorp these products.

Most fungi consist of Arread like filaments referred to as vegetative hyphae. These hyphae elongate into food source and absorb nutrients from the environment. The dispersal of fungal spores which are produced on reproductive hyphae enables a fungus to purckly spread through environment and utilize resources when they are abundant.

172. (1) Normal carbon assimilation is known as the C3 pathway in which six turns are necessary for the formation of one glucose molecule. A simple equation is: CO_2 + RuBP> 2PGA Essentially, a 5 carbon and 1 carbon are converted into two 3 carbon molecules (PGA) which are later combined

to form glucose. However this is an inefficient process for two reasons: (1) there are low levels of carbon in the atmosphere, and (2) rubisco (RuSP) has a low affinity for CO_2 In response, plants produce high levels of RuBP. However, when these high concentrations come into contact with O_2 , a major bi-product of photosynthesis, exidation occurs and the process is further reduced in efficiency. So as O_2 levels increase, carbon assimilation rates are decreased. Plants generally compensate for this by keeping their stomatas open during the day.

The evolution of an additional step in carbon assimilation pathway is what distinguishes C4 plants from C3 plants (C4) plants have an extra step which allows spatial separation within the leaf. In these plants, CO_2 is sequestered into the bundle sheath cells where a new molecule. (Phosphoenol pyravate) PEP carboxylase, resides and has a high affinity for CO2 Also, bundle sheath cells are smaller than mesophyll cells, resulting in a higher concentration of CO2, simply by virtue of transport from mesophyll to bundle sheath. PEP carboxylase combines PEP with CO2 and results in OAA (oxaloacetate) which then proceeds in the remainder of the dark reactions. Essentially, C4 plants concentrate levels of CO2 and keep RuBP away from O2, both of which make photosynthesis a more efficient process

- 173. (2) the ozone layer in the stratosphere keeps 95-99% of the suns ultraviolet radiation from striking the earth A number of consequences can result from increased levels of UV(ultraviolet radiation) striking the earth, including: genetic damage, eye damage and damage to marine life. Increased UV radiation in the lower atmosphere, called the troposphere, can result in increased amounts of photochemical smog. Photochemical smog is already a health hazard in many of the world's largest cities.
 - **Global warming** is a term used to describe the increase over time of the average temperature of the Earth's atmosphere and oceans. "most of the warming observed over the last 50 years is attributable to human activities", most prominently the emission of greenhouse gases such as carbon dioxide (CO_2)
Greenhouse gases (GHG) are gaseous components of the atmosphere that contribute to the greenhouse effect. The major natural greenhouse gases are water vapor, which causes about 36-70% of the greenhouse effect on Earth (not including clouds): carbon dioxide, which causes between 9-26%; and ozone, which causes between 3-7%

Minor greenhouse gases include, but are not limited to: methane, nitrous oxide, sulfur hexafluoride, and chlorofluorocarbons

174. (4) More than 100 cases of true tail has been reported in humans. The true atavistic tail of human results from incomplete regression of the most distal end of the normal embryonic tail found in the developing human foetus. This is the case of atavism. Hence the gene for tail formation is still present in human. As the human embryo still shows presence of a tail.

The theory of continuity of germ plasma was given by Weismann In his view the somaplasm (body cell) simply provide the housing for the germplasm (gamete producing cells), seeing to it that the germplasm is protected, nourished and conveyed to the germplasm of the opposite sex to create the next generation.

175. (2) Comparative biochemistry is the field of biology that deals with comparing similarities among different species DNA and proteins produced from the DNA. The more similar two different species DNA is, the closer the evolutionane link, and the more recent the two species shared a common ancestor. This is evidenced in the fact that humans and apes have more than 99% similar DNA seguences!

The genetic code is a set of rules, which maps DNA sequences to proteins in the living cell, and is employed in the process of protein synthesis. Nearly all living things use the same genetic code, called the standard genetic code, although a few organisms use minor variations of the standard code.

176. (1) Darwin's finches share similar size. coloration and habits. Their salient difference is in the size and shape of their beak. However, beak shapes can be very variable, and the size and shape in one individual can overlap into the range of another species Darwin's finches are an excellent example of the way in which species' gene pools have adapted in order for long term survival via their offspring

Indeed, the Galapagos have been called a thring taboratory where speciation can be seen at work. A few million years ago, one species of finch migrated to the rocky Galapagos from the mainland of Central or South America. From this one migrant species would come many - at least 13 species of finch evolving from the single ancestor.

This process in which one species gives rise to multiple species that exploit different niches is called adaptive radiation. The ecological niches exert the selection pressures that push the populations in various directions. On various islands, finch species have become adapted for different diets seeds inserts flowers, the blood of seabirds, and leaves

- 177. (3) the O₂ compensation point is the CO₂ concentration at which Net Photosynthesis for a leaf a zero. (This is the point where gross photosynthetic rate equals respiration). It is reached when the level of CO₂ in atmosphere is LESS than that required to go above CO₂ compensation Point Similarly, the light compensation point is the light level at which Net Photosynthesis for a leaf is zero although CO₂ is in abundance.
- 178. (2) France and Germany are developed countries. The age-sex structure of the developed world gives steeper pyramid which represents a nearly stable population

In developing countries like Sudan. India. Pakistan, Bangladesh etc., the population is growing rapidly hence giving a less steep age-sex pyramid as it has a much larger number of young people.

179. (2) The Class Mammalia includes about 5000 species placed in 26 orders

All mammals share at least three characteristics not found in other animals: 3 middle ear bones, hair, and the production of milk by modified sweat glands called mammary glands. The three middle ear bones, the malleus, incus, and stapes (more commonly referred to as the hammer, anvil, and stirrup) function in the transmission of vibrations from the tympanic membrane (eardrum) to the inner ear. The malleus and incus are derived from

plasmid into the nucleus of intected cells where it is subsequently stable integrated into the host genome and transcribed, causing the crown gall	 disease The tumour formation is a transformation process of plant cells resulted from transfer and integration of T-DNA and the subsequent expression of T-DNA 	genes. Secondly, the T-DNA genes are transcribed only in plant cells and do not play any role during the transfer process. Thirdly, any foreign DNA	placed between the T-DNA borders can be trans- ferred to plant cell, no matter where it comes from. These well established facts, allowed the construc-	tion of the first vector and bacterial strain systems for plant transformation	Lo CML
cestors. Mammalian hair is present in all mammalian an- cestors. Mammalian hair is present in all mammals at some point in their development. Hair has sev-	eral functions, including insulation, color pattern- ing, and aiding in the sense of fouch All female mammals produce milk from their mammary glands in order to nourish newborn offspring.	180(1). Plant transformation mediated by the soit plant pathogen Agrobacterium tumefaciens has be- come the most used method for plant transforma-	tion. A.tumefaciens naturally infects the wound sites in dicotyledonous plant causing the formation of the crown gall tumours.	A.tumefaciens is capable to transfer a particular DNA segment (T-DNA) of the tumour-inducing (Ti)	

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