ADVANCED PATTERN CUMULATIVE TEST-1 (ACT-1)

TARGET : JEE (MAIN+ADVANCED) 2017

PAPER-1   COURSE : VIJETA (ADP), VIJAY (ADR)   Revision Plan-2

Date : 30-04-2017   **Time: 3 Hours**   **Maximum Marks : 225**

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

GENERAL :

1. The sealed booklet is your Question Paper. Do not break the seal till you are instructed to do so.
2. The question paper CODE is printed on the right hand top corner of this sheet and the right hand top corner of the back cover of this booklet.
3. Use the Optical Response Sheet (ORS) provided separately for answering the question.
4. Blank spaces are provided within this booklet for rough work.
5. Write your Name and Roll Number in the space provided on the below cover.
6. After the open booklet, verify that the booklet contains all the **60** questions along with the options are legible.

QUESTION PAPER FORMAT AND MARKING SCHEME :

7. The question paper has three parts : **Mathematics, Physics and Chemistry**. Each part has two sections.
8. Each section as detailed in the following table :

| Section | Question Type | Number of Questions | Category-wise Marks for Each Question | | | | Maximum Marks of the Section |
			Full Marks	Partial Marks	Zero Marks	Negative Marks	
1	One or More Correct Option(s)	15	+4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened	+1 For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened	0 If none of the bubbles is darkened	−1 In all other cases	60
2	Single digit Integer (0-9)	5	+3 If only the bubbles corresponding to the correct answer is darkened	–	0 if not attempted	−1 In all other cases	15

OPTICAL RESPONSE SHEET :

9. Darken the appropriate bubbles on the original by applying sufficient pressure.
10. The original is machine-gradable and will be collected by the invigilator at the end of the examination.
11. Do not tamper with or mutilate the ORS.
12. Write your name, roll number and the name of the examination centre and sign with pen in the space provided for this purpose on the original. **Do not write any of these details anywhere else**. Darken the appropriate bubble under each digit of your roll number.

DARKENING THE BUBBLES ON THE ORS :

13. Use a **BLACK BALL POINT** to darken the bubbles in the upper sheet.
14. Darken the bubble **COMPLETELY.**
15. Darken the bubble **ONLY** if you are sure of the answer.
16. The correct way of darkening a bubble is as shown here : ●
17. There is **NO** way to erase or "un-darkened bubble.
18. The marking scheme given at the beginning of each section gives details of how darkened and **not darkened** bubbles are evaluated.

NAME OF THE CANDIDATE : …………………………………………………………..………………………

ROLL NO. : ……………………….....……………………..

I have read all the instructions   I have verified the identity, name and roll number
and shall abide by them   of the candidate.

-     -
Signature of the Candidate   Signature of the Invigilator

DO NOT BREAK THE SEALS WITHOUT BEING INSTRUCTED TO DO SO BY THE INVIGILATOR

PART : I MATHEMATICS

SECTION – 1 : (Maximum Marks : 60)

Ñ   This section contains **FIFTEEN** questions
Ñ   Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
Ñ   For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
Ñ   For each question, marks will be awarded in <u>one of the following categories :</u>

Full Marks   :   +4   If only the bubble(s) corresponding to all the correct option(s) is(are) darkened.
Partial Marks   :   +1   For darkening a bubble corresponding to **each correct option,** provided NO incorrect option is darkened.
Zero Marks   :   0   If none of the bubbles is darkened.
Negative Marks   :   –1   In all other cases.

Ñ   For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks ; darkening only (A) and (D) will result in +2 marks and darkening (A) and (B) will result in –1 marks, as a wrong option is also darkened.

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1.   Number of real values of x satisfying the equation $x + \sqrt{x} + \sqrt{x+2} + \sqrt{x^2+2x} = 3$ is (are) ?

(A) 0   (B) 1   (C) 2   (D) Less than 2

2.   If $f(x) = \min\{1, \cos x, 1 - \sin x\}, -\pi \le x \le \pi$, then

(A) f(x) is not differentiable at x = 0   (B) f(x) is differentiable at $x = \dfrac{\pi}{4}$

(C) f(x) is not differentiable at $x = \dfrac{\pi}{2}$ (D) f(x) is bounded

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Space for Rough Work

3. Let y = f(x) be a function such that $\lim\limits_{t \to 0} \dfrac{f(2+t) - f(2-t)}{t} = 4$. Which of the following conclusions cannot be drawn from this information:

(A) f(x) is differentiable at x = 2   (B) f(x) is continuous at x = 2

(C) f(x) has to be discontinuous at x = 2   (D) f(2) is finite

4. If the inequality $\sin^2 x + a\cos x + a^2 \geq 1 + \cos x$ holds for every x ∈ R then the possible negative values of 'a' is(are)

(A) – 1   (B) – 2   (C) – 3   (D) – 4

5. Let $f(x) = \begin{cases} -4 & , \ -4 \leq x < 0 \\ x^2 - 4 & , \ 0 \leq x \leq 4 \end{cases}$ and g(x) = f(|x|) + |f(x)|. Which of the following are **CORRECT** ?

(A) g(x) is continuous at x = 0.   (B) g(x) is differentiable at x = 0.

(C) g(x) is continuous at x = 2   (D) g(x) is differentiable at x = 2.

6. If $\sin^{-1}\left(\dfrac{\sqrt{x}}{2}\right) + \sin^{-1}\left(\sqrt{1-\dfrac{x}{4}}\right) + \tan^{-1} y = \dfrac{2\pi}{3}$, then

(A) Maximum value of $x^2 + y^2$ is $\dfrac{49}{3}$ (B) Maximum value of $x^2 + y^2$ is 4

(C) Minimum value of $x^2 + y^2$ is $\dfrac{1}{3}$ (D) Minimum value of $x^2 + y^2$ is 3

7. Let $f(x) = \begin{cases} 0 & , \ x = 0 \\ (1-x)^{\alpha} x^{\beta}(1 - \cos 2\pi x) & , \ 0 < x < 1 \\ 0 & , \ x = 1 \end{cases}$. If Rolle's theorem is applicable to f(x) for x ∈ [0, 1], then

(A) α ∈ R   (B) α ∈ (–2, ∞)   (C) β ∈ (–1, ∞)   (D) α ∈ (–1, ∞)

Space for Rough Work

8. The value of $\displaystyle\sum_{P=1}^{20} \sum_{q=1}^{20} 2\tan^{-1}\left(\frac{p}{q}\right)$ is equal to

(A) $200\,\pi$

(B) $220\,\pi$

(C) $\displaystyle\sum_{P=1}^{20} \sum_{q=1}^{20}\left(\tan^{-1}\frac{q}{p} + \tan^{-1}\frac{p}{q}\right)$

(D) $400\,\pi$

9. Let $f(x) = x^3 + 2x^2 - x + 1$, then which of the following is/are correct

(A) $\sin^{-1}(\sin[\alpha]) + \cos^{-1}(\cos[\alpha]) = 6 - \pi$ (where α is real root of $f(x) = 0$ and $[\cdot]$ denotes the G.I.F)

(B) $f(x) = 0$ has three distinct real roots

(C) $f(x) = 0$ has only one real root.

(D) $\sin^{-1}(\sin[\alpha]) + \cos^{-1}(\cos[\alpha]) = 5 - 2\pi$ (where α is real root of $f(x) = 0$ and $[\cdot]$ denotes the G.I.F)

10. The acute angle that the vector $2\hat{i} - 2\hat{j} + \hat{k}$ makes with the plane contained by the two vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $\hat{i} - \hat{j} + 2\hat{k}$ is given by

(A) $\cos^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$

(B) $\sin^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$

(C) $\tan^{-1}\left(\sqrt{2}\right)$

(D) $\cot^{-1}\left(\sqrt{2}\right)$

11. If m_1 and m_2 are the roots of the equation $x^2 - ax - a - 1 = 0$, then the area of the triangle formed by the three straight lines $y = m_1x$, $y = m_2x$ and $y = a(a \neq -1)$ is

(A) $\dfrac{a^2(a+2)}{2(a+1)}$ if $a > -1$

(B) $\dfrac{-a^2(a+2)}{2(a+1)}$ if $a < -1$

(C) $\dfrac{-a^2(a+2)}{2(a+1)}$ if $-2 < a < -1$

(D) $\dfrac{a^2(a+2)}{2(a+1)}$ if $a < -2$

Space for Rough Work

SECTION – 2 : (Maximum Marks : 15)

Ñ   This section contains **FIVE** questions

Ñ   The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive

Ñ   For each question, darken the bubble corresponding to the correct integer in the ORS

Ñ   Marking scheme :

   +3 If the bubble corresponding to the answer is darkened

    0 If none of the bubbles is darkened

   –1 In all other cases

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16.   If $f(x) = \cot\left(\dfrac{x}{2^n}\right)$ then $\displaystyle\lim_{x \to \frac{\pi}{4}}\left(f(x) - \sum_{r=1}^{n}\operatorname{cosec}\dfrac{x}{2^{r-1}}\right)$ is equal to

17.   Let $f(x) = [\sin x] + [\sin 2x] \ \forall \ x \in (0, 10)$, [.] is the greatest integer function, then number of values of x

for which $f(x)$ is discontinous is λ. Find the value of $\lambda - 6$.

Space for Rough Work

18. If the line passing through the points (-1, 8) and (0,6) is tangent to the curve $y = \dfrac{a^2}{x-1}$ then a^2

equals

19. If $3f(x) + 2f\left(\dfrac{x+59}{x-1}\right) = 10x + 30 \; \forall \; x \in R - \{1\}$, then f(7) is equal to

20. If $f(x) = \Big|\;\big|\;\big|\;|\;|x-1|-1\big|-1\big|-1\big|-1\;\Big|$, then the number of points at which f(x) is non-differentiable.

Space for Rough Work

PART - II : PHYSICS

SECTION – 1 : (Maximum Marks : 60)

Ñ   This section contains **FIFTEEN** questions
Ñ   Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
Ñ   For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
Ñ   For each question, marks will be awarded in <u>one of the following categories</u> :

Full Marks   :   +4   If only the bubble(s) corresponding to all the correct option(s) is(are) darkened.
Partial Marks   :   +1   For darkening a bubble corresponding to **each correct option,** provided NO incorrect option is darkened.
Zero Marks   :   0   If none of the bubbles is darkened.
Negative Marks :   –1   In all other cases.

Ñ   For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks ; darkening only (A) and (D) will result in +2 marks and darkening (A) and (B) will result in –1 marks, as a wrong option is also darkened.

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21.   For a prism of refracting angle $\pi/2$ and refractive index μ ($\sin \mu \geq \dfrac{1}{\sqrt{2}}$), if γ is the angle of minimum deviation and β is the deviation of the ray at grazing incidence, then which of the following options is/are correct:-
(A) $\sin \gamma = \sin^2 \beta$ (B) $\cos \gamma = \mu \cos \beta$ (C) $\sin \gamma = \mu \sin \beta$ (D) $\sin \gamma = \cos^2 \beta$

22.   Read and examine the following statements regarding constant acceleration for a moving particle. Which of the following is /are correct/ true?
(A) $a_x \neq 0$, $a_y = 0$, $a_z = 0$ is necessarily a case of one dimensional motion.
(B) $v_x \neq 0$, $v_y = 0$, $v_z = 0$ is necessarily a case of one dimensional motion.
(C) If $v_x \neq 0$, $a_x \neq 0$; $v_y \neq 0$, $a_y \neq 0$; $v_z = 0$, $a_z = 0$ is necessarily a case of motion in one plane.
(D) If $a_x = a_y = a_z = 0$ is necessarily a case of one dimensional motion.

Space for Rough Work

23. In the arrangement shown, W_1 = 200 N, W_2 = 100 N and μ = 0.25 for all surfaces in contact. The block W_1 just slide under the block W_2
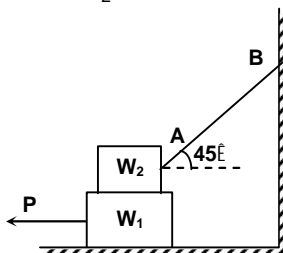
(A) a pull of 50 N is to be applied on W_1

(B) a pull of 90 N is to be applied on W_1.

(C) tension in the string AB is $10\sqrt{2}$ N

(D) tension in the string AB is $20\sqrt{2}$ N

24. A steady state current of 4 A flows in a coil when connected to a 12 V dc source. If the same coil is connected to a 12 V, 50 rad/s ac source a current of 2.4 A flows in the circuit.
(A) the inductance of the coil is 0.08H
(B) the power developed in the circuit if a 2500 F capacitor is connected in series with the coil is 17.28 W.
(C) the inductance of the coil is 0.8H
(D) the power developed in the circuit if a 2500 μF capacitor is connected in series with the coil is 17.28 W.

25. The density of a rod AB increases linearly from A to B. Its midpoint is O and its centre of mass is at C. Four axes pass through A, B, O and C, all perpendicular to the length of the rod. The moments of inertia of the rod about these axes are I_A, I_B, I_O and I_C respectively
(A) $I_A > I_B$ (B) $I_A < I_B$ (C) $I_O > I_C$ (D) $I_O < I_C$

Space for Rough Work

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26. A cylinder and a variable mass M are arranged on a fixed wedge using a light string and a massless pulley. There is enough friction between cylinder and the wedge to prevent any slipping.
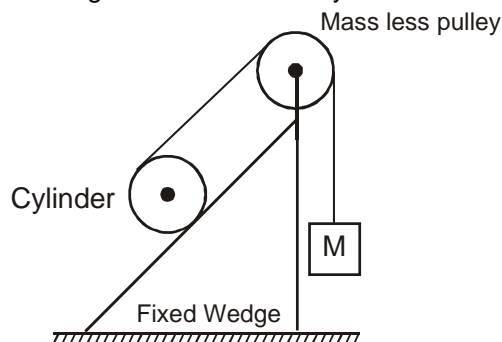
(A) Only one value of M is possible for which cylinder can remain in equilibrium.
(B) There is a range of value of M for which cylinder can remain in equilibrium.
(C) For a certain value of M, the cylinder starts to roll up the plane. In this situation, magnitude of friction force on the cylinder by the wedge will be greater than tension in the string
(D) For a certain value of M, the cylinder starts to roll down the plane. In this situation, magnitude of friction force on the cylinder by the wedge will be greater than tension in the string

27. Initially distance between two small blocks A and B is 1m and natural length of spring is 2m. Now the system is released. If B hits the vertical wall elastically then : (All surfaces are smooth)
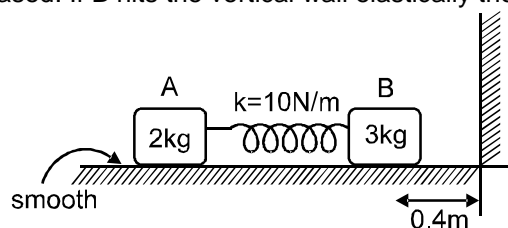

(A) Maximum extension in spring during complete motion is 20cm.

(B) Maximum speed of block B during complete motion is $\dfrac{2}{\sqrt{3}}$ m/sec.

(C) At maximum extension speed of block A is $\dfrac{4\sqrt{3}}{5}$ m/sec.

(D) Impulse by vertical wall on block B is $4\sqrt{3}$ N.sec.

Space for Rough Work

28. A particle moving with constant speed u inside a fixed smooth hemispherical bowl of radius a describes a horizontal circle at a distance $\dfrac{a}{2}$ below its centre. Then

(A) The radius of the circular motion is $\dfrac{a\sqrt{3}}{2}$

(B) The value of u is $\sqrt{\dfrac{3ag}{2}}$

(C) The normal reaction of the spherical surface on the particle is $\dfrac{mg}{2}$

(D) The magnitude of the resultant force acting on the particle is zero, in an inertial frame.

29. The current in coil (as shown in figure) is I (centers of all the circular loops lie at same point) and angular spread of coil is 90°, n is number of turns per unit radian and R is radius of each turn. (Assume that turns are very close)
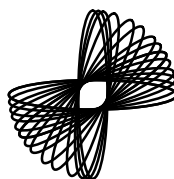
(A) B at common centre will be $\dfrac{\mu_0 nI}{\sqrt{2}R}$

(B) B at common centre will be $\dfrac{\sqrt{2}\mu_0 nI}{R}$

(C) Magnetic moment of loop will be $\dfrac{nI\pi^2 R^2}{\sqrt{2}}$

(D) Magnetic moment of loop will be $\sqrt{2}nI\pi R^2$

Space for Rough Work

30. Figure shows LC circuit with two inductor and two capacitors The current in circuit is. given by

$$I = 12 \sin\left(2t + \frac{\pi}{3}\right)$$
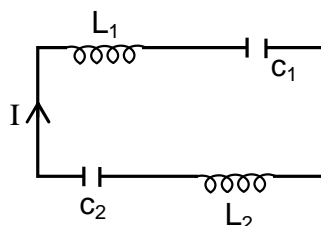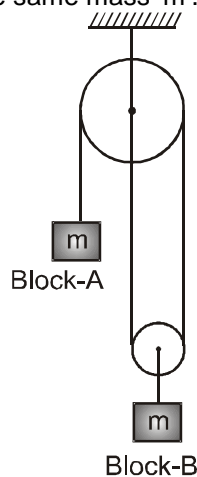

$L_1 = 3H,$ $\qquad L_2 = 2H,$ $\qquad C_1 = 0.2\ F$

select correct statement(s)

(A) $C_2 = \dfrac{200}{3}mF$

(B) C_2 cannot be determined from given information

(C) At $t = \dfrac{\pi}{12}$ energy in inductor (L_1) is maximum.

(D) At $t = \dfrac{\pi}{12}$ energy in capacitor C_1 must be zero.

Space for Rough Work

31. Both the blocks shown in figure have same mass 'm'. All the pulley and strings are massless.

Block-A

Block-B

(A) Acceleration of block A is $\dfrac{2g}{5}$

(B) Acceleration of block A is $\dfrac{g}{5}$

(C) Acceleration of block B is $\dfrac{g}{5}$

(D) Tension in the string attached with A is $\dfrac{3mg}{5}$

32. Two concentric metallic shell's of radius R and 2R, out of which the inner shell is having charge Q and outer shell is uncharged. If they are connected with a conducting wire. Then,
(A) Q amount of charge will flow from inner to outer shell.
(B) Q/e number of electrons will flow from inner to outer shell, where e is charge of electron.

(C) $\dfrac{KQ^2}{8R}$ amount of heat is produced in the wire

(D) $\dfrac{KQ^2}{4R}$ amount of heat is produced in the wire.

Space for Rough Work

33. A charge 'q' is placed on the diagonal AP of a cube at a distance $\dfrac{AP}{3}$ from the point A. Choose the correct options.
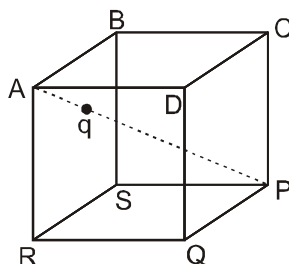

(A) the sum of electric flux passing through the surfaces ABCD and PQRS is $\dfrac{q}{3\varepsilon_0}$

(B) the sum of electric flux passing through the surfaces ABCD and PQRS is $\dfrac{q}{8\varepsilon_0}$

(C) the flux through both the surfaces ABCD and PQRS are same

(D) the flux through the surfaces ABCD is larger than the flux through surface PQRS.

34. Select the correct statements from following.

(A) converging lens can form real image of virtual object

(B) diverging mirror can form real image of real object

(C) converging mirror can form real image of virtual object

(D) diverging lens can form real image of virtual object

Space for Rough Work

35. A satellite(S) is launched with speed v_0 at a distance x from centre of earth as shown in the figure. Which of the following options is/are correct.
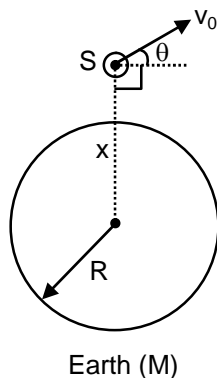
Earth (M)

(A) For $v_0 = \sqrt{\dfrac{GM}{x}}$ and $\theta = 0^0$, satellite will follow circular orbit of radius x.

(B) For $v_0 = \sqrt{\dfrac{GM}{x}}$ and $\theta \neq 0^0$ satellite will follow elliptical path of semi major axis = x and eccentricity e = sinθ.

(C) For $v_0 > \sqrt{\dfrac{2GM}{x}}$ and $\theta = 0^0$, satellite will escape earth's gravitational field in hyperbolic path

(D) For $v_0 = \sqrt{\dfrac{GM}{x}}$ and $\theta \neq 0^0$ satellite will follow elliptical path of semi major axis = x and eccentricity e = cosθ.

Space for Rough Work

SECTION – 2 : (Maximum Marks : 15)

Ñ   This section contains **FIVE** questions
Ñ   The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive
Ñ   For each question, darken the bubble corresponding to the correct integer in the ORS
Ñ   Marking scheme :
     +3 If the bubble corresponding to the answer is darkened
      0 If none of the bubbles is darkened
     −1 In all other cases

36.   A man in a boat wishes to cross a 400 m wide river flowing at the rate of 2 m/s. Speed of boat in still water is 4 m/s. The person starts to row the boat perpendicular to the river flow from one bank of the river. When he reaches the middle of the river, he starts to row the boat at an angle θ with the direction perpendicular to river flow so as to reach the point directly opposite to the starting point on the opposite bank. The value of tan θ is $\dfrac{4}{n}$. Find value of n.

37.   The current in the outer coil is varying with time as I = 2t². The heat developed in the inner coil between t = 0 to t seconds is $\dfrac{k\mu_0^2\pi^2a^4t^3}{3b^2R}$, where the resistance of the inner coil is R and b >> a. Find k.
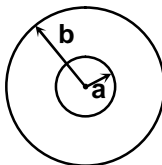
Space for Rough Work

38. Two uniformly charged identical non-conducting rings of radius R are fixed coaxially at separation of 2R. A uniformly charged non-conducting sphere of radius R is placed between rings such that its centre lies at the mid point of line joining the centres of two rings. Charge on ring 1 is Q. Electric field and potential is zero at centre of the sphere. If the potential at the centre of ring 2 $\dfrac{KQ}{R}\left(1+\dfrac{1}{\sqrt{x}}-\dfrac{2\sqrt{2}}{y}\right)$ then, x + y will be :

39. In a region, potential energy varies with x as $U(x) = 30 - (x - 5)^2$ Joule, where x is in meters. A particle of mass 0.5 kg is projected from x = 11 m towards origin with a velocity 'u'. u is the minimum velocity, so that the particle can reach the origin. (x = 0). Find the value of $\dfrac{u}{2}$ in meter/second.

40. A block of mass M is suspended by a string. Bullets each of mass m are fired vertically upwards towards the centre of the block at speed u. If the bullets rebound after striking the block and coefficient of restitution for each collision is same and equal to e, how many bullets per second are to be fired so that the string just becomes slack ? (Use M = m, g = 10 m/s², u = $\dfrac{4}{3}$ m/s, e = $\dfrac{1}{2}$)
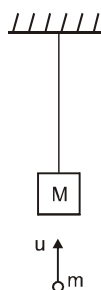
Space for Rough Work

PART - III : CHEMISTRY

Atomic masses : [H = 1, D = 2, Li = 7, C = 12, N = 14, O = 16, F = 19, Na = 23, Mg = 24, Al = 27, Si = 28, P = 31, S = 32, Cl = 35.5, K = 39, Ca = 40, Cr = 52, Mn = 55, Fe = 56, Cu = 63.5, Zn = 65, As = 75, Br = 80, Ag = 108, I = 127, Ba = 137, Hg = 200, Pb = 207]

SECTION – 1 : (Maximum Marks : 60)

Ñ This section contains **FIFTEEN** questions

Ñ Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct

Ñ For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS

Ñ For each question, marks will be awarded in <u>one of the following categories :</u>

Full Marks   :   +4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened.

Partial Marks   :   +1 For darkening a bubble corresponding to **each correct option,** provided NO incorrect option is darkened.

Zero Marks   :   0 If none of the bubbles is darkened.

Negative Marks :   –1 In all other cases.

Ñ For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks ; darkening only (A) and (D) will result in +2 marks and darkening (A) and (B) will result in –1 marks, as a wrong option is also darkened.

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41. 34.3 g Pb_3O_4 is dissolved in 500 mL of 4M HNO_3 then : (Pb = 207)

(A) there is no residue left.

(B) the weight of residue is 11.9 g.

(C) 300 mL of 6M NaOH is required to neutralize excess of HNO_3.

(D) it is a redox reaction.

Space for Rough Work

42. The resistance of a conductivity cell is 500 Ω, when it is filled with 0.1M acetic acid and the resistance drops to 100 Ω when enough NaCl is added to make the solution 0.1M in NaCl as well, then which of the following is/are correct ?

[Considering molar conductivity λ_m for strong electrolyte at given concentration is same as λ_m^∞]

Given : λ^∞ (HCl) = 420 Ω^{-1} cm^2 mol^{-1}

$\qquad$ λ^∞ (NaCl) = 160 Ω^{-1} cm^2 mol^{-1}

$\qquad$ λ^∞ (CH$_3$COONa) = 140 Ω^{-1} cm^2 mol^{-1}

(A) Cell constant is 2 cm^{-1}

(B) The pH of acetic acid solution is 2

(C) λ_m of 0.1M acetic acid is 50 Ω^{-1} cm^2 mol^{-1}

(D) Conductance due to 0.1M NaCl is 8×10^{-2} Ω^{-1}

43. Which of the following is/are correct regarding galvanic cell?

(A) Anode is of negative sign and at anode reduction occurs.

(B) Cathode is of positive sign and at cathode reduction occurs.

(C) EMF of cell can be written as the difference of the two reduction potentials.

(D) In cell spontaneous chemical reaction takes place.

44. Select correct statement (s) :

(A) Hydrophilic colloid is a colloid in which there is a strong attraction between the dispersed phase and water

(B) Hydrophobic colloid is a colloid in which there is a lack of attraction between the dispersed phase and water

(C) Hydrophobic sols are often formed when a solid crystallises rapidly from a chemical reaction or a supersaturated solution

(D) Stabilisation of a lyophobic colloid is due to preferential adsorption of dissimilar charged particles on colloids surface

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45. The correct order is/are

(A) $CO_3^{2-} < CO_2 < CO$ (C–O bond length)

(B) $N_2O_4 > N_3^- > N_2$ (N–N bond length)

(C) $SO_3 > SO_2 > SO_3^{2-}$ (S–O bond order)

(D) $HClO < HClO_2 < HClO_4$ (thermal stability)

46. Select correct statement(s) about complex $[Cr(NO_2)(NH_3)_5]$ $[ZnCl_4]$

(A) IUPAC name of the compound is Pentaaminenitrito-N-chromium (III) tetrachloridozincate (II)

(B) It shows geometrical isomerism

(C) It shows linkage isomerism

(D) It show co-ordination isomerism

47. In normal spinel having one eight of tetrahedral holes occupied by one type of metal ion and one half of the octahedral holes occupied by another type of metal ion and oxide ion forms F.C.C. lattice. Such spinel is formed by Mg^{2+}, Al^{3+}, O^{2-}. If oxide ion is replaced by $X^{-8/3}$ ion then :

(A) The number of anionic vacancies per unit cell is 2 .

(B) Formula of spinel becomes $MgAl_2X_3$.

(C) Spinel becomes charged species.

(D) Al^{3+} is in octahedral void.

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48. Which statement(s) is/are incorrect according to MOT ?

(A) O_2^+ is paramagnetic and bond order is greater than O_2.

(B) N_2 can act as oxidizing agent and reducing agent.

(C) All bonding molecular orbitals are gerade.

(D) C_2 is paramagnetic.

49. A 0.1M sodium acetate solution was prepared having $K_h = 10^{-9}$

(A) h(degree of hydrolysis) is 10^{-4}

(B) $[OH^-]$ is 10^{-5} M

(C) $[H^+]$ in solution is 10^{-10} M

(D) This solution turns red litmus to blue

50. Select the correct option(s) :

(A) Packing fraction of an ionic compound which has NaCl type lattice is 80.55%. Given $r^+ = 1\text{Å}$, $r^- = 2\text{Å}$

(B) Frenkel defect is also known as dislocation defect

(C) The distance between nearest neighbours in CsCl structure is $\dfrac{\sqrt{3}\,a}{2}$ (edge length = a)

(D) The total number of next nearest neighbours is 6 in FCC lattice of a metal.

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51. Select the correct statement(s).

(A) The total number of bravais lattice in 2-D crystal system is 5.

(B) A cubic system contain 9 planes of symmetry.

(C) For monoclinic system $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90$.

(D) The packing fraction of BCC is 52%.

52. The correct statement(s) about MnO_4^- & $Cr_2O_7^{2-}$ is/are :

(A) All the bond lengths are identical in both anions separately.

(B) Both the anions are colourless & diamagnetic.

(C) Both the anions are coloured & diamagnetic.

(D) Both $KMnO_4$ & $K_2Cr_2O_7$ on heating produce same colourless paramagnetic gas.

53. Alkali metals dissolve in liquid NH_3 forms blue colour solution which is paramagnetic, conductive. What happen to the magnetic property and conductivity by increasing concentration of alkali metal in liquid ammonia when color changes from blue to bronze?

(A) Paramagnetic character increases

(B) Conductivity decreases

(C) Paramagnetic character decreases

(D) Conductivity increases

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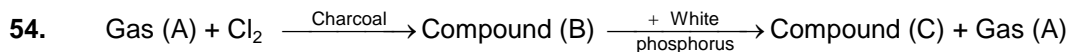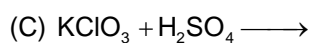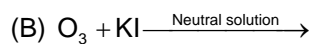
54. Gas (A) + Cl$_2$ $\xrightarrow{\text{Charcoal}}$ Compound (B) $\xrightarrow[\text{phosphorus}]{\text{+ White}}$ Compound (C) + Gas (A)

Correct statement(s) regarding the above sequence is/are :

(A) Gas (A) acts as reducing agent.

(B) Aqueous solutions of compound A, B & C are acidic.

(C) Compound C is used to form chloro derivative from alcohol.

(D) Two types of bond length are present in Compound (C).

55. In which of the following coloured gas is a product ?

(A) $H_3PO_3 \xrightarrow{\Delta}$

(B) $O_3 + KI \xrightarrow{\text{Neutral solution}}$

(C) $KClO_3 + H_2SO_4 \longrightarrow$

(D) $HBr + H_2SO_4 \text{(conc.)} \longrightarrow$

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SECTION – 2 : (Maximum Marks : 15)

1

Ñ   This section contains **FIVE** questions

Ñ   The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive

Ñ   For each question, darken the bubble corresponding to the correct integer in the ORS

Ñ   Marking scheme :

+3 If the bubble corresponding to the answer is darkened

　0 If none of the bubbles is darkened

–1 In all other cases

---

56.   What is the valancy factor of HCl in following reaction? (Give your answer on multiplying by seven.)

$$K_2Cr_2O_7 + 14HCl \longrightarrow 2KCl + 2CrCl_3 + 3Cl_2 + 7H_2O$$

57.   How many of the following have standard enthalpy of formation zero value ?

$H_2(g)$, H^+ (aq), P(red), S(Rhombic), I_2 (g), Zn(s), C(graphite), $D_2(s)$, $O_3(g)$, Al(s), Hg(ℓ).

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Palladium foil

76 cm of Hg

H_2
$p = 76$ cm of Hg
V
T

partition

N_2
$p = 76$ cm of Hg
V
T

58.
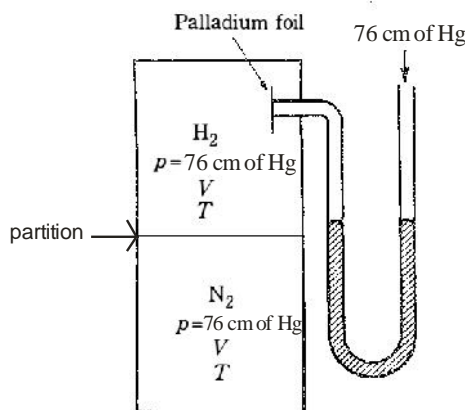
After removing partition what will be difference in Hg level (in cm) on both arm.

Note : Only hydrogen can pass the palladium foil. Give your answer after dividing by 19.

Neglect volume of manometer and it is sufficiently long.

59. A solution is 0.01M both in Cu^{2+} and Cd^{2+} ion. What will be the concentration of Cd^{2+} remains in the solution when 99.9% Cu^{2+} ion has been ppt. as CuS by addition of S^{2-}?

Given K_{sp} (CuS) = 8.7×10^{-36}

K_{sp} (CdS) = 3.6×10^{-29}

give your answer by multiplying 100.

60. How many of the following compounds liberate NH_3 on heating ?

$(NH_4)_2SO_4$, NH_4HCO_3 , NH_4Cl, NH_4NO_3 , $(NH_4)_2Cr_2O_7$, NH_4ClO_4, NH_4COONH_2

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