1. The radius of curvature of a spherical surface is measured using
A. a spherometer B. spectrometer C. screw gauge D. slide callipers

2. If the dimensions of length are expressed as G^x, C^y, h^z, where *G*, *C*, *h* are universal gravitational constant, speed of light and Plank's constant respectively, then
A. $x = 1/2$, $y = 1/2$ B. $x = 1/2$, $z = 1/2$ C. $y = 1/2$, $z = 3/2$ D. $y = + 3/2$, $z = 1/2$

3. The dimensional formula of electric field strength is:
A. $MLT^{-2} I^{-1}$ B. $MLT^{-3}A^{-1}$ C. $T^{-2}A^{-1}$ D. $MLTA^{-2}$

4. *A* man throws a ball in air in such a way that when the ball is in its maximum height he throws another ball. If the balls are thrown after the time difference of 1 sec, then what wilt be the height attained by them
A. 19.6 m B. 9.8 m C. 4.9 m D. 2.45 m

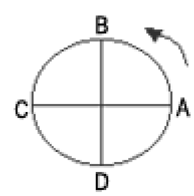
5. If the velocity time graph of a body is a straight line sloping downwards, the body has
A. acceleration B. declaration C. zero acceleration D. constant acceleration

6. Which one of the following equations represents the motion of body with finite constant acceleration?
A. $y = at$ B. $y = at + bt^2$ C. $y = at + bt^2 + ct^3$ D. $y = at + bt$

7. What is the magnitude of the velocity of the body when it is projected horizontally from a point above the ground after 0.2 seconds?
A. $\sqrt{2}$ ms^{-1} B. $2\sqrt{2}$ ms^{-1} C. $3\sqrt{2}$ ms^{-1} D. $4\sqrt{2}$ ms^{-1}

8. A string can withstand a tension of 25 N. What is the greatest speed at which a body of mass 1 kg can be whirled in a horizontal circle using 1 m length of the string?
A. 25 ms^{-1} B. 5 ms^{-1} C. 75 ms^{-1} D. 10 ms^{-1}

9. An object tied to a piece of string is whirled in a vertical circle, at constant speed. The tention in the string is maximum at
A. *A* B. *B*
C. *C* D. *D*



10. The maximum force of friction that comes into play is called
A. limiting friction B. kinetic friction C. static friction D. minimum friction

11. A body of mass 5 Kg is raised vertically to a height of 10 m by a force of 170 N. The final velocity of the body is
A. 15 ms^{-1} B. 17 ms^{-1} C. 20 ms^{-1} D. 22 ms^{-1}

12. A cyclist moving at a speed of 17.64 km/h describes a circle of radius 9.8 m. If the cyclist is held in balance, the co-efficient of friction between the tyre and the ground is

A. 0.25 B. 0.29 C. 0.36 D. 0.35

13. Two bodies with masses m_1 and m_2 have equal kinectic energies. If P_1 and P_2 are their respective momenta, then $P_1 = P_2$ is

A. $m_1 : m_2$ B. $m_2 : m_1$ C. $m_1^2 : m_2^2$ D. $\sqrt{m_1} : \sqrt{m_2}$

14. In elastic collision,

A. only energy is conserved B. only momentum is conserved
C. both energy and momentum is conserved D. none of these

15. The velocity of a particle whose kinetic energy is equal to the rest energy is

A. (1/2) C B. C C. $\sqrt{3}/3$ D. $\sqrt{3}\,C$

16. The propeller of a ship makes 350 rev. while its speed increases from 200 rpm to 500 rpm. Then the time taken for this is

A. 1 min B. 1.2 minute C. 5.3 seconds D. 53 seconds

17. The K.E. needed to project a body from the earth's surface to infinity is

A. mgR B. 2 mgR C. 1/2 (mgR) D. 1/4 (mgR)

18. The distance of two planets from the sun are 10^{13} and 10^{12} meters respectively. The ratio of time period of these two planets is

A. $\sqrt{10}$ B. $1/\sqrt{10}$ C. 100 D. $10\sqrt{10}$

19. Poisson ratio is the ratio of

A. the linear strain to the lateral strain B. the lateral strain to the linear strain
C. the linear stress to the lateral stress D. the lateral stress to the linear stress

20. Two wires L and M are of the same material and of the same length, but the diameter of L is twice that of M stretching force applied to L is four times that of M. Then the ratio of the elongation of L to that of M is

A. 1 : 4 B. 4 : 1 C. 1 : 1 D. 2 : 1

21. Which of the substance breaks just beyond the elastic limit?

A. Elastic B. Malleable C. Brittle D. Ductile

22. A stone of mass 16 kg is attached to a string 144-meter-long and is whirled in a horizontal circle. The maximum tension the string can stand is 16 N. The maximum velocity of revolution that can be given to the stone without breaking it will be

A. 12 ms^{-1} B. 14 ms^{-1}

C. 16 ms^{-1} D. 20 ms^{-1}

23. A vessel containing 0.1 m^3 of air at 76 cm of Hg pressure is connected to an evacuated vessel of capacity 0.09 m^3. The resultant air pressure is

A. 20 cm of Hg B. 30 cm of Hg C. 40 cm of Hg D. 50 cm of Hg

24. Two gases *A* and *B* having the same temperature *T*, same pressure *P* and the same volume *V* are mixed. If the mixture is at the same temperature *T* and occupies a volume *V*, the pressure of the mixture is

A. *P* B. 2*P* C. *P*/2 D. 4*P*

25. A solid ball of metal has spherical cavity inside it. If the ball is heated, the volume of the cavity will

A. increase B. decrease C. remain the same D. disappear

26. If the law of heat conduction is written in the form of Ohm's law, then the quantity similar to electrical resistance is

A. A/dλ B. Ad/λ C. Aλ/d D. d/Aλ

27. The work done from 250 cals of heat is

A. 1045 ergs B. 1045 joules C. 1045 watt D. 1045 N

28. The time taken by a particle executing S.H.M of period *T* to move the mean position to half the maximum displacement is

A. *T*/2 B. *T*/4 C. *T*/8 D. *T*/12

29. Let *g* be the acceleration due to gravity at earth's surface and *K* be the rotational K.E. of the earth. Suppose the earth's radius decreases by 2%, then

A. *g* decreases by 2% and *K* decreases by 4% B. *g* decreases by 4% and *K* increases by 2%
C. *g* increases by 4% and *K* decreases by 4% D. decreases by 4% and *K* increases by 4%

30. A particle of mass *m* is hanging vertically by an ideal spring of force constant *K*. If the mass is made to oscillate vertically, its total energy is

A. maximum at the extreme position B. maximum at the equilibrium
C. minimum at the equilibrium D. same at all position

31. Velocity of sound in CO_2 is less than in hydrogen because

A. CO_2 is heavier than hydrogen B. CO_2 is a compound and hydrogen is an element
C. CO_2 is more soluble in water D. CO_2 can be more easily liquefied

32. The velocity of sound in air at room temperature is 110 m/sec. The length of the wave coming from a vibrating fork at frequency 275 is

A. 0.4 m B. 100 m C. 825 m D. 1375 m

33. The temperature at which velocity of sound in air is double its velocity at 0°C is

A. 435°C B. 694°C C. 781°C D. 819°C

34. Static electricity is produced by

A. induction B. friction
C. both induction and friction D. none of the above

35. Surface charge density on a pear shaped conductor is

A. maximum in the middle position B. maximum near the tapering end
C. maximum near the broad end D. equal throughout the surface

36. A given charge situated at a certain distance from an electric dipole in the end on position experiences a force *F*. If the distance of the charge is doubled, the force acting on the charge will be

A. 2*F* B. *F*/2 C. *F*/4 D. *F*/8

37. A piece of fuse wire melts when the current is 5 A. The energy produced then is 1 J/s. The resistance of the fuse in ohm is

A. 0.04 B. 0.1 C. 0.5 D. 10

38. The gravitational force between two point masses m_1 and m_2 at separation r is given by $F = (m_1m_2)/r^2$ Then constant *K*

A. depends on systems of units only B. depends on medium between masses only
C. depends of both masses and units D. none of these

39. A piece of copper and another of germanium are cooled from room temperature to 80 K. The resistance of

A. each of them increases B. each of them decreases
C. copper increases and germanium decreases D. germanium increases and copper decreases

40. In a given thermocouple, the temperature of the cold junction is 20°C, while the neutral temperature is 27°C. What will be the temperature of immersion ?

A. 420°C B. 425°C C. 520°C D. 525°C

41 When different parts of a metal are kept at different temperature and current is passed through it, heat is either evolved or absorbed. The effect is called

A. Peltier effect B. Seebeck effect C. Thompson effect D. Joule effect

42. A storage battery is to be charged from a d.c. supply which terminal of the battery be connected to the positive side of the line

A. positive B. negative

C. both positive and negative
D. first negative and after the lapse of 5 minutes positive

43. The force between two parallel wires carrying currents in the same direction is a
A. force of attraction
B. force of repulsion
C. no resultant force between the wires
D. resultant force acting perpendicular to the flow of wires

44. The motion of an electric charge produces
A. only an electric field
B. only a magnetic field
C. both magnetic and electric field
D. none of the above

45. An ammeter is connected in series with a 2V circuit containing a 2V battery when the switch is closed, the ammeter shows high deflection and comes to zero. The circuit may contain a
A. resistance of 20Ω
B. fuse
C. diode
D. triode

46. Ferromagnetic substances have
A. very high permeability and susceptibility
B. low permeability but high susceptibility
C. high permeability and low susceptibility
D. none of these

47. The permeability of the paramagnetic substance is
A. very large
B. very small
C. negative
D. small but more than 1

48. When a material is subjected to a small field *H*, the intensity of magnetisation is proportional to
A. $\sqrt{H}$
B. H
C. H^2
D. $1/\sqrt{H}$

49. In a capacitance circuit the resistance is
A. ωC
B. $1/\omega C$
C. $1/\sqrt{\omega}\, C$
D $\sqrt{\omega} \times C$

50. In electromagnetic induction, the induced e.m.f. is independent of
A. change of flux
B. time
C. number of lines of force
D. resistance of the cells

51. A coil of area *A* is kept perpendicular to a magnetic field *B*. If coil is rotated by 180^0, then change in the flux will be
A. BA
B. zero
C. $2BA$
D. $3BA$

52. The displacement current flows in the dielectric of a capacitor when the P.D. across its plates
A. is increasing with time
B. is not decreasing with time
C. has assured a constant value
D. becomes zero

53. Electromagnetic waves
A. are longitudinal waves
B. travel in free space at the speed of light
C. are produced by
D. travel with the same

charges moving with uniform velocity speed in all media

54. The frequency of visible light is of the order of
A. 10^8 Hz B. 10^{18} Hz C. 10^{15} Hz D. 10^{12} Hz

55. A concave mirror of focal length 15cm forms an image at a distance of 40 cm from it. The distance of the object from the mirror is
A. 10 cm B. 20 cm C. 24 cm D. 30 cm

56. Binoculars are made conveniently short by making use of right angled isosceles prism of glass. In a normal pair of binoculars, the number of prism is
A. 1 B. 2 C. 4 D. 5

57. A ray incident on a 60° prism of refractive index $\sqrt{2}$ suffers minimum deviation. The angle of incidence is
A. 0° B. 45° C. 60° D. 75°

58. Two electron beams having velocities in the ratio of 1 : 2 are subjected separately to identical magnetic field. The ratio of deflection produced is
A. 4 : 1 B. 1 : 2 C. 1 : 4 D. 2 : 1

59. The ray used for determining the crystal structure of solid is
A. α -ray B. β -ray C. γ -ray D. X-ray

60. For the structural analysis of crystals X-ray are used because
A. X-rays have wavelength of the order of the inter-atomic spacing
B. X-rays are highly penetrating radiation
C. wavelength of X-rays is of order of nuclear size
D. X-rays are coherent radiation

61. The ratio of the molar amounts of H_2S needed to precipitate the metal ions from 20 ml each of 1 M Cd $(NO_3)_2$ and 0.5 M $CuSO_4$ is
A. 2:1 B. 1:1 C. 1:2 D. indefinite

62. Among the following elements, which one has the highest value of first ionization potential?
A. Argon B. Barium C. Cesium D. Oxygen

63. Which of the following concepts best explains that o-nitrophenol is more volatile than p-nitrophenol?
A. Resonance B. Conjugation C. Hydrogen binding D. Covalent bonding

64. Which of the following statements is false?
A. Ionic compounds generally have low m.p.and b.p.
B. Carbon tetrachloride is a non-polar molecule

C. Anhydrous $AlCl_3$ is a covalent substance
D. A molecule represents a more stable state as compared to individual atoms

65. The chemical species having same number of electrons in the outermost and penultimate shell is

A. Al^{3+} B. O^{2-} C. Na^{+} D. Cl^{-}

66. The solution was prepared by dissolving 0.0005 mol of $Ba(OH)_2$ in 100 ml of the solution. If the base is assume to ionize completely, the pOH of the solution will be

A. 10 B. 12 C. 2 D. unpredictable

67. In which of the following neutralization will the enthalpy of neutralization be the smallest?

A. H_3PO_4 with NaOH B. NaOH and CH_3OOH C. NaOH with HCl D. HCl with NH_4OH

68. The pH of 10^{-8} M NaOH will be

A. 6.96 B. 7.04 C. 12.0 D. 8

69. Gas deviates from ideal gas nature because molecules

A. attract each other B. contain covalent bond
C. show Brownian movement D. are colourless

70. Among the following reactions, the fastest one is

A. precipitation of silver chloride by mixing silver nitrate and sodium chloride solutions
B. burning of coal
C. rusting of iron in moist air
D. conversion of monoclinic sulphur to rhombic sulphur

71. When 5.0 g of $BaCl_2$ is dissolved in water to have 10^6 g of solution. The concentration of solution is

A. 5M B. $5gmL^{-1}$ C. 2.5 ppm D. 5 ppm

72. The unit of electrochemical equivalent is

A. coulomb/gram B. gm-ampere C. gm./coulomb D. gm-ampere^{-1}

73. Adsorption increases when

A. temperature remains constant B. temperature increases
C. temperature decreases D. none of the above

74. The number of hours required for a current of 3.0 A to decompose electrically 18 g of water is

A. 12 hours B. 24 hours C. 6 hours D. 18 hours

75. The number of electrons per second, which pass through a cross section of a copper wire carrying 10 -16 A, is

A. 16×10^{-2} e/s B. 1.6×10^{-3} C. 60 e/s D. 625 e/s

76. 20 ml of HCl having certain normality neutralizes exactly 1.0 g $CaCO_3$. The normality of acid is

A. 0.1 N B. 1.0 N C. 0.5 N D. 0.01 N

77. The alkali metal used in photoelectric cell is

A. Cs B. Fr C. K D. Rb

78. Calcium is extracted from

A. fused $CaSO_4$ B. fused $Ca_3(PO_4)_3$ C. fused $CaCl_2$ D. aqueous $CaCl_2$ solution

79. $SbCl_3$ upon hydrolysis yields

A. $Sb(OH)_3$ B. SbO^+ C. Sb^{+3} D. None of the above

80. Which of the following trioxides can exist as monomer molecule?

A. SO_3 in gaseous state B. TeO_3 C. SeO_3 in all states D. SO_3 in solid state

81. Pure chlorine is obtained

A. by heating $PtCl_4$

B. by heating a mixture of NaCl and MnO_2 with conc. H_2SO_4

C. by heating MnO_2 with HCl

D. by treating bleaching powder with HCl

82. Which of the following gases is used in very low temperature thermometers?

A. N_2 B. H_2 C. Ne D. He

83. Number of nucleons in D_2 molecule is

A. 4 B. 1 C. 2 D. 3

84. There is no s-s bond in

A. $S_2O_7^{2-}$ B. $S_2O_3^{2-}$ C. $S_2O_4^{2-}$ D. $S_2O_5^{2-}$

85. The ratio of C_p/C_v for inert gas is

A. 1.66 B. 1.33 C. 1.99 D. 2.13

86. Electrolytic reduction method is used in the extraction of

A. highly electropositive elements B. transition metals

C. noble metals D. highly electronegative elements

87. The metal that is extracted from sea water is

A. Mg B. Au C. Ca D. Fe

88. The compound having blue colour is
A. $HgSO_4$ B. $PbSO_4$ C. $CuSO_4.5H_2O$ D. $CuSO_4$

89. Which of the following is known as 'Wol-framite'?
A. $Na_2CO_3 + K_2CO_3$ B. $FeWO_4$ C. SnO_2 D. 98% pure Zinc

90. Within each transition series, the oxidation state
A. first decreases till the middle of period and then increases
B. decreases regularly in moving from left to right
C. first increases till the middle of period and then decreases
D. none of the trend is correct

91. Which of the following properties of graphite and diamond are identical?
A. Density B. Crystal structure C. Atomic weight D. Electrical conductivity

92. Which of the following is an example of co-polymer?
A. PAN B. PTFE C. Polythene D. Buna-S

93. The reagent which forms crystalline osazone derivative when reacted with glucose is
A. Hydroxylamine B. Benedict solution C. Fehling solution D. Phenylhydrazine

94. To which class of dyes does phenolphthalein belong?
A. Phthalein dyes B. Triphenyl methane dyes C. Nitro dyes D. Azo dyes

95. Peroxo linkage is present in
A. $H_2S_2O_8$ B. H_2SO_3 C. $H_2S_2O_7$ D. H_2SO_4

96. Tautomerism is exhibited by
A. RCH_2NO_2 B. R_3CNO_2 C. $(CH_3)_2NH$ D. $(CH_3)_3CNO$

97. Latest technique for purification, isolation and separation of organic substances is
A. chromatography B. sublimation C. crystallization D. distillation

98. Lactic acid looses optical activity when reduced with red P and HI because
A. racemic mixture is formed B. spatial arrangement is changed
C. symmetry of the molecule is destroyed D. chirality of the molecule is destroyed

99. In order to convert aniline into chlorobenzene, the reagents needed are
A. $Cl_2/AlCl_3$ B. Cl_2/CCl_4 C. $NaNO_2/HCl$ and CuCl D. CuCl

100. Which of the following alcohol on dehydration with conc. H_2SO_4 will yield 2-butene?
A. 2-methyl-2-propanol B. 2-methyl-2-butanol C. 2-propanol D. Sec. Butyl alcohol

101. A compound A has a molecular formula C_2Cl_3OH. It reduces Fehling solution and an oxidation gives a monocarboxylic acid B. It can be obtained by the action of chlorine on ethyl alcohol. A is

A. Chloral B. Chloroform C. Methyl chloride D. Monochloroacetic acid

102. Which of the following will yield Benzaldimine hydrochloride?

A. benzonitrile and $SnCl_2/HCl$ B. nitrobenzene and $SnCl_2/HCl$
C. benzene and hydrazine D. hydrazine and HCl

103. Isopropyl alcohol is heated on a water bath with the suspension of bleaching powder. Which of the following products will be formed?

A. Propene B. Ethanol C. Isopropyl chloride D. Trichloromethane

104. Which of the following compounds is least basic?

A. $C_6H_5NH_2$ B. $C_2H_5NH_2$ C. CH_3NH_2 D. NH3

105. Iodine dissolves in KI solution due to the formation of

A. I^+ B. I^- C. I_2^- D. I_3^-

106. Hydrogen sulphide exhibits

A. acidic properties B. basic properties C. oxidising properties D. none of the above

107. White Phosphorus reacts with caustic soda. The products are pH_3 and NaH_2PO_2. This reaction is an example of

A. oxidation B. reduction C. oxidation and reduction D. neutralisation

108. Ammonia solution dissolves fairly in

A. Hg_2Cl_2 B. $PbCl_2$ C. $Cu(OH)_2$ D. AgI

109. Amongst the trihalides of nitrogen, which one is the least basic?

A. NF_3 B. NCl_3 C. NBr_3 D. NI_3

110. Among the various allotropes of carbon,

A. diamond is the hardest B. graphite is the hardest C. lamp black is the hardest D. coke is the hardest

111. Bone charcoal is used for decolourising sugar because it

A. reduces colouring matter B. oxidises colouring matter
C. absorbs colouring matter D. none of the above

112. Tin (II) chloride is used as a

A. mordant in dying B. catalyst C. oxidising agent D. none of the above

113. Inert pair effect is most prominent in
A. aluminium B. boron C. gallium D. thallium

114. In the alumino thermite process, aluminium acts as
A. an oxidising agent B. a flux C. a reducing agent D. a solder

115. The correct structure of mercurous ion is
A. Hg^{+} B. Hg^{2+} C. Hg_2^{+} D. Hg_2^{2+}

116. Which one of the following is purely ionic?
A. Sodium chloride B. Beryllium chloride C. Lithium chloride D. Carbon tetrachloride

117. A compound 'A' on heating gives a colourless gas. The residue is dissolved in water to obtain B. Excess CO_2 is passed through aqueous solution of B, when C is formed. C on gentle heating gives back A. The compound A is
A. $NaHCO_3$ B. Na_2CO_3 C. $Ca(HCO_3)_2$ D. $CaCO_3$

118. A solution of sodium sulphate in water is electrolysed using inert electrodes. The products at the cathode and anode are respectively
A. H_2, O_2 B. O_2, H_2 C. O_2, Na D. O_2, SO_2

119. The metals occurring in the form of their compound in the earth's crust are called
A. matters B. minerals C. alloys D. gangue

120. A commercial sample of hydrogen peroxide is labelled as 10 volume. Its percentage strength is nearly
A. 1% B. 3% C. 10% D. 90%

121. If $(1 + x)^n = P_0 + P_1 + P_2x^2 + P_2x^2 + ... + P_nx^n$, then the value of $P_0 - P_2 + P_4 - .....$ is
A. $2^n \cos n\pi/4$ B. $2^{n/2} \cos n\pi/4$ C. $2^{n/2} \sin n\pi/4$ D. $2^n \sin n\pi/4$

122. If a, b, c and x are real numbers, then $x^2 + 2bx + c$ will be positive if
A. $b^2 > c$ B. $b^2 < c$ C. $b^2 > 4c$ D. $b^2 < 4c$

123. The one of the values of $(-i)^{1/3}$ is
A. $(1/2)(\sqrt{3} - i)$ B. $(-1/2)(\sqrt{3} + i)$ C. $\pm (1/2)(\sqrt{3} + i)$ D. none of the above

124. Let A = R ≈ {m}and B = R ≈ {n}, where R is a set of real numbers. Let f(x) = (x - n)/(x - m), then f is (where m, n are any integers)
A. one-one onto B. many one onto C. one-one into D. many one into

125. Cards are dealt one by one from a well shuffled pack until an ace appears. The probability that exactly n cards are dealt with before the first ace appears is

A. [4(51 - n)(50 - n)(49 - n)]/(13.51.50.49) B. 4/(52 - n)
C. [48 - (n - 1)]/(52 - n) D. none of the above

126. A determinant is chosen at random from the set all determinants of order 2 with element 0 and only. The probability that the value of determinant chosen is positive, is
A. 11/18 B. 11/14 C. 13/16 D. 3/16

127. The value of the integral $\int_0^2 |1 - x|\, dx$ **equals**

A. 1 B. 2 C. 4 D. 0

128. The domain of the function f(x) = $\sin^{-1}\left[\log_2 (x^2/2)\right]$ is

A. $[-2, 2] \approx \{0\}$ B. $[-1, 1] \approx \{0\}$ C. [-2, 2] D. [-1, 1]

129. Lt (1 - x) [(tanπx)/2] equals
$x \to 0$
A. π/2 B. 2/π C. π - 2 D. π + 2

130. The function f(x) = | x |/x; x ≠ 0 and f(x) = 1; x = 0 is discontinuous at
A. x = 0 B. x = 1 C. x = 2 D. x = -2

131. If x = a (t - sint), y = a (t - cost), then d^2y/dx^2 is equal to
A. $(1/4a)(\text{cosec}^2 t/2)$ B. $(1/4a)(\text{cosec}^3 t/2)$ C. $-[(1/4a)(\text{cosec}^2 t/3)]$ D. $-[(1/4a)(\text{cosec}^4 t/2)]$

132. If x, y, and z are arithmetic, geometric, and harmonic means respectively of two distinct position numbers, then
A. z < y < x B. x < y < z C. x < z < y D. x > z > y

133. All the solutions of the equation $16xy + x^2 + y^2 - 8x - 8y - 20 = 0$ represents
A. a straight line B. pair of straight lines C. a circle D. a parabola

134. The solution set of an inequality 5 - 15y > 125, y ∈ R is
A. { y | y ∈ R } B. { y | y > 6 } C. { y | y < -8 } D. { y | y ∈ 8 & y ∈ 9 }

135. Unit vector in the xy-plane that makes an angle of 45^o with the vector i + j and an angle of 60^o with the vector 3i - 4j is
A. i B. 2i C. √2i D. none of the above

136. Given the line (x + 3)/2 = (y - 4)/3 = (z + 5)/2 and the plane 4x - 2y

- z = 1,then the line is

A. perpendicular to the plane
B. inclined with 60^o to the plane
C. inclined with 45^o to the plane
D. parallel to the plane

137. Lt $[x \sin x + \log (1 - x)^x]/x^3$ equals
$x \to 0$

A. 1/2 B. - 1/2 C. 1/4 D. - 1/4

138. Four numbers are such that the first three are in A.P., while the last three are in G.P. The first number is 6 and common ratio of G.P. is 1/2, then the numbers are

A. 2, 4, 6, 8 B. 6, 4, 2, 1 C. 6, 4, 3, 2 D. 6, 9, 3, 1

139. If the arithmetic and geometric mean of two distinct positive numbers are A and G respectively, then their harmonic mean is

A. $A/\sqrt{G}$ B. A/G^2 C. G^2/A D. $\sqrt{A/G}$

140. The area bounded by the straight lines y = 1, x + y = 2, and x - y = 2 is

A. 11 B. 11/2 C. 1/2 D. 2/11

141. The value of $5^2 \log_{25} 5$ is

A. 4 B. 5 C. 6 D. 8

142. If the angle of intersection between the curves $y = x^2$ and $y^2 = 4x$, then the point of intersection is

A. (0, 0) B. (0, 1) C. (1, 0) D. (1, 1)

143. The pair of points which lie on the same side of the straight line 3x - 8y = 7 is

A. (-4, -3), (1, 1) B. (0, 1), (3, 0) C. (-1, -1), (3, -7) D. (-1, -1), (3, 7)

144. The equation $x^2 - 8x + 16 = 0$ has

A. coincident root B. imaginary root C. unequal root D. none of the above

145. If b = 3, c = 4 and $B = \pi/4$, then the number of triangles that can be formed is

A. 1 B. 2 C. 3 D. none of the above

146. Lim $(\tan m\theta)/m$ equals
$\theta \to 0$

A. θ B. $-\theta$ C. θ^2 D. 0

147. The range of the function f(x)[1 - x] - 1 = 0 is

A. a set of irrational numbers
B. a set of rational numbers

C. a set of real numbers D. none of the above

148. If a, b, c are in A.P., then
A. 1/(a - b) = 1/(b - c) B. (a - b)/(b - c) = 2 C. (a - c)/2 = b D. b + c = 2a

149. The sum of all numbers greater than 1000 formed by using the digits 1, 3, 5, 7, no digit repeated in any number is
A. 106656 B. 101276 C. 82171 D. 81273

150. The vertices of a triangle are represented by the complex numbers 4 - 2i, -1 + 4i, and 6 + i, then the complex number representing the centroid of a triangle is
A. 3 + i B. 3 - i C. 9 + i D. 9 - i

151. $\sin(\pi + \theta) \sin(\pi - \theta) \operatorname{cosec}^2\theta$ is equal to
A. $\sin\theta$ B. $\cos\theta$ C. 1 D. -1

152. In a triangle ABC, $[(b^2 - c^2)/a]\cos A + [(c^2 - b^2)/a]\cos B + [(a^2 - b^2)/a]\cos C$ is equal to
A. abc B. 1/abc C. $a^2b^2c^2$ D. 0

153. If ex-radii r_1, r_2, r_3 of a triangle ABC are in H.P., then the sides of the triangle are in
A. A.P. B. G.P. C. H.P. D. none of the above

154. The vertices of a triangle are A(6, 4), B(4, -3) and C(-2, 3), which one of the following is true for triangle ABC?
A. an isosceles triangle B. an equilateral triangle C. a right angled triangle D. none of the above

155. The length of tangent from (5, 1) to the circle $x^2 + y^2 - 6x + 4y + 3 = 0$ is
A. 7 B. 14 C. 28 D. 36

156. If $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 4\hat{i} + 3\hat{j} - 2\hat{k}$, then the projection of b on a is
A. $2/\sqrt{29}$ B. $5/\sqrt{29}$ C. $3/\sqrt{29}$ D. 2

157. Which one is true?
A. P(A/B) = P(A) + P(AB) B. P(A/B) = P(A) - P(B) C. P(A/B) = [P(AB)]/P(B) D. P(A/B) = P(A) - P(B/A)

158. If $y = (1/2)[\log(\tan x)]$, then the value of dy/dx at $x = \pi/4$ is
A. 1 B. 0 C. -1 D. ∞

159. If $y = (\tan x + \sec x)^x$, then dy/dx is equal to
A. x secx B. y secx C. m secx D. mxy

160. The equation $2x^2 + 3x + 1 = 0$ has

A. rational root B. irrational root C. equal root D. none of the above

161. A bag contains 6 red, 5 green, and 7 white balls. The probability of choosing a red or a white ball is

A. 1/3 B. 11/13 C. 13/18 D. 3/8

162. $\int (x + 2)/(x + 4)\, dx$ is equal to

A. $1/2[\tan^{-1}(x - 2/x)] + c$ B. $\tan^{-1}x + c$ C. $1/2[\tan^{-1}(2/x)] + c$ D. none of the above

163. The length intercepted on the line $3x + 4y + 1 = 0$ by the circle $(x - 1)^2 + (y - 4)^2 = 25$ is

A. 3 B. 4 C. 5 D. 6

164. The period of the function $\cos[(3/5)\alpha] - \sin[(2/7)\alpha]$ is

A. 7π B. 10π C. 70π D. 3π

165. The minimum value of x^x is attained when x is equal to

A. - e B. + e C. e^{-1} D. 1/e

166. If a, b, c and u, v, w are complex numbers representing the vertices of two triangles such that $c = (1 - r)a + rb$ and $w = (1 - r)u + rv$, where r is a complex number, then the two triangles are

A. similar B. congruent C. equal in area D. equal bases

167. In a triangle ABC, if r and R are the in-radius and circum-radius respectively, then $(a \cos A + b \cos B + c \cos C)/(a + b + c)$ is

A. r/R B. R/r C. R^2/r D. r^2/R

168. $\int [(x + \sin x)/(1 + \cos x)]\, dx$ is equal to

A. $x \tan(x/2)$ B. $x \tan(x/2) + c$ C. $\log(1 + \cos x) + c$ D. $x \log(\cos x) + c$

169. The differential coefficient of $f[\log(x)]$ when $f(x) \log x$ is

A. $x \log x$ B. $x/(\log x)$ C. $1/(x \log x)$ D. $(\log x)/x$

170. If $x = 9 \sin 2\theta (1 + \cos 2\theta)$ and $y = b \cos 2\theta (1 - \cos 2\theta)$, then the value of dy/dx is

A. $(b \tan \theta)/a$ B. $a/(b \tan \theta)$ C. $(a \tan \theta)/b$ D. $ab \tan \theta$

171. The number of solution of the equation $(\tan x + \sec x = 2 \cos x)$ lying in the interval $(0, 2\pi)$ is

A. 0 B. 1 C. 2 D. 3

172. If θ and ϕ are angles in the first quadrant such that $\tan \theta = 1/7$ and $\sin \phi = 1/\sqrt{10}$, then

A. $\theta + 2\phi = 90^o$ B. $\theta + 2\phi = 60^o$ C. $\theta + 2\phi = 30^o$ D. $\theta + 2\phi = 45^o$

173. If $a \cos 2\theta + b \sin 2\theta = c$ has a and b as its solution, then the value of $\tan \alpha + \tan \beta$ is
A. $(c + a)/2b$ B. $2b/(c + a)$ C. $(c - a)/2b$ D. $b/(c + a)$

174. The perimeter of a certain sector of a circle is equal to the length of the arc of a semi-circle having the same radius, the angle of the sector is
A. 65^o 24' B. 64^o 24' C. 63^o 24' D. 62^o 24'

175. The value of $\tan^{-1}x + \cot^{-1}x$ is
A. $\pi/3$ B. $\pi/6$ C. $2\pi/3$ D. 2π

176. If a circle cuts a rectangular hyperbola $xy = c^2$ in A, B, C, D and the parameters of these four points be t_1, t_2, t_3 and t_4 respectively, then
A. $t_1 t_2 = t_3 t_4$ B. $t_1 t_2 t_3 t_4 = 1$ C. $t_1 = t_2$ D. $t_3 = t_4$

177. If the normal to $y^2 = 12x$ at (3, 6) meets the parabola again in (27, -8) and the circle on the normal chord as diameter is
A. $x^2 + y^2 + 30x + 12y - 27 = 0$ B. $x^2 + y^2 + 30x + 12y + 27 = 0$
C. $x^2 + y^2 - 30x - 12y - 27 = 0$ D. $x^2 + y^2 - 30x + 12y - 27 = 0$

178. If the normal any point P on the ellipse cuts the major and the minor axes in G and g respectively and C be the centre of the ellipse, then
A. $a^2 (CG)^2 + b^2 (Cg)^2 = (a^2 - b^2)^2$ B. $a^2 (CG)^2 - b^2 (Cg)^2 = (a^2 - b^2)^2$
C. $a^2 (CG)^2 - b^2 (Cg)^2 = (a^2 + b^2)^2$ D. none of the above

179. The point of intersection of the tangent at the end of the latus rectum of the parabola $y^2 = 4x$ is
A. (-1, 1) B. (1, 1) C. (-1, 0) D. (0, 0)

180. If a, b, c are distinct positive numbers, then the expression $(b + c - a)(c + a - b)(a + b - c) - abc$ is
A. positive B. negative
C. both negative and positive D. none of the above