UPSEE - 2008

Full Paper

Section-1

Physics

1. Two wires have lengths, diameters and specific resistances all in the ratio of 1 : 2. The resistance of the first wire is 10 ohm. Resistance of the second wire in ohm will be

   1) 5   2) 10   3) 20   4) infinite

2. The dimensions of coefficient of self inductance are

   1) $[ML^2T^{-2}A^{-2}]$

   2) $[ML^2T^{-2}A^{-1}]$

   3) $[MLT^{-2}A^{-2}]$

   4) $[MLT^{-2}A^{-1}]$

3. Two spheres of equal masses, one of which is a thin spherical shell and the other a solid, have the same moment of inertia about their respective diameters. The ratio of their radii will be

   1) 5 : 7

   2) 3 : 5

   3) $\sqrt{3} : \sqrt{5}$

   4) $\sqrt{3} : \sqrt{7}$

4. The acceleration of the centre of mass of a uniform solid disc rolling down an inclined plane of angle α is

   1) g sin α

   2) 2/3 g sin α

   3) 1/2 g sin α

   4) 1/3 g sin α

5. A thin wire of mass M and length L is bent to form a circular ring. The moment of inertia of this ring about its axis is

   1) $(1/4\pi^2) ML^2$

   2) $(1/12) ML^2$

   3) $(1/3\pi^2) ML^2$

   4) $(1/\pi^2) ML^2$

6. If g is the acceleration due to gravity on earth's surface, the gain of the potential energy of an object of mass m raised from the surface of the earth to a height equal to the radius R

   of the earth is

of the earth is

1) 2mgR

2) mgR

3) (1/2) mgR

4) (1/4) mgR

7. A wave travelling along a string is described by the equation
$y = A \sin(\omega t - kx)$
The maximum particle velocity is

1) $A\omega$

2) ω/k

3) $d\omega/dk$

4) x/l

8. Oxygen and hydrogen are at the same temperature T. The ratio of the mean kinetic energy of oxygen molecules to that of the hydrogen molecules will be

1) 16 : 1

2) 1 : 1

3) 4 : 1

4) 1 : 4

9. The charge carriers in a p-type semiconductor are

1) electrons only

2) holes only

3) holes in larger numbers and electrons in smaller numbers

4) holes and electrons in equal numbers

10. A ball thrown by one player reaches the other in 2 s. The maximum height attained by the ball above the point of projection will be ($g = 10$ m/s^2)

1) 2.5 m

2) 5 m

3) 7.5 m

4) 10 m

11. What causes chromatic aberration ?

1) Non-paraxial rays

2) Paraxial rays

3) Variation of focal length with colour

4) Difference in radii of curvature of the bounding surfaces of the lens

12. The graph between the time period and the length of a simple pendulum is

1) straight line

2) curve

3) ellipse

4) parabola

13. The image formed by a concave mirror

    1) is always real

    2) is always virtual

    3) is certainly real if the object is virtual

    4) is certainly virtual

14. The Bulk Modulus for an incompressible liquid is

    1) zero

    2) unity

    3) infinity

    4) between 0 and 1

15. A 20 μF capacitor is connected to 45 V battery through a circuit whose resistance is 2000 Ω. What is the final charge on the capacitor ?

    1) 9×10^{-4} C

    2) 9.154×10^{-4} C

    3) 9.8×10^{-4} C

    4) None of these

16. A particle having almost zero mass and exactly zero charge is

    1) positron

    2) electron

    3) neutron

    4) neutrino

17. The ionisation potential of hydrogen atom is 13.6 eV. The energy required to remove an electron from the second orbit of hydrogen will be

    1) 27.4 eV

    2) 13.6 eV

    3) 3.4 eV

    4) None of these

18. A long spring is stretched by 2 cm and its potential energy is U. If the spring is stretched by 10 cm; its potential energy will be

    1) U/5

    2) U/25

    3) 5 U

    4) 25 U

19. A change of 8.0 mA in the emitter current brings a change of 7.9 mA in the collector current. The values of α and β are

    1) 0.99, 90

    2) 0.96, 79

    3) 0.97, 99

    4) 0.99, 79

20. The intensity of radiation emitted by the sun has its maximum value at a wavelength of 510 nm and that emitted by the north star has the maximum value at wavelength of 350 nm. If these stars behave like black bodies, then the ration of surface temperatures of the sun and north star is

    1) 1.46   2) 0.69   3) 1.21   4) 0.83

21. If the linear momentum is increased by 50%, then kinetic energy will be increased by

    1) 50%

    2) 20%

    3) 125%

    4) None of these

22. Two resistances R and 2R are connected in parallel in an electric circuit. The thermal energy developed in R and 2R are in the ratio

    1) 1 : 2

    2) 2 : 1

    3) 1 : 4

    4) 4 : 1

23. An electric current passes through a circuit containing two wires of the same material connected in parallel. If the lengths of the wires are in the ration of 4/3 and radius of the wires are in the ratio of 2/3, then the ratio of the currents passing through the wires will be

    1) 3

    2) 1/3

    3) 8/9

    4) None of these

24. Two identical positive charges are fixed on the y-axis at equal distances from the origin O. A negatively charged particle starts on the x-axis, at a large distance from O, moves along the x-axis, passes through O and moves far away from O. Its acceleration a is taken as positive along its direction of motion. The best graph between the particle's acceleration and its x-coordinate is represented by

    1)

2)

3)

4)
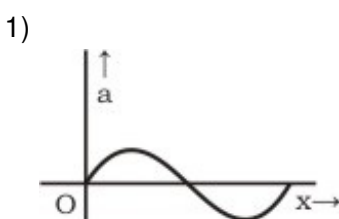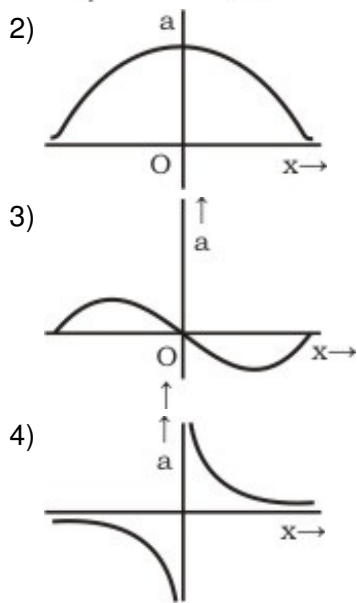
25. The Poisson's ratio cannot have the value

   1) 0.7   2) 0.2   3) 0.1   4) 0.3

26. The dimensions of electric dipole moment are

   1) $[L^2 I]$

   2) $[LI]$

   3) $[LTI]$

   4) $[T^{-2}]$

27. If K denotes coefficient of thermal conductivity, d the density and c the specific heat, the unit of X, where X = K/dc will be

   1) cm sec^{-1}

   2) cm^2 sec^{-2}

   3) cm sec

   4) cm^2 sec^{-1}

28. Charge Q, is divided into two parts which are then kept some distance apart. The force between them will be maximum if the two parts are having the charge

   1) Q/2 each

   2) Q/4 and 3Q/4

   3) Q/3 and 2Q/3

   4) e and (Q - e), where e = electronic charge

29. A copper rod of length L and radius r is suspended from the ceiling by one of its ends. What will be elongation of the rod due to its own weight when ρ and Y are the density and Young's modulus of the copper respectively ?

   1) $\rho^2 g L^2 / 2Y$

2) $\rho g L^2/2Y$

3) $\rho^2 g^2 L^2/2Y$

4) $\rho g L/2Y$

30. A tube of length L is filled with an incompressible liquid of mass M and closed at both ends. The tube is then rotated in a horizontal plane about one of its ends with a uniform angular velocity ω. The force exerted by the liquid at the other end will be

1) $(1/2) M^2 \omega^2 L$

2) $(1/2) M \omega^2 L$

3) $(1/2) M \omega^2 L^2$

4) None of these

31. A solid ball of metal has a concentric spherical cavity within it. If the ball is heated, the volume of the cavity will

1) increase

2) decrease

3) remain unaffected

4) None of these

32. A solid sphere of mass 2 kg rolls on a smooth horizontal surface at 10 m/s. It then rolls up a smooth inclined plane of inclination 30º with the horizontal. The height attained by the sphere before it stops is

1) 700 cm

2) 701 cm

3) 7.1 m

4) None of these

33. In an interference experiment, the spacing between successive maxima or minima is

1) $\lambda d/D$

2) $\lambda D/d$

3) dD/λ

4) $\lambda d/4D$

34. A lens made of glass whose index of refraction is 1.60 has a focal length of +20 cm in air. Its focal length in water, whose refractive index is 1.33, will be

1) three times longer than in air

2) two times longer than in air

3) same as in air

4) None of the above

35. Which of the following statements are incorrect ?

1. If there were no friction, work need to be done to move a body up an inclined plane

is zero.

2. If there were no friction, moving vehicles could not be stopped even by locking the brakes.

3. As the angle of inclination is increased, the normal reaction on the body placed on it increases.

4. A duster weighing 0.5 kg is pressed against a vertical board with a force of 11 N. If the coefficient of friction is 0.5, the work done in rubbing it upward through a distance of 10 cm is 0.55 J.

   1) 1 and 2

   2) 1, 2 and 4

   3) 2 and 3

   4) All of these

36. A 25 W and 100 W bulb are joined in series and connected to the mains. Which bulb will glow brighter ?

   1) 25 W bulb

   2) 100 W bulb

   3) Both bulb will glow brighter

   4) None will glow brighter

37. A hollow sphere is filled with water through the small hole in it. It is then hung by a long thread and made to oscillate. As the the water slowly flow out of the hole at the bottom, the period of oscillation will

   1) Continuously decrease

   2) Continuously increase

   3) first decrease then increase

   4) first increase then decrease

38. By increasing the temperature of a liquid its

   1) volume and density decrease

   2) volume and density increase

   3) volume increases and density decreases

   4) volume decreases and density increases

39. When a ceiling fan is switched off, its angular velocity falls to half while it makes 36 rotations. How many more rotations will it make before coming to rest ?

   1) 24   2) 36   3) 18   4) 12

40. Block A of mass m and block B of mass 2m are placed on a fixed triangular wedge by means of a massless, inextensible string and a frictionless pulley as shown in figure. The wedge inclined at 45º to the horizontal on both the sides. If the coefficient of friction between the block A and the wedge is 2/3 and that between the block B and the wedge is 1/3 and both the blocks A and B are released from rest, the acceleration of A will be
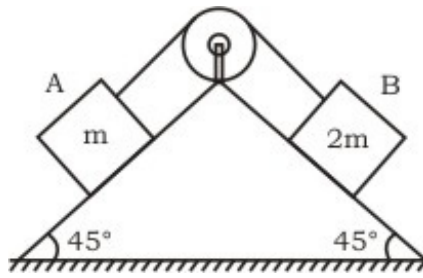
1) -1   2) 1.2   3) 0.2   4) zero

41. Three identical rods, each of length x, are joined to form a rigid equilateral triangle. Its radius of gyration about an axis passing through a corner and perpendicular to the triangle is

   1) x/√3

   2) x/2

   3) √(3/2) x

   4) x/√2

42. A solid sphere is rotating in free space. If the radius of sphere is increased keeping mass same which one of the following will not be affected ?

   1) Angular velocity

   2) Angular momentum

   3) Moment of inertia

   4) Rotational kinetic energy

43. The coefficient of limiting friction μ is defined as

   1) μ = (R/F)

   2) μ = √(F/R)

   3) μ = (F/R)

   4) μ = √(R/F)

44. Two waves represented by y = a sin (ωt - kx) and y = a cos (ωt - kx) are superposed. The resultant wave will have an amplitude

   1) a

   2) √2 a

   3) 2 a

   4) zero

45. Which of the following is not the property of the photons ?

   1) Momentum

   2) Energy

   3) Charge

   4) Velocity

46. What is an ideal gas ?

  1) One that consists of molecules

  2) A gas satisfying the assumptions of kinetic theory

  3) A gas having maxwellian distribution of speed

  4) A gas consisting of massless particles

47. A truck is moving on a friction less surface with uniform velocity of 10 m/s. A leak occurs in the water tank of the truck at the rate of 2 kg/s. What is the speed of truck after 50 s if the mass of truck is 100 kg and mass of water in the truck initially was 100 kg ?

  1) 20 m/s

  2) 10 m/s

  3) 5 m/s

  4) None of these

48. The numerical ratio of average velocity to average speed is

  1) always less than one

  2) always equal to one

  3) always more than one

  4) equal to or less than one

49. An ideal refrigerator has a freezer at a temperature of -13ºC. The coefficient of performance of the engine is 5. The temperature of the air (to which heat is rejected) will be

  1) 325ºC

  2) 325ºK

  3) 39ºC

  4) 320ºC

50. Which of the following is not the case with the image formed by a concave lens ?

  1) It may be erect or inverted

  2) It may be magnified or diminished

  3) It may be real or virtual

  4) Real image may be between the pole and focus or beyond focus

51. Cadmium rods are used in a nuclear reactor for

  1) slowing down fast neutrons

  2) speeding up slow neutrons

  3) absorbing neutrons

  4) regulating the power level of reactor

52. Ultrasonic waves are produced by

  1) Piezoelectric effect

2) Peltier effect

3) Doppler's effect

4) Coulomb's law

53. In a cathode ray oscillograph, the focusing of beam on the screen is achieved by

   1) convex lenses

   2) magnetic field

   3) electric potential

   4) All of these

54. A body of mass 12 kg is suspended by a coil spring of natural length 50 cm and spring constant 2×10^3 N/m. The length of the spring after extension will be

   1) 0.00588 m

   2) 0.0588 m

   3) 0.5588 m

   4) None of these

55. A ball is dropped on a floor and bounces back to a height somewhat less than the original height, which of the curves depicts its motion correctly ?
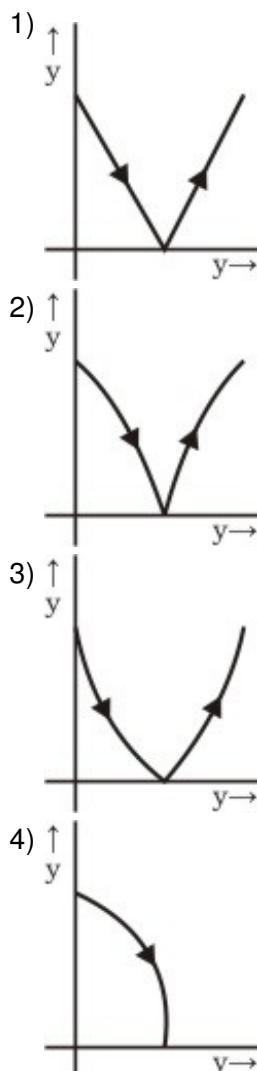
56. In the relation x = cos (ωt + kx), the dimensions of ω are

   1) $[M^0LT]$

   2) $[M^0L^{-1}T^0]$

   3) $[M^0L^0T^{-1}]$

   4) $[M^0LT^{-1}]$

57. The frequency and intensity of a light source are doubled. Consider the following statements
(1) Saturation photocurrent remains almost the same.
(2) Maximum kinetic energy of the photoelectrons is doubled.

   1) Both (1) and (2) are true

   2) (1) is true but (2) is false

   3) (1) is false but (2) is true

   4) Both (1) and (2) are false

58. The temperature at which speed of sound in air becomes double of its value at 27ºC is

   1) 54ºC

   2) 327ºC

   3) 927ºC

   4) None of these

59. A body moving with a uniform acceleration crosses a distance of 65 m in the 5th second and 105 m in 9th second. How far will it go in 20 s ?

   1) 2040 m

   2) 240 m

   3) 2400 m

   4) 2004 m

60. Bernoulli's theorem is a consequence of the law of conservation of

   1) momentum

   2) mass

   3) energy

   4) angular momentum

61. A 4 kg mass and a 1 kg mass are moving with the equal kinetic energies. The ratio of their momentums is

   1) 1 : 2

   2) 1 : 1

   3) 2 : 1

   4) 4 : 1

62. Which of the following while in motion cannot be deflected by magnetic field ?

    1) Protons
    2) Cathode rays
    3) Alpha particles
    4) Neutrons

63. X-rays cannot penetrate through a sheet of

    1) wood
    2) paper
    3) aluminium
    4) lead

64. The angle between particle velocity and wave velocity in a transverse wave is

    1) zero   2) $\pi/4$ 3) $\pi/2$ 4) π

65. Two bullets are fired simultaneously, horizontally and with different speeds from the same place. Which bullet will hit the ground first ?

    1) The faster bullet
    2) The slower bullet
    3) Both will hit simultaneously
    4) Depends on the masses

66. The air bubble formed by explosion inside water performed oscillation with time period T that is directly proportional to $p^a d^b E^c$, where p is the pressure, d is the density and E is the energy due to explosion. The values of *a*, *b* and *c* will be

    1) -5/6, 1/2, 1/3
    2) 5/6, 1/3, 1/2
    3) 5/6, 1/2, 1/3
    4) None of the above

67. A machine gun fires a bullet of mass 40 g with a velocity 1200 m/s. The man holding it can exert a maximum force of 144 N on the gun. How many bullets can be fired per second at the most ?

    1) Only one
    2) Three
    3) Can fire any number of bullets
    4) 144 × 48

68. An ideal heat engine exhausting heat at 27ºC is to have 25% efficiency. It must take heat at

    1) 127ºC
    2) 227ºC
    3) 327ºC

4) None of these

69. A solid sphere is rolling without slipping on a horizontal surface. The ratio of its rotational kinetic energy to its translational kinetic energy is

1) 2/9   2) 2/7   3) 2/5   4) 7/2

70. An artificial satellite is moving in a circular orbit around the earth with a speed equal to half the magnitude of escape velocity from the earth. The height of the satellite above the earth's surface will be

1) 6000 km

2) 5800 km

3) 7500 km

4) 6400 km

71. A strong argument for the particle nature of cathode rays is that they

1) produce fluorescence

2) travel through vacuum

3) get deflected by electric and magnetic fields

4) cast shadow

72. A spring, which is initially in its unstretched condition, is first stretched by a length x and then again by a further length x. The work done in the first case is W_1, and in the second case is W_2. Then

1) $W_2 = W_1$

2) $W_2 = 2W_1$

3) $W_2 = 3W_1$

4) $W_2 = 4W_1$

73. Digital circuit can be made by repetitive use of this gate

1) AND   2) OR   3) NOT   4) NAND

74. Three balls A, B, C are thrown from a height h with equal speeds upwards, downwards and horizontally respectively. What is the relation among speeds v_A, v_B, v_C with which they hit the ground ?

1) $v_A = v_B = v_C$

2) $v_A > v_C > v_B$

3) $v_A = v_B > v_C$

4) $v_A < v_C < v_B$

75. When the two inputs of a NAND gate are shorted, the resulting gate is

1) NOR   2) OR   3) NOT   4) AND

76. pH of a 0.0001M HCl solution is
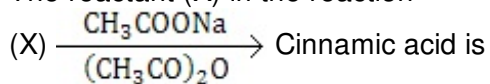
1) 4.0   2) 2.0   3) 6.0   4) 7.0

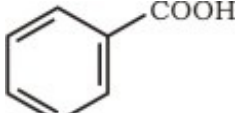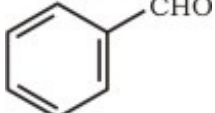77. In Lucas test an alcohol reacts immediately and gives insoluble chloride. The alcohol is
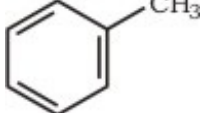
1) CH_3OH

2) CH_3CH_2OH

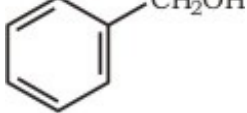3) $(CH_3)_2CHOH$

4) $(CH_3)_3COH$

78. Microcosmic salt is

1) $Na_4P_2O_7$

2) $Na(NH_4)HPO_4$

3) $Na(NH_3)HPO_4 4H_2O$

4) $MgNH_4PO_4$

79. The reactant (X) in the reaction

$(X) \xrightarrow[\text{(CH}_3\text{CO)}_2\text{O}]{\text{CH}_3\text{COONa}}$ Cinnamic acid is

1)

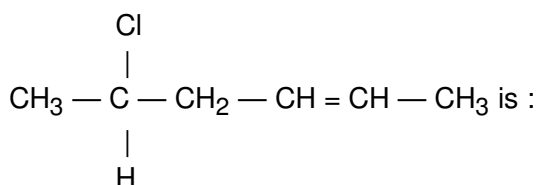COOH

2)

CHO

3)

CH_3

4)

CH_2OH

80. Which of the following does not react with sodium metal ?

1) $(CH_3)_2O$

2) CH_3CH_2OH

3) CH_3COOH

4) C_6H_5OH

81. The IUPAC name for

81. The IUPAC name for

$$CH_3 - \overset{\overset{\displaystyle Cl}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} - CH_2 - CH = CH - CH_3 \text{ is :}$$

   1) 5-chloro-hex-2-ene

   2) 2-chloro-hex-5-ene

   3) 1-chloro-1-methyl-pent-3-ene

   4) 5-chloro-5-methyl-pent-2-ene

82. A reaction proceeds by first order, 75% of this reaction was completed in 32 min. The time required for 50% completion is

   1) 8 min

   2) 16 min

   3) 20 min

   4) 24 min

83. Aqueous solution of ferric chloride is acidic due to

   1) ionization

   2) polarization

   3) dissociation

   4) hydrolysis

84. The correct order of heat of formation of halogen acids is

   1) HI > HBr > HCl > HF

   2) HF > HCl > HBr > HI

   3) HCl > HF > HBr > HI

   4) HCl > HBr > HF > HI

85. A compound (X) on ozonolysis followed by reduction gives an aldehyde C_2H_4O and 2-butanone, compound (X) is

   1) 3-methyl pentene-2

   2) 3-methyl pentene-3

   3) 3-methyl hexene-3

   4) 3-ethyl pentene-3

86. The element which on burning in air gives peroxide is

   1) lithium

   2) sodium

   3) rubidium

   4) caesium

87. The C–O–H bond angle in ethanol is nearly

1) 90º

2) 104º

3) 120º

4) 180º

88. Protic solvent is

1) diethyl ether

2) n-hexane

3) acetone

4) ethanol

89. In cyclopropane, cyclobutane and cyclohexane, the common group is

1)
$$\begin{array}{c} | \\ -C- \\ | \end{array}$$

2)
$$\begin{array}{c} | \\ CH_2 \\ | \end{array}$$

3) $- CH_3$

4)
$$\begin{array}{c} | \\ -CH \\ | \end{array}$$

90. CH_3CH_2OH and CH_3OCH_3 are the examples of

1) chain isomerism

2) functional isomerism

3) position isomerism

4) metamerism

91. In the following reaction

$RCH_2COOH \xrightarrow{Br_2/P} X \xrightarrow{excess\ NH_3} Y$

The major amounts of X and Y are,
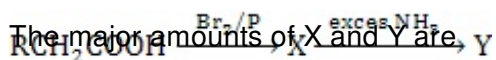
1) $RCHBrCONH_2$; $RCH(NH_2)COOH$

2) $RCHBrCOOH$; $RCH(NH_2)COOH$

3) RCH_2COBr ; RCH_2COONH_4

4) $RCHBr\ COOH$; RCH_2CONH_2

92. A buffer solution is prepared by mixing 0.1 M ammonia and 1.0 M ammonium chloride. At 298 k, the pK_b of NH_4OH is 5.0. The pH of the buffer is

1) 10.0   2) 9.0   3) 6.0   4) 8.0

93. Among NH_3, HNO_3, NaN_3 and Mg_3N_2 the number of molecules having nitrogen in

negative oxidation state is

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

94. $KMnO_4$ (acidic/alkaline) is not decolourised by

1) Mohr salt

2) Oxalic acid

3) Benzene

4) Propene

95. White lead is

1) $PbCO_3PbO$

2) $PbCO_3$

3) $Pb(OH)_2 \cdot 2PbCO_3$

4) $PbSO_4 \cdot PbO$

96. Which one of the following will dissolve in water most readily ?

1) I_2

2) $BaCO_3$

3) KF

4) PbI_2

97. Born-Haber cycle may be used to calculate

1) electronegativity

2) mass number

3) oxidation number

4) electron affinity

98. The heat of formations for $CO_2(g)$, $H_2O(l)$ and $CH_4(g)$ are -400 kJ mol^{-1}, -280 kJ mol^{-1} and -70 kJ mol^{-1} respectively. The heat of combustion of CH_4 in kJ mol^{-1} is

1) 890   2) -160   3) -890   4) -90

99. In silica (SiO_2), each silicon atom is bonded to

1) two oxygen atoms

2) four oxygen atoms

3) one silicon and two oxygen atoms

4) one silicon and four oxygen atoms

100. Hydrolysis of urea is an example of

1) homogenous catalysis

2) heterogenous catalysis

3) biochemical catalysis

4) zeolite catalysis

101. Glycerol is more viscous than ethanol due to

    1) high molecular weight

    2) high boiling point

    3) many hydrogen bonds per molecule

    4) Fajan's rule

102. Heavy water is represented as

    1) $H_2^{18}O$

    2) D_2O

    3) $D_2^{18}O$

    4) H_2O at 4ºC

103. The molecule having zero dipole moment is

    1) CH_2Cl_2

    2) BF_3

    3) NF_3

    4) ClF_3

104. The radius ratio in CsCl is 0.93. The expected lattice structure is
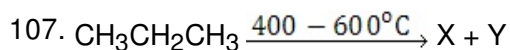
    1) tetrahedral

    2) square planar

    3) octahedral

    4) body-centred cubic

105. Which compound is used in photography ?

    1) Na_2SO_5

    2) $Na_2S_2O_8$

    3) $Na_2S_2O_6$

    4) $Na_2S_2O_3$

106. The bond angle is smallest in

    1) H_2O

    2) H_2S

    3) $BeCl_2$

    4) N_2O

107. $CH_3CH_2CH_3 \xrightarrow{400-600^oC} X + Y$

X and Y are

1) hydrogen

2) methane

3) methylene

4) ethylene

108. In the equation

$$CrO_4^{2-} + SO_3^{2-} \rightarrow Cr(OH)_4^- + SO_4^{2-}$$
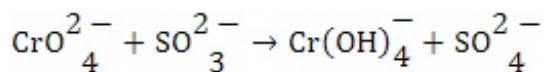
the oxidation number of Cr changes from

1) +6 to +4

2) +6 to +3

3) +8 to +4

4) +4 to +3

109. How many π bonds are present in naphthalene ?

1) 4　　　　　　　　2) 5　　　　　　　　3) 6　　　　　　　　4) 7

110. A Zwitter ion is

1) a negatively charged ion without metal atom

2) a heavy ion with a small charge on it

3) an ion with positive and negative charge at different points on it

4) a positively charged ion without a metal atom

111. The vapour pressure of pure liquid A is 0.80 atm. When a non volatile B is added to A its vapour pressure drops to 0.60 atm. The mole fraction of B in the solution is

1) 0.125　　　　2) 0.25　　　　3) 0.5　　　　4) 0.75

112. The velocity of oxidation of oxalic acid by acidified $KMnO_4$ increases as the reaction progress. It is an example of

1) promoters

2) catalytic poisons

3) autocatalysis

4) inhibitors

113. What flows in the internal circuit of a galvanic cell ?

1) Ions

2) Electrons

3) Electricity

4) Atoms

114. Oxygen and sulphur both are the member of same group in periodic table but H_2O is liquid while H_2S is gas because

    1) molecular weight of water is more

    2) electronegativity of sulphur is more

    3) H_2S is weak acid

    4) water molecules are having weak hydrogen bonds between them

115. Osmotic pressure of a solution at a given temperature

    1) increases with concentration

    2) decreases with concentration

    3) remains same

    4) initially increases and then decreases

116. Toluene on treatment with CrO_3 and $(CH_3CO)_2O$ followed by hydrolysis with dil HCl gives

    1) benzaldehyde

    2) benzoic acid

    3) phenol

    4) phenylacetaldehyde

117. $F_2C = CF_2$ is a monomer of

    1) teflon

    2) nylon

    3) glyptal

    4) buna-S

118. Which of the following is not a property of colloidal solution ?

    1) Heterogeneity

    2) Particle size > 100 nm

    3) Tyndall effect

    4) Brownian movement

119. Diffusion of helium gas is four times faster than

    1) CO_2

    2) SO_2

    3) NO_2

    4) O_2

120. Which of the following shell, form an outer octahedral complex ?

    1) d^4

    2) d^8

3) d^6

4) None of these

121. $C(s) + O_2(g) \rightarrow CO_2(g); \Delta H = -94$ kcal

$2CO(g) + O_2(g) \rightarrow 2CO_2(g); \Delta H = -135.2$ kcal.

The heat of formation of $CO(g)$ is

1) -26.4 kcal

2) 41.2 kcal

3) 26.4 kcal

4) 229.2 kcal

122. Which of the following will be easily nitrated ?

1)   CH₃

2)
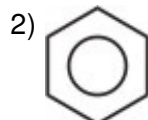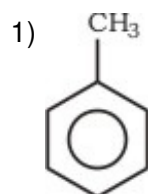
3) CH_3NO_2

4) $C_6H_5NO_2$

123. In Kjeldahl's method of estimation of nitrogen, $CuSO_4$ acts as

1) oxidising agent

2) reducing agent

3) catalytic agent

4) hydrolysis agent

124. The hydroxide insoluble in $NH_4OH + NH_4Cl$ is

1) $Al(OH)_3$

2) $Ca(OH)_3$

3) $Zn(OH)_2$

4) $Mg(OH)_2$

125. Time period of a wave is 5×10^{-3} s, what is the frequency ?

1) 5×10^{-3} s⁻¹

2) 2×10^2 s⁻¹

3) 23×10^3 s⁻¹

4) 5×10^2 s⁻¹

126. Which of the following, is an example of aldol condensation?

1) $2CH_3COCH_3 \xrightarrow{\text{dil NaOH}} CH_3COHCH_3CH_2COCH_3$

2) $2HCHO \xrightarrow{\text{dil NaOH}} CH_3OH$

3) $C_6H_5CHO + HCHO \xrightarrow{\text{dil NaOH}} C_6H_5CH_2OH$

4) None of the above

127. Conjugate acid of HF_2^- is

1) H^+
2) HF
3) F_2^-
4) H_2F_2

128. Sodium thiosulphate is a

1) reducing agent
2) oxidising agent
3) complexing agent
4) bleaching agent

129. An electron from one Bohr stationary orbit can go to next higher orbit

1) by emission of electromagnetic radiation
2) by absorption of any electromagnetic radiation
3) by absorption of electromagnetic radiation of particular frequency
4) without emission or absorption of electromagnetic radiation

130. Valence bond theory of metallic bond was given by

1) Dalton
2) Drudel
3) Fajan
4) Pauling

131. Splitting of spectrum lines in magnetic field is

1) Stark
2) Raman effect
3) Zeeman effect
4) Rutherford effect

132. The number of possible alkynes with molecular formula C_5H_8 is

1) 3   2) 4   3) 5

4) 6

133. Isoelectronic pair among the following is

　　1) Ca and K

　　2) Ar and Ca^{2+}

　　3) K and Ca^{2+}

　　4) Ar and K

134. For the following reaction in gaseous phase
$CO(g) + (1/2)O_2 (g) \rightarrow CO_2(g)$ K_p/K_c is

　　1) $(RT)^{1/2}$

　　2) $(RT)^{-1/2}$

　　3) (RT)

　　4) $(RT)^{-1}$

135. An organic amino compound reacts with aqueous nitrous acid at low temperature to produce an oily nitroso amine. The compound is

　　1) CH_3NH_2

　　2) $CH_3CH_2NH_2$

　　3) $CH_3CH_2NHCH_2CH_3$

　　4) $(CH_3CH_2)_3N$

136. The drug used to bring down fever are known as

　　1) analgesic

　　2) antibiotic

　　3) antipyretic

　　4) sulpha drugs

137. A metal 'M' reacts with N_2 to give a compound 'A' (M_3N). 'A' on heating at high temperature gives back 'M' and 'A' on reacting with H_2O give a gas B. 'B' turns $CuSO_4$ solution blue on passing through it. M and B can be

　　1) Al and NH_3

　　2) Li and NH_3

　　3) Na and NH_3

　　4) Mg and NH_3

138. In the reaction sequence

(X) is :
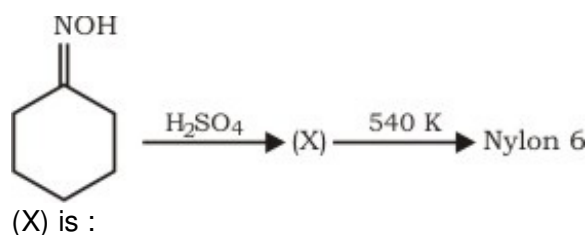
1) cyclohexanone

2) caprolactum

3) $HO(CH_2)_6NH_2$

4) hexamethylene diisocyanate

139. Plaster of Paris on making paste with little water sets to hard mass due to formation of

   1) $CaSO_4$

   2) $CaSO_4 \cdot 1/2\ H_2O$

   3) $CaSO_4 \cdot H_2O$

   4) $CaSO_4 \cdot 2H_2O$

140. C — C bond length is maximum in

   1) diamond

   2) graphite

   3) naphthalene

   4) fullerene

141. Ammoniacal silver nitrate form a white precipitate easily with

   1) $CH_3C \equiv CH$

   2) $CH_3C \equiv C — CH_3$

   3) $CH_3CH = CH_2$

   4) $CH_2 = CH_2$

142. A solution of sodium thiosulphate on addition of few drops of ferric chloride gives violet colour due to the formation of

   1) $Na_2S_4O_6$

   2) $Fe_2(SO_4)_3$

   3) $Fe_2(S_2O_3)_3$

   4) $Fe_2(S_2O_3)_2$

143. The osmotic pressure (At 27° C) of an aqueous solution (200 mL) containing 6 g of a protein is 2×10^{-3} atm. If R = 0.080 L atm mol^{-1}K^{-1}, the molecular weight of protein is

   1) 7.2×10^5

   2) 3.6×10^5

   3) 1.8×10^5

   4) 1.0×10^5

144. The property which distinguishes formic acid from acetic acid is

   1) only ammonium salt of formic acid on heating gives amide

   2) when heated with alcohol/H_2SO_4 only acetic acid forms ester

3) only acetic acid forms salts with alkali

4) only formic acid reduces Fehling's solution

145. On adding 1 g arsenic to 80 g benzene, the freezing point of benzene is lowered by 0.19°C. The formula of arsenic is

1) As

2) As_2

3) As_3

4) As_4

146. Alloy is an example of

1) gel

2) solidified emulsion

3) solid solution

4) sol

147. The standard emf of a cell, involving one electron change is found to be 0.591 V at 25°C. The equilibrium constant of the reaction is (F = 96500 C mol^{-1})

1) 1.0×10^1

2) 1.0×10^5

3) 1.0×10^{10}

4) 1.0×10^{30}

148. One mole of magnesium nitride on the reaction with an excess of water gives

1) one mole of NH_3

2) two moles of NH_3

3) one mole of HNO_3

4) two moles of HNO_3

149. Which of the following oxides is amphoteric in character ?

1) SnO_2

2) SiO_2

3) CO_2

4) CaO

150. p-cresol reacts with chloroform in alkaline medium to give the compound A which adds hydrogen cyanide to form the compound B. The latter on acidic hydrolysis gives chiral carboxylic acid. The structure of the carboxylic acid is

1)

CH₃ ... CH₂COOH ... OH

(structure with CH₃, CH₂COOH, OH)

2)

CH₃ ... CH₂COOH ... OH

3)

CH₃ ... CH(OH).COOH ... OH

4)

CH₃ ... CH(OH).COOH ... OH
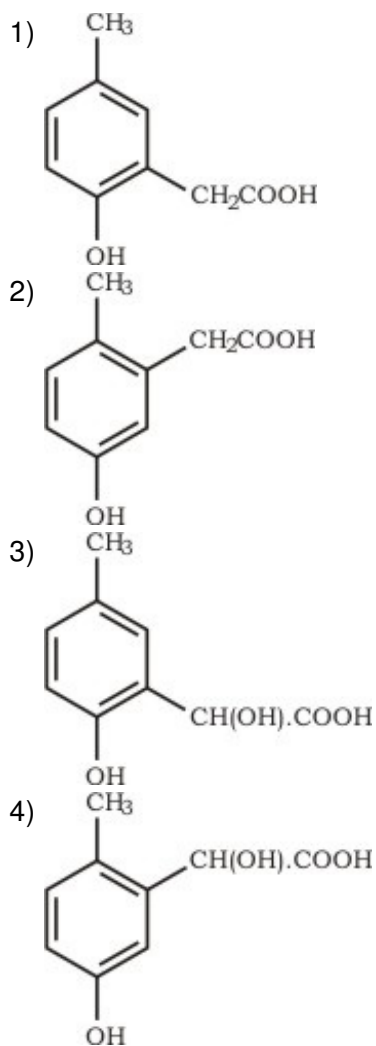
Section-3

Mathematics

151. Let $f(x) = \begin{cases} 5^{1/x}, & x < 0 \\ \lambda[x], & x \geq 0 \end{cases}$ and $\lambda \in R$,

then at $x = 0$

1) f is discontinuous

2) f is continuous only, if $\lambda = 0$

3) f is continuous only, whatever λ may be

4) None of the above

152. Eccentricity of the ellipse

$x^2 + 2y^2 - 2x + 3y + 2 = 0$ is

1) $1/\sqrt{2}$

2) $1/2$

3) $1/2\sqrt{2}$

4) $1/\sqrt{3}$

153. The slopes of the lines represented by $x^2 + 2hxy + 2y^2 = 0$ are in the ratio $1 : 2$, then it

equals

1) ±(1/2)

2) ±(3/2)

3) ±1

4) ±3

154. $1 + (2^3/2!) + (3^3/3!) + (4^3/4!) + ... \infty$ equals

1) 5e   2) 4e   3) 3e   4) 2e

155. A train of length 200 m, traveling at 30 m/s overtakes another train of length 300 m, traveling at 20 m/s in the same direction. The time taken by the first train to pass the second is

1) 30 s

2) 50 s

3) 10 s

4) 40 s

156. If a falling body covers 75 m in its last second, then the height from which it is falling is (take g = 10 m/s^2) (in metres)

1) 320   2) 300   3) 350   4) 360

157. If S be the sum, P be the product and R be the sum of the reciprocals of n terms of a GP, then P^2 is equal to

1) $(S/R)^n$

2) S/R

3) $(R/S)^n$

4) R/S

158. In the expansion of $(x - (1/x))^6$, the constant term is

1) 20   2) -20   3) 30   4) -30

159. If ABCDEF is a regular hexagon with $\overrightarrow{AB} = \vec{a}$ and $\overrightarrow{BC}$ $\vec{b}$ $\overrightarrow{CE}$ = , then $\vec{b}$ $\vec{a}$ equals

1) $\vec{b}$

2) $\vec{b}$ $\vec{a}$

3) 2

4) None of these

160. The maximum value of 5cos θ + 3cos (θ + (π/3)) + 3 is

1) 5   2) 11   3) 10   4) -1

P(Ā ∩ B) is equal to

1) 5/12   2) 3/8   3) 5/8   4) 1/4

162. A survey shows that 63% of the Americans like cheese whereas 76% like apples. If x% of the Americans like both cheese and apples, then

1) x = 39

2) x = 63

3) 39 ≤ x ≤ 63

4) None of these

163. Magnitudes of vectors $\vec{a}, \vec{b}, \vec{c}$ are 3, 4, 5 respectively. If $\vec{a}$ and $\vec{b} + \vec{c}$, $\vec{b}$ and $\vec{c} + \vec{a}$, $\vec{c}$ and $\vec{a} + \vec{b}$ are mutually perpendicular, then magnitude of $\vec{a} + \vec{b} + \vec{c}$ is

1) 4√2

2) 3√2

3) 5√2

4) 3√3

164. Which one of the following is not true ?

1) Matrix addition is commutative

2) Matrix addition is associative

3) Matrix multiplication is commutative

4) Matrix multiplication is associative

165.
If matrix $\begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ \lambda & -3 & 0 \end{bmatrix}$ is singular, then λ is equal to

1) -2   2) -1   3) 1   4) 2

166. Twelve tickets are numbered from 1 to 12. One ticket is drawn at random, then the probability of the number to be divisible by 2 or 3, is

1) 2/3   2) 7/12   3) 5/6   4) 3/4

167.
If f be a function such that $f(9) = 9$ and $f'(9) = 3$, then   is equal to

$$\lim_{x \to 9} \frac{\sqrt{f(x)} - 3}{\sqrt{x} - 3}$$

1) 9

2) 3

3) 1

4) None of these

168. The most general value of θ satisfying the equations sin θ = sin α and cos θ = cos α is

1) 2nπ + α

2) 2nπ - α

3) $n\pi + \alpha$

4) $n\pi - \alpha$

169. The distance between the pair of lines represented by the equation
$x^2 - 6xy + 9y^2 + 3x - 9y - 4 = 0$ is

1) $15/\sqrt{10}$

2) $1/2$

3) $\sqrt{(5/2)}$

4) $1/\sqrt{10}$

170. The differential equation of all circles which passes through the origin and whose centre lies on y-axis is

1) $(x^2 - y^2)(dy/dx) - 2xy = 0$

2) $(x^2 - y^2)(dy/dx) + 2xy = 0$

3) $(x^2 - y^2)(dy/dx) - xy = 0$

4) $(x^2 - y^2)(dy/dx) + xy = 0$

171.
If sum of the series $\displaystyle\sum_{n=0}^{\infty} r^n = S$, for $|r| < 1$, then sum of the series $\displaystyle\sum_{n=0}^{\infty} r^{2n}$, is

1) S^2

2) $S^2/(2S + 1)$

3) $2S/(S^2 - 1)$

4) $S^2/(2S - 1)$

172. If A = $\begin{bmatrix} 2x & 0 \\ x & x \end{bmatrix}$ and A^{-1} = $\begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$, then x equals

1) 2   2) $-(1/2)$ 3) 1   4) 1/2

173. Sum of *n* terms of the series $(1/2) + (3/4) + (7/8) + (15/16) + ...$ is

1) 2^{-n}

2) $2^{-n}(n - 1)$

3) $2^n(n - 1) + 1$

4) $2^{-n} + n - 1$

174. If forces $\vec{P}$, $\vec{Q}$, $\vec{R}$, $\vec{0}$ acting at a point can be represented by the sides of a triangle taken in order, then $\vec{P} + \vec{Q} + \vec{R} = \vec{0}$

1) $\vec{P} + \vec{Q} + \vec{R} = \vec{0}$

4) $\vec{P} - \vec{Q} - \vec{R} = \vec{0}$

175. The area bounded by the curve $y^2(2a - x) = x^3$ and the line $x = 2a$ is

1) $3\pi a^2$ sq unit

2) $(3\pi a^2/2)$ sq unit

3) $(3\pi a^2/4)$ sq unit

4) $(6\pi a^2/5)$ sq unit

176. Angles of a triangle are in the ratio 4 : 1 : 1. The ratio between its greatest side and perimeter is

1) $3/(2 + \sqrt{3})$

2) $1/(2 + \sqrt{3})$

3) $\sqrt{3}/(\sqrt{3} + 2)$

4) $2/(2 + \sqrt{3})$

177. A sphere S_1 impings directly on an equal sphere S_2 at rest. If the coefficient of restitution is e, then the velocities of S_1 and S_2 are in the ratio

1) $(1 + e)/(1 - e)$

2) $(1 - e)/(1 + e)$

3) $(e - 1)/(e + 1)$

4) $(e + 1)/(e - 1)$

178. If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ and the vectors

$\vec{A} = (1, a, a^2)$, $\vec{B} = (1, b, b^2)$ and $\vec{C} = (1, c, c^2)$
are non-coplanar, then abc is equal to

1) 0

2) -1

3) 1

4) None of these

179. The magnitude of the two forces forming a couple is 36 N each and the arm of the couple is 4 m. The magnitude of each force of an equivalent couple whose arm is 9 m, is (in Newtons)

1) 18   2) 26   3) 16   4) 15

180. The locus of the equation $x^2 - y^2 = 0$ is

1) a circle

2) a hyperbola

3) a pair of lines

4) a pair of lines at right angles

181. Let z_1, z_2 and z_3 be the affixes of the vertices of a triangle having the circumcentre at the origin. If z is the affix of its orthocentre, then z is equal to

   1) $(z_1 + z_2 + z_3)/3$

   2) $(z_1 + z_2 + z_3)/2$

   3) $z_1 + z_2 + z_3$

   4) None of these

182. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then $\alpha/(a\beta + b)) + \beta/(a\alpha + b))$ is equal to

   1) 2/a   2) 2/b   3) 2/c   4) -(2/a)

183. If $a + 2b + 3c = 12$, $(a, b, c \in R^+)$, then ab^2c^3 is

   1) $\geq 2^3$

   2) $\geq 2^6$

   3) $\leq 2^6$

   4) None of these

184. The number of solutions of $\log_4(x + 1) = \log_2(x - 3)$ is

   1) 3   2) 1   3) 2   4) 0

185. If the AM of two numbers be A and GM be G, then the numbers will be

   1) $A \pm (A^2 - G^2)$

   2) $\sqrt{A} \pm \sqrt{A^2 - G^2}$

   3) $A \pm \sqrt{(A + G)(A - G)}$

   4) $\dfrac{A \pm \sqrt{(A + G)(A - G)}}{2}$

186. The determinant $\begin{vmatrix} a & b & a\alpha + b \\ b & c & b\alpha + c \\ a\alpha + b & b\alpha + c & 0 \end{vmatrix} = 0$, if a, b, c are in

   1) AP

   2) GP

   3) HP

   4) None of these

187. How many 10 digits numbers can be written by using digits (9 and 2) ?

   1) $^{10}C_1 + {}^9C_2$

   2) 2^{10}

3) $^{10}C_2$

4) 10!

188. If four dice are thrown together. Probability that the sum of the numbers appearing on them is 13, is

1) 35/324

2) 5/216

3) 11/216

4) 11/432

189. If $\dfrac{\sin (x + y)}{\sin (x - y)} = \dfrac{a + b}{a - b}$, then $\dfrac{\tan x}{\tan y}$ is equal to

1) b/a

2) a/b

3) ab

4) None of these

190. If in a ΔABC, $2b^2 = a^2 + c^2$, then $\dfrac{\sin 3B}{\sin B}$ is equal to

1) $\dfrac{c^2 - a^2}{2ca}$

2) $\dfrac{c^2 - a^2}{ca}$

3) $\left(\dfrac{c^2 - a^2}{ca}\right)^2$

4) $\left(\dfrac{c^2 - a^2}{2ca}\right)^2$

191. If $\tan^{-1}(x - 1) + \tan^{-1} x + \tan^{-1}(x + 1) = \tan^{-1} 3x$, then x is

1) ± (1/2)

2) 0, (1/2)

3) 0, -(1/2)

4) 0, ±(1/2)

192. A pole stands vertically inside a triangular park ABC. If the angle of elevation of the top of the pole from each corner of the park is same, then in park the foot of the pole is at the

1) centroid

2) circumcentre

3) incentre

4) orthocentre

193. Circumcentre of triangle whose vertices are (0, 0), (3, 0) and (0, 4) is

1) ((3/2), 2)

2) (2, (3/2))

3) (0, 0)

4) None of these

194. The equation of the line bisecting perpendicularly the segment joining the points (-4, 6) and (8, 8) is

1) 6x + y - 19 = 0

2) y = 7

3) 6x + 2y - 19 = 0

4) x + 2y - 7 = 0

195. The length of the common chord of the circles
$x^2 + y^2 + 2x + 3y + 1 = 0$ and
$x^2 + y^2 + 4x + 3y + 2 = 0$ is

1) 9/2　　　　　　2) 2√2　　　　　　3) 3√2　　　　　　4) 3/2

196. Locus of mid point of any focal chord of $y^2 = 4ax$ is

1) $y^2 = a(x - 2a)$

2) $y^2 = 2a(x - 2a)$

3) $y^2 = 2a(x - a)$

4) None of these

197. The number of values of c such that the straight line y = 4x + c touches the curve$(x^2/4) + y^2 = 1$, is

1) 0　　　　　　2) 2　　　　　　3) 1　　　　　　4) ∞

198. The product of perpendiculars drawn from any point if, a hyperbola to its asymptotes, is

1) $(a^2b^2/(a^2 + b^2))$

2) $((a^2 + b^2)/a^2b^2)$

3) ab/(√a + √b)

4) ab/($a^2 + b^2$)

199. The domain of the function f(x) = $\log_{2x-1}$ (x - 1) is

1) (1, ∞)

2) (1/2, ∞)

3) (0, ∞)

4) None of these

200.
$$\lim_{x \to 0} \left\{ \frac{1 + \tan x}{1 + \sin x} \right\}^{\cosec x}$$ is equal to

1) 1/e
2) 1
3) e
4) e^2

201. If $f(x) = \cot^{-1} ((x^x - x^{-x})/2)$, then f'(1) is equal to

1) -1
2) 1
3) log 2
4) - log 2

202. The minimum value of $x^2 + (1/(1 + x^2))$ is at

1) x = 0
2) x = 1
3) x = 4
4) x = 3

203. $\int \cosec^4 x \, dx$ is equal to

1) $\cot x + ((\cot^3 x)/3) + C$
2) $\tan x + ((\tan^3 x)/3) + C$
3) $-\cot x - ((\cot^3 x)/3) + C$
4) $-\tan x - ((\tan^3 x)/3) + C$

204.
$$\int_0^{1000} e^{x-[x]} \, dx \text{ is}$$

1) $e^{1000} - 1$
2) $(e^{1000} - 1)/(e - 1)$
3) $1000 (e - 1)$
4) $(e - 1)/1000$

205. The area bounded by the curves $y^2 = 4a^2(x - 1)$ and lines x = 1 and y = 4a is

1) $4a^2$ sq unit
2) (16a/3) sq unit
3) $(16a^2/3)$ sq unit
4) None of these

206. The solution of the differential equation
$(x + y)^2 (dy/dx) = a^2$ is

1) $(x + y)^2 = (a^2x/2) + C$

2) $(x + y)^2 = a^2x + C$

3) $(x + y)^2 = 2a^2x + C$

4) None of the above

207. If A, B and C are the vertices of a triangle whose position vectors $\vec{a}, \vec{b},$ and $\vec{c}$ respectively and G is the centroid of the ΔABC, then $\overrightarrow{GA} + \overrightarrow{GB} + \overrightarrow{GC}$ is

1) $\vec{0}$

2) $\vec{a} + \vec{b} + \vec{c}$

3) $(\vec{a} + \vec{b} + \vec{c})/3$

4) $(\vec{a} - \vec{b} - \vec{c})/3$

208. A plane which passes through the point (3, 2, 0) and the line $((x - 3)/1) = ((y - 6)/5) = ((3 - 4)/4)$ is

1) $x - y + z = 1$

2) $x + y + z = 5$

3) $x + 2y - z = 0$

4) $2x - y + z = 5$

209. Median of
$^{2n}C_0, \, ^{2n}C_1, \, ^{2n}C_2, \, ^{2n}C_3, \, ..., \, ^{2n}C_n$
(where n is even) is

1) $^{2n}C_{(n/2)}$

2) $^{2n}C_{(n + 1)/2}$

3) $^{2n}C_{(n - 1)/2}$

4) None of these

210. Two bodies of masses m and $4m$ are moving with equal momentum. The ratio of their KE is

1) 1 : 4

2) 4 : 1

3) 1 : 1

4) 1 : 2

211. A particle is projected from the top of tower 5 m high and at the same moment another particle is projected upward from the bottom of the tower with a speed of 10 m/s, meet at distance 'h' from the top of tower, then h is equal to

1) 1.20 m

2) 2.5 m

3) 1.25 m

4) None of these

212. Let $f(x) = \dfrac{1}{2} - \tan\left(\dfrac{\pi x}{2}\right)$, $-1 < x < 1$ and $g(x) = \sqrt{(3 + 4x - 4x^2)}$, then dom $(f + g)$ is given by

    1) $[(1/2), 1]$

    2) $[(1/2), -1)$

    3) $[-(1/2), 1)$

    4) $[-(1/2), -1]$

213. The equation

$z\bar{z} + (2 - 3i)z + (2 + 3i)\bar{z} + 4 = 0$ represents a circle of radius

    1) 2   2) 3   3) 4   4) 6

214. If the roots of the equations $px^2 + 2qx + r = 0$ and $qx^2 - 2\sqrt{(pr)}\, x + q = 0$ be real, then

    1) $p = q$

    2) $q^2 = pr$

    3) $p^2 = qr$

    4) $r^2 = pr$

215. If $a + b = 8$, then ab is greatest when

    1) $a = 4, b = 4$

    2) $a = 3, b = 5$

    3) $a = 6, b = 2$

    4) None of these

216. If $|x| < 1$, then the sum of the series $1 + 2x + 3x^2 + 4x^3 + \dots \infty$ will be

    1) $1/(1 - x)$

    2) $1/(1 + x)$

    3) $1/(1 + x^2)$

    4) $1/(1 - x^2)$

$\dfrac{1}{81^n} - \dfrac{10}{81^n} \quad \dfrac{10^2}{81^n} \quad - \dfrac{10^3}{81^n} \quad \dfrac{10^{2n}}{81^n}$ is

    1) 2   2) 0   3) 1/2   4) 1

218. If $a \neq b \neq c$, the value of x which satisfies the equation $\begin{vmatrix} 0 & x - a & x - b \\ x + a & 0 & x - c \\ x + b & x + c & 0 \end{vmatrix} = 0$, is

    1) $x = 0$

    2) $x = a$

    3) $x = b$

4) x = c

219. For how many value(s) of x in the closed internal [-4, -1], is the matrix

$$\begin{bmatrix} 3 & -1+x & 2 \\ 3 & -1 & x+2 \\ x+3 & -1 & 2 \end{bmatrix}$$ singular ?

1) 2   2) 0   3) 3   4) 1

220. If $^8C_r - {}^7C_3 = {}^7C_2$, then r is equal to

1) 3   2) 4   3) 8   4) 6

221.
The value of $\dfrac{1}{r_1^2}+\dfrac{1}{r_2^2}+\dfrac{1}{r_3^2}+\dfrac{1}{r^2}$ is

1) 0

2)

3) $\dfrac{a^2+b^2+c^2}{\Delta^2}$

4) $\dfrac{\Delta^2}{a^2+b^2+c^2}$

$\dfrac{a^2+b^2+c^2}{\Delta}$

222. The slopes of the lines given by the equation

$3x^2 + 10xy + 3y^2 - 15x - 21y + 18 = 0$ are

1) 3 and (1/3)
2) -3 and -(1/3)
3) -3 and (1/3)
4) 3 and -(1/3)

223. If function

$$f(x) = \begin{cases} x, & \text{if x is rational} \\ 1-x, & \text{if x is irrational} \end{cases}$$, then the number of points at which $f(x)$ is continuous, is

1) ∞
2) 1
3) 0
4) None of these

224. If $x^m y^n = (x + y)^{m+n}$, then (dy/dx) is

1) (x + y)/xy
2) xy
3) x/y
4) y/x

225. $\displaystyle\int \frac{1 + x + \sqrt{x + x^2}}{\sqrt{x} + \sqrt{1 + x}} \, dx$ is equal to

 1) $(1/2) \sqrt{(1 + x)} + C$

 2) $(2/3) (1 + x)^{3/2} + C$

 3) $\sqrt{(1 + x)} + C$

Answer Key

1) 2	2) 1	3) 3	4) 2	5) 1	6) 3	7) 1	8) 2	9) 3	10) 2
11) 3	12) 4	13) 3	14) 3	15) 1	16) 4	17) 3	18) 4	19) 4	20) 2
21) 3	22) 2	23) 2	24) 3	25) 1	26) 3	27) 4	28) 1	29) 2	30) 2
31) 2	32) 3	33) 2	34) 1	35) 3	36) 1	37) 3	38) 3	39) 4	40) 4
41) 1	42) 2	43) 3	44) 2	45) 3	46) 2	47) 4	48) 4	49) 3	50) 2
51) 3	52) 1	53) 3	54) 3	55) 2	56) 3	57) 3	58) 3	59) 3	60) 3
61) 3	62) 4	63) 4	64) 3	65) 3	66) 1	67) 2	68) 1	69) 3	70) 4
71) 3	72) 3	73) 4	74) 3	75) 3	76) 1	77) 4	78) 2	79) 2	80) 1
81) 1	82) 2	83) 4	84) 2	85) 1	86) 2	87) 1	88) 4	89) 2	90) 2
91) 2	92) 4	93) 3	94) 3	95) 3	96) 3	97) 4	98) 3	99) 2	100) 3
101) 3	102) 2	103) 2	104) 4	105) 4	106) 2	107) 2	108) 2	109) 2	110) 3
111) 2	112) 3	113) 1	114) 4	115) 1	116) 1	117) 1	118) 2	119) 2	120) 4
121) 1	122) 1	123) 3	124) 1	125) 2	126) 1	127) 4	128) 1	129) 3	130) 2
131) 3	132) 1	133) 2	134) 2	135) 3	136) 3	137) 2	138) 2	139) 4	140) 1
141) 1	142) 3	143) 2	144) 4	145) 4	146) 3	147) 3	148) 2	149) 1	150) 3
151) 3	152) 1	153) 2	154) 1	155) 2	156) 1	157) 1	158) 2	159) 3	160) 3
161) 1	162) 3	163) 3	164) 3	165) 4	166) 1	167) 2	168) 3	169) 3	170) 1
171) 4	172) 4	173) 4	174) 1	175) 2	176) 2	177) 2	178) 2	179) 3	180) 2
181) 3	182) 4	183) 3	184) 2	185) 3	186) 2	187) 2	188) 1	189) 2	190) 4
191) 4	192) 1	193) 1	194) 1	195) 2	196) 3	197) 2	198) 1	199) 1	200) 2
201) 1	202) 1	203) 3	204) 3	205) 2	206) 4	207) 1	208) 1	209) 1	210) 2
211) 3	212) 3	213) 2	214) 2	215) 1	216) 4	217) 4	218) 1	219) 4	220) 1
221) 2	222) 2	223) 3	224) 4	225) 2					