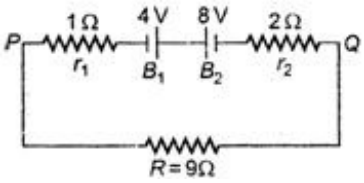
UP-CPMT - 2001

Paper-2

Physics

1. Two batteries of emf 4V and 8V with internal resistance 1Ω and 2Ω are connected in a circuit with a resistance of 9 Ω shown in figure. The current in circuit is :



   1) 1/2 A
   2) (1/3) A
   3) (1/6) A
   4) 1/4 A

2. The reading of hot wire ammeter connected in AC circuit is 10 A. The peak value of current is :
   1) 10 A
   2) $20\sqrt{2}$ A
   3) $10\sqrt{2}$ A
   4) 20 A

3. In Bohr's model, the radius of Bohr's first orbit in H-atom is a_0. The radius of Bohr's third orbit will be :
   1) $a_{0/9}$
   2) $a_0/3$
   3) $3a_0$
   4) $9a_0$

4. Light appears to travel in straight line because :
   1) its velocity is very large
   2) its wavelength is very small
   3) it is formed of corpuscles
   4) its frequency is very small

5. A body is rotating with angular velocity $\vec{\omega} = (3\hat{i} - 4\hat{j} + \hat{k})$. The linear velocity of a point having position vector $\vec{r} = (5\hat{i} - 6\hat{j} + 6\hat{k})$ is :
   1) $8\hat{i} + 2\hat{j} - 3\hat{k}$

2) $18\hat{i} + 13\hat{j} - 2\hat{k}$

3) $-18\hat{i} - 13\hat{j} + 2\hat{k}$

4) $9\hat{i} - 2\hat{j} + 16\hat{k}$

6. The molecular weight of a gas is 44. The volume occupied by 2.2 g of this gas at 0°C and 2 atmospheric pressure will be :

1) 2.8 L

2) 0.56 L

3) 11.2 L

4) 22.4 L

7. $[ML^{-1}T^{-1}]$ stand for dimensions of :

1) work

2) torque

3) Energy

4) coefficient

8. A boat crosses a river with a velocity of 8 km/h. If the resulting velocity of boat is 10 km/h, then the velocity of river water is :

1) 4 km/h

2) 6 km/h

3) 16 km/h

4) 32 km/h

9. At what depth below the surface of earth the acceleration due to gravity g will, be half of its value 1600 km above the surface of earth ?
(Radius of earth = 6400 km)

1) 2126 km

2) 2526 km

3) 3548 km

4) 4352 km

10. In a capillary tube water rises by 2 mm. The height of water that will rise in another capillary tube of half to radius, will be :

1) 2 mm

2) 6 mm

3) 4 mm

4) 10 mm

11. During a mean life of a radioactive element the fraction that disintegrates is :

1) e-1

2) 1/e-1

3) (e - 1)/e

4) e/(e - 1)

12. The necessary condition for the bob of a pendulum to execute SHM is :

1) the length of pendulum should be small

2) the mass of bob should be small

3) amplitude of oscillations should be small

4) the velocity of bob should be small

13. The bob of a simple pendulum is a hollow sphere filled with water. If a hole is made at its bottom, so that water emerges out slowly, then time period of oscillations :

1) will go on increasing

2) will go on decreasing

3) will remain unchanged

4) will first increase and then decrease

14. An electron enters in an electric field of magnitude 50×10^2 V/m. If (e/m) of an electron is 1.76×10^{11} C/kg, then the acceleration of electron (in m/s^2) is :

1) zero

2) 4.4×10^{12}

3) 7.2×10^{14}

4) 8.8×10^{14}

15. For lenses of focal lengths +5 cm, +20 cm, +100 cm and +200 cm are available for making and astronomical telescope. To produce largest magnification, the focal length of the objective (f_o) and of eye piece (f_e) should be :

1) f_o = +10 cm, f_e = +5 cm

2) f_o = +200 cm, f_e = +5 cm

3) f_o = +100 cm, f_e = +50 cm

4) f_o = +100 cm, f_e = +5 cm

16. Two bodies having masses 4 g and 9 g respectively have equal kinetic energies. The ratio of their momenta is :

1) 16 : 9

2) 9 : 16

3) 3 : 2

4) 2 : 3

17. An air column of length 20 cm resonates with a tuning fork of frequency 500 Hz, the speed of sound is :

1) 150 m/s

2) 300 m/s

3) 400 m/s

4) 500 m/s

18. Two charges each of 2 μC are placed 0.5 m apart in air. The force between them is :

1) 0.144 N

2) 1.44 N

3) 14.4 N

4) 0.0144 N

19. An electric current passes through a long straight wire. The magnetic field at a distance 5 cm from the wire is B, the magnetic field at a distance of 20 cm from the wire will be :

1) 8B 2) B/8 3) B/4 4) 4B

20. A plano-convex lens is made of glass of refractive index 1.6. The radius of curvature of the curved surface is 60 cm. The focal length of the lens is :

1) 0.50 m

2) 1.00 m

3) 3.00 m

4) 5.00 m

21. A black body of surface area 10 cm^2 is at 27°C. The rate of energy rediated by it is E. If its temperature is raised to 627°C, the rate of energy radiated will increase by :

1) 20 E 2) 40 E 3) 80 E 4) 90 E

22. A satellite is revolving around the earth at a height of 1200 km. A ball is released from the satellite. Then, (neglect friction of air) :

1) the ball will fall down vertically on earth

2) the ball will go far away into space

3) the ball will fall to earth following spiral path

4) the ball will follow the satellite

23. The relation between critical angles of water-air (C_w) and glass-air (C_g) interfaces is :

1) $C_w = C_g$

2) $C_w > C_g$

3) $C_w < C_g$

4) C_w and C_g cannot be confirmed

24. Binding energies per nucleon of deuteron ($_1H^2$) and helium atom ($_2He^4$) are 1.1 MeV and 7 MeV respectively. If two deuteron atoms react to form a single helium atom, then the energy released is :

1) 12.3 MeV

2) 23.6 MeV

3) 39.9 MeV

4) 52.4 MeV

25. A ring of radius 20 cm is hinged from a point on its periphery. The time period of its oscillations will be : (g = 9.8 m/s)

1) 4 s

2) $(2\pi/7)$ s

3) $(2\sqrt{2}\pi/7)$ s

4) $(\sqrt{2}\pi/7)$ s

26. If the energy released in the fission of one nucleus is 3.2×10^{-11} J. Then the numbers of nuclei required per second in a power plant of 16 kW is (assume efficiency of plant = 1%)

1) 5×10^{12}

2) 5×10^{14}

3) 5×10^{18}

4) 51.2×10^{20}

27. The speed of a wave in a medium is 1500 m/s. If 3600 waves pass through a point in 1 min in this medium, then the wavelength of wave is :

1) 25 m

2) 50 m

3) 75 m

4) 100 m

28. The work function is a metal is 2 eV. The threshold wavelength for photoelectric effect wavelength for photoelectric effect is nearly :

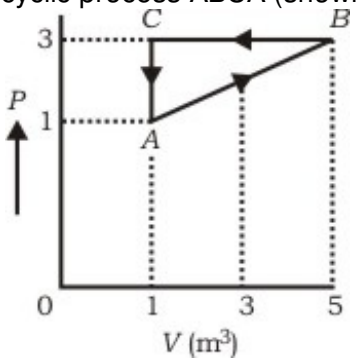
1) 130 nm

2) 260 nm

3) 620 nm

4) 1240 nm

29. The heat supplied to gas in the cyclic process ABCA (shown in figure) is :



1) -3 J

2) 4 J

3) -4 J

4) 6 J

30. The equation of a progressive wave is y = 0.3 sin (314t - 1.57x) the velocity of the wave is :

1) 50 m/s

2) 200 m/s

3) 250 m/s

4) 450 m/s

31. Two drops of a liquid coalesce to form a single big drop. In this process :

1) energy is released

2) energy is absorbed

3) energy remains unchanged

4) energy may increase or decrease depending on index of liquid

32. Three capacitor of capacitances 3 μF, 10 μF and 15 μF are connected in series to a voltage source of 100 V. The charge on 15 μF capacitor is :

1) 300 μC

2) 150 μC

3) 200 μC

4) 500 μC

33. A body when heated emits radiations of all possible wavelengths. Then the body is said be :

1) good unconductor

2) Kirchhoff 's body

3) black body

4) polished body

34. A voltmeter has range 0 - V_1 volt with a series resistance of R. When series resistance is increased to 2R. The range becomes 0 - V_2 volt. The correct relation between V_1 and V_2 is :

1) $V_2 = 2V_1$

2) $V_2 > 2V_1$

3) $V_2 < 2V_1$

4) $V_2 = (3/2)V_1$ exactly

35. A wire is stretched by 5 mm when it is pulled by a certain force. If the wire of same material but of double the length and double the diameter be stretched by the same force, the elongation in wire will be :

1) 2.5 mm

2) 5 mm

3) 15 mm

4) 30 mm

36. Two open organ pipes give 4 beat's when sounded in these fundamental notes. If the lengths of pipes are 100 cm and 102.5 cm respectively, then the speed of sound is :

1) 128 m/s

2) 228 m/s

3) 328 m/s

4) 428 m/s

37. A particle is moving in a straight line along x-axis, its position is given by $x = 2t^2 + 2t + 4$ where x is in metre and t in second, the acceleration of the particle is :

1) $2\ m/s^2$

2) $4\ m/s^2$

3) $16\ m/s^2$

4) $32\ m/s^2$

38. The volume of a gas at 20°C is 100 cm^3 at 1 atmospheric pressure. When it is heated to 100°C, its volume coefficient of gas at constant pressure is :

1) $3.6 \times 10^{-3}/°C$

2) $3.6 \times 10^{-4}/°C$

3) $5.2 \times 10^{-3}/°C$

4) $6.2 \times 10^{-3}/°C$

39. A coil of area 100 cm^2 has 50 turns. It is placed in a magnetic field of 2×10^{-2} T at right angle to it. When the coil is removed from the field in time t the induced emf is 0.1 V, then the value of t is :

1) 0.01 s

2) 0.1 s

3) 0.25 s

4) 2.5 s

40. The equation of a stationary wave is given by $y = 0.4 \sin 160\pi t \cos(\pi/16)x$ where t is in second, x and y in cm, separation between successive nodes is :

1) 32 cm

2) 16 cm

3) 10 cm

4) 5 cm

41. At the same temperature if the densities of two diatomic gases are d_1 and d_2, then the

ratio of velocities of sound in these gases will be :

1) $\sqrt{(d_1/d_2)}$

2) $\sqrt{(d_2/d_1)}$

3) (d_1/d_2)

4) (d_2/d_1)

42. Which of the following nature of light waves is responsible for diffraction ?

1) Newton's corpulscular theory

2) Huygen's wave theory

3) Einstein's quantum theory

4) Maxwell's electromagnetic theory

43. When current in a coil is changed from 10 A in one direction to 10 A in opposite direction in 0.5 s, the induced emf is 1V. The self-inductance of the coil is :

1) 25 mH

2) 125 mH

3) 250 mH

4) 625 mH

44. Which one of the following is a thermodynamic functions ?

1) Work

2) Internal energy

3) Heat

4) Temperature

45. If at the same temperature and pressure, the densities of two diatomic gases are d_1 and d_2 respectively, the ratio of mean kinetic energy per molecules of gases will be :

1) 1 : 1

2) $d_1 : d_2$

3) $\sqrt{d_1} : \sqrt{d_2}$

4) $\sqrt{d_2} : \sqrt{d_1}$

46. For the production of X-rays, the target should be made of :

1) steel

2) copper

3) tungsten

4) aluminium

47. Silicon is doped with indium, then the resulting material is called :

1) insulator

2) n-type semiconductor

3) p-type semiconductor
4) superconductor

48. A heater is switched on. It attains temperature T. After some time it is switched off. If surroundings are at temperature T_0. Then :
    1) it is cooled to temperature T_0 and in the process it radiates heat to surroundings without absorbing any heat from them
    2) it is cooled to temperature less then T_0 because surroundings continue to absorb heat
    3) it is cooled to temperature T_0 and in this process it radiates heat to surroundings and also receives from surroundings
    4) it is cooled to temperature T_0 and then its temperature begins to rise because initially heater loses heat and after some time it receives radiations from surroundings

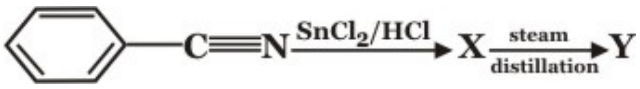
49. The null points of a bar magnet lie on the equatorial line of a bar magnet when its north pole of the magnet points along :
    1) north
    2) south
    3) east
    4) west

50. A coin, placed on a rotating turn-table stops, when it is placed at a distance of 9 cm from its centre. If the angular velocity of the turn-table is tripled, it will just stop at a distance r from centre. The value of r is :
    1) 1 cm
    2) 2 cm
    3) 8 cm
    4) 16 cm

Chemistry

51. Water gas is a mixture of :
    1) $H_2O + CO$
    2) $H_2O + CO_2$
    3) $CO + H_2$
    4) $CO + CO_2$

52. In adsorption of oxalic acid on activated charcoal, the activated charcoal is called :
    1) adsorber
    2) adsorbate
    3) adsorbent
    4) occlusion

53. 

Y is :

1) benzamide
2) benzophenone
3) benzoic acid
4) benzaldehyde

54. Maltose on hydrolysis produce :

1) glucose
2) fructose
3) mannose
4) galactose

55. Which law states entropy of all pure crystalline solids is zero at absolute zero?

1) First law of thermodynamics
2) Second law of thermodynamics
3) Third law of thermodynamics
4) Hess's law

56. The solubility product of calcium fluoride is 3.2×10^{-11} M^3. its solubility in saturated solution is :

1) 1×10^{-12} ML^{-1}
2) 2×10^{-4} ML^{-1}
3) 16×10^{-12} ML^{-1}
4) 16×10^{-4} ML^{-1}

57. Bauxite is an ore of :

1) Al 2) Fe 3) Pb 4) Cu

58. A solution of pH 9.0 is 1000 times as basic as a solution. The pH of this solution is :

1) 3 2) 13 3) 7 4) 6

59. The osmotic pressure of 12% solution of cane sugar at 17°C is :

1) 3.42 atm
2) 4.33 atm
3) 8.35 atm
4) 10.35 atm

60. If the solubility of lithium sodium hexafluoroaluminate is 'a' mol/L, its solubility product is :

1) a^8

2) $10a^5$

3) $180a^9$

4) $2916\ a^8$

61. The most abundant metal in the earth's crust is :

1) Al 2) Ca 3) Zn 4) Cu

62. Starch is a polymer of :

1) glucose
2) fructose
3) both (1) and (2)
4) none of these

63. The atomic number of an element is 17. The number of orbitals containing electron pairs in its valence shell is :

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

64. The substances whose presence decreases the activity of a catalyst are known as :

1) catalytic inhibitors
2) catalytic poison
3) auto-catalysts
4) induced catalysts

65. Molecular formula $C_4H_9NH_2$ shows how many isomers of primary amines?

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

66. Which one of the following is independent of temperature?

1) Normality
2) Molality
3) Molarity
4) Weight-volume percentage

67. Benzene on oxidation with V_2O_5 produce :

1) toluene
2) benzaldehyde
3) maleic anhydride
4) benzophenone

68. The product formed by the reaction between aniline and nitrous acid is :

1) nitrobenzene
2) benzene diazonium chloride

3) chlorobenzene

4) phenol

69. In pyrophosphoric acid the number of hydroxyl groups are :

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

70. The Nessler's reagent contains :

1) HgI^-_2

2) HgI_4^{2-}

3) HgI^{2+}

4) Hg_2^{2+}

71. If the solubility of $BaSO_4$ (mol. wt. 233) is 2.33×10^{-4}g/100 mL then the solubility product of $BaSO_4$ is :

1) 1×10^{-5} mol/L

2) 1×10^{-10} mol/L

3) 1×10^{-7} mol/L

4) 1×10^{-12} mol/L

72. Fusion of borane with NaOH produce :

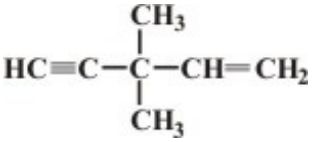
1) $B_2O_3 + H_2$

2) $NaBO_2 + H_2$

3) $Na_2B_4O_7 + H_2$

4) $Na_3BO_3 + H_2$

73. The IUPAC name of :



is :

1) 3, 3-dimethyl pent-1-ene-4-yne

2) 3, 3-dimethyl pent-1-yne-4-ene

3) 3, 3-dimethyl but-l-yne-4-ene

4) 3, 3-dimethyl but-l-ene-4-yne

74. The binding energy of an atom is 128 MeV. The binding energy per nucleon is 8, the number of nucleon is :

1) 2

2) 12

3) 16

4) 24

75. The shape of IF_5 is :

1) pentagonal bipyramidal
2) square pyramidal
3) octahedral
4) trigonal planar

76. Fluorine reacts with water to produce :

1) $HF + O_2 + O_3$
2) $HF + O_2$
3) $HF + OF_2$
4) $HF + O_3$

77. 2g of C_6H_5COOH dissolved in 25g of C_6H_6 shows a depression in freezing point equal to 1.62 K. If it forms dimer in solution the percentage association of acid is :
[C_6H_6 molal depression constant = 4.9 K^{-1} kg]

1) 77.2%
2) 99.2%
3) 88.2%
4) 79.4%

78. Reducing power of Ge^{2+}, Sn^{2+} and Pb^{2+} decreases in the order :

1) $Ge^{2+} > Sn^{2+} > Pb^{2+}$
2) $Sn^{2+} > Ge^{2+} > Pb^{2+}$
3) $Pb^{2+} > Sn^{2+} > Ge^{2+}$
4) $Sn^{2+} > Pb^{2+} > Ge^{2+}$

79. The action of enzymes in living system is to :

1) circulate oxygen
2) supply energy to tissue
3) create immunity
4) enhance the rate of biochemical reactions

80. Formation of isothiocyanate by heating a mixture of primary aliphatic amine, carbon disulphide, and mercuric chloride is known as :

1) Hell-Volhard-Zelinsky reaction
2) Hofmann mustard oil reaction
3) Gattermann-Koch reaction
4) Gabriel phthalimide reaction

81. Which is not a colligative property?

1) Osmotic pressure
2) Optical activity
3) Elevation in boiling point
4) Depression in freezing point

82. The pH of a solution obtained by mixing 5 g of CH_3COOH and 7.5 g of CH_3COONa and making the volume equal to 500 mL is :
[K_a for $CH_3COOH = 1.80 \times 10^{-5}$]

1) 1.8854
2) 4.7882
3) 8.1975
4) 5.9494

83. The reducing agent used in thermite process is :

1) MgO_2
2) Al
3) BaO_2
4) Cr_2O_3

84. Lead as impurity in the extraction of silver is removed by which process?

1) Cyanide process
2) Solvay process
3) Parke's process
4) Froth floatation process

85. Which one of the following is the weakest acid?

1) HCl 2) HBr 3) HF 4) HI

86. The co-ordination number of platinum in $[Pt(NH_3)_4Cl_2]^{2+}$ ion is :

1) 2 2) 4 3) 6 4) 10

87. 120 g of urea is present in 5 L of solution. The active mass of urea is :

1) 0.16
2) 0.8
3) 0.4
4) 0.32

88. The correct order of decreasing first ionization potential is :

1) Ca > K > Rb > Cs
2) Cs > Rb > K > Ca

3) Ca > Cs > Rb > K

4) K > Rb > Cs > Ca

89. $\underset{\text{acid chloride}}{RCOCl} + H_2 \xrightarrow{Pd/BaSO_4} \underset{\text{alkanal}}{RCHO} + HCl$

This reaction is known as :

1) Rosenmund's reduction

2) Stephen's reaction

3) Meerwein-Ponndorf Verley reduction

4) Clemmensen's reduction

90. The migration of colloidal particle under the influence of electric field towards an electrode is known as :

1) electrophoresis

2) electro-osmosis

3) Tyndall effect

4) Brownian movement

91. Which one of the following cannot act as a reducing agent?

1) CO_2

2) SO_2

3) NO_2

4) ClO_2

92. The gas formed by the reaction between ethylamine and sodium metal is :

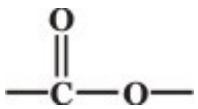
1) N_2

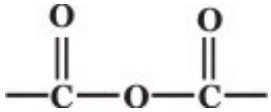
2) NH_3

3) H_2

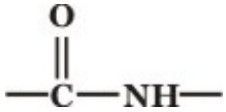
4) C_2H_5

93. The linkage present in proteins and peptides is :

1) 

2) 

3) 

4) 

94. The total number of electrons present in all the p-orbitals of bromine is :

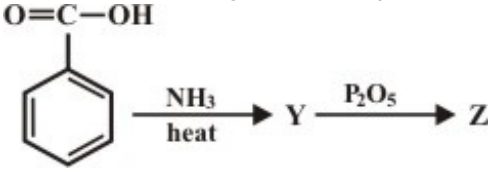
1) 7
2) 14
3) 17
4) 21

95. An organic compound of molecular formula C_3H_6O does not produce any precipitate with 2, 4-dinitrophenyl hydrazine and does not react with sodium metal. This compound is :
1) $CH_3—CO—CH_3$
2) $CH_2 = CH—OCH_3$
3) $CH_3—CH_2—CHO$
4) $CH_2 = CH—CH_2OH$

96. The enthalpies of formation of C_2H_2 (g) and C_6H_6 (g) at 298K are 230 and 85 kJ/mol respectively. The enthalpy change for the reaction is :
1) 605 kJ/mol
2) 775 kJ/mol
3) -605 kJ/mol
4) -775 kJ/mol

97. For an ideal gas Joule-Thomson coefficient is :
1) zero
2) negative
3) positive
4) depend on molecular weight

98. $$N_2(g)+3H_2(g) \underset{\text{200 - 900 atm Pressure}}{\overset{\text{Fe/MO, 500°C}}{\rightleftharpoons}} 2NH_3 + 22.4\text{kcal}$$
Formation of NH_3 by above reaction shows :
1) cyanide process
2) Serpeck's process
3) Haber's process
4) none of the above

99. From the following reactions product *Z* is :


1) benzamide
2) aniline
3) benzanilide

4) benzonitrile

100. The normality of H_2SO_4 having 50 milli equivalent in 2L is :

1) 2.25
2) 0.035
3) 0.050
4) 0.025

Answer Key

1) 2	2) 3	3) 4	4) 2	5) 3	6) 2	7) 4	8) 2	9) 4	10) 3
11) 3	12) 3	13) 4	14) 4	15) 2	16) 4	17) 3	18) 1	19) 3	20) 2
21) 3	22) 4	23) 2	24) 2	25) 3	26) 2	27) 1	28) 3	29) 3	30) 2
31) 1	32) 3	33) 3	34) 3	35) 1	36) 3	37) 2	38) 1	39) 2	40) 2
41) 2	42) 2	43) 1	44) 2	45) 1	46) 3	47) 3	48) 3	49) 1	50) 1
51) 3	52) 3	53) 4	54) 1	55) 3	56) 2	57) 1	58) 4	59) 3	60) 4
61) 1	62) 1	63) 1	64) 2	65) 3	66) 2	67) 3	68) 2	69) 3	70) 2
71) 2	72) 4	73) 1	74) 3	75) 2	76) 1	77) 2	78) 1	79) 4	80) 2
81) 2	82) 2	83) 2	84) 3	85) 2	86) 3	87) 3	88) 1	89) 1	90) 1
91) 1	92) 3	93) 4	94) 3	95) 2	96) 3	97) 1	98) 3	99) 4	100) 4