UP-CPMT - 2003

Paper-2

Physics

1. The values +1/2 and -1/2 of spin quantum number show :

   1) rotation of e^- clockwise and anticlockwise direction respectively

   2) rotation of e^- anticlockwise and clockwise direction respectively

   3) rotation in any direction according to convention

   4) none of the above

2. Acceleration due to gravity at earth's surface is g ms^{-2}. Find the effective value of gravity at a height of 32 km from sea level (R_e = 6400 km).

   1) 0.88 g ms^{-2}

   2) 0.99 g ms^{-2}

   3) 1.21 g ms^{-2}

   4) 0.77 g ms^{-2}

3. A body is moving in a circular path with acceleration a. If its velocity gets doubled, find the ratio of acceleration after and before the change.

   1) 1 : 4

   2) 1 : 2

   3) 1 : 1

   4) 4 : 1

4. If a capacitor of capacitance 10 μF has potential difference of 100 V across its ends. The energy stored in it is :

   1) 0.05 J

   2) 5 J

   3) 0.005 J

   4) 1 J

5. Distance between successive compression and rarefaction is 1 m and velocity of sound is 360 ms^{-1}. Find frequency.

   1) 180 Hz

   2) 90 Hz

   3) 135 Hz

   4) 15 Hz

6. If there is a straight line parallel to volume axis in a P-V diagram, then it is a ..... graph.
   1) isochoric
   2) isobaric
   3) isothermal
   4) none of these

7. If resistance of wire at 50°C is 5R Ω and at 100°C is 6R Ω. Find resistance at 0°C.
   1) zero
   2) 3R Ω
   3) 5R Ω
   4) 4R Ω

8. A body of mass 0.1 kg attains a velocity of 10 ms^{-1} in 0.1s. The force acting on the body is :
   1) 10 N
   2) 1 N
   3) 0.1 N
   4) 100 N

9. A ball is thrown upwards, it takes 4 s to reach back to the ground. Find its initial velocity :
   1) 50 ms^{-1}
   2) 60 ms^{-1}
   3) 40 ms^{-1}
   4) 20 ms^{-1}

10. If electric flux varies according to $\Phi = 3t^2 + 4t + 2$, find emf at t = 2s.
   1) 24 V
   2) 20 V
   3) 28 V
   4) 16 V

11. If relation between distance and time is $s = a + bt + ct^2$, find initial velocity and acceleration.
   1) b + 2ct, 2c
   2) b, 2c
   3) 2c, b
   4) b + 2c, 2c

12. A ball is dropped from height h and another from 2h. The ratio of time taken by the two balls to reach ground is :
   1) 1 : √2

2) $\sqrt{2} : 1$

3) 2 : 1

4) 1 : 1

13. If a sample of 16 g radioactive substance disintegrate to 1 g in 120 days, then what will be the half-life of the sample ?

1) 15 days

2) 45 days

3) 30 days

4) 105 days

14. If wavelength λ= 5400 Å is threshold value for a certain metal, then its work function would be :

1) 2.3 eV

2) 0.023 eV

3) 15 eV

4) 0.23 eV

15. A cube has point charges of magnitude - q at all its vertices. Electric field at the centre of the cube is :

1) $(1/(4\pi\varepsilon_0))\ (6q/3a^2)$

2) $(1/(4\pi\varepsilon_0))\ (4q/a^2)$

3) zero

4) $(1/(4\pi\varepsilon_0))\ (-4q/a^2)$

16. An object is placed at a distance of 10 cm from a convex lens of power 5D. Find the position of the image.

1) -20 cm

2) 50 cm

3) 20 cm

4) -50 cm

17. A source and observer are approaching each other with 50 ms^{-1} velocity. What will be original frequency if the observer receives 400 cycle/s?

1) 300 cycle/s

2) 420 cycle/s

3) 360 cycle/is

4) 480 cycle/s

18. At what temperature volume of an ideal gas at 0°C becomes triple?

1) 546°C

2) 282°C

3) 919°C

4) 746°C

19. Efficiency of engine working at 40°C and 20°C is :

1) 0.054 %

2) 0.64%

3) 54 %

4) 6.4 %

20. In an L-C-R circuit, if impedance is $\sqrt{3}$ times of resistance and capacitive reactance is zero. Find the phase difference.

1) zero 2) 30° 3) 60° 4) 90°

21. A man is at a height of 100 m. He sees a car which makes an angle of $\pi/6$ with man's position. If the car moves to a point where angle is $\pi/3$,what is the distance moved by it ?

1) $(50/\sqrt{3})$ m

2) $(200\sqrt{3})$ m

3) $(200/\sqrt{3})$ m

4) $(50\sqrt{3})$ m

22. An equilateral prism has $\mu = \sqrt{3}$. Its angle of minimum deviation will be :

1) 30°

2) 60°

3) 90°

4) 135°

23. If kinetic energy is doubled, find fractional change in momentum.

1) $\sqrt{2}$

2) 2

3) 1/2

4) $1/2\sqrt{2}$

24. In an adiabatic process :

1) $P^{\gamma}V$ = constant

2) $TV^{\gamma-1}$ = constant

3) PV = constant

4) all of these

25. If we hollow the ball of pendulum and fill it with sand, what would be the effect of change on the, centre of mass ?

1) It would distorted

2) Its value will decrease only
3) Its value will increase only
4) its value will first decrease and then increase

26. Maximum and minimum intensities obtained by two sources having intensities 4I and I are :
1) 5I, -I
2) 9I, I
3) 9I, -I
4) 5I, I

27. Amplitude of a pendulum is 60 mm and angular velocity is 2 rad s^{-1}. Find its velocity if its displacement is 20 mm.
1) 101 mm s^{-1}
2) 113 mm s^{-1}
3) 105 mm s^{-1}
4) 151 mm s^{-1}

28. A source is approaching a stationary observer with velocity (1/10) th that of sound. Ratio of observed and real frequencies will be :
1) 9/10 2) 7/10 3) 7/11 4) 10/9

29. A bar magnet is dropped between a current carrying coil. What would be its acceleration ?
1) g downwards
2) Greater than g downwards
3) Less than g downwards
4) Bar will be stationary

30. The angular velocity of second hand, of a clock is :
1) $(\pi/2)$ rad s^{-1}
2) $(\pi/15)$ rad s^{-1}
3) $(\pi/30)$ rad s^{-1}
4) $(\pi/90)$ rad s^{-1}

31. If n drops of potential V merge, find new potential on the big drop.
1) $n^{2/3}V$
2) n^3V
3) n^2V
4) $V^{n/3}$

32. If phosphorus and arsenic impurities are added to a semiconductor, then it becomes :

1) transistor
2) p-type semiconductor
3) amplifier
4) n-type semiconductor

33. If inductance of a coil is L and current passing through it is i_0, find of energy stored in it,
1) Li^2_0
2) $4Li^2_0$
3) Li^2_0
4) $(1/2)Li^2_0$

34. If separation between screen and source is increased by 2% what would be the effect on the intensity ?
1) Increases by 8%
2) Increases by 2%
3) Decreases by 8%
4) Decreases by 4%

35. Near earth's surface, time period of a satellite is 4 h. Find its time period at height 4R from the centre of earth.
1) 32 h
2) $(1/8^3\sqrt{2})$ h
3) $8\sqrt{2}$ h
4) 16 h

36. If reading of an ammeter is 10 A, the peak value of current is :
1) $(10/\sqrt{2})$ A
2) (5/2) A
3) (2/5) A
4) $(10\sqrt{2})$ A

37. If $\lambda = 10^{-10}$ m changes to $\lambda' = 0.5 \times 10^{-10}$ m, find energy difference (ΔE) give to the particle.
1) ΔE is equal to (1/4)th of initial energy
2) ΔE is equal to (1/2)th of initial energy
3) ΔE is equal to twice of initial energy
4) ΔE is equal to initial energy

38. Five resistances of resistance R Ω are there, three are connected in parallel and are joined to them in series. Find resultant resistance.
1) (3/7) R Ω

2) (7/3) R Ω
3) (9/7) R Ω
4) (7/9) R Ω

39. M_P and M_N are masses of proton and neutron respectively, at rest. If they combine to form deuterium nucleus. The mass of the nucleus will be
    1) less than Mp
    2) less than $(M_P + M_N)$
    3) less than $(M_P + 2M_N)$
    4) greater than $(M_P + 2M_N)$

40. Separation between slits is halved and between screen and slits is doubled. Find fringe width, if original is.
    1) 2W 2) 9W 3) 4W 4) 8W

41. One filament takes 10 min to heat a kettle and another takes 15 min if connected in parallel. They combindly take …. minute to heat the same kettle.
    1) 6
    2) 12.5
    3) 24
    4) 27.5

42. The means of energy transfer in vacuum is :
    1) irradiation
    2) convection
    3) radiation
    4) conduction

43. A fan is moving around its axis. What will be its motion regarded as ?
    1) Pure rolling
    2) Rolling with slipping
    3) Skidding
    4) Pure rotation

44. Two conductors having current in opposite directions .....
    1) attract each other
    2) repel each other
    3) do not affect each other
    4) effect depends on the material of wire

45. If maximum height and range of a projectile are same, what is the angle of projection ?
    1) 36° 2) 76° 3) 54° 4) 90°

46. If velocity of a charged particle is doubled and strength of magnetic field is halved, then radius becomes :

1) 16 times
2) 8 times
3) 4 times
4) 12 times

47. Magnification of a telescope having focal lengths of objective lens and eye piece f_o, and f_e respectively, is :

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

48. If force $\vec{F} = 5\hat{i} + 3\hat{j} + 4\hat{k}$ makes a displacement of $\vec{s} = 6\hat{i} - 5\hat{k}$ work done by the force is :

1) 10 units
2) 124 $\sqrt{2}$ units
3) $5\sqrt{122}$ units
4) 20 units

49. If the door of refrigerator is opened while connected to supply, the room gets :

1) cooled
2) heated
3) no effect
4) temperature is not given

50. Dimensions of relative density is :

1) $[ML^{-1}]$
2) $[ML^{-4}]$
3) dimensionless
4) $[M^1L^{-6}]$

Chemistry

51. Which one of the following pair shows Buffer's solution ?

1) NaCl + NaOH
2) $CH_3COONa + CH_3COOH$
3) $CH_3COOH + CH_3COONH_4$
4) $H_2SO_4 + CuSO_4$

52. Phenacetin is used as :

1) antipyretics
2) antiseptic
3) analgesic
4) antimalarials

53. Which of the following electronic configuration represents noble gas?

1) ns^2np^6
2) ns^2np^5
3) ns^2np^4
4) ns^2np^3

54. The molecule having largest dipole moment among the following is :

1) CHI_3
2) CH_4
3) $CHCl_3$
4) CCl_4

55. The compressibility factor of an ideal gas is :

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

56. In a chemical reaction two reactants takes part. The rate of reaction is directly proportional to the concentration of one of them and inversely proportional to the concentration of the other. The order of reaction is :

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

57. $C_6H_5NO_2 \xrightarrow{Sn/HCl} C_6H_5X$ 'X' is identified as :

1) NO
2) $-NH_2$
3) NHOH
4) none of these

58. The test for unsaturation is confirmed by the decolourisation of which of the following ?

1) Iodine water
2) $CuSO_4$ solution
3) Bromine water
4) All of these

59. 0.005 M acid solution has 5 pH. The percentage ionisation of acid is :

1) 0.1% 2) 0.5% 3) 0.4% 4) 0.2%

60. The metal used to recover copper from a solution of $CuSO_4$ is :

1) Fe 2) Hg 3) Na 4) Ag

61. Cadmium rods are used for which purpose ?

1) Emit electrons
2) Absorb neutrons
3) Emit neutrons
4) Absorb electrons

62. Which reaction is used for the preparation of acetophenone ?

1) Reimer-Tiemann reaction
2) Wurtz-Fittig reaction
3) Friedel-Craft's reaction
4) Cannizaro's reaction

63. Which of the following converts carbonyl compounds into hydrocarbons ?

1) H_2/Pt
2) $LiAlH_4$
3) $K_2Cr_2O_7/H_2SO_4$
4) Zn-Hg/HCl

64. Amino acids have peptide linkage which is :

1) —CO—NH—
2) —C—NH_2
3) —SO—NH—
4) —CO—N—

65. Gravity separation process is used for the concentration of :

1) calamine
2) haematite
3) chalcopyrite
4) bauxite

66. By dissolving 5 g substance in 50 g of water, the decrease in freezing point is 1.2°C. The gram molal depression is 1.85°C. The molecular weight of substance is :

1) 115.4
2) 118.2
3) 127.2
4) 154.2

67. Soaps can be classified as :

1) carbohydrates
2) ether
3) salts of fatty acids
4) none of these

68. PCl_3 and cold water reacts to produce which of the following ?

1) H_3PO_3
2) H_3PO_2
3) $H_4P_2O_7$
4) H_3PO_4

69. Which one of the following has unit positive charge and 1 amu mass ?

1) Electron
2) Neutron
3) Proton
4) None of these

70. What is the co-ordination number of body centred cube ?

1) 8
2) 10
3) 12
4) 0

71. Saturated fatty acids are represented by which of the formula ?

1) $C_nH_nO_2$
2) $C_nH_{3n}O_2$
3) C_nH_{2n+1}
4) $C_nH_{2n}O_2$

72. When H_2S gas is passed in a metal sulphate solution in presence of NH_4OH, a white precipitate is produced. The metal is identified as :

1) Zn 2) Fe 3) Pb 4) Hg

73. The value of amu is which of the following ?

1) 1.57×10^{-25} kg
2) 1.66×10^{-28} kg
3) 1.99×10^{-23} kg
4) 1.66×10^{-27} kg

74. CH_3COOH is weaker acid than H_2SO_4. It is due to :

1) more ionization
2) less ionization
3) covalent bond
4) electrovalent bond

75. Sodium pyrophosphate is represented by which of the following formula ?

1) $Na_2P_2O_4$
2) $Na_4P_2O_5$
3) $Na_4P_2O_7$
4) $Na_2P_2O_5$

76. How many neutrons are present in tritium nucleus ?

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

77. Which of the following chloride is water insoluble ?

1) HCl
2) AgCl
3) Both (1) and (2)
4) None of these

78. A gaseous mixture contains 56 g of N_2, 44 g of CO_2 and 16 g of CH_4. The total pressure of mixture is 720 mm of Hg. The partial pressure of methane is :

1) 30 atm
2) 60 atm
3) 180 atm
4) 90 atm

79. Acetonitriles on hydrolysis produce which of the following ?

1) Amide
2) Acid
3) Amines
4) Carbonyl compounds

80. 35.4 mL of HCl is required for the neutralization of a solution containing 0.275 g of sodium hydroxide. The normality of hydrochloric acid is :

1) 0.85 N
2) 0.145 N
3) 0.194 N
4) 0.248 N

81. When calcium acetate is distilled, it will produce which of the following compound ?

1) CH_3COOH
2) CH_3CHO
3) CH_2COCH_3
4) All of these

82. The correct sequence of hybridisation of methane, ethene and acetylene is :

1) sp, sp^2, sp^3
2) sp^2, sp^3, sp
3) sp^3, sp^2, sp
4) sp^3 sp, sp^2

83. The total number of protons in 10g of calcium carbonate is ($N_0 = 6.023 \times 10^{23}$) :

1) 3.01×10^{24}
2) 5.06×10^{24}
3) 4.01×10^{24}
4) 7.02×10^{24}

84. Which of the following compound shows aromatic properties ?

1) Valine
2) Leucine
3) Serine
4) Tyrosine

85. The high boiling point of water is due to which reason ?

1) Co-ordinate bonding
2) Covalent bond
3) Electrostatic force of attraction
4) Hydrogen bonding

86. Which is correct for an endothermic reaction ?

1) ΔH is positive
2) ΔH is negative
3) ΔE is negative
4) ΔH = zero

87. The radius of hydrogen atom is 0.53 Å. The radius of $_3Li^{2+}$ is of :

1) 2.27 Å
2) 0.17 Å
3) 1.57 Å

4) 1.99 Å

88. Which one of the following can produce hydrogen when treated with metallic sodium ?

1) $(CH_3)_2$ NH
2) CH_3NH_2
3) $C_6H_5NH_2$
4) CH_3CONH_2

89. Which phosphorus reacts with KOH solution to produce phosphene gas ?

1) White phosphorus
2) Red phosphorus
3) Both (1) and (2)
4) None of the above

90. The purest form of coal is :

1) peat
2) anthracite
3) bituminous
4) lignite

91. The volume of oxygen necessary for the complete combustion of 20 L of propane is :

1) 10 L
2) 25 L
3) 50 L
4) 100 L

92. $_{84}Rn^{219}$ is a member of actinium series. The other member of this series is :

1) $_{89}AC^{225}$
2) $_{90}Th^{232}$
3) $_{15}P^{34}$
4) $_{92}U^{235}$

93. The *ortho* and *para* hydrogen differ in respect of which of the following ?

1) In the molecular weight
2) In the nature of spin of protons
3) In the nature of spin of electrons
4) In the number of protons

94. What is the effect of dilution on the equivalent conductance of strong electrolyte ?

1) Decrease on dilution

2) Remains unchanged
3) Increase on dilution
4) None of the above

95. Which of the following is correct according to adsorption isotherm ?

1) $(x/m) \propto p^0$
2) $(x/m) \propto p^1$
3) $(x/m) \propto (1/p^{1/n})$
4) All of these

96. Propionic acid and KOH reacts to produce which one of the following ?

1) Potassium propionate
2) Propyl alcohol
3) Propionaldehyde
4) Does not react

97. PVC polymer can be prepared by which of the monomer ?

1) $CH_3CH = CH_2$
2) $C_6H_5CH = CH_2$
3) $CH_2 = CH_2$
4) $CH_2 = CH - Cl$

98. Which gas is evolved by the treatment of magnesium with very dilute solution of HNO_3 ?

1) N_2
2) NO_2
3) H_2
4) H_2O

99. Which of the following element shows maximum valency ?

1) Carbon
2) Barium
3) Nitrogen
4) Sulphur

100. Acetic acid and P_2O_5 reacts to produce which of the following ?

1) Acetic anhydride
2) Acetaldehyde
3) Phosphoric acid
4) Acetone

Answer Key

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