UP-CPMT - 2005

Paper-2

Physics

1. If the temperature difference on the two sides of a wall increases from 100°C to 200°C, its thermal conductivity :
   1) remains unchanged
   2) is doubled
   3) is halved
   4) becomes four times

2. A thermoelectric refrigerator works on :
   1) Joule effect
   2) Seebeck effect
   3) Peltier effect
   4) Thermionic effect

3. An arrow is shot into air. Its range is 200 m and its time of flight is 5 s. If $g = 10\ m/s^2$, then the horizontal component of velocity of the arrow is :
   1) 10 m/s
   2) 20 m/s
   3) 30 m/s
   4) 40 m/s

4. At which of the following temperatures, the value of surface tension of water is minimum ?
   1) 8°C
   2) 12.5°C
   3) 37.5°C
   4) 75°C

5. If C and R denote capacity and resistance, the dimensions of CR are :
   1) $[M^0L^0T]$
   2) $[ML^0T^0]$
   3) $[M^0L^0T^3]$
   4) not expressible in terms of M, L and T

6. A person standing in front of a mirror finds his image larger than himself. This implies that the mirror is :

1) convex
2) parabolic
3) plane
4) concave

7. In a sample of radioactive material, what percentage of the initial number of active nuclei will decay during one mean life :

1) 21% 2) 42% 3) 63% 4) 84%

8. On applying reverse bias to a junction diode, it :
   1) lowers the potential barrier
   2) raises the potential barrier
   3) increases the majority carrier current
   4) increases the minority carrier current

9. Two parallel wires carrying currents in the same direction attract each other because of :
   1) potential difference between them
   2) mutual inductance between them
   3) electric force between them
   4) magnetic force between them

10. A hydrogen atom is paramagnetic. A hydrogen molecule is :
   1) diamagnetic
   2) paramagnetic
   3) ferromagnetic
   4) none of these

11. When a drop splits up into a number of drops, then :
   1) area increases
   2) volume increases
   3) energy is absorbed
   4) energy is liberated

12. An electron with kinetic energy 5 eV is incident on a H-atom in its ground state. The collision :
   1) must be elastic
   2) may be partially elastic
   3) may be completely elastic
   4) may be completely inelastic

13. A ball of mass m elastically collides with a wall with velocity v, then change in its momentum is equal to :

1) 2 m
2) 2 mv
3) 4 mv
4) zero

14. A solid sphere is rotating about a diameter at an angular velocity ω. If it cools so that its radius reduces to (1/n)of its original value, its angular velocity becomes :
    1) ω/n
    2) ω/n^2
    3) $n\omega^2$
    4) $n^2\omega$

15. An electron and a proton are possessing same amount of kinetic energies. The de-Broglie wavelength is greater for :
    1) electron
    2) proton
    3) both (1) and (2)
    4) none of these

16. For the stability of any nucleus :
    1) binding energy per nucleon will be more
    2) binding energy per nucleon will be less
    3) number of electrons will be more
    4) none of the above

17. Two satellites A and B go around a planet P in circular orbits having radius 4 R and R respectively. If the speed of satellite A is 3v, then the speed of satellite B will be :
    1) 6v
    2) 5v
    3) 4v
    4) none of these

18. Let there be four articles having colours blue, red, black and white. When they are heated together and allowed to cool, which article will cool at the earliest ?
    1) Blue
    2) Red
    3) Black
    4) White

19. A small circular flexible loop of wire of radius *r* carries a current I. It is placed in a uniform magnetic field B. The tension in the loop will be doubled if :
    1) I is doubled

2) B is halved

3) *r* is doubled

4) both B and I are doubled

20. A light of wavelength 5000 Å falls on a sensitive plate with photoelectric work function 1.90 eV. Kinetic energy of the emitted photoelectrons will be :
(Given, h = 6.62 x 10^{-34} J-s)

1) 0.2 eV

2) 2 eV

3) 0.58 eV

4) 1.25 eV

21. Which of the following equations represents a wave travelling along y-axis ?

1) $y = A \sin (k x - \omega t)$

2) $x = A \sin (k y - \omega t)$

3) $y = A \sin k y \cos \omega t$

4) $y = A \cos k y \sin \omega t$

22. The difference between soft and hard X-rays is of :

1) velocity

2) intensity

3) frequency

4) polarization

23. A train approaches a stationary observer, the velocity of train being (1/20) of the velocity of sound. A sharp blast is blown with the whistle of the engine at equal intervals of a second. The interval between the successive blasts as heard by the observer :

1) (1/19) s

2) (1/19) min

3) (19/20) s

4) (19/20) min

24. Two spheres of radii R_1 and R_2 respectively are charged and joined by a wire. The ratio of electric fields of spheres is :

1) R_2^2/R_1^2

2) R_1^2/R_2^2

3) R_2/R_1

4) R_1/R_2

25. If the half-life of any sample of radioactive substance is 4 days, then the fraction of sample will remain undecayed after 2 days, will be :

1) 2

2) $1/\sqrt{2}$

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

4) 4

26. A 5 m aluminium wire ($Y = 7 \times 10^{10}$ N/m^2) of diameter 3 mm supports a 40 kg mass. In order to have the same elongation in a copper wire ($Y = 12 \times 10^{10}$ N/m^2) of the same length under the same weight, the diameter should be in mm :

1) 2.75

2) 4.0

3) 2.3

4) 3.2

27. An electrical cable of copper has just one wire of radius 9 mm. Its resistance is 5 Ω. The single wire of the cable is replaced by 6 different well insulated copper wires each of radius 3 mm. The total resistance of the cable will now be equal to :

1) 75 Ω

2) 90 Ω

3) 105 Ω

4) 7.5 Ω

28. The capacity of an isolated conducting sphere of radius R is proportional to :

1) R^2

2) $1/R^2$

3) $1/R$

4) R

29. An n-type semiconductor is :

1) negatively charged

2) positively charged

3) neutral

4) none of the above

30. In an oscillating L-C circuit, the maximum charge on the capacitor is Q. The charge on the capacitor, when the energy is stored equally between the electric and magnetic field is :

1) Q/2

2) $Q/\sqrt{2}$

3) $Q/\sqrt{3}$

4) Q

31. For a telescope, larger the diameter of the objective lens :

1) greater is the resolving power

2) smaller is the resolving power

3) greater is the magnifying power

4) smaller is the magnifying power

32. A current of 2 A flowing through a conductor produces 80 J of heat in 10 s. The resistance of the conductor is :

1) 0.5 Ω

2) 2 Ω

3) 6 Ω

4) 10 Ω

33. If v_g, v_x and v_m are the speeds of gamma rays, X-rays and microwaves respectively in vacuum then :

1) $v_g > v_m > v_x$

2) $v_g > v_x > v_m$

3) $v_g = v_x = v_m$

4) none of these

34. Two bodies of masses *m* and 2 *m* have equal kinetic energies. The ratio of their linear momenta is :

1) 1 : 1

2) 1 : 2

3) 1 : $\sqrt{2}$

4) 2 : 1

35. A galvanometer has resistance of 400 Ω and deflects full scale for current of 0.2 mA through it. The shunt resistance required to convert it into 3 A ammeter is :

1) 0.027 Ω

2) 0.009 Ω

3) 0.018 Ω

4) none of these

36. The power factor of a series L-C-R circuit when at resonance is :

1) zero

2) 0.4

3) 1.0

4) depends on values of L, C and R

37. For high frequency, capacitor offers :

1) more resistance

2) less resistance

3) zero resistance

4) none of these

38. If the critical angle for total internal reflection from medium to vacuum is 30°, the velocity of light in medium is :

1) 6×10^8 m/s
2) 1.5×10^8m/s
3) 4×10^8m/s
4) $\sqrt{2} \times 10^8$m/s

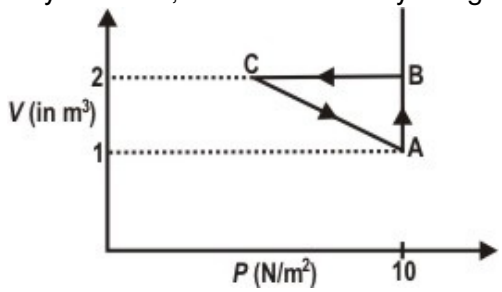
39. The period of oscillation of a simple pendulum of constant length at surface of the earth is T. Its time period inside a mine will be :

1) cannot be compared
2) equal to T
3) less than T
4) more than T

40. In isochoric process :

1) $\Delta W = 0$
2) $\Delta U = 0$
3) $\Delta Q = 0$
4) $\Delta T = 0$

41. An ideal gas is taken through the cycle A → B → C → A, as shown in figure. If the net heat supplied to the gas in the cycle is 5 J, the work done by the gas in the process. C → A is :



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

42. A particle executing simple harmonic motion has a time period of 4 s. After how much interval of time from $t = 0$ will its displacement be half of its amplitude ?

1) (1/3) s
2) (1/4) s
3) (2/3) s
4) (1/8) s

43. If a positive charge is shifted from a low potential region to a high potential energy :

1) decreases
2) increases
3) remains the same
4) may increase or decrease

44. The deviation is maximum for which colour :
1) violet
2) red
3) blue
4) green

45. A piece of red glass when heated in dark to red hot state will appear to be :
1) white
2) red
3) green
4) invisible

46. The relation between amplification factor (μ), plate resistance (r_p) and mutual conductance (g_m) of a triode valve is given by :
1) $\mu = r_p \times g_m$
2) $r_p = \mu \times g_m$
3) $g_m = \mu \times r_p$
4) none of these

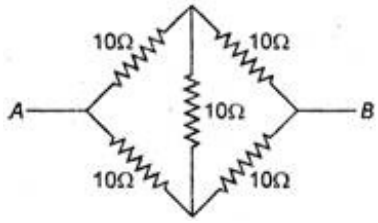
47. The emission of electrons is possible by :
1) photoelectric effect
2) thermionic effect
3) both (1) and (2)
4) none of the above

48. A force of 49 N is just able to move a block of wood weighing 10 kg on a rough horizontal surface. Its coefficient of friction is :
1) 0.2
2) 0.4
3) 0.5
4) 0.8

49. In single slit diffraction pattern :
1) central fringe has negligible width than others
2) all fringes are of same width
3) central fringes do not exist

4) none of the above

50. The equivalent resistance between A and B is :



1) 10 Ω
2) 15 Ω
3) 25 Ω
4) 35 Ω

Chemistry

51. Which gives nucleophilic addition most easily?

1) CH_3CHO
2) CH_3CH_2CHO
3) $CH_3—\underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}}—CHO$
4) HCHO

52. Lucas reagent reacts fastest with :

1) butanol-1
2) butanol-2
3) 2-methyl-propanol-2
4) 2-methyl-propanol-1

53. Hybridization present in ClF_3 is :

1) sp^2
2) sp^3
3) dsp^2
4) sp^3d

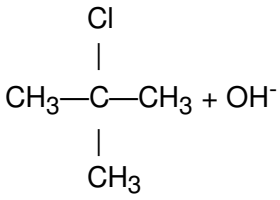
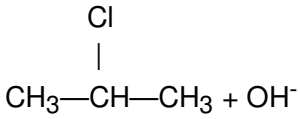
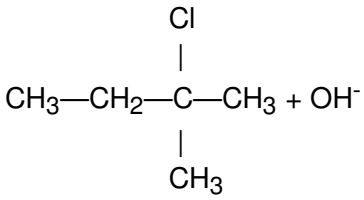
54. Normal solution is :

1) inert solution
2) acidic solution
3) one litre containing one equivalent
4) basic solution

55. Geometrical isomerism is found in :

1) pentene-1
2) propene
3) 2-butene
4) butene-1

56. S_N2 mechanism is involved in the following substitution :

1) $CH_3—CH_2—Cl + OH^-$
2) 
3) 
4) 

57. Oxidation number of sulphur in $H_2S_2O_8$ is :

1) +6
2) +10
3) +14
4) +7

58. Which is the correct relation for diffusion of gases?

1) $r \propto d$
2) $r \propto \sqrt{d}$
3) $r \propto (1/\sqrt{d})$
4) None of these

59. Number of electrons surrounding Kr in KrF_2 is :

1) 10
2) 5
3) 3
4) 7

60. Iodine is tested by the following reagent :

1) starch
2) urea

3) glucose
4) glycerol

61. Radioactive metal is :

1) Li 2) Ce 3) Na 4) Ra

62. K_2HgI_4 is used to test the following :

1) NH^+_4
2) Cl
3) Br
4) I

63. Phenol on reaction with Br_2 gives :

1) o-bromophenol
2) p-bromophenol
3) 2, 4, 6-tribromophenol
4) 1, 3, 5-tribromobenzene

64. Aniline with $CHCl_3$ and KOH on heating gives :

1) isocyanide
2) cyanide
3) phenol
4) salicylic acid

65. Bond order in benzene is :

1) 1 2) 2 3) 1.5 4) 3

66. Element having maximum ionization energy :

1) Na 2) Li 3) K 4) Rb

67. Following is estimated by Liebig method :

1) C and H
2) nitrogen
3) chlorine
4) bromine

68. HCHO reacts with NH_3 to give :

1) urotropine
2) bakelite
3) terylene
4) glyptal

69. Fuel used in nuclear reactor is :

1) plutonium
2) thorium
3) radium
4) deuterium

70. Reagent used to extract silver from Ag_2S is :

1) NaCN
2) NaCN in presence of O_2
3) NaCl
4) $AgNO_3$

71. Isotopic pair is :

1) $_{20}X^{40}$, $_{21}Y^{40}$
2) $_{20}X^{40}$, $_{20}Y^{41}$
3) $_{40}X^{20}$, $_{41}Y^{20}$
4) none of these

72. Following pair is separated by yellow ammonium sulphide :

1) CdS, Bi_2S_3
2) Bi_2S_3, PbS
3) PbS, HgS
4) CdS, Ag_2S_3

73. Cationic hydrolysis gives the following solution :

1) acidic
2) basic
3) neutral
4) amphoteric

74. Difference in the melting and boiling points of inert gases is :

1) large
2) small
3) no difference
4) none of these

75. Which has smallest size?

1) Na^+
2) Mg^{2+}

3) Ne

4) O^{2-}

76. Number of moles of $K_2Cr_2O_7$ reduced by one mole of Sn^{2+}?

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

77. Least ionised salt is :

1) KCl

2) AgCl

3) $MgCl_2$

4) $CaCl_2$

78. In exothermic reaction, heat is :

1) given out

2) absorbed

3) not involved

4) given out or absorbed

79. Suitable conditions for melting of ice :

1) high temperature and high pressure

2) high temperature and low pressure

3) low temperature and low pressure

4) low temperature and high pressure

80. Essential component of amalgam is :

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

81. Hydrolysis of sodium acetate gives :

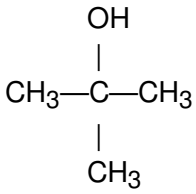
1) acidic solution

2) basic solution

3) amphoteric solution

4) neutral solution

82. Compound reacting with alkaline $KMnO_4$:

1)


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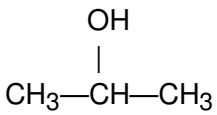


3) $(CH_3)_3$—C—CH_2OH

4) none of the above

83. Anode in the galvanic cell is :

1) negative electrode
2) positive electrode
3) neutral electrode
4) none of the above

84. Radioactive isotope of hydrogen is :

1) uranium
2) deuterium
3) tritium
4) none of these

85. Electron deficient molecule is :

1) CCl_4
2) PCl_5
3) BF_3
4) SF_6

86. Half-life of a radioactive element is :

1) 0.632
2) $1/(0.693)^2$
3) 0.693/k
4) k/0.693

87. Atomic number of an element is equal to the number of :

1) protons
2) neutrons
3) protons + electrons
4) protons + neutrons

88. Essential compound to manufacture acrolein is :

1) glycerol
2) benzene
3) phenol
4) ammonia

89. Phenol and benzoic acid may be distinguished by :

1) $NaHCO_3$

2) NaOH
3) Na
4) PCl_5

90. Correct order of basic nature is :

1) $NH_3 > CH_3NH_2 > C_6H_5NH_2$
2) $C_6H_5NH_2 > NH_3 > CH_3NH_2$
3) $CH_3NH_2 > NH_3 > C_6H_5NH_2$
4) none of the above

91. Number of unpaired electrons in O_2 molecule is :

1) zero 2) one 3) two 4) four

92. Electronic configuration of hydride ion is :

1) $1s^0$
2) $1s^1$
3) $1s^2$
4) $1s^2\,2s^1$

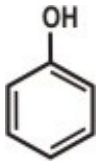
93. H–O–O bond angle in H_2O_2 is :

1) 90.4°
2) 91.4°
3) 105.5°
4) 94.8°

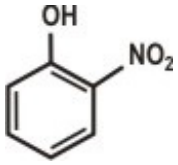
94. Element having maximum electron affinity is :

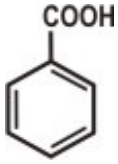
1) fluorine
2) chlorine
3) bromine
4) iodine

95. Most acidic is :

1) 

2) 

3) 

4) 

96. $Z \xrightarrow{PCl_5} X \xrightarrow{alc.KOH} Y \xrightarrow[2H_2O/\Delta]{conc.\ H_2SO_4} Z$

Here Z is :

1) $CH_3—CH_2—CH_2—OH$

2) $(CH_3)_3—C—OH$

3) $CH_3—\underset{\underset{OH}{|}}{CH}—CH_3$

4) none of the above

97. Nausadar is :

1) NH_4NO_3

2) NH_4Cl

3) $(NH_4)_2SO_4$

4) NH_4OH

98. Inorganic graphite is :

1) BN

2) BF_3

3) B_2H_6

4) none of these

99. Half-life of radioactive substance is 4 days. Amount of the substance decayed in two days is :

1) $1/\sqrt{2}$

2) $(1 - (1/\sqrt{2})\ N_0$

3) 30%

4) 1/16

100. Reason of passivity of iron is :

1) Fe_2O_3

2) Fe_3O_4

3) FeO

4) $Fe_2O_4 . 3H_2O$

Answer Key

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