PAPER – I
PHYSICS

1. A stone is just released from the window of a train moving along a horizontal straight track. The stone will hit the ground for an observer at the ground following a

(a) straight line path (b) circular path (c) parabolic path (d) hyperbolic path

2. Light travels through a glass plate of thickness t and having refractive index μ. If c be the velocity of light in vacuum, the time taken by the light to travel this thickness of glass is

(a) $\frac{t}{\mu c}$ (b) $t \mu c$ (c) $\frac{\mu t}{c}$ (d) $\frac{t c}{\mu}$

3. A ray of light is incident on the plane mirror at rest. The mirror starts turning at a uniform angular acceleration of 2π rad s^{-2}. The reflected ray, at the end of $\frac{1}{4}$ s must have turned through

(a) 90° (b) 45° (c) 22.5° (d) 11.25°

4. The Young's double slits experiment is performed with blue and with green light of wavelengths 4360 Å and 5460 Å respectively. If x is the distance of 4^{th} maxima from the central one, then

(a) x (blue) = x (green) (b) x (blue) > x (green)
(c) x (blue) < x (green) (d) x (blue) / x (green) = 5460 / 4360

5. Monochromatic light from a narrow slit illuminates two parallel narrow slits producing an interference pattern on a screen. The separation between the two slits is now doubled and the distance between the screen and the slits is reduced to half. The fringe width

(a) is doubled (b) becomes four times
(c) becomes one-fourth (d) remains the same

6. A transformer

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(a) transforms energy
(b) transforms frequency
(c) transforms voltage
(d) generates e.m.f.

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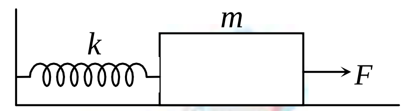
7. A block of mass 'm' is pulled by horizontal constant force F = 5μmg over a rough surface of coefficient of friction μ as shown. Initially spring was at its natural length, the position where block will finally comes to rest will be



(a) $\frac{\mu mg}{k}$ (b) $\frac{4\mu mg}{k}$ (c) $\frac{6\mu mg}{k}$ (d) $\frac{8\mu mg}{k}$

8. Two pure inductors, each of self inductance L are connected in parallel but are well separated from each other, then the total inductance is

(a) L (b) 2 L (c) L / 2 (d) L / 4

9. Two simple harmonic motions are represented by the equations $y_1 = a\sin(\pi t + \pi/3)$ and $y_2 = a\cos\pi t$. The phase difference of velocity of particle 1 w.r.t. velocity of particle 2 is

(a) $-\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $-\frac{\pi}{6}$ (d) $\frac{\pi}{3}$

10. The length, width and thickness of a block are (100.0 ± 0.1) cm, (10.00 ± 0.01) cm and (1.000 ± 0.001) cm respectively. The maximum possible error in its volume will be

(a) ± 0.111 cm^3 (b) ± 0.012 cm^3 (c) + 0.03 cm^3 (d) none of these

11. A thin rod of length f/3 is placed along the optic axis of a concave mirror of focal length f such that its image, which is real and elongated, just touches the rod. The magnification is

(a) 2 (b) 4 (c) 2.4 (d) 1.5

12. A particle subjected to two SHM along x and y directions according to x = 6 sin 100 π t and y = 8 cos (100 π t – π/2)

(a) motion of particle is ellipse (b) motion of particle is circle
(c) motion of particle is straight line (d) can't say

13. Moment of inertia of ring about any of diameters is I_0. The moment of inertia of the ring about any tangent perpendicular to the plane is

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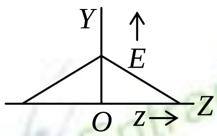
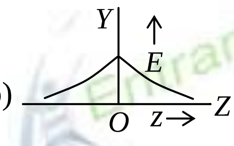
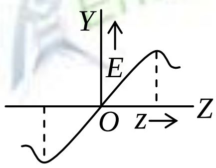
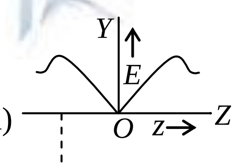
(a) I_0 (b) $2I_0$ (c) $3I_0$ (d) $4I_0$

14. A circular ring carries a uniformly distributed positive charge and lies in X–Y plane with centre at origin of co-ordinate system. If at a point (0, 0, z), the electric field is E, then which of the following graphs is correct?

(a)


(b)


(c)


(d)


15. The plane face of plano-convex lens of focal length 20 cm is silvered. This combination is equivalent to the type of mirror and its focal length is

(a) convex, f = 20 cm (b) concave, f = 20 cm
(c) convex, f = 10 cm (d) concave, f = 10 cm

16. A positively charged thin metal ring of radius R is fixed in $x - y$ plane with its centre at the origin O. A negatively charged particle P is released from rest at the point (0, 0, Z_0). Then the motion of P is

(a) periodic for all values of Z_0
(b) SHM for all values of Z_0 satisfying $0 < Z_0 < R$
(c) approximately SHM, provided $Z >> R$
(d) can't be said

17. For a solid sphere of radius R and mass M, the magnitude of gravitational field g and potential V due to the sphere at a distance 'r' from its centre are such that

(a) g and V both increase for $r < R$
(b) g increases and V decreases for $r < R$
(c) g and V both decrease, for $r < \infty$
(d) g and V with increase for $R < r < \infty$

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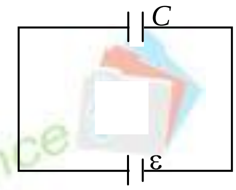
18. A capacitor of capacitance 'C' is connected with a battery of emf ε as shown. After full charging a dielectric of same size of capacitor and dielectric constant k is inserted then choose correct statements. (capacitor is always connected to battery)



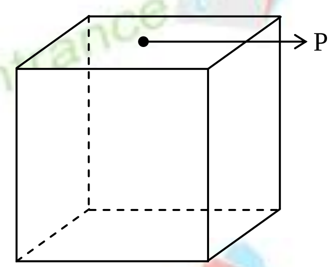
(a) electric field between plates of capacitor remain same

(b) charge on capacitor is $C\varepsilon$

(c) energy on capacitor decreased

(d) electric field between plates of capacitor increased.

19. A solid cube is placed on a horizontal surface. The coefficient of friction between them is μ, where $\mu < 1/2$. A variable horizontal force is applied on the cube's upper face, perpendicular to one edge and passing through the mid-point of edge, as shown in figure. The maximum acceleration with which it can move without toppling is



(a) $g\,(1 - 2\,\mu)$ (b) $g\,(1 + 2\,\mu)$ (c) $g\,/\,(1 - 2\mu)$ (d) $g\,/\,(1 + 2\,\mu)$

20. S.I. unit of inductance can be written as

(a) weber/ampere (b) Joule / ampere^2 (c) Ohm – second (d) all of the above

21. A bullet is fired horizontally from a rifle at a distant target. Ignoring the effects of air resistance, what are the horizontal and vertical accelerations of the bullet?

	Horizontal	vertical
(a)	9.8 m/s^2	9.8 m/s^2
(b)	9.8 m/s^2	0 m/s^2
(c)	0 m/s^2	9.8 m/s^2
(d)	0 m/s^2	0 m/s^2

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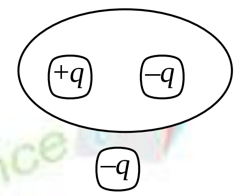
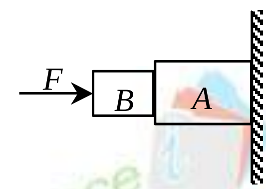
22. Shown in the figure is a distribution of charges. The flux of electric field due to these charges through the surface is



(a) $3\,q / \varepsilon_0$ (b) $2\,q / \varepsilon_0$
(c) q / ε_0 (d) zero

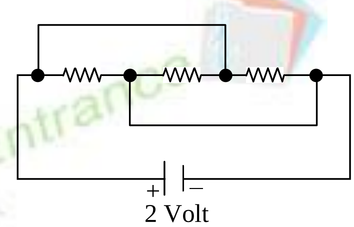
23. Consider the system shown in figure. The wall is smooth, but the surface of blocks *A* and *B* in contact are rough. The friction on *B* due to *A* in equilibrium is



(a) upward
(b) downward
(c) zero
(d) the system can not remain in equilibrium

24. The probability of a radioactive atom for not disintegrating till 3 times of its half life is
(a) 1/3 (b)1/4 (c) 1/8 (d) 7/8

25. Three equal resistances each of *R* ohm are connected as shown in the figure. A battery of 2 *V* and internal resistance 0.1 ohm is connected across the circuit. The value of *R* for which the heat generated in the circuit will be maximum if internal resistance of the cell is 0.1 Ohm.



(a) 0.3 Ω (b) 0.01 Ω (c) 0.1 Ω (d) 0.03 Ω

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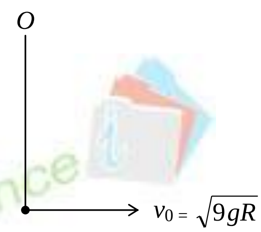
26. A ball is projected with horizontal velocity $\upsilon_0 = \sqrt{9gR}$ at the bottom most point attached with inextensible string of length R and fixed at O as shown. Tension in the string in horizontal position



(a) 3 mg (b) 5 mg
(c) 7 mg (d) 9 mg

27. A thermocouple is made from two metals, Antimony and Bismuth. If one junction of the couple is kept hot and the other is kept cold then, an electric current will

(a) flow from antimony to Bismuth at the cold junction
(b) flow from Antimony to Bismuth at the hot junction
(c) flow from Bismuth to Antimony at the cold junction
(d) net flow through the thermocouple

28. The time by a photoelectron to come out after the photon strikes is approximately

(a) 10^{-1}s (b) 10^{-4}s (c) 10^{-10}s (d) 10^{-16}s

29. The wavelength of a certain line in the x-ray spectrum for tungsten (Z = 74) is 200 Å. What would be the wavelength of the same line for platinum (Z = 78)? The screening constant a is unity.

(a) 179.76 Å (b) 189.76 Å (c) 289.76 Å (d) 379.76 Å

30. The threshold frequency for a metallic surface corresponds to an energy of 6.2 eV, and the stopping potential for a radiation incident on this surface 5 V. The incident radiation lies in

(a) X-ray region (b) ultra-violet region
(c) infra-red region (d) visible region

31. A particle executes simple harmonic motion along a straight line with an amplitude A. The potential energy is maximum when the displacement is

(a) $\pm A$ (b) zero (c) $\pm A/2$ (d) $\pm A/\sqrt{2}$

Space for rough work

32. When $_3Li^7$ nuclei are bombarded by protons, and the resultant nuclei are $_4Be^8$, the emitted particles will be

(a) neutrons (b) alpha particles

(c) beta particles (d) gamma photons

33. A solid which is transparent to visible light and whose conductivity increases with temperature is formed by

(a) Metallic binding (b) Ionic binding

(c) Covalent binding (d) Vander Waals binding

34. If the ratio of the concentration of electrons and that of holes in a semiconductor is $\frac{7}{5}$ and the ratio of currents is $\frac{7}{4}$, then what is the ratio of their drift velocities?

(a) $\frac{7}{4}$ (b) $\frac{5}{8}$ (c) $\frac{4}{5}$ (d) $\frac{5}{4}$

35. In a common base mode of a transistor, the collector current is 5.488 mA for an emitter current of 5.60 mA. The value of the base current amplification factor (β) will be

(a) 48 (b) 49 (c) 50 (d) 51

36. The potential energy of a 1 kg particle free to move along the x-axis is given by $U(x) = \left(\frac{x^4}{4} - \frac{x^2}{2}\right)J$. The total mechanical energy of the particle is 2 J. Then, the maximum speed (in m/s) is

(a) 2 (b) $3/\sqrt{2}$ (c) $\sqrt{2}$ (d) $1/\sqrt{2}$

37. A force of $-F\hat{k}$ acts on O, the origin of the coordinate system. The torque about the point (1, −1) is

(a) $-F(\hat{i} - \hat{j})$ (b) $F(\hat{i} - \hat{j})$ (c) $-F(\hat{i} + \hat{j})$ (d) $F(\hat{i} + \hat{j})$

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38. A thin circular ring of mass m and radius R is rotating about its axis with a constant angular velocity ω. Two objects each of mass M are attached gently to the opposite ends of a diameter of the ring. The ring now rotates with an angular velocity ω′ =

(a) $\frac{\omega m}{(m+2M)}$ (b) $\frac{\omega(m+2M)}{m}$ (c) $\frac{\omega(m-2M)}{(m+2M)}$ (d) $\frac{\omega m}{(m+M)}$

39. A small drop of water falls from rest through a large height h in air, the final velocity is

(a) proportional to $\sqrt{h}$ (b) proportional to h

(c) inversely proportional to h (d) independent of h

40. The work of 146 kJ is performed in order to compress one kilo mole of gas adiabatically and in this process the temperature of the gas increases by 7° C. The gas is

(R = 8.3 J mol^{-1} K^{-1})

(a) monoatomic (b) diatomic

(c) triatomic (d) a mixture of monoatomic and diatomic

41. The rms value of the electric field of the light coming from the Sun is 720 N/C. The average total energy density of the electromagnetic wave is

(a) 3.3×10^{-3} J/m^3 (b) 4.58×10^{-6} J/m^3 (c) 6.37×10^{-9} J/m^3 (d) 81.35×10^{-12} J/m^3

42. The Doppler effect can be observed for the following case (s)

(a) supersonic speed (b) ultrasonic waves (c) both of these (d) none of these

43. An electric bulb is rated 220 volt – 100 watt. The power consumed by it when operated on 110 volt will be

(a) 50 watt (b) 75 watt (c) 40 watt (d) 25 watt

44. Speed of sound wave is v. If a reflector moves towards a stationary source emitting waves of frequency f with speed u, the wavelength of reflected wave will be

(a) $\frac{v-u}{v+u}f$ (b) $\frac{v+u}{v}f$ (c) $\frac{v+u}{v-u}f$ (d) $\frac{v-u}{v}f$

45. The ‘rad’ is the correct unit used to report the measurement of

Space for rough work

(a) the rate of decay of radioactive source
(b) the ability of a beam of gamma ray photons to produce ions in a target
(c) the energy delivered by radiation to a target.
(d) the biological effect of radiation.

46. If the binding energy per nucleon in $_3^7Li$ and $_2^4He$ nuclei are 5.60 MeV and 7.06 MeV respectively, then in the reaction $_1^1H + _3^7Li \rightarrow 2_2^4He$ energy of proton must be

(a) 39.2 MeV (b) 28.24 MeV (c) 17.28 MeV (d) 1.46 MeV

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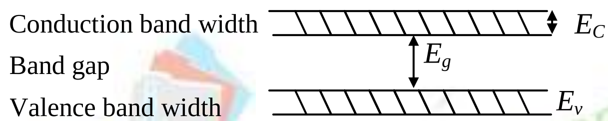
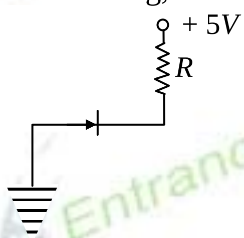
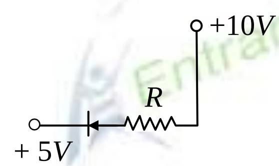
47. If the lattice constant of this semiconductor is decreased, then which of the following is correct?

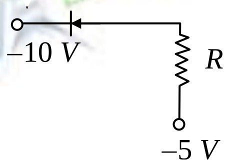


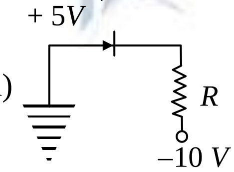
(a) All E_c, E_g, E_v decrease
(b) All E_c, E_g, E_v increase
(c) E_c, and E_v increase but E_g decrease
(d) E_c, and E_v, decrease E_g increase

48. In the following, which one of the diodes is reverse biased?

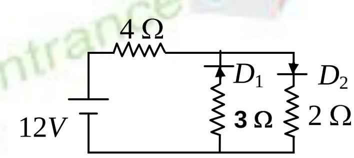
(a)


(b)


(c)


(d)


49. The circuit has two oppositely connected ideal diodes in parallel. What is the current flowing in the circuit?



(a) 1.33 A
(b) 1.71 A
(c) 2.00 A
(d) 2.31 A

50. A long soleniod has 200 turns per cm and carries a current i. The magnetic field at its centre is 6.28×10^{-2} Weber/m^2. Another long solenoid has 100 turns per cm and it carries a current $\frac{i}{3}$. The value of the magnetic field at its centre is

(a) 1.05×10^{-4} Weber/m^2
(b) 1.05×10^{-2} Weber/m^2
(c) 1.05×10^{-5} Weber/m^2
(d) 1.05×10^{-3} Weber/m^2

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51. Which of the following is true?

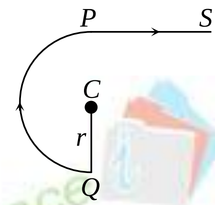
(a) Diamagnetism is temperature dependent

(b) Paramagnetism is temperature dependent

(c) Paramagnetism is temperature independent

(d) None of the above

52. The magnetic induction field at the centre C of the arrangement shown in figure is



(a) $\frac{\mu_0 i}{4\pi r}(1+\pi)$ (b) $\frac{\mu_0 i}{2\pi r}(1+\pi)$

(c) $\frac{\mu_0 i}{\pi r}(1+\pi)$ (d) $\frac{\mu_0 i}{r}(1+\pi)$

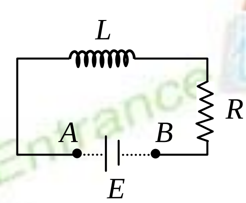
53. Two rigid boxes containing different ideal gases are placed on a table. Box A contains one mole of nitrogen at temperature T_0, while Box B contains one mole of helium at temperature (7/3) T_0. The boxes are then put into thermal contact with each other and heat flows between them until the gases reach a common final temperature. (Ignore the heat capacity of boxes). Then, the final temperature of the gases, T_f, in terms of T_0 is

(a) $T_f = \frac{5}{2}T_0$ (b) $T_f = \frac{3}{7}T_0$ (c) $T_f = \frac{7}{3}T_0$ (d) $T_f = \frac{3}{2}T_0$

54. Two spherical conductors A and B of radii 1 mm and 2 mm are separated by a distance of 5 cm and are uniformly charged. If the spheres are connected by a conducting wire then in equilibrium condition, the ratio of the magnitude of the electric fields at the surface of spheres A and B is

(a) 1 : 4 (b) 4 : 1 (c) 1 : 2 (d) 2 : 1

55. An inductor (L = 100 mH), a resistor (R = 100Ω) and a battery (E = 100V) are initially connected in series as shown. After a long time the battery is disconnected after short circuiting the points A and B. The current in the circuit 1 ms after the circuit is disconnected will be



(a) 1 A (b) 1/e A

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(c) $e\,A$ (d) $0.1\,A$

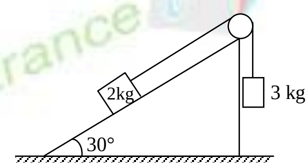
56. Two bodies A and B of equal mass are suspended from two separate massless springs of spring constant k_1 and k_2 respectively. If the bodies oscillate vertically such that their maximum velocities are equal, the ratio of the amplitude of A to that of B is

(a) $\frac{k_1}{k_2}$ (b) $\sqrt{\frac{k_1}{k_2}}$ (c) $\frac{k_2}{k_1}$ (d) $\sqrt{\frac{k_2}{k_1}}$

57. The centre of a wheel rolling on a plane surface moves with a speed v_0. A particle on the rim of the wheel at the same level as the centre will be moving at speed

(a) zero (b) v_0 (c) $\sqrt{2}\,v_0$ (d) $2v_0$

58. A system is shown in figure. Blocks 2 kg and 3 kg are at rest. Co-efficient of friction between 2 kg and incline is



(a) $\frac{2}{\sqrt{3}}$ (b) $\frac{1}{2}$

(c) $\frac{1}{3}$ (d) $\frac{1}{\sqrt{3}}$

59. An ice block moved downward on a inclined plane which makes 45^o with the horizontal plane. The time taken by block to move a certain distance is t. The time taken by the ice block to move the same distance on a frictionless plane which also make 45^o with the horizontal plane is $t/2$. Then coefficient of friction between the ice and the first plane is

(a) 0.5 (b) 0.65 (c) 0.75 (d) 0.35

60. Three identical spheres each of radius 10 cm and mass 1 kg are placed touching one another on a horizontal surface. Where is their centre of mass located?

(a) on the horizontal surface (b) at the point of contact of any two spheres

(c) at the centre of one ball (d) none of these

Space for rough work

CHEMISTRY

Atomic masses: H = 1, B = 10.8, C = 12, O = 16

61. There are two different HCl solutions having concentration 3M and 1 M respectively. How much volume of each solution should be mixed together to form one litre solution of concentration 1.2 M?

(a) 900 ml of 1M and 100 ml of 3M
(b) 100 ml of 1M and 900 ml of 3M
(c) 500 ml of each
(d) 250 ml of 1M and 750 ml of 3M

62. Consider the reaction $N_2 + 3H_2 \rightarrow 2NH_3$.
If molecular weights of NH_3 and N_2 are M_1 and M_2 and their equivalent weights are E_1 and E_2 respectively, then the value of $(E_1 - E_2)$ is:

(a) $\left(\frac{2M_1 - M_2}{6}\right)$
(b) $(M_1 - M_2)$
(c) $(3M_1 - M_2)$
(d) $(M_1 - 3M_2)$

63. The depression in freezing point of 93% aqueous solution of A is equal to that of 9% aqueous solution of B. Molecular weight of A is 60. Assuming both A and B are non volatile and non electrolytes, what would be the molecular weight of B?

(a) 90
(b) 45
(c) 20
(d) 180

64. The vapour pressure of a solution of non volatile solute in benzene is 722 mm Hg and that of solvent is 760 mm Hg at a certain temperature. The molality of the solution in mol kg^{-1} is

(a) 0.67
(b) 6.7
(c) 1.34
(d) 2.68

65. $2H_2S(g) \rightleftharpoons 2H_2(g) + S_2(g)$. At equilibrium there is 1 mole of H_2S, 0.2 mole of H_2 and 0.8 mole of S_2 in a 2L vessel. What is the value of equilibrium constant (K_c) of the given reaction?

(a) 0.004 mol L^{-1}
(b) 0.080 mol L^{-1}
(c) 0.016 mol L^{-1}
(d) 0.032 mol L^{-1}

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66. For a reaction A $\longrightarrow$ Products, it is found that rate of reaction increases by a factor of 6.25 when concentration of A is increased by a factor of 2.5. The order of reaction with respect to A is

(a) 2 (b) 2.5
(c) 0.5 (d) 1

67. For a first order reaction A $\longrightarrow$ Products, the rate of reaction at [A] = 0.2 mol L^{-1} is 10^{-2} mol L^{-1} min^{-1}. What is the half life of the reaction?

(a) 832 sec (b) 440 sec
(c) 416 sec (d) 14 sec

68. Equal volumes of a solution of pH = 5 and that of pH = 3 are mixed. The pH of the resulting solution is

(a) 4 (b) 3.3
(c) 5.0 (d) 4.5

69. Which one of the following species behaves both as an acid and base?

(a) HCO_3^- (b) NO_3^-
(c) CO_3^{2-} (d) SO_4^{2-}

70. Three faraday of electricity is passed through aqueous solutions of $AgNO_3$, $NiSO_4$ and $CrCl_3$ kept in three different vessels using inert electrodes. The ratio of moles of metals Ag, Ni and Cr deposited at the respective cathodes is

(a) 1 : 2 : 3 (b) 3 : 2 : 1
(c) 6 : 3 : 2 (d) 2 : 3 : 6

71. The hydrogen electrode is dipped in a solution of pH = 3 at 25ºC. The potential of hydrogen electrode would be

(a) 0.177 V (b) –0.177 V
(c) 0.087 V (d) 0.059 V

Space for rough work

72. $S + \frac{3}{2}O_2 \longrightarrow SO_3 + 2x$ kcal

$SO_2 + \frac{1}{2}O_2 \longrightarrow SO_3 + y$ kcal

Find out the heat of formation of SO_2 in kcal mol^{-1}.

(a) $2x - y$
(b) $\frac{2x - y}{2}$
(c) $y - 2x$
(d) $2y$

73. A monoatomic gas $\left(\gamma = \frac{5}{3}\right)$ is suddenly compressed to $\frac{1}{8}$ of its volume adiabatically, then the pressure of the gas will change to ……. times of its initial pressure.

(a) $\frac{24}{5}$
(b) 8
(c) $\frac{40}{3}$
(d) 32

74. If the reaction $X_2(g) + Y_2(s) \longrightarrow 2XY(g)$ is endothermic and spontaneous then

(a) $\Delta H < O, \Delta S > O$
(b) $\Delta H < O, \Delta S < 0$
(c) $\Delta H > O, \Delta S > O$
(d) $\Delta H > O, \Delta S < 0$

75. Which one of the following aqueous solutions will cause most rapid coagulation of As_2S_3 sol?

(a) 1 N–NaCl
(b) 1 N–$BaCl_2$
(c) 1 N–Na_3PO_4
(d) 1 N–$Al_2(SO_4)_3$

76. NaCl is doped with 2×10^{-3} mole% $SrCl_2$, the concentration of cation vacancies is

(a) 60.2×10^{18} mol^{-1}
(b) 12.04×10^{18} mol^{-1}
(c) 3.01×10^{18} mol^{-1}
(d) 12.04×10^{20} mol^{-1}

77. The coordination number of cation and anion in CaF_2 and TiO_2 are respectively

(a) 6 : 4 and 4 : 4
(b) 4 : 2 and 2 : 4
(c) 8 : 4 and 6 : 3
(d) 6 : 6 and 8 : 8

Space for rough work

78. Equal weights of two gases of molecular weight 4 and 40 are mixed. The pressure of mixture is 1.1 atm. The partial pressure of the lighter gas in the mixture is

(a) 0.55 atm
(b) 0.11 atm
(c) 1 atm
(d) 0.1 atm

79. ${}_{83}Bi^{213}$ decays with emission of an α-particle. The resulting nuclide emits a β-particle. The final nuclide is

(a) ${}_{83}Be^{213}$
(b) ${}_{81}Tl^{209}$
(c) ${}_{2}He^{4}$
(d) ${}_{82}Pb^{209}$

80. Which does not give a precipitate with $AgNO_3$ solution?

(a) $[Co(NH_3)_6]Cl_3$
(b) $[Co(NH_3)_5Cl]Cl_2$
(c) $[Co(NH_3)_4Cl_2]Cl$
(d) $[Co(NH_3)_3Cl_3]$

81. $(C_6H_5)_2\ [Pd(SCN)_4]$ and $(C_6H_5)_2[Pd(NCS)_4]$ are

(a) Linkage isomers
(b) Co-ordination isomers
(c) Ionization isomers
(d) Geometrical isomers

82. Which bond angle θ would result in maximum dipole moment for triatomic molecule YXY?

(a) $\theta = 90^o$
(b) $\theta = 120^o$
(c) $\theta = 180^o$
(d) $\theta = 150^o$

83. What is the hybridisation of As in AsF_4^- ?

(a) sp
(b) sp^2
(c) sp^3
(d) sp^3d

84. The ratio of difference in energy between first and second Bohr orbit to that between second and third Bohr orbit is

(a) $\frac{1}{2}$
(b) $\frac{1}{3}$
(c) $\frac{4}{9}$
(d) $\frac{27}{5}$

Space for rough work

85. Which electronic level would allow the hydrogen atom to absorb a photon, but not to emit a photon?
(a) 3s (b) 2p
(c) 2s (d) 1s

86. The number of electrons required to balance the following equation
$NO_3^- + 4H^+ + e^- \rightarrow 2H_2O + NO$
(a) 5 (b) 4
(c) 3 (d) 2

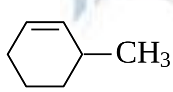
87. Lithopone is a mixture of
(a) $BaS + ZnSO_3$ (b) $BaSO_4 + ZnS$
(c) $BaSO_4 + ZnCO_3$ (d) $BaCO_3 + ZnCO_3$

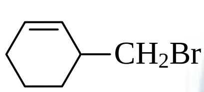
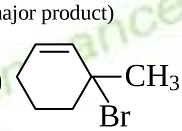
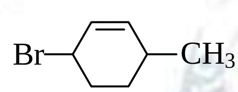
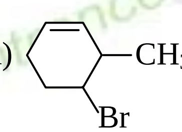
88. The size of given species are such that
(a) $I > I^+ > I^-$ (b) $I^+ > I^- > I$
(c) $I^- > I > I^+$ (d) $I > I^- > I^+$

89. Pb_3O_4 on heating gives
(a) $PbO + O_2$ (b) $PbO + O_3$
(c) $PbO_2 + O_2$ (d) $PbO_2 + O_3$

90. Carnallite is an ore of
(a) Cu (b) Fe
(c) Sn (d) Mg

91. $2Na_2S_2O_3 + I_2 \longrightarrow 2NaI + X$
X is
(a) Na_2SO_4 (b) SO_2
(c) $Na_2S_4O_6$ (d) Na_2S

92.  + NBS $\xrightarrow[\text{(major product)}]{}$ A. A is:

(a)  (b)  (c)  (d) 

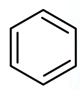
Space for rough work

93. Ketene contains

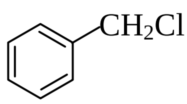
(a) only sp^2 hybridised C-atoms.
(b) only sp hybridised C-atoms.
(c) both sp and sp^2 hybridised C-atoms.
(d) all sp, sp^2, sp^3 hybridised C-atoms.

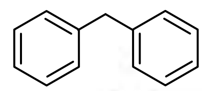
94. Which one of the following compounds is an electrophile?

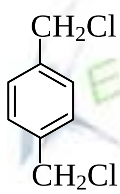
(a) Benzene
(b) Water
(c) Ethylene
(d) BF_3

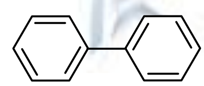
95.  + $CH_2Cl_2 \xrightarrow{AlCl_3}$ X. X is :

(excess)

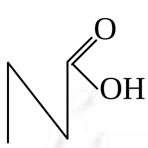
(a) 

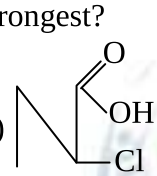
(b) 

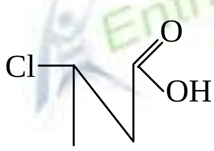
(c) 

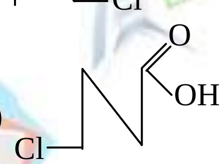
(d) 

96. Among the following organic acids, which is strongest?

(a) 

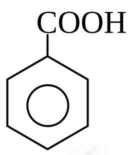
(b) 

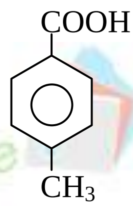
(c) 

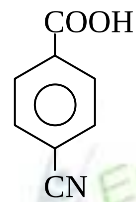
(d) 

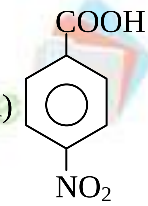
Space for rough work

97. Which of the following is least acidic?

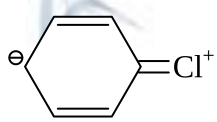
(a) 

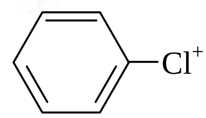
(b) 

(c) 

(d) 

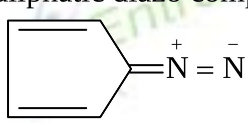
98. Which one of the following structures is most stable?

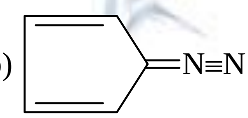
(a) 

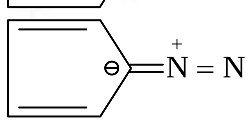
(b) 

(c) Both have equal stability
(d) Stability can't be compared

99. Which one of the following structures would not make any contribution to resonance hybrid of aliphatic diazo compound?

(a) 

(b) 

(c) 

(d) All have equal stability

100. Which one of the following compounds would have the highest heat of hydrogenation?

(a) $CH_2{=}CH_2$
(b) $CH_3{-}CH_2{-}CH{=}CH_2$
(c) $CH_3{-}CH{=}CH{-}CH_3$
(d) $(CH_3)_2C{=}C(CH_3)_2$

101. Which of the following is expected to be least soluble in water?

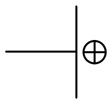
(a) CH_3NH_2
(b) $(CH_3)_2NH$
(c) $(CH_3)_3N$
(d) $C_2H_5NH_2$

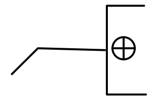
102. Carbon atom of singlet carbine is

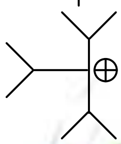
(a) sp^2 hybridised
(b) sp^3 hybridised
(c) sp hybridised
(d) sometimes sp^3 and sometimes sp^2

Space for rough work

103. Which one of the following carbonium ions is the most stable?

(a) 

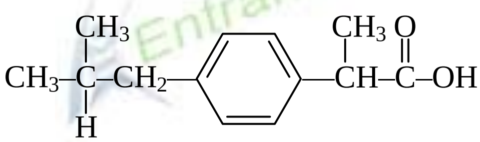
(b) 

(c) 

(d) $\overset{\oplus}{C}H_3$

104. Aniline when treated with CH_3COCl followed by Cl_2 / Fe and subsequently H_3O^+, produces …… as the major product.

(a) o-chloroaniline
(b) m-chloroaniline
(c) p-chloroaniline
(d) mixture of ortho and para-chloroaniline in equal amounts

105. 

The compound shows

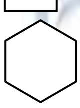
(a) Geometrical isomerism
(b) Optical isomerism
(c) Tautomerism
(d) None of these

106. What is A in the following reaction?

$CH_2{=}CH_2 + CH_2N_2 \longrightarrow A$

(a) 

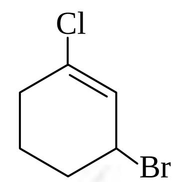
(b) 

(c) 

(d) 

Space for rough work

107. The IUPAC name of compound shown below is

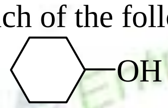
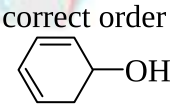
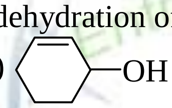
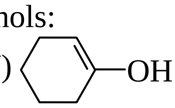


(a) 1-bromo-3-chlorocyclohexene
(b) 2-bromo-6-chlorocyclohex-1-ene
(c) 6-bromo-2-chlorocyclohexene
(d) 3-bromo-1-chlorocyclohexene

108. Phenyl magnesium bromide reacts with methanol to give

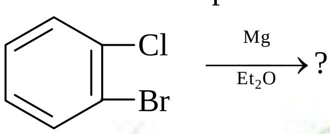
(a) a mixture of phenol and Mg(Me)Br
(b) a mixture of anisole and Mg(OH)Br
(c) a mixture of benzene and Mg(OMe)Br
(d) a mixture of toluene and Mg(OH)br

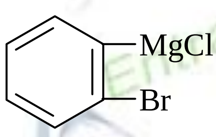
109. Which of the following is the correct order of ease of dehydration of the alcohols:

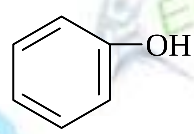
(I)  (II)  (III)  (IV) 

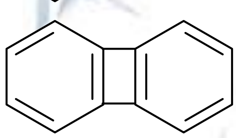
(a) (I) < (II) < (III) < (IV)
(b) (IV) < (I) < (III) < (II)
(c) (III) < (II) < (I) < (IV)
(d) (IV) < (II) < (I) < (III)

110. What is the end product in the following reaction?



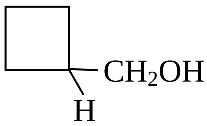
(a) 

(b) 

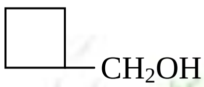
(c) 

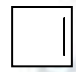
(d) none of these

Space for rough work

111.  $\xrightarrow{H^+}$ A?

A is

(a) 

(b) 

(c) 

(d) none of these

112. Reaction of ethyl formate with excess of CH_3MgI followed by hydrolysis gives

(a) n-propyl alcohol
(b) isopropyl alcohol
(c) acetaldehyde
(d) acetone

113. A compound C_3H_9N reacts with benzene sulphonyl chloride to give a solid insoluble in alkali. The compound is

(a) $CH_3CH_2CH_2NH_2$

(b) $(CH_3)(C_2H_5)NH$

(c) $(CH_3)_3N$

(d) $(CH_3)(H_3C)CH{-}NH_2$

114. Terylene contains

(a) Ester group
(b) Amide group
(c) Carboxylic group
(d) Nitro group

115. ‘Saran’ is trade name for

(a) Polyvinyl alcohol
(b) Polyacrylonitile
(c) Polyvinyl chloride
(d) Polystyrene

116. Final product upon hydrolysis of starch is

(a) glucose
(b) fructose

Space for rough work

(c) amylase

(d) amylopectin

117. The pyrimidine bases present in DNA are

(a) Cytosine and Uracil

(b) Cytosine and adenine

(c) Cytosine and guanine

(d) Cytosine and thymine

118. One mole each of monoatomic, diatomic and triatomic gases are mixed. $\frac{C_p}{C_v}$ for the mixture is

(a) 1.40

(b) 1.428

(c) 1.67

(d) none of these

119. According to Arrhenius equation the rate constant $k = Ae^{-E_a/RT}$. A straight line is obtained if

(a) k is plotted against $e^{-E_a/RT}$

(b) k is plotted against T

(c) k is plotted against $\frac{1}{T}$

(d) ln k is plotted against $\frac{1}{T}$

120. The heat of vaporization of benzene is 7353 cal mol^{-1}. The approximate boiling point of benzene is

(a) 77.1ºC

(b) 350.1ºC

(c) 201.6ºC

(d) 623.1ºC

Space for rough work