



AIPMT Exam 2015 (Paper & Solution)

Code – E

Date : 03-05-2015

Q.1 If energy (E), velocity (V) and time (T) are chosen as the fundamental quantities, the dimensional formula of surface tension will be -

- (1) $[EV^{-2}T^{-1}]$
- (2) $[EV^{-1}T^{-2}]$
- (3) $[EV^{-2}T^{-2}]$
- (4) $[E^{-2}V^{-1}T^{-3}]$

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Unit & Dimension, Example 8, Page no. 15]

Surface tension

$$S = E^x V^y T^z$$

$$M^1 L^0 T^{-2} = (M^1 L^2 T^{-2})^x (L^1 T^{-1})^y (T^1)^z$$

$$M^1 L^0 T^{-2} = M^x L^{2x+y} T^{-2x+z-y}$$

Comparing power of M

$$x = 1 \quad \dots(i)$$

Comparing power of L

$$2x + y = 0$$

$$2(1) + y = 0$$

$$y = -2 \quad \dots(ii)$$

Comparing power of T

$$-2x + z - y = -2$$

$$-2(1) + z - (-2) = -2$$

$$z = -2 \quad \dots(iii)$$

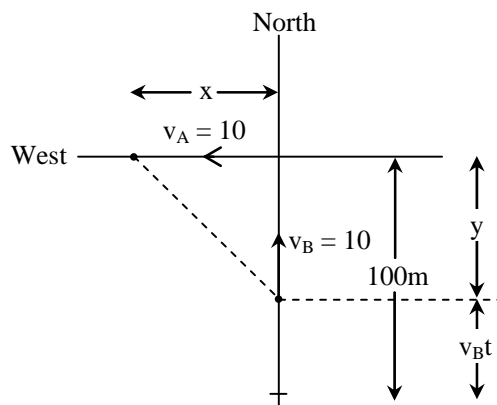
$$\text{So } S = E^1 V^{-2} T^{-2}$$

Q.2 A ship A is moving Westwards with a speed of 10 kmh^{-1} and a ship B 100 km South of A, is moving Northwards with a speed of 10 kmh^{-1} . The time after which the distance between them becomes shortest, is -

- (1) 0 h
- (2) 5 h
- (3) $5\sqrt{2}$ h
- (4) $10\sqrt{2}$ h

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Motion in one dimension, Classroom notes]



At time t : A will cover $10 t$ distance

So $x = - 10 t$

and B will cover $10 t$

$y = 100 - 10 t$

distance between them

$$= \sqrt{x^2 + y^2} = \sqrt{100t^2 + (100 - 10t)^2}$$

$$x = \sqrt{100t^2 + 10000 + 100t^2 - 2000t}$$

$$\Rightarrow x = \sqrt{200t^2 - 2000t + 1000}$$

for minimum distance $\frac{dx}{dt} = 0$

$$\Rightarrow 400 t - 2000 = 0 \Rightarrow t = \frac{2000}{400} = 5 \text{ h}$$

Q.3 A particle of unit mass undergoes one-dimensional motion such that its velocity varies according to

$$v(x) = \beta x^{-2n},$$

where β and n are constants and x is the position of the particle. The acceleration of the particle as a function of x , is given by -

(1) $- 2n\beta^2 x^{-2n-1}$

(2) $- 2n\beta^2 x^{-4n-1}$

(3) $- 2\beta^2 x^{-2n+1}$

(4) $- 2n\beta^2 e^{-4n+1}$

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Motion in one dimension, Classroom notes/Minor Test CP]

$$v = \beta x^{-2n}$$

$$\text{acceleration } a = v \frac{dv}{dx}$$

$$= \beta x^{-2n} \frac{d}{dx} [\beta x^{-2n}]$$

$$= \beta x^{-2n} \beta \times - 2n x^{-2n-1}$$

$$= - 2n\beta^2 x^{-4n-1}$$

So option (2) is correct.

Q.4 Three blocks A, B and C of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is -



(1) 2 N

(2) 6 N

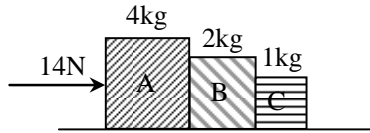
(3) 8 N

(4) 18 N

Ans. [2]

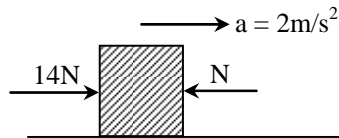


Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Laws of motion, Ex. 3(B), Q.1, Page no. 53]



$$\text{Acceleration of all block} = \frac{F}{M_{\text{total}}} = \frac{14}{4 + 2 + 1} = 2 \text{ m/s}^2$$

Free body diagram of A



$$14 - N = 4 \times 2$$

$$N = 14 - 8 = 6 \text{ N}$$

Q.5 A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of kinetic friction between the block and the table is μ_k . When the block A is sliding on the table, the tension in the string is -

(1) $\frac{(m_2 + \mu_k m_1)g}{(m_1 + m_2)}$

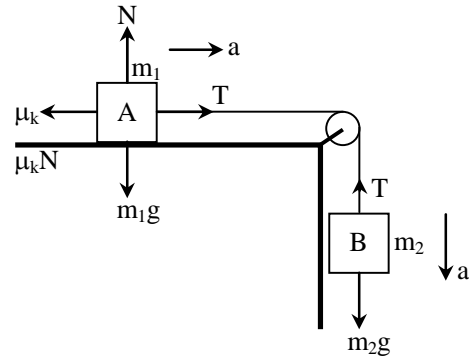
(2) $\frac{(m_2 - \mu_k m_1)g}{(m_1 + m_2)}$

(3) $\frac{m_1 m_2 (1 + \mu_k)g}{(m_1 + m_2)}$

(4) $\frac{m_1 m_2 (1 - \mu_k)g}{(m_1 + m_2)}$

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Friction, Ex. 2, Q.46, Page no. 49]



For motion of B

$$m_2 g - T = m_2 a \quad \dots(i)$$

For A : $N = m_1 g \quad \dots(ii)$

For motion of A

$$T - \mu_k N = m_1 a \quad \dots(iii)$$

From (ii) & (iii)

$$T - \mu_k m_1 g = m_1 a \quad \dots(iv)$$

From (i) & (iv)

$$m_2 g m_1 - T m_1 - T \times m_2 + \mu_k m_1 m_2 g = 0$$

$$T = \frac{m_1 m_2 (1 + \mu_k) g}{(m_1 + m_2)}$$

Q.6 Two similar springs P and Q have spring constants K_P and K_Q , such that $K_P > K_Q$. They are stretched, first by the same amount (case a), then by the same force (case b). The work done by the springs W_P and W_Q are related as, in case (a) and case (b), respectively -

(1) $W_P = W_Q ; W_P > W_Q$

(2) $W_P = W_Q ; W_P = W_Q$

(3) $W_P > W_Q ; W_Q > W_P$

(4) $W_P < W_Q ; W_Q < W_P$

**Ans.** [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Work, Power & Energy, Ex. 3(B), Q.44, Page no. 105]

Case (a) :

When they are stretched by same amount

$$\text{Work done} = \frac{1}{2} Kx^2$$

As x is same \therefore work done \propto K

$$\therefore K_P > K_Q \therefore W_P > W_Q$$

Case (b)

When they are stretched by same force then elongation of both spring is different

$$F = Kx$$

$$x = \frac{F}{K}$$

$$\text{Work done} = \frac{1}{2} Kx^2$$

$$= \frac{1}{2} K \frac{F^2}{K^2} \Rightarrow \frac{1}{2} \frac{F^2}{K}$$

As F is same for both spring

$$\therefore \text{Work done} \propto \frac{1}{K}$$

$$\therefore K_P > K_Q$$

$$\therefore W_Q > W_P$$

Q.7 A block of mass 10 kg, moving in x direction with a constant speed of 10 ms^{-1} , is subjected to a retarding force $F = 0.1 \text{ x J/m}$ during its travel from $x = 20 \text{ m}$ to 30 m . Its final KE will be -

(1) 475 J

(2) 450 J

(3) 275 J

(4) 250 J

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Work, Power & Energy, Ex. 3(A), Q.29, Page no. 97]

$$\text{Work done} = \Delta KE$$

(work energy theorem)

Calculation of work done by variable force

$$\Rightarrow \int dW = \int_{x=20}^{x=30} -0.1x \, dx$$

$$W = -0.1 \left[\frac{x^2}{2} \right]_{20}^{30}$$

$$W = -\frac{0.1}{2} [30^2 - 20^2]$$

$$= -\frac{0.1}{2} \times 10 \times 50 = -25 \text{ Joule}$$

$$W = KE_f - KE_i$$

$$-25 = KE_f - \frac{1}{2} \times 10 \times 10^2$$

$$KE_f = -25 + \frac{1}{2} \times 10 \times 10^2$$

$$= -25 + 500 = 475 \text{ Joule}$$



Q.8 A particle of mass m is driven by a machine that delivers a constant power k watts. If the particle starts from rest the force on the particle at time t is -

(1) $\sqrt{\frac{mk}{2}} t^{-1/2}$

(2) $\sqrt{mk} t^{-1/2}$

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

(4) $\frac{1}{2} \sqrt{mk} t^{-1/2}$

Ans. [1]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Work, Power & Energy, Example 4, Page no. 64]**

$$\text{Power} = \frac{dW}{dt}$$

$$k = \frac{dW}{dt}$$

$$dW = k dt$$

$$W = kt$$

$$W = \Delta KE$$

$$kt = KE_f - KE_i$$

$$kt = \frac{1}{2} mv^2 - 0$$

$$v = \sqrt{\frac{2kt}{m}}$$

$$F = m \frac{dv}{dt}$$

$$= m \sqrt{\frac{2k}{m}} \times \frac{1}{2} t^{-1/2}$$

$$= \sqrt{\frac{mk}{2}} t^{-1/2}$$

Q.9 Two particles of masses m_1, m_2 move with initial velocities u_1 and u_2 . On collision, one of the particles get excited to higher level, after absorbing energy ϵ . If final velocities of particles be v_1 and v_2 then we must have -

(1) $m_1^2 u_1 + m_2^2 u_2 - \epsilon = m_1^2 v_1 + m_2^2 v_2$

(2) $\frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2 = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 - \epsilon$

(3) $\frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2 - \epsilon = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2$

(4) $\frac{1}{2} m_1^2 u_1^2 + \frac{1}{2} m_2^2 u_2^2 + \epsilon = \frac{1}{2} m_1^2 v_1^2 + \frac{1}{2} m_2^2 v_2^2$

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Laws of conservation, Classroom notes]**

$$K_f = K_i - \epsilon$$

$$\Rightarrow \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 = \frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2 - \epsilon$$

Q.10 A rod of weight W is supported by two parallel knife edges A and B and is in equilibrium in a horizontal position. The knives are at a distance d from each other. The centre of mass of the rod is at distance x from A. The normal reaction on A is -



(1) $\frac{Wx}{d}$

(2) $\frac{Wd}{x}$

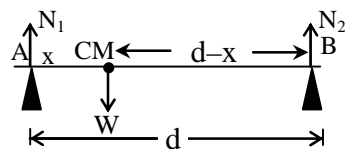
(3) $\frac{W(d-x)}{x}$

(4) $\frac{W(d-x)}{d}$

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Center of Mass, Classroom notes]

Free body diagram

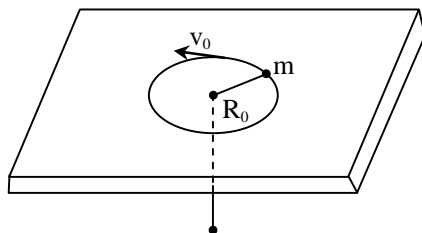


Torque about point B is zero as rod is in equilibrium.

$N_1 \times d = W \times (d - x)$

$N_1 = \frac{W(d-x)}{d}$

Q.11 A mass m moves in a circle on a smooth horizontal plane with velocity v0 at a radius R0. The mass is attached to a string which passes through a smooth hole in the plane as shown.



The tension in the string is increased gradually and finally m moves in a circle of radius $\frac{R_0}{2}$. The final value of the kinetic energy is -

(1) mv_0^2

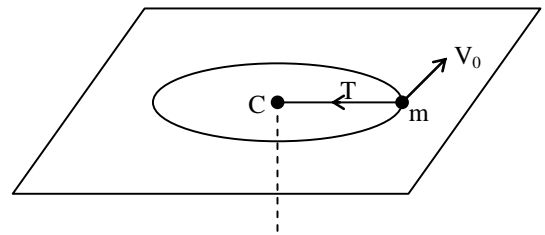
(2) $\frac{1}{4} mv_0^2$

(3) $2 mv_0^2$

(4) $\frac{1}{2} mv_0^2$

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Rotational Motion, Ex. 3A, Q.34, Page no. 157]



Tension T is passing through centre C

∴ Torque about centre C is zero.

∴ Angular momentum = constant

$L_i = L_f$

$mv_0R_0 = mv \times \frac{R_0}{2}$

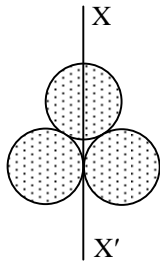
$v = 2 v_0$

Final kinetic energy = $KE = \frac{1}{2} m \times (2v_0)^2$

$= 2 mv_0^2$



Q.12 Three identical spherical shells, each of mass m and radius r are placed as shown in figure. Consider an axis XX' which is touching to two shells and passing through diameter of third shell. Moment of inertia of system consisting of these three spherical shells about XX' axis is -

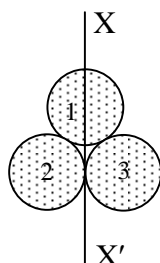


- (1) $\frac{11}{5} mr^2$
- (2) $3 mr^2$
- (3) $\frac{16}{5} mr^2$
- (4) $4 mr^2$

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Rotational Motion, Ex. 1, Q.115, Page no. 147]

Moment of inertia of I spherical shell = $\frac{2}{3} mr^2$



Moment of inertia of II and III spherical shell

$$I_2 = I_3 = I_{cm} + Md^2$$

$$= \frac{2}{3} mr^2 + mr^2 = \frac{5}{3} mr^2$$

So total moment of inertia

$$I = I_1 + I_2 + I_3$$

$$= \frac{2}{3} mr^2 + \frac{5}{3} mr^2 + \frac{5}{3} mr^2$$

$$= \frac{12}{3} mr^2$$

$$= 4 mr^2$$

Q.13 Kepler's third law states that square of period of revolution (T) of a planet around the sun, is proportional to third power of average distance r between sun and planet

$$\text{i.e. } T^2 = Kr^3$$

here K is constant.

If the masses of sun and planet are M and m respectively then as per Newton's law of gravitation force of attraction between them is $F = \frac{GMm}{r^2}$, here G is gravitational constant. The relation between G and K is described as -

$$(1) GK = 4\pi^2$$

$$(2) GMK = 4\pi^2$$

$$(3) K = G$$

$$(4) K = \frac{1}{G}$$

Ans. [2]

**Sol.**

Students may find similar question in CP Exercise Sheet: [Chapter : Gravitation, Ex. 2, Q.31, Page no. 200]

Force of attraction provide centripetal force of circular motion.

$$\frac{GMm}{r^2} = m\omega^2 r$$

$$\omega = \frac{(GM)^{1/2}}{r^{3/2}}$$

$$\text{Time period of revolution} = T = \frac{2\pi}{\omega}$$

$$T = \frac{2\pi}{(GM)^{1/2}} r^{3/2}$$

$$T^2 = \frac{4\pi^2}{GM} r^3$$

Comparing with

$$T^2 = Kr^3$$

$$K = \frac{4\pi^2}{GM}$$

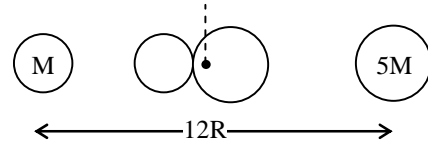
$$GMK = 4\pi^2$$

Q.14 Two spherical bodies of mass M and $5M$ and radii R and $2R$ are released in free space with initial separation between their centres equal to $12R$. If they attract each other due to gravitational force only, then the distance covered by the smaller body before collision is -

- (1) $2.5R$
- (2) $4.5R$
- (3) $7.5R$
- (4) $1.5R$

Ans. [3]**Sol.**

Students may find similar question in CP Exercise Sheet: [Chapter : Gravitation, Classroom notes] (AIEEE)



Position of CM from M

$$x = \frac{5M}{M + 5M} \times 12R$$

$$= \frac{5M}{6M} \times 12R$$

$$x = 10R$$

finally distance of CM from M

$$x' = \frac{5M}{M + 5M} \times 3R$$

$$= \frac{5M}{2} = 2.5R$$

$$\text{Distance travelled} = 10R - 2.5R$$

$$= 7.5R$$

Q.15 On observing light from three different stars P , Q and R , it was found that intensity of violet colour is maximum in the spectrum of P , the intensity of green colour is maximum in the spectrum of R and the intensity of red colour is maximum in the spectrum of Q . If T_P , T_Q and T_R are the respective absolute temperatures of P , Q and R , then it can be concluded from the above observations that -



(1) $T_P > T_Q > T_R$

(2) $T_P > T_R > T_Q$

(3) $T_P < T_R < T_Q$

(4) $T_P < T_Q < T_R$

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Heat Transfer, Ex. 3B, Q.40, Page no. 40]**

According to Weins displacement formula

$$\lambda_m \text{ or } \lambda_{\max} \propto \frac{1}{\text{Temperature of body}}$$

for P $\lambda_m \Rightarrow$ Violet i.e. λ_{violet} for Q $\lambda_m \Rightarrow$ Red i.e. λ_{red} for R $\lambda_m \Rightarrow$ Green i.e. λ_{green}

$$\lambda_{\text{red}} > \lambda_{\text{green}} > \lambda_{\text{violet}}$$

$$\therefore T_P > T_R > T_Q$$

Q.16 The approximate depth of an ocean is 2700 m. The compressibility of water is $45.4 \times 10^{-11} \text{ Pa}^{-1}$ and density of water is 10^3 kg/m^3 . What fractional compression of water will be obtained at the bottom of the ocean ?

(1) 0.8×10^{-2}

(2) 1.0×10^{-2}

(3) 1.2×10^{-2}

(4) 1.4×10^{-2}

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Properties of matter, Example 12, Page no. 175]**

$$B = - \frac{dP}{\frac{dV}{V}} \quad \dots (i)$$

When we go in depth of ocean change in pressure is $dP = \rho gh$

$$\Rightarrow 10^3 \times 10 \times 2700$$

$$\Rightarrow 27 \times 10^6 \text{ N/m}^2$$

$$C = \frac{1}{B}$$

$$45.4 \times 10^{-11} = \frac{1}{B}$$

$$B = \frac{10^{11}}{45.4}$$

From equation (i),

$$\frac{10^{11}}{45.4} = - \frac{27 \times 10^6}{\frac{dV}{V}}$$

$$- \frac{dV}{V} \Rightarrow \frac{27 \times 10^6 \times 45.4}{10^{11}}$$

$$\Rightarrow 0.012$$

$$\Rightarrow 1.2 \times 10^{-2}$$

Q.17 The two ends of metal rod are maintained at temperatures 100°C and 110°C . The rate of heat flow in the rod is found to be 4.0 J/s. If the ends are maintained at temperatures 200°C and 210°C , the rate of heat flow will be :



- (1) 44.0 J/s
- (2) 16.8 J/s
- (3) 8.0 J/s
- (4) 4.0 J/s

Ans. [4]

Sol. Students may find similar question in CP
**Exercise Sheet: [Chapter : Heat Transfer,
 Ex. 1, Q.62, Page no. 209]**

$$\frac{d\theta}{dt} = \frac{kA}{L} (T_1 - T_2)$$

$$\frac{d\theta}{dt} \propto (T_1 - T_2)$$

$$\frac{\left(\frac{d\theta}{dt}\right)_2}{\left(\frac{d\theta}{dt}\right)_1} = \frac{210 - 200}{110 - 100} = \frac{10}{10} = 1$$

$$\left(\frac{d\theta}{dt}\right)_2 = \left(\frac{d\theta}{dt}\right)_1 = 4 \text{ J/sec.}$$

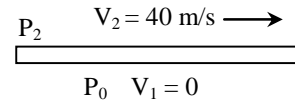
Q.18 A wind with speed 40 m/s blows parallel to the roof of a house. The area of the roof is 250 m². Assuming that the pressure inside the house is atmospheric pressure, the force exerted by the wind on the roof and the direction of the force will be :

$$(P_{\text{air}} = 1.2 \text{ kg/m}^3)$$

- (1) 4.8×10^5 N, downwards
- (2) 4.8×10^5 N, upwards
- (3) 2.4×10^5 N, upwards
- (4) 2.4×10^5 N, downwards

Ans. [3]

Sol. Students may find similar question in CP
**Exercise Sheet: [Chapter : Fluid
 mechanics, Classroom notes]**



By using Bernoulli's theorem

$$P_1 + \frac{1}{2}\rho V_1^2 = P_2 + \frac{1}{2}\rho V_2^2$$

(for same horizontal level)

$$P_0 + 0 = P_2 + \frac{1}{2}\rho V_2^2$$

 \Rightarrow Pressure difference

$$P_0 - P_2 = \frac{1}{2}\rho V_2^2$$

$$= \frac{1}{2} \times 1.2 \times (40)^2$$

$$= .6 \times 1600$$

$$\Delta P = 960$$

$$\begin{aligned} \text{Force } F &= \Delta P \times A \\ &= 960 \times 250 \\ &= 240000 \\ &= 2.4 \times 10^5 \text{ N} \end{aligned}$$

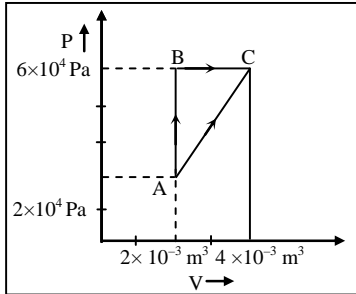
$$\text{as } v_2 > v_1$$

$$\Rightarrow P_2 < P_1$$

force will be in upwards direction.



Q.19 Figure below shows two paths that may be taken by a gas to go from a state A to a state C.



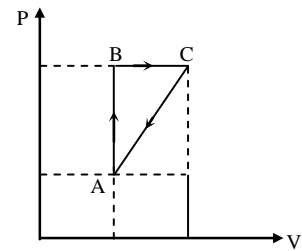
In process AB, 400 J of heat is added to the system and in process BC, 100 J of heat is added to the system. The heat absorbed by the system in the process AC will be :

- (1) 380 J
- (2) 500 J
- (3) 460 J
- (4) 300 J

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Thermodynamics, Ex. 1, Q.19, Page no. 162]

$$\begin{aligned}
 Q_{AB} &= 400 \text{ J} \\
 Q_{BC} &= 100 \text{ J} \\
 Q_{ABC} &= Q_{AB} + Q_{BC} = 500 \text{ J} \\
 W_{ABC} &= W_{AB} + W_{BC} \\
 &= 0 + 6 \times 10^4 (4 - 2) \times 10^{-3} \\
 &= 6 \times 10^4 \times 2 \times 10^{-3} \\
 &= 120 \text{ J}
 \end{aligned}$$



$$\begin{aligned}
 dU_{AC} &= \Delta Q_{ABC} - \Delta W_{ABC} \\
 &= 500 - 120 = 380 \text{ J} \\
 \Delta Q_{AC} &= \Delta W_{AC} + dU_{AC}
 \end{aligned}$$

$$\begin{aligned}
 &= \left(\frac{1}{2} \times 2 \times 10^{-3} \times 4 \times 10^4 + 2 \times 10^4 \times 2 \times 10^{-3} \right) + 380 \\
 &= 40 + 40 + 380 = 460 \text{ J}
 \end{aligned}$$

Q.20 A Carnot engine, having an efficiency of $\eta = \frac{1}{10}$ as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is :

- (1) 100 J
- (2) 99 J
- (3) 90 J
- (4) 1 J

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Thermodynamics, Ex. 3B, Q.8, Page no. 175] (AIEEE-2007)

$$\begin{aligned}
 \eta &= \frac{1}{10} \left\{ \eta = \frac{W_1}{Q_1} \Rightarrow Q_1 = \frac{W}{\eta} = \frac{10\text{J}}{1/10} \right. \\
 W &= 10\text{J} \\
 Q_1 &= 100 \text{ J} \\
 W &= Q_1 - Q_2
 \end{aligned}$$

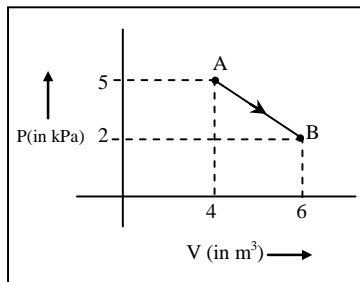


$$Q_2 = Q_1 - W$$

$$= 100 - 10$$

$$Q_2 = 90 \text{ J}$$

Q.21 One mole of an ideal diatomic gas undergoes a transition from A to B along a path AB as shown in the figure,



The change in internal energy of the gas during the transition is :

- (1) 20 kJ
- (2) -20 kJ
- (3) 20 J
- (4) -12 kJ

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Thermodynamics, Ex.2, Q.17 , Page no. 161]

$$du = \mu C_V dT$$

$$= \mu C_V (T_B - T_A)$$

$$= \mu C_V \left(\frac{P_B V_B}{\mu R} - \frac{P_A V_A}{\mu R} \right)$$

$$\left(T = \frac{PV}{\mu R} \right)$$

$$= \frac{C_V}{R} (P_B V_B - P_A V_A)$$

$$= \frac{5}{2} R (P_B V_B - P_A V_A)$$

$$= \frac{5}{2} [2 \times 6 - 5 \times 4] \times 10^3$$

$$= \frac{5}{2} (12 - 20) \times 10^3 = \frac{5}{2} \times -8 \times 10^3 \text{ J}$$

$$= -20 \text{ kJ}$$

Q.22 The ratio of the specific heats $\frac{C_p}{C_v} = \gamma$ in terms of degrees of freedom (n) is given by :

- (1) $\left(1 + \frac{1}{n} \right)$
- (2) $\left(1 + \frac{n}{3} \right)$
- (3) $\left(1 + \frac{2}{n} \right)$
- (4) $\left(1 + \frac{n}{2} \right)$

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Calorimetry, Ex. 3B, Q.12, Page no. 104]

$$y = 1 + \frac{2}{f}$$



Q.23 When two displacements represented by $y_1 = a \sin(\omega t)$ and $y_2 = b \cos(\omega t)$ are superimposed the motion is :

- (1) not a simple harmonic
- (2) simple harmonic with amplitude $\frac{a}{b}$
- (3) simple harmonic with amplitude $\sqrt{a^2 + b^2}$
- (4) simple harmonic with amplitude $\frac{(a + b)}{2}$

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : S.H.M., Solved Example 2, Page no. 238]**

$$y = y_1 + y_2$$

$$\Rightarrow y = a \sin \omega t + b \cos \omega t$$

$$\text{Let } a = A \cos \phi \quad \dots(1)$$

$$\& b = A \sin \phi \quad \dots(2)$$

$$y = A \sin \omega t \cos \phi + A \cos \omega t \sin \phi$$

$$= A [\sin \omega t \cos \phi + \cos \omega t \sin \phi]$$

$$y = A \sin (\omega t + \phi)$$

It is represent SHM

By adding squares of Equation (1) & (2)

$$a^2 + b^2 = A^2 \cos^2 \phi + A^2 \sin^2 \phi$$

$$A = a^2 + b^2 \Rightarrow A = \sqrt{a^2 + b^2}$$

Q.24 A particle is executing SHM along a straight line. Its velocities at distances x_1 and x_2 from the mean position are V_1 and V_2 , respectively. Its time period is :

$$(1) 2\pi \sqrt{\frac{x_1^2 + x_2^2}{V_1^2 + V_2^2}}$$

$$(2) 2\pi \sqrt{\frac{x_2^2 - x_1^2}{V_1^2 - V_2^2}}$$

$$(3) 2\pi \sqrt{\frac{V_1^2 + V_2^2}{x_1^2 + x_2^2}}$$

$$(4) 2\pi \sqrt{\frac{V_1^2 - V_2^2}{x_1^2 - x_2^2}}$$

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : S.H.M., Classroom notes]**

$$V = \omega \sqrt{A^2 - x^2}$$

$$\Rightarrow V = \omega^2 (A^2 - x^2)$$

$$\Rightarrow V^2 = \omega^2 A^2 - \omega^2 x^2$$

$$\text{For } V = V_1 \text{ } x = x_1$$

$$\& V = V_2 \text{ } x = x_2$$

$$\text{so } V_1^2 = \omega^2 A^2 - \omega^2 x_1^2 \quad \dots(1)$$

$$V_2^2 = \omega^2 A^2 - \omega^2 x_2^2 \quad \dots(2)$$

By subtracting equation (2) from equation (1)

we get

$$V_1^2 - V_2^2 = \omega^2 x_2^2 - \omega^2 x_1^2$$

$$\Rightarrow V_1^2 - V_2^2 = \omega^2 (x_2^2 - x_1^2)$$



$$\Rightarrow \frac{V_1^2 - V_2^2}{x_2^2 - x_1^2} = \omega^2$$

$$\Rightarrow \omega = \sqrt{\frac{V_1^2 - V_2^2}{x_2^2 - x_1^2}}$$

$$\Rightarrow T = \frac{2\pi}{\omega}$$

$$T = 2\pi \sqrt{\frac{x_2^2 - x_1^2}{V_1^2 - V_2^2}}$$

Q.25 The fundamental frequency of a closed organ pipe of length 20 cm is equal to the second overtone of an organ pipe open at both the ends. The length of organ pipe open at both the ends is :

- (1) 80 cm
- (2) 100 cm
- (3) 120 cm
- (4) 140 cm

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Wave Motion, Ex. 2, Q.145, Page no. 44]

$$\frac{V}{4\ell_{\text{C.O.P.}}} = \frac{3V}{2\ell_{\text{C.O.P.}}}$$

$$\ell_{\text{C.O.P.}} = 6\ell_{\text{C.O.P.}}$$

$$= 6 \times 20$$

$$= 120 \text{ cm}$$

Q.26 A parallel plate air capacitor of capacitance C is connected to a cell of emf V and then disconnected from it. A dielectric slab of dielectric constant K, which can just fill the air gap of the capacitor, is now inserted in it. Which of the following is **incorrect** ?

- (1) The potential difference between the plates decreases K times
- (2) The energy stored in the capacitor decreases K time.
- (3) The change in energy stored is $\frac{1}{2}CV^2 \left(\frac{1}{K} - 1 \right)$.
- (4) The charge on the capacitor is not conserved.

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Capacitance, Ex. 3B, Q.36, Page no. 126]

Battery is removed, So charge $Q = CV$

$$= \text{constant} \Rightarrow V \propto \frac{1}{C}$$

When dielectric is filled then $C' = KC$

So potential is $V' = V/K$

$$\text{Energy } U = \frac{Q^2}{2C} \propto \frac{1}{C} \propto \frac{1}{K}$$

Change in potential energy = $U_2 - U_1$

$$= \frac{1}{2} \frac{CV^2}{K} - \frac{1}{2} CV^2$$

$$= \frac{1}{2} CV^2 \left(1 - \frac{1}{K} \right)$$



Q.27 The electric field in a certain region is acting radially outward and is given by $E = Ar$. A charge contained in a sphere of radius 'a' centred at the origin of the field, will be given by :

- (1) $4\pi\epsilon_0 Aa^2$
- (2) $A \epsilon_0 a^2$
- (3) $4\pi\epsilon_0 Aa^3$
- (4) $\epsilon_0 Aa^3$

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Electric Field, Classroom notes]**

When distribution of charge in sphere is uniform then E inside sphere is proportional to r.

$$E = \frac{Pr}{3\epsilon_0} = Ar$$

$$\therefore P = 3\epsilon_0 A$$

$$Q = \frac{4}{3}\pi a^3 \times P$$

$$= \frac{4}{3}\pi a^3 \times A \times 3\epsilon_0$$

$$\Rightarrow A \times 4\pi a^3 \epsilon_0$$

Q.28 A potentiometer wire has length 4 m and resistance 8 Ω . The resistance that must be connected in series with the wire and an accumulator of e.m.f. 2V, So as to get a potential gradient 1 mV per cm on the wire :

- (1) 32 Ω
- (2) 40 Ω
- (3) 44 Ω
- (4) 48 Ω

Ans. [1]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Current Electricity, Example 14, Page no. 182]**

$$\text{Potential gradient (x)} = \frac{E}{R + R'} \left(\frac{R}{L} \right)$$

$$\frac{10^{-3}}{10^{-2}} = \frac{2}{8 + R'} \left(\frac{8}{4} \right)$$

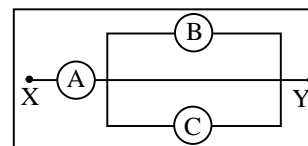
$$0.1 = \frac{4}{8 + R'}$$

$$0.1R' + 0.8 = 4$$

$$\Rightarrow 0.1 R' = 4 - 0.8 = 3.2$$

$$R' = \frac{3.2}{0.1} = 32 \Omega$$

Q.29 A, B and C are voltmeters of resistance R, 1.5 R and 3R respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A , V_B and V_C respectively. Then :

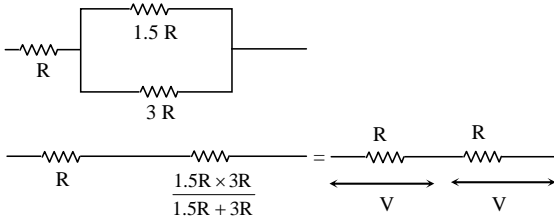


- (1) $V_A = V_B = V_C$
- (2) $V_A \neq V_B = V_C$
- (3) $V_A = V_B \neq V_C$
- (4) $V_A \neq V_B \neq V_C$



Ans. [1]

Sol. Students may find similar question in CP Major test of test series Test No. T-2]



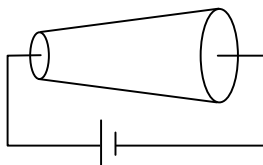
Parallel combination of B and C is equal to A so potential $V_A = V_B = V_C$

Q.30 Across a metallic conductor of non-uniform cross section a constant potential difference is applied. The quantity which remains constant along the conductor is :

- (1) current density
(2) current
(3) drift velocity
(4) electric field

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Current Electricity, Ex. 1, Q No. 6, Page no. 187]

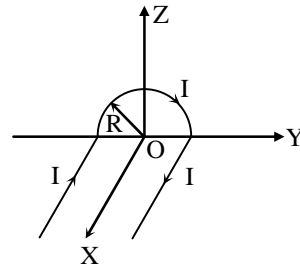


V = IR = constant.

I = constant (In coming current = outgoing current)

R = constant

Q.31 A wire carrying current I has the shape as shown in adjoining figure. Linear parts of the wire are very long and parallel to X-axis while semicircular portion of radius R is lying in Y-Z plane. Magnetic field at point O is :



- (1) B = (mu_0 I / 4pi R) (pi i + 2k)
(2) B = - (mu_0 I / 4pi R) (pi i - 2k)
(3) B = - (mu_0 I / 4pi R) (pi i + 2k)
(4) B = (mu_0 I / 4pi R) (pi i - 2k)

Ans. [3]

Sol. Students may find similar question in CP DPP, Q. No. 7(C), Page no. 1]

Magnetic field due to circular part B_YZ = (1/2) * (mu_0 I / 2R) * (-i) (Current is CW)

magnetic field due to straight wire B_S

= 2 * (mu_0 I / 4pi R) * (-k) * (-i) (Current is CW)

So net magnetic field B_S + B_YZ

= - (mu_0 I / 2pi R) k - (mu_0 I / 4R) i

= - (mu_0 I / 4pi R) (2k) - (mu_0 I pi / 4pi R) i = - (mu_0 I / 4pi R) (pi i + 2k)



Q.32 An electron moving in a circular orbit of radius r makes n rotations per second. The magnetic field produced at the centre has magnitude:

- (1) $\frac{\mu_0 ne}{2\pi r}$
- (2) Zero
- (3) $\frac{\mu_0 n^2 e}{r}$
- (4) $\frac{\mu_0 ne}{2r}$

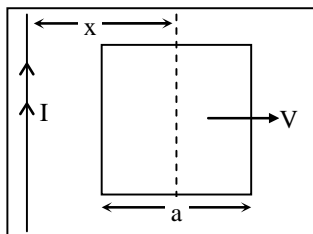
Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Magnetic field, Ex. 3(A) , Q. No. 56, Page no. 86]

$$B = \frac{\mu_0 I}{2r} = \frac{\mu_0 ne}{2r}$$

Here , I = ne

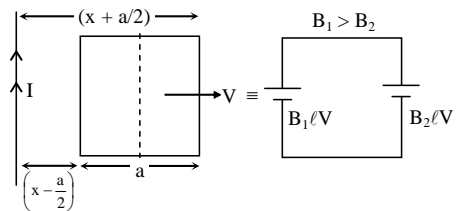
Q.33 A conducting square frame of side 'a' and a long straight wire carrying current I are located in the same plane as shown in the figure. The frame moves to the right with a constant velocity 'V'. The emf induced in the frame will be proportional to :



- (1) $\frac{1}{x^2}$
- (2) $\frac{1}{(2x - a)^2}$
- (3) $\frac{1}{(2x + a)^2}$
- (4) $\frac{1}{(2x - a)(2x + a)}$

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : E.M.I, Type-IV, Page no. 139]



$$e = \ell V (B_1 - B_2)$$

$$= \ell V \left[\frac{\mu_0 I}{2\pi(x - a/2)} - \frac{\mu_0 I}{2\pi(x + a/2)} \right]$$

$$= \frac{\mu_0 I \ell V}{2\pi} \left[\frac{4a}{(2x - a)(2x + a)} \right]$$

Q.34 A resistance 'R' draws power 'P' when connected to an AC source. If an inductance is now placed in series with the resistance, such that the impedance of the circuit becomes 'Z', the power drawn will be :



(1) $P \left(\frac{R}{Z} \right)^2$

(2) $P \sqrt{\frac{R}{Z}}$

(3) $P \left(\frac{R}{Z} \right)$

(4) P

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : A.C. ,Example 12, Page no. 215]

For pure AC circuit $Z = R$

$$\therefore I_{\text{rms}} = \frac{V}{Z} = \frac{V}{R}$$

$$\text{Power} = I_{\text{rms}}^2 \times R$$

$$P = \frac{V^2}{R^2} \times R$$

$$V = \sqrt{PR} \quad \dots (1)$$

When inductance is placed in series impedance become Z

$$I_{\text{rms}} = \frac{V}{Z}$$

$$P = \left(\frac{V}{Z} \right)^2 \times R$$

$$= \frac{V^2}{Z^2} \times R$$

$$\text{From equation (1) } P' = \frac{PR}{Z^2} \times R$$

$$\Rightarrow P \left(\frac{R}{Z} \right)^2$$

Q.35 A radiation of energy 'E' falls normally on a perfectly reflecting surface. The momentum transferred to the surface is (C = Velocity of light) :

(1) $\frac{E}{C}$

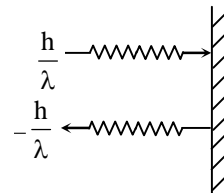
(2) $\frac{2E}{C}$

(3) $\frac{2E}{C^2}$

(4) $\frac{E}{C^2}$

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Photoelectric effect, Ex. 3(A), Q.No. 31, Page no. 86]



$$* \text{ Change in momentum} = -\frac{h}{\lambda} - \frac{h}{\lambda} = -\frac{2h}{\lambda}$$

* Momentum transfer to the surface

$$= \frac{2h}{\lambda} = \frac{2hc}{c\lambda}$$

$$= \frac{2E}{C}$$

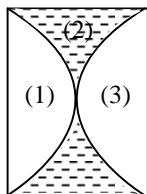


Q.36 Two identical thin plano-convex glass lenses (refractive index 1.5) each having radius of curvature of 20 cm are placed with their convex surfaces in contact at the centre. The intervening space is filled with oil of refractive index 1.7. The focal length of the combination is :

- (1) – 20 cm
- (2) – 25 cm
- (3) – 50 cm
- (4) 50 cm

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Ray optics (lens), Ex. 3(A), Q. 35, Page no. 72]



Focal length of (1) and (3) lens

$$\frac{1}{f_1} = \frac{1}{f_3} = (1.5 - 1) \left(\frac{1}{\infty} - \frac{1}{-20} \right) = \frac{1}{40 \text{ cm}}$$

Focal length of (2) lens

$$\begin{aligned} \frac{1}{f_2} &= (1.7 - 1) \left(\frac{1}{-20} - \frac{1}{20} \right) \\ &= 0.7 \left(-\frac{1}{10} \right) = - \left(-\frac{1}{10} \right) \end{aligned}$$

Focal length of combination

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3} = \frac{1}{40} - \frac{7}{100} + \frac{1}{40}$$

$$\frac{1}{f} = \frac{5 - 14 + 5}{200} = \frac{-4}{200} = -\frac{1}{50 \text{ cm}}$$

$$f = -50 \text{ cm}$$

Q.37 For a parallel beam of monochromatic light of wavelength ‘λ’, diffraction is produced by a single slit whose width ‘a’ is of the order of the wavelength of the light. If ‘D’ is the distance of the screen from the slit, the width of the central maxima will be :

- (1) $\frac{2D\lambda}{a}$
- (2) $\frac{D\lambda}{a}$
- (3) $\frac{Da}{\lambda}$
- (4) $\frac{2Da}{\lambda}$

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Wave optics, Ex. 2, Q.20, Page no. 94]

$$\text{Width of the central maxima} = \frac{2\lambda D}{a}$$

Q.38 In a double slit experiment, the two slits are 1 mm apart and the screen is placed 1 m away. A monochromatic light of wavelength 500 nm is used. What will be the width of each slit for obtaining ten maxima of double slit within the central maxima of single slit pattern ?



- (1) 0.2 mm
- (2) 0.1 mm
- (3) 0.5 mm
- (4) 0.02 mm

Ans. [1]**Sol.** **Students may find similar question in CP Class Room Notes**Given $d = 10^{-3}$ m $D = 1$ m $\lambda = 500 \times 10^{-9}$ m

width of 10 maxima of double slit pattern =

$$\frac{10\lambda D}{d}$$

width of the central maxima of single slit

$$\text{pattern} = \frac{2\lambda D}{a}$$

(a is slit width)

$$\frac{10\lambda D}{d} = \frac{2\lambda D}{a}$$

$$a = \frac{d}{5} = \frac{1\text{mm}}{5} = 0.2 \text{ mm}$$

Q.39 The refracting angle of a prism is A, and refractive index of the material of the prism is $\cot(A/2)$. The angle of minimum deviation is :

- (1) $180^\circ - 3A$
- (2) $180^\circ - 2A$
- (3) $90^\circ - A$
- (4) $180^\circ + 2A$

Ans. [2]**Sol.** **Students may find similar question in CP Exercise Sheet: [Chapter : Ray optics, Ex. 3(A), Q. No. 1]**Given $\mu = \cot A/2$ prism angle is A

$$\mu = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin A/2}$$

$$\cot A/2 = \frac{\cos A/2}{\sin A/2} = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin A/2}$$

$$\sin(90 - A/2) = \sin\left(\frac{\delta_m + A}{2}\right)$$

$$90 - \frac{A}{2} = \frac{\delta_m + A}{2}$$

$$180 - A = \delta_m + A$$

$$\delta_m = 180 - 2A$$

Q.40 A certain metallic surface is illuminated with monochromatic light of wavelength, λ . The stopping potential for photo-electric current for this light is $3V_0$. If the same surface is illuminated with light of wavelength 2λ , the stopping potential is V_0 . The threshold wavelength for this surface for photo-electric effect is :

- (1) 6λ
- (2) 4λ
- (3) $\frac{\lambda}{4}$
- (4) $\frac{\lambda}{6}$



Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Photoelectric effect, Example 15, Page no. 71]

$$3V_0 = \frac{hc}{e\lambda} - \frac{W}{e} \quad \dots(1)$$

$$V_0 = \frac{hc}{e(2\lambda)} - \frac{W}{e} \quad \dots (2)$$

$$\frac{3V_0}{V_0} = \frac{\frac{hc}{e\lambda} - \frac{W}{e}}{\frac{hc}{2e\lambda} - \frac{W}{e}}$$

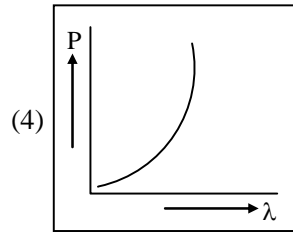
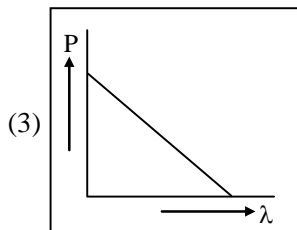
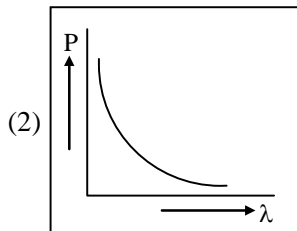
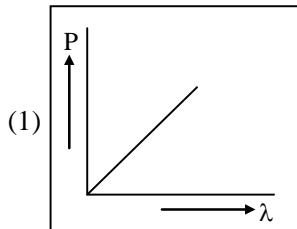
$$3\left(\frac{hc}{2e\lambda} - \frac{W}{e}\right) = \frac{hc}{e\lambda} - \frac{W}{e}$$

$$\frac{3}{2} \frac{hc}{e\lambda} - \frac{3W}{e} = \frac{hc}{e\lambda} - \frac{W}{e}$$

$$\frac{3}{2} \frac{hc}{e\lambda} - \frac{hc}{e\lambda} = \frac{2W}{e}$$

$$\frac{hc}{2e\lambda} = \frac{2hc}{e\lambda_0} \Rightarrow \lambda_0 = 4\lambda$$

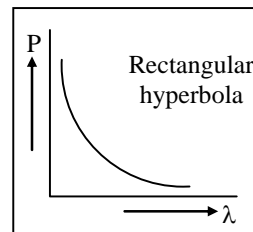
Q.41 Which of the following figures represent the variation of particle momentum and the associated de-Broglie wavelength ?



Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Matter waves, Point No. 9, Page no. 95]

$$\lambda = \frac{h}{p} \propto \frac{1}{p}$$



Q.42 Consider 3rd orbit of He⁺ (Helium) , using non-relativistic approach, the speed of electron in this orbit will be :

[given K = 9 × 10⁹ constant, Z = 2 and h(Planck's Constant) = 6.6 × 10⁻³⁴ J s]

- (1) 2.92 × 10⁶ m/s
- (2) 1.46 × 10⁶ m/s
- (3) 0.73 × 10⁶ m/s
- (4) 3.0 × 10⁸ m/s

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Atomic structure, Class room notes]

$$V_n = 2.2 \times 10^6 \frac{Z}{n} \text{ m/sec}$$

$$= 2.2 \times 10^6 \times \frac{2}{3} = \frac{4.4}{3} \times 10^6 \text{ m/sec}$$

$$= 1.46 \times 10^6 \text{ m/sec}$$



Q.43 If radius of the $^{27}_{13}\text{Al}$ nucleus is taken to be R_{Al} , then the radius of $^{125}_{53}\text{Te}$ nucleus is nearly :

- (1) $\left(\frac{53}{13}\right)^{1/3} R_{\text{Al}}$
- (2) $\frac{5}{3} R_{\text{Al}}$
- (3) $\frac{3}{5} R_{\text{Al}}$
- (4) $\left(\frac{13}{53}\right)^{1/3} R_{\text{Al}}$

Ans. [2]

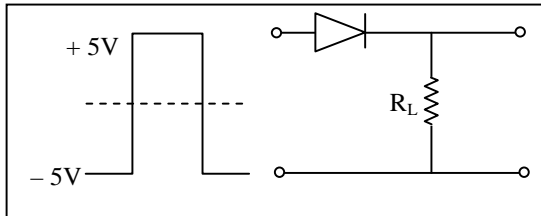
Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Nuclear physics, Ex. 3(B), Q.21, Page no. 23]

$$r \propto (A)^{1/3}$$

$$\frac{r_{\text{Te}}}{r_{\text{Al}}} = \left(\frac{125}{27}\right)^{1/3} = \frac{5}{3}$$

$$r_{\text{Te}} = \frac{5}{3} r_{\text{Al}}$$

Q.44 If in a p-n junction, a square input signal of 10 V is applied, as shown



then the output across R_L will be :

- (1)
- (2)

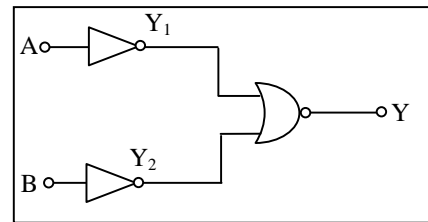
- (3)
- (4)

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Modern physics. Electronics, Ex. 3(B), Page no. 203]

It is a half wave rectifier allow only positive clips

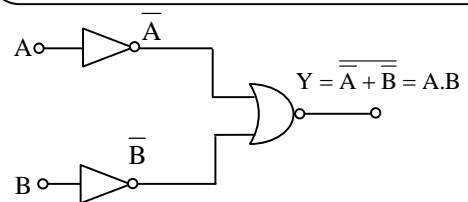
Q.45 Which logic gate is represented by the following combination of logic gates ?



- (1) OR
- (2) NAND
- (3) AND
- (4) NOR

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Electronics (Modern physics), Ex. 1, Q.60, Page no. 182]



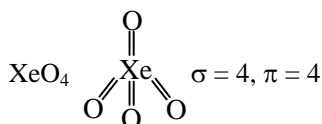


Q.46 Which of the following species contains equal number of σ and π -bonds ?

- (1) HCO_3^-
- (2) XeO_4
- (3) $(\text{CN})_2$
- (4) $\text{CH}_2(\text{CN})_2$

Ans. [2]

Sol. **Students may find Similar question in CP Exercise Sheet: [Chapter : p-block, inert gas Ex. 1, Q.15, Page no. 36]**



In XeO_4 molecule 4σ and 4π bond are present

Q.47 The species Ar , K^+ and Ca^{2+} contain the same number of electrons. In which order of their radii increase ?

- (1) $\text{Ar} < \text{K}^+ < \text{Ca}^{2+}$
- (2) $\text{Ca}^{2+} < \text{Ar} < \text{K}^+$
- (3) $\text{Ca}^{2+} < \text{K}^+ < \text{Ar}$
- (4) $\text{K}^+ < \text{Ar} < \text{Ca}^{2+}$

Ans. [3]

Sol. **Students may find Similar question in CP Exercise Sheet: [Chapter : Periodic Table, Ex. 3A, Q.41, Page no. 188]**

$$\text{Size} \propto \frac{1}{Z_{\text{eff}}}$$

$$\text{Size} \quad \frac{\text{Ca}^{+2} < \text{K}^+ < \text{Ar}}{Z_{\text{eff}} \downarrow \text{Size} \uparrow}$$

Q.48 The function of "Sodium pump" is a biological process operating in each and every cell of all animals. Which of the following biologically important ions is also a constituent of this pump ?

- (1) Ca^{2+}
- (2) Mg^{2+}
- (3) K^+
- (4) Fe^{2+}

Ans. [3]

Sol. Na^+/K^+ pumps operate in plasma membrane of the cells to maintain ionic equilibrium in intra cellular and extra cellular fluid.

Q.49 "Metals are usually not found as nitrates in their ores".

Out of the following two (a and b) reasons which is/are **true** for the above observation ?

- (a) Metal nitrates are highly unstable
- (b) Metal nitrates are highly soluble in water

- (1) a and b are true
- (2) a and b are false
- (3) a is false but b is true
- (4) a is true but b is false

Ans. [3]

**Sol.**

Students may find Similar question in CP
Exercise Sheet: [Chapter : Class Notes of
s-block

All nitrates are highly soluble in water so their minerals not exist in earth crust.

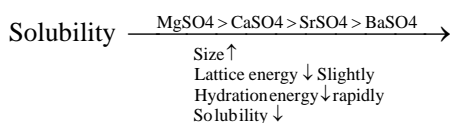
Q.50 Solubility of the alkaline earth's metal sulphates in water decreases in the sequence:

- (1) $Mg > Ca > Sr > Ba$
- (2) $Ca > Sr > Ba > Mg$
- (3) $Sr > Ca > Mg > Ba$
- (4) $Ba > Mg > Sr > Ca$

Ans. [1]**Sol.**

Students may find Similar question in CP
Exercise Sheet: [Chapter : s-block, Q.100,
Page no. 27]

Solubility of II A sulphate decreases down the group because lattice energy decreases slightly where as hydration energy decreases rapidly



Q.51 Because of lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii ? (Numbers in the parenthesis are atomic numbers).

- (1) Ti (22) and Zr (40)
- (2) Zr (40) and Nb (41)

(3) Zr (40) and Hf (72)

(4) Zr (40) and Ta (73)

Ans. [3]**Sol.**

Students may find Similar question in CP
Exercise Sheet: [Chapter : Periodic Table,
Ex. 3B, Q.100, Page no. 195]

| | | |
|----|----|----|
| Sc | Ti | 3d |
| Y | Zr | 4d |
| La | Hf | |
| | | 5d |

Size of Zr \approx Hf

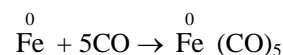
due to lanthanoid contraction or poor shielding of d & f electron, Z_{eff} increases

Q.52 Which of the following processes does **not** involve oxidation of iron ?

- (1) Rusting of iron sheets
- (2) Decolourization of blue CuSO_4 solution by iron
- (3) Formation of $\text{Fe}(\text{CO})_5$ from Fe
- (4) Liberation of H_2 from steam by iron at high temperature

Ans. [3]**Sol.**

Students may find same question in CP
Class notes of d-block



Oxidation state of iron remain same



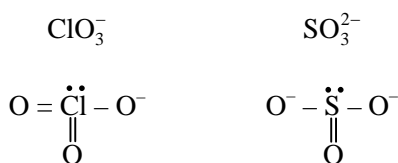
Q.53 Which of the following pairs of ions are isoelectronic and isostructural ?

- (1) CO_3^{2-} , SO_3^{2-}
- (2) ClO_3^- , CO_3^{2-}
- (3) SO_3^{2-} , NO_3^-
- (4) ClO_3^- , SO_3^{2-}

Ans. [4]

Sol. Students may find same question in CP class notes of chemical bonding

ClO_3^- and SO_3^{2-} are isoelectronic and isostructural



sp^3 , pyramid shape

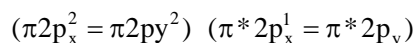
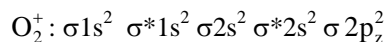
total electrons \Rightarrow 12

Q.54 Which of the following options represents the **correct** bond order ?

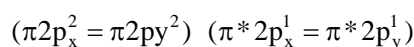
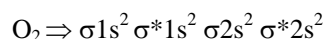
- (1) $\text{O}_2^- > \text{O}_2 > \text{O}_2^+$
- (2) $\text{O}_2^- < \text{O}_2 < \text{O}_2^+$
- (3) $\text{O}_2^- > \text{O}_2 < \text{O}_2^+$
- (4) $\text{O}_2^- < \text{O}_2 > \text{O}_2^+$

Ans. [2]

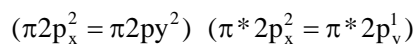
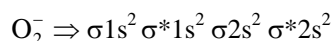
Sol. Students may find Similar question in CP Exercise Sheet: [Chapter: Chemical Bonding, Ex. 1, Q.114, Page no. 219]



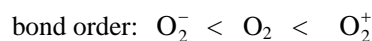
$$\text{bond order} = \frac{6-1}{2} = 2.5$$



$$\text{bond order} = \frac{6-2}{2} = 2$$



$$\text{bond order} = \frac{6-3}{2} = 1.5$$



$$1.5 \quad 2.0 \quad 2.5$$

Q.55 Nitrogen dioxide and sulphur dioxide have some properties in common. Which property is shown by one of these compounds, but **not** by the other ?

- (1) forms 'acid-rain'
- (2) is a reducing agent
- (3) is soluble in water
- (4) is used as a food-preservative

Ans. [4]



Sol. Students may find same question in CP class notes of p-block

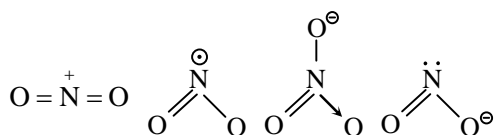
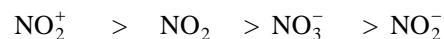
NO₂ used as a food preservative due to its non toxic nature whereas SO₂ is toxic with pungent smell.

Q.56 Maximum bond angle at nitrogen is present in which of the following ?

- (1) NO₂
- (2) NO₂⁻
- (3) NO₂⁺
- (4) NO₃⁻

Ans. [3]

Sol. Students may find Same question in CP Exercise Sheet: [Chapter : Chemical Bonding, DPPS-7, Q.11]



| | | | |
|--------|-----------------|-----------------|-----------------|
| sp | sp ² | sp ² | sp ² |
| linear | angular | planar | angular |
| 180 | 132° | 120° | <120° |

Q.57 Magnetic moment 2.84 B.M. is given by:

(At. Nos, Ni = 28, Ti = 22, Cr = 24, Co = 27)

- (1) Ni²⁺
- (2) Ti³⁺
- (3) Cr²⁺
- (4) Co²⁺

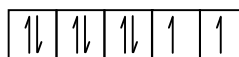
Ans. [1]

Sol. Students may find Similar question in CP Exercise Sheet: [Chapter : Coordination Chemistry, Ex. 11B, Q.94, Page no. 74]

$$\mu = \sqrt{n(n+2)}$$

$$\mu = 2.84 \text{ B.M. when } n = 2$$

means no. of unpaired $\Rightarrow 2$

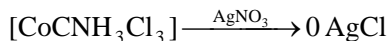
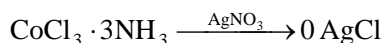
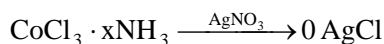


Q.58 Cobalt(III) chloride forms several octahedral complexes with ammonia. Which of the following will **not** give test for chloride ions with silver nitrate at 25°C ?

- (1) CoCl₃ · 3NH₃
- (2) CoCl₃ · 4NH₃
- (3) CoCl₃ · 5NH₃
- (4) CoCl₃ · 6NH₃

Ans. [1]

Sol. Students may find Similar question in CP Exercise Sheet: [Chapter : Coordination Chemistry, Ex. 11B, Q.47, Page no. 71]

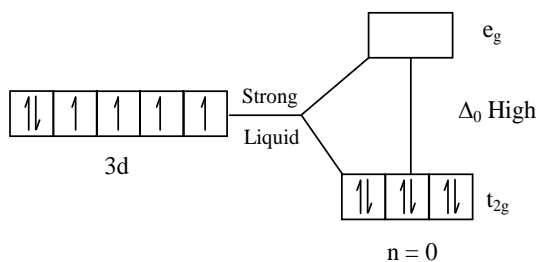
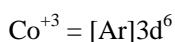


Q.59 Which of these statements about $[\text{Co}(\text{CN})_6]^{3-}$ is **true** ?

- (1) $[\text{Co}(\text{CN})_6]^{3-}$ has no unpaired electrons and will be in a low-spin configuration
- (2) $[\text{Co}(\text{CN})_6]^{3-}$ has four unpaired electrons and will be in a low-spin configuration
- (3) $[\text{Co}(\text{CN})_6]^{3-}$ has four unpaired electrons and will be in a high-spin configuration
- (4) $[\text{Co}(\text{CN})_6]^{3-}$ has no unpaired electrons and will be in a high-spin configuration

Ans. [4]

Sol. **Students may find same question in CP class notes of coordination compounds**



Q.60 The activation energy of a reaction can be determined from the slope of which of the following graphs ?

(1) $\ln K$ vs. T

(2) $\frac{\ln K}{T}$ vs. T

(3) $\ln K$ vs. $\frac{1}{T}$

(4) $\frac{T}{\ln K}$ vs. $\frac{1}{T}$

Ans. [3]

Sol. **Students may find Same question in CP Exercise Sheet: [Chapter: Chemical Kinetics, Ex. 3A, Q.17, Page no. 198]**

According to $\log K$ v/s T graph of Arrhenius theory

Q.61 Which one is **not** equal to zero for an ideal solution ?

(1) ΔH_{mix}

(2) ΔS_{mix}

(3) ΔV_{mix}

(4) $\Delta P = P_{\text{observed}} - P_{\text{Raoult}}$

Ans. [2]

Sol. **Students may find Similar question in CP Exercise Sheet: [Chapter : Solution & Colligative Properties, Ex. 1, Q.13, Page no. 66]**

According to the condition of ideal solution

$\Delta S_{\text{mix}} \neq 0$



Q.62 A mixture of gases contains H₂ and O₂ gases in the ratio of 1 : 4 (w/w). What is the molar ratio of the two gases in the mixture ?

- (1) 1 : 4
- (2) 4 : 1
- (3) 16 : 1
- (4) 2 : 1

Ans. [2]

Sol. **Students may find Similar question in CP Exercise Sheet: [Chapter : Atom Molecule, Ex. 1, Q.5, Page no. 64]**

$$\begin{array}{l} \text{H}_2 : \text{O}_2 \\ \text{Weight ratio} \quad 1 : 4 \\ \therefore \text{Mole ratio} \quad \frac{1}{2} : \frac{4}{32} \\ \frac{1}{2} : \frac{1}{8} \\ \frac{4:1}{8} \quad 4:1 \end{array}$$

Q.63 A given metal crystallizes out with a cubic structure having edge length of 361 pm. If there are four metal atoms in one unit cell, what is the radius of one atom ?

- (1) 40 pm
- (2) 127 pm
- (3) 80 pm
- (4) 108 pm

Ans. [2]

Sol. **Students may find Same question in CP Exercise Sheet: [Chapter : Solid State, Ex. 3A, Q.9, Page no. 122]**

Z = 4 For fcc unit cell

$$r = \frac{a}{2\sqrt{2}} = \frac{361}{2\sqrt{2}}$$

r = 127 pm

Q.64 When initial concentration of a reactant is doubled in a reaction, its half-life period is not affected. The order of the reaction is:

- (1) Zero
- (2) First
- (3) Second
- (4) More than zero but less than first

Ans. [2]

Sol. **Students may find Same question in CP Class Notes: Five Star Question marked**

$t_{1/2} = \frac{0.693}{k}$ for first order means half life period of first order reaction doesn't depend on the concentration of reactant

Q.65 If the value of an equilibrium constant for a particular reaction is 1.6×10^{12} then at equilibrium the system will contain:

- (1) All reactants
- (2) Mostly reactants
- (3) Mostly products
- (4) Similar amounts of reactants and products



Ans. [3]

Sol. Students may find Similar question in CP
Exercise Sheet: [Chapter: Chemical Kinetic, Ex. 1, Q.59]

Value of equilibrium constant is very high so dissociation x is very high so we will use the concept of limiting reagent (L.R.) so product are mostly present

Q.66 A device that converts energy of combustion of fuels like hydrogen and methane, directly into electrical energy is known as:

- (1) Fuel Cell
- (2) Electrolytic Cell
- (3) Dynamo
- (4) Ni-Cd cell

Ans. [1]

Sol. Students may find Same question in CP
Exercise Sheet: [Chapter: Electrochemistry, Page no. 5]

Fuel cell

Q.67 The boiling point of 0.2 mol kg^{-1} solution of X in water is greater than equimolar solution of Y in water. Which one of the following statements is **true** in this case ?

- (1) X is undergoing dissociation in water
- (2) Molecular mass of X is greater than the molecular mass of Y

- (3) Molecular mass of X is less than the molecular mass of Y
- (4) Y is undergoing dissociation in water while X undergoes no change.

Ans. [1]

Sol. Students may find Similar question in CP
Exercise Sheet: Chapter: Solution & Colligative Properties, Ex. 2, Q.17, Page no. 73]

$$(\Delta T_b)_{\text{Observed}} = i \times (\Delta T_b)_{\text{Theoretical}}$$

$$= i \times K_b \times m$$

but molality is same so $(\Delta T_b)_{\text{obs}}$ means boiling point depends on Vant Hoff factor i . and it will maximum of dissociation

So X will dissociation into water so colligative properties will increase

Q.68 Which one o the following electrolytes has the same value of van't Hoff's factor (i) as that of $\text{Al}_2(\text{SO}_4)_3$ (if all are 100% ionised) ?

- (1) K_2SO_4
- (2) $\text{K}_3[\text{Fe}(\text{CN})_6]$
- (3) $\text{Al}(\text{NO}_3)_3$
- (4) $\text{K}_4[\text{Fe}(\text{CN})_6]$

Ans. [4]

Sol. Students may find Similar question in CP
Exercise Sheet: Chapter: Solution & Colligative Properties, Ex. 2, Q.6, Page no. 72]



For 100% ionization

Vant Hoff factor $i =$ no. of particles and for $\text{Al}_2(\text{SO}_4)_3$ i.e. 5

so ans (4) $\text{K}_4 [\text{Fe}(\text{CN})_6]$

Q.69 The number of d-electrons in Fe^{2+} ($Z = 26$) is **not** equal to the number of electrons in which one of the following ?

- (1) s-electrons in Mg ($Z = 12$)
- (2) p-electrons in Cl ($Z = 17$)
- (3) d - electrons in Fe ($Z = 26$)
- (4) p - electrons in Ne ($Z = 10$)

Ans. [2]

Sol. **Students may find same question in CP class notes of d-block**

$\text{Fe}^{+2} : [\text{Ar}] 3d^6$ No. of $d e^-$ is = 6

- (1) Mg : $1s^2 2s^2 2p^6 3s^2$ No. of $s e^- = 6$
- (2) Cl : $1s^2 2s^2 2p^6 3s^2 3p^5$ No. of $p e^- = 11$
- (3) Fe : $[\text{Ar}] 3d^6 4s^2$ No. of $d e^- = 6$
- (4) Ne : $1s^2 2s^2 2p^6$ No. of $p e^- = 6$

(so not equal to Cl $p e^-$)

Q.70 The correct bond order in the following species is :

- (1) $\text{O}_2^{2+} < \text{O}_2^+ < \text{O}_2^-$
- (2) $\text{O}_2^{2+} < \text{O}_2^- < \text{O}_2^+$
- (3) $\text{O}_2^+ < \text{O}_2^- < \text{O}_2^{2+}$
- (4) $\text{O}_2^- < \text{O}_2^+ < \text{O}_2^{2+}$

Ans. [4]

Sol. **Students may find Same question in CP Exercise Sheet: [Chapter: Chemical bonding, Ex. 1, Q.114, Page no. 219]**

$\text{O}_2^+ : \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2$

$(\pi 2p_x^2 = \pi 2p_y^2) (\pi^* 2p_x^1 = \pi^* 2p_y^1)$

bond order: $\frac{6-1}{2} = 2.5$

$\text{O}_2^{+2} \Rightarrow \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2$

$(\pi 2p_x^2 = \pi 2p_y^2)$

bond order = $\frac{6-0}{2} = 3.0$

$\text{O}_2^- \Rightarrow \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2$

$(\pi 2p_x^2 = \pi 2p_y^2) (\pi^* 2p_x^2 = \pi^* 2p_y^1)$

bond order = $\frac{6-3}{2} = 1.5$

bond order: $\text{O}_2^- < \text{O}_2^+ < \text{O}_2^{2+}$
 1.5 2.5 3.0

Q.71 The angular momentum of electron in 'd' orbital is equal to :

- (1) $\sqrt{6} \hbar$
- (2) $\sqrt{2} \hbar$
- (3) $2\sqrt{3} \hbar$
- (4) $0 \hbar$



Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Atomic structure, Ex. 3B, Q.56, Page no. 38]

$$\text{Angular momentum} = \sqrt{\ell(\ell + 1)} \times \hbar$$

For d orbital $\ell = 2$

$$\begin{aligned} \therefore &= \sqrt{2(2+1)} \times \hbar \\ &= \sqrt{6} \hbar \end{aligned}$$

Q.72 The K_{SP} of Ag_2CrO_4 , $AgCl$, $AgBr$ and AgI are respectively, 1.1×10^{-12} , 1.8×10^{-10} , 5.0×10^{-13} , 8.3×10^{-17} , Which one of the following salts will precipitate last if $AgNO_3$ solution is added to the solution containing equal moles of $NaCl$, $NaBr$, NaI and Na_2CrO_4 ?

- (1) AgI
- (2) $AgCl$
- (3) $AgBr$
- (4) Ag_2CrO_4

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Ionic equilibrium, Ex. 3A, Q.49, Page no. 157]

That will ppt very late whose solubility is high

For $Ag_2CrO_4 \therefore A_2B$ type

$$K_{sp} = 4s^3 = 1.1 \times 10^{-12}$$

$$\therefore S^3 = \frac{1.1}{4} \times 10^{-12}$$

$$S_1 = (0.275 \times 10^{-12})^{1/3}$$

$$S_1 = (275 \times 10^{-15})^{1/3}$$

$$S_1 = 6.5 \times 10^{-5}$$

$$\text{For } AgCl \quad K_{sp} = S^2 = 1.8 \times 10^{-10}$$

$$\therefore S_2 = 1.3 \times 10^{-5}$$

$$\text{For } AgBr \quad K_{sp} = S^2 = 5 \times 10^{-13}$$

$$S_3 = (50 \times 10^{-14})^{1/2} = 7 \times 10^{-7}$$

$$\text{For } AgI \quad K_{sp} = S^2 = 8.3 \times 10^{-17}$$

$$S_3 = (83 \times 10^{-18})^{1/2} = 9 \times 10^{-9}$$

So answer is Ag_2CrO_4

\therefore is solubility is maximum

Q.73 Which property of colloidal solution is independent of charge on the colloidal particles?

- (1) Coagulation
- (2) Electrophoresis
- (3) Electro-osmosis
- (4) Tyndall effect

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Surface chemistry, Ex. 3B, Q.10, Page no. 161]

Tyndall effect



Q.74 Which of the following statements is correct for a reversible process in a state of equilibrium?

- (1) $\Delta G = -2.30 RT \log K$
- (2) $\Delta G = 2.30 RT \log K$
- (3) $\Delta G^\circ = -2.30 RT \log K$
- (4) $\Delta G^\circ = 2.30 RT \log K$

Ans. [3]

Sol. Students may find Same question in CP Exercise Sheet: [Chapter : Chemical thermo dynamics, Ex. 3A, Q.17, Page no. 153]

$$\Delta G^\circ = -2.303 RT \log k$$

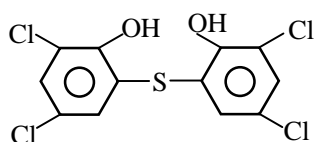
Q.75 Bithional is generally added to the soaps as an additive to function as a/an :

- (1) Softener
- (2) Dryer
- (3) Buffering agent
- (4) Antiseptic

Ans. [4]

Sol. Students may find similar question in CP Theory Sheet: [Chapter : Chemistry in Everyday life, Page no. 201]

Bithional is added to soaps to impart antiseptic properties. Structure of Bithional is:-

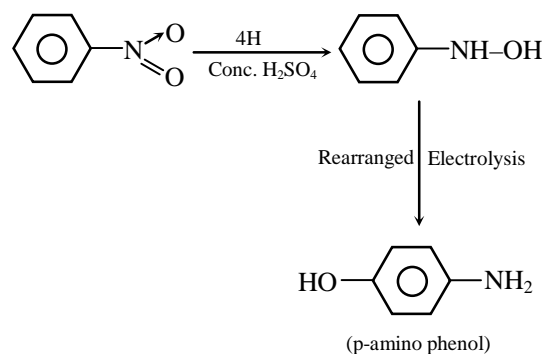


Q.76 The electrolytic reduction of nitrobenzene in strongly acidic medium produces :

- (1) p-Aminophenol
- (2) Azoxybenzene
- (3) Azobenzene
- (4) Aniline

Ans. [1]

Sol. Students may find similar question in CP Theory Sheet: [Chapter: Nitrogen Compounds, Page no. 121]



Q.77 In Duma's method for estimation of nitrogen 0.25 g of an organic compound gave 40 mL of nitrogen collected at 300 K temperature and 725 mm pressure. If the aqueous tension at 300 K is 25 mm, the percentage of nitrogen in the compound is :

- (1) 17.36
- (2) 18.20
- (3) 16.76
- (4) 15.76

Ans. [3]



Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Purification & Characterization, Ex. 1, Q.51, Page no. 229]

Given volume of nitrogen collected at 300 K and 725 mm pressure is 40 ml.

Actual pressure = 725 – 25 = 700 mm

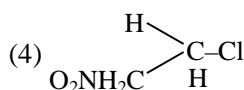
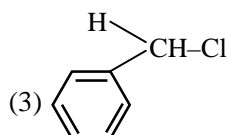
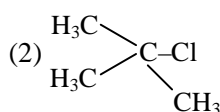
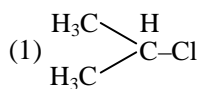
$$\begin{aligned} \text{Volume of nitrogen at STP} &= \frac{273 \times 700 \times 40}{300 \times 760} \\ &= 33.52 \text{ mL} \end{aligned}$$

22,400 mL of nitrogen at STP weighs = 28 gm

$$33.52 \text{ mL of nitrogen weighs} = \frac{28 \times 33.52}{22400} \text{ gm}$$

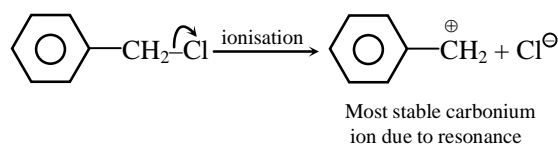
$$\% \text{ of nitrogen} = \frac{28 \times 33.52 \times 100}{22400 \times 0.25} = 16.76$$

Q.78 In which of the following compounds, the C – Cl bond ionization shall give most stable carbonium ion ?

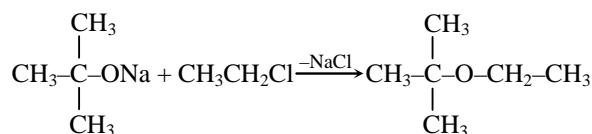


Ans. [3]

Sol. Students may find similar question in CP Class notes of GOC-II



Q.79 The reaction

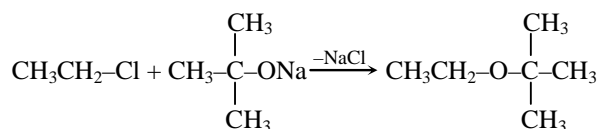


is called :

- (1) Williamson Synthesis
- (2) Williamson continuous etherification process
- (3) Etard reaction
- (4) Gatterman – Koch reaction

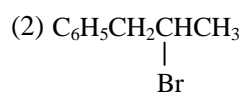
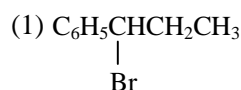
Ans. [1]

Sol. Students may find similar question in CP Theory Sheet: [Chapter: Oxygen compounds, Page no. 53]



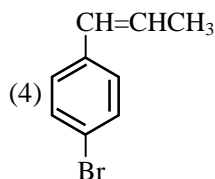
It is Williamson's synthesis which gives ether.

Q.80 The reaction of $\text{C}_6\text{H}_5\text{CH}=\text{CHCH}_3$ with HBr produces :



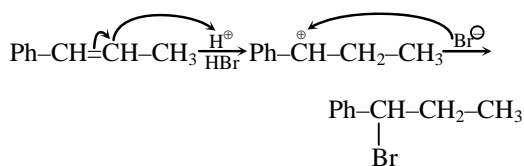


(3) $C_6H_5CH_2CH_2CH_2Br$

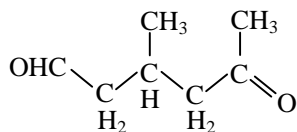


Ans. [1]

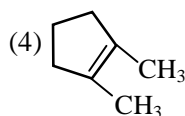
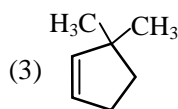
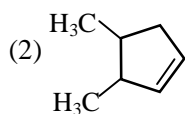
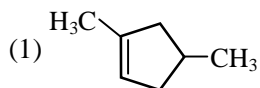
Sol. **Students may find similar question in CP class notes of GOC-II**



Q.81 A single compound of the structure

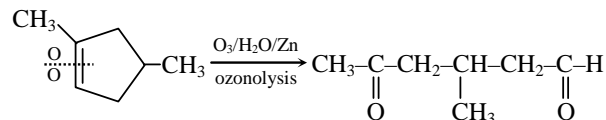


is obtainable from ozonolysis of which of the following cyclic compounds ?



Ans. [1]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Alkene, Ex. 2, Q.67, Page no. 157]**



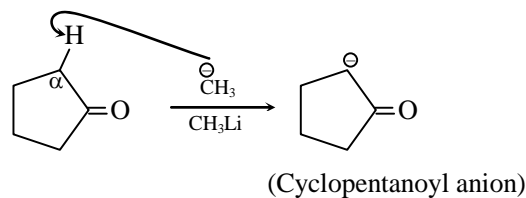
Q.82 Treatment of cyclopentanone

with methyl lithium gives which of the following species ?

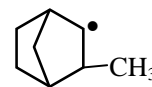
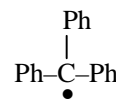
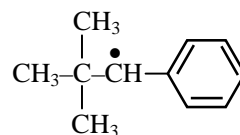
- (1) Cyclopentanonyl anion
- (2) Cyclopentanonyl cation
- (3) Cyclopentanonyl radical
- (4) Cyclopentanonyl biradical

Ans. [1]

Sol. Since α - H is acidic. It is acid-base reaction.



Q.83 Consider the following compounds



(I) (II) (III)

Hyperconjugation occurs in :

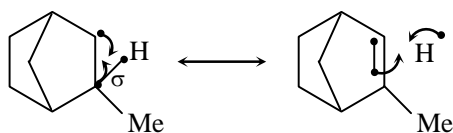


- (1) I only
- (2) II only
- (3) III only
- (4) I and III

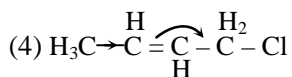
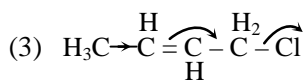
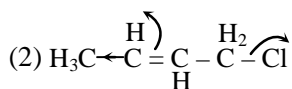
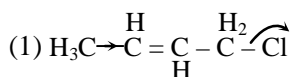
Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : GOC-II, Ex. 1, Q.38, Page no. 108]**

Hyperconjugation is possible when conjugated σ (C-H) – odd e^- are present.



Q.84 Which of the following is the most correct electron displacement for a nucleophilic reaction to take place ?



Ans. [3]

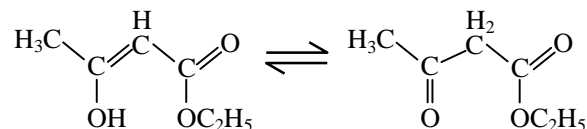
Sol. **Students may find similar question in CP class notes of GOC-II**

CH_3 group shows +I effect and Cl shows -I effect.

Hence most correct electron displacement for nucleophilic reaction will be –



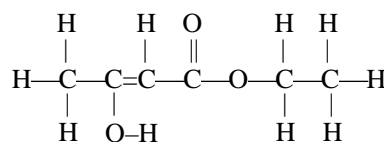
Q.85 The enolic form of ethyl acetoacetate as below has :



- (1) 18 sigma bonds and 2 pi-bonds
- (2) 16 sigma bonds and 1 pi-bond
- (3) 9 sigma bonds and 2 pi-bonds
- (4) 9 sigma bonds and 1 pi-bond

Ans. [1]

Sol. **Students may find similar question in CP class notes of GOC-I**

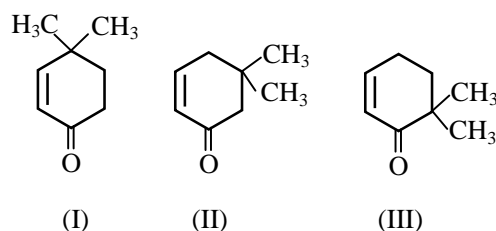


(Enol form of ethyl aceto acetate)

Total σ bonds = 18

Total π bonds = 2

Q.86 Given :





Which of the given compounds can exhibit tautomerism ?

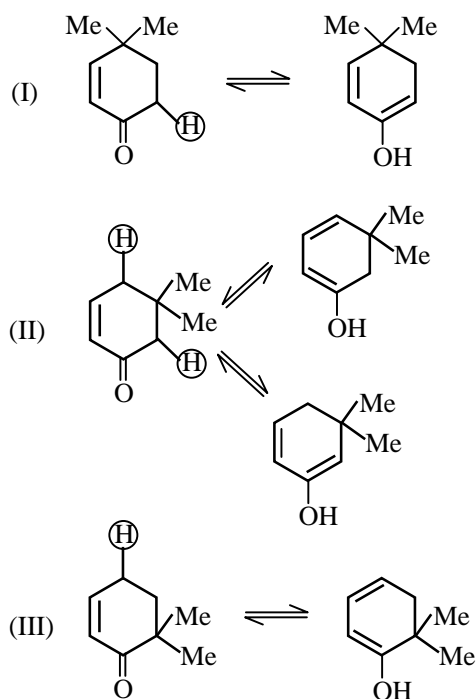
- (1) I and II
- (2) I and III
- (3) II and III
- (4) I, II and III

Ans. [4]

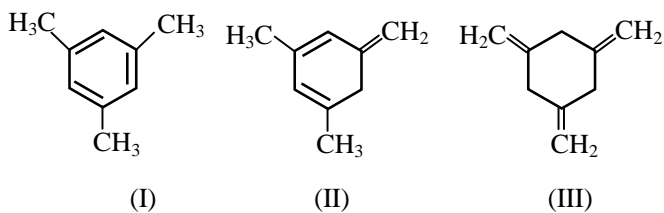
Sol. **Students may find similar question in CP DPPS: [Chapter : GOC-I, DPPS-2, Q.9**

All the three compound have active –H atom

So all can exhibit tautomerism



Q.87 Given :



The enthalpy of hydrogenation of these compounds will be in the order as :

- (1) I > II > III
- (2) III > II > I
- (3) II > III > I
- (4) II > I > III

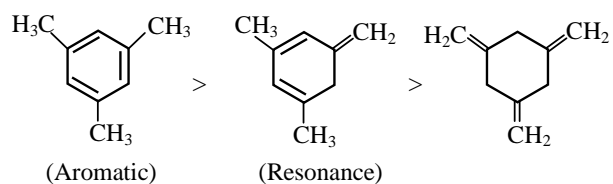
Ans. [2]

Sol. **Students may find similar question in CP class notes of alkene**

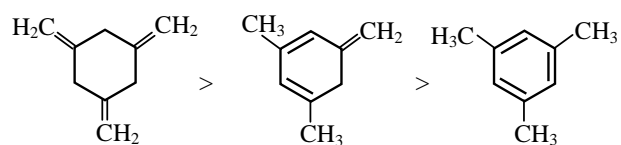
Generally

$$\text{Enthalpy of hydrogenation} \propto \frac{1}{\text{Stability}}$$

∴ Stability order



∴ Enthalpy order



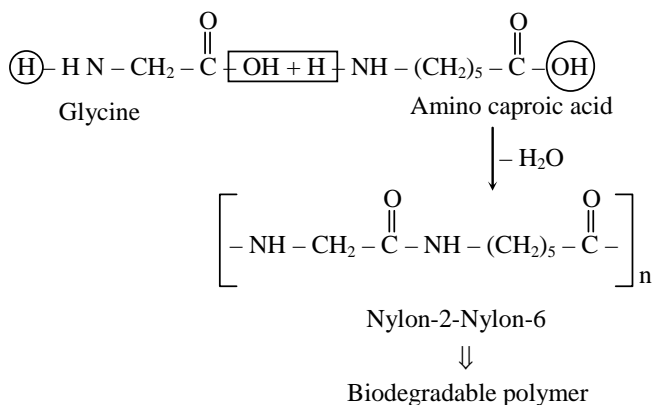
Q.88 Biodegradable polymer which can be produced from glycine and aminocaproic acid is :

- (1) Nylon 2-nylon 6
- (2) PHBV
- (3) Buna - N
- (4) Nylon 6, 6

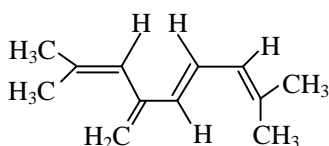


Ans. [1]

Sol. **Students may find similar question in CP Theory Sheet: [Chapter : Polymers, Page no. 194]**



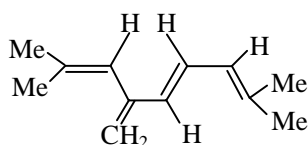
Q.89 The total number of π - bond electrons in the following structure is :



- (1) 4
- (2) 8
- (3) 12
- (4) 16

Ans. [2]

Sol. **Students may find similar question in CP DPPS: [Chapter : GOC-I, DPPS-2, Q.8]**



Total π bonds = 4

Total π bond electrons = 8

Q.90 An organic compound 'X' having molecular formula $\text{C}_5\text{H}_{10}\text{O}$ yields phenyl hydrazone and gives negative response to the Iodoform test and Tollen's test. It produces n-pentane on reduction. 'X' could be :

- (1) pentanal
- (2) 2-pentanone
- (3) 3-pentanone
- (4) n-amyl alcohol

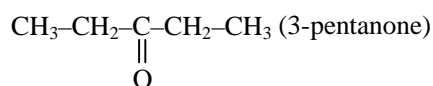
Ans. [3]

Sol. **Students may find same question in CP Exercise Sheet: [Chapter : Oxygen compounds, Ex. 6, Q.22, Page no. 89]**

Given molecular formula is $\text{C}_5\text{H}_{10}\text{O}$

- (i) It gives phenyl hydrazone i.e. It is either aldehyde or ketone
- (ii) It gives -ve Tollen's test i.e. it must be ketone (not aldehyde)
- (iii) It gives -ve Iodoform test i.e. it can't be methyl ketone

So we can say suitable answer is





Q.91 Which one of the following matches is correct?

| | | | |
|-----|---------------------|-----------------------------|----------------|
| (1) | <i>Phytophthora</i> | Aseptate mycelium | Basidiomycetes |
| (2) | <i>Alternaria</i> | Sexual reproduction absent | Deuteromycetes |
| (3) | <i>Mucor</i> | Reproduction by Conjugation | Ascomycetes |
| (4) | <i>Agaricus</i> | Parasitic fungus | Basidiomycetes |

Ans. [2]

Sol. **Students may find it in CP Exercise Sheet: [Chapter : Plant Diversity, Page no. 88]**

Alternaria is a genus of deuteromycetes and so sexual reproduction is absent

For other options :

Phytophthora – Oomycetes (Phycomycetes)

Mucor – Zygomycetes (Phycomycetes)

Agaricus– Basidiomycetes (Saprotrophic fungus)

Q.92 Read the following five statements (A to E) and select the option with all correct statements :

(A) Mosses and Lichens are the first organisms to colonise a bare rock

(B) *Selaginella* is a homosporous pteridophyte

(C) Coralloid roots in *Cycas* have VAM

(D) Main plant body in bryophytes is gametophytic, whereas in pteridophytes it is sporophytic

(E) In gymnosperms, male and female gametophyte are present within sporangia located on sporophyte.

(1) (A), (C) and (D)

(2) (B), (C) and (D)

(3) (A), (D) and (E)

(4) (B), (C) and (E)

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Plant Diversity, Q.No. 17, Page no. 130]**

A, D and E options are correct

For other options :

– *Selaginella* is a heterosporous pteridophyte

– Coralloid roots in *Cycas* have BGA (*Anabaena cycadae*)

Q.93 In which of the following gametophyte is not independent free living?

(1) *Funaria*

(2) *Marchantia*

(3) *Pteris*

(4) *Pinus*

Ans. [4]

Sol. **Students may find it in CP Exercise Sheet: [Chapter : Plant Diversity, Page no. 136]**

Gametophyte is dependent in gymnosperms and angiosperms whereas independent in bryophytes and pteridophytes.

Bryophytes – *Funaria*, *Marchantia*

Pteridophytes – *Pteris*

Gymnosperm – *Pinus*



Q.94 Which one of the following statements is wrong?

- (1) Algin and carragen are products of algae
- (2) Agar-agar is obtained from *Gelidium* and *Gracilaria*
- (3) *Chlorella* and *Spirulina* are used as space food
- (4) Mannitol is stored food in Rhodophyceae

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Plant Diversity, Q.No. 10, Page no. 106]

Mannitol is stored food in brown algae (Phaeophyceae)

Q.95 The guts of cow and buffalo possess :

- (1) *Fucus* spp.
- (2) *Chlorella* spp.
- (3) Methanogens
- (4) Cyanobacteria

Ans. [3]

Sol. Students may find it in CP Exercise Sheet: [Chapter : Plant Diversity, Page no. 24]

Methanogens are present in gut of cow and buffalo. They are commercially used in Biogas plants.

Q.96 Male gametes are flagellated in -

- (1) *Polysiphonia*
- (2) *Anabaena*
- (3) *Ectocarpus*
- (4) *Spirogyra*

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Plant Diversity, Q.No. 37, Page no. 108]

Ectocarpus is brown algae with flagellated male gametes

For other options :

Polysiphonia – Red algae – No flagella

Anabaena – BGA – No flagella or gamete

Spirogyra – Green algae – No flagella

Q.97 Vascular bundles in monocotyledons are considered closed because :

- (1) A bundle sheath surrounds each bundle
- (2) Cambium is absent
- (3) There are no vessels with perforations
- (4) Xylem is surrounded all around by phloem

Ans. [2]

Sol. Students may find it in CP Sheet: [Chapter : Structural organisation in plant, Page no. 28]

When intra fascicular cambium is not present in vascular bundle then vascular bundle is known as closed, which is commonly present in monocot stem.



Q.98 $\oplus \overset{\curvearrowright}{\text{♂}} K_{(5)} C_{(5)} A_5 G_{(2)}$ is the floral formula of :

- (1) *Allium*
- (2) *Sesbania*
- (3) *Petunia*
- (4) *Brassica*

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Structural organisation in plant, Q. No. 128 Page No. 171]

Given floral formula is of solanaceae family. Petunia is a plant of solanaceae family.

Q.99 A major characteristic of the monocot root is the presence of :

- (1) Open vascular bundles
- (2) Scattered vascular bundles
- (3) Vasculature without cambium
- (4) Cambium sandwiched between phloem and xylem along the radius

Ans. [3]

Sol. Students may find it in CP Sheet: [Chapter : Structural organisation in plant, Page no. 30]

Radial vascular bundle is present in monocot root and in radial vascular bundle of monocot root cambium is not present.

Q.100 Keel is the characteristic feature of flower of :

- (1) Tulip
- (2) *Indigofera*
- (3) *Aloe*
- (4) Tomato

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Structural organisation in plant, Q.No. 85 Page no. 128]

Keel is a common character of flower of fabaceae family. In fabaceae family anterior petal is known as keel. *Indigophora* is a plant of fabaceae family.



Q.101 Perigynous flowers are found in :

- (1) Guava
- (2) Cucumber
- (3) China rose
- (4) Rose

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Structural organisation in plant, Q. No. 91, Page No. 128]



In perigynous flower bowl or cup shape thalamus is present in which ovary is present in the centre and other floral organ are originated from the rim of thalamus.

Q.102 Leaves become modified into spines in :

- (1) *Opuntia*
- (2) Pea
- (3) Onion
- (4) Silk Cutton

Ans. [1]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Structural organisation in plant, Q. No. 59, Page No. 127]**

In opuntia leaves are modified in spine to reduce transpiration loss of water.

Q.103 The structures that are formed by stacking of organized flattened membranous sacs in the chloroplasts are :

- (1) Cristae
- (2) Grana
- (3) Stroma lamellae
- (4) Stroma

Ans. [2]

Sol. **Students may find it in CP Sheet: [Chapter : Cell biology, Page no. 20]**

Grana is formed by stacking of organised flattened membranous sac in the chloroplast.

Q.104 The chromosomes in which centromere is situated close to one end are :

- (1) Metacentric
- (2) Acrocentric
- (3) Telocentric
- (4) Sub-metacentric

Ans. [2]

Sol. **Students may find similar question in CP DPPS : [Chapter : Cell the basic unit of life-3, Q.No. 13 Page no. 3]**

In acrocentric chromosome centromere is present very close to one end of chromosome.

Q.105 Select the correct matching in the following pairs :

- (1) Smooth ER – Oxidation of phospholipids
- (2) Smooth ER – Synthesis of lipids
- (3) Rough ER – Synthesis of glycogen
- (4) Rough ER – Oxidation of fatty acids

Ans. [2]

Sol. **Students may find it in CP Sheet: [Chapter : Cell biology, Page no. 23]**

SER is involved in lipid biosynthesis.

Q.106 True nucleus is absent in :

- (1) *Anabaena*
- (2) *Mucor*
- (3) *Vaucheria*
- (4) *Volvox*



Ans. [1]

Sol. **Students may find it in CP Sheet: [Chapter : Cell biology, Page no. 3]**

True nucleus is not present in prokaryotes.
Anabena is a prokaryotes.

Q.107 Which one of the following is not an inclusion body found in prokaryotes?

- (1) Phosphate granule
- (2) Cyanophycean granule
- (3) Glycogen granule
- (4) Polysome

Ans. [4]

Sol. **Students may find it in CP Sheet: [Chapter: Cell biology, Page no. 29]**

Polysome or polyribosome is string of ribosome on mRNA.

Q.108 Transpiration and root pressure cause water to rise in plants by :

- (1) Pulling it upward
- (2) Pulling and pushing it, respectively
- (3) Pushing it upward
- (4) Pushing and pulling it, respectively

Ans. [2]

Sol. **Students may find it in CP Sheet: [Plant Physiology (Chapter – Plant water relation & mineral nutrition), Page no. 189]**

Transpiration is due to transpiration pull which is due to negative hydrostatic pressure

gradient or a pulling force, while root pressure is due to positive hydrostatic pressure gradient which is a kind of pushing force.

Q.109 Minerals known to be required in large amounts for plant growth include :

- (1) Phosphorus, potassium, sulphur, calcium
- (2) Calcium, magnesium, manganese, copper
- (3) Potassium, phosphorus, selenium, boron
- (4) Magnesium, sulphur, iron, zinc

Ans. [1]

Sol. **Students may find it in CP Sheet: [Plant Physiology (Chapter – Plant water relation & mineral nutrition), Page no. 285]**

Phosphorous, potassium, sulphur, calcium are macronutrients.

Q.110 What causes a green plant exposed to the light on only one side, to bend toward the source of light as it grows?

- (1) Green plants need light to perform photosynthesis
- (2) Green plants seek light because they are phototropic
- (3) Light stimulates plant cells on the lighted side to grow faster
- (4) Auxin accumulates on the shaded side, stimulating greater cell elongation there

Ans. [4]



Sol. Students may find this question in CP Sheet: [Plant Physiology (Chapter : Plant growth), Ex # 1, Q. No. 37]

Due to light photo-oxidation of auxin occurs, towards lightened side, cause less growth at lightened side and more growth on shaded side. It cause curvature.

Q.111 In a ring girdled plant :

- (1) The shoot dies first
- (2) The root dies first
- (3) The shoot and root die together
- (4) Neither root nor shoot will die

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Plant Physiology (Chapter : Plant water relation), Ex. # 1, Q No. 158]

In girdling experiment phloem is removed. Phloem is responsible for food conduction mainly, so first the root will died.

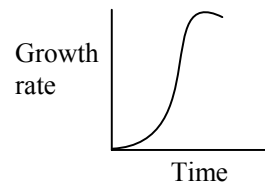
Q.112 Typical growth curve in plants is :

- (1) Sigmoid
- (2) Linear
- (3) Stair-steps shaped
- (4) parabolic

Ans. [1]

Sol. Students may find it in CP Sheet: [Plant Physiology (Chapter : Plant growth and hormone), Page no. 136]

Plant growth curve is s-shaped or sigmoid.



Q.113 Which one gives the most valid and recent explanation for stomatal movements?

- (1) Transpiration
- (2) Potassium influx and efflux
- (3) Starch hydrolysis
- (4) Guard cell photosynthesis

Ans. [2]

Sol. Students may find similar question in CP Exercise Sheet: [Plant Physiology (Chapter : Plant water relation), Ex. # 1, Q. No. 242, 244]

Most valid and recent explanation of stomatal movement was given by Levitt, known as active $K^+ \rightleftharpoons H^+$ ion exchange theory. Also known as potassium influx and efflux theory.

Q.114 The hilum is a scar on the :

- (1) Seed, where funicle was attached
- (2) Fruit, where it was attached to pedicel
- (3) Fruit, where style was present
- (4) Seed, where micropyle was present

Ans. [1]

Sol. Students may find it in CP Exercise Sheet: [Chapter : Reproduction in flowering plant, Page no. 41]



Hilum is present in both ovule and seed and is point of attachment of funicle with respective body.

Q.115 Which one of the following may require pollinators, but is genetically similar to autogamy?

- (1) Geitonogamy
- (2) Xenogamy
- (3) Apogamy
- (4) Cleistogamy

Ans. [1]

Sol. **Students may find it in CP Exercise Sheet: [Chapter : Reproduction in flowering plant, Page no. 23]**

Geitonogamy occurs in same plant but between different flowers and so may require pollinators but is genetically similar to autogamy.

Q.116 Which one of the following statements is **not** true?

- (1) Pollen grains are rich in nutrients, and they are used in the form of tablets and syrups
- (2) Pollen grains of some plants cause severe allergies and bronchial afflications in some people
- (3) The flowers pollinated by flies and bats secrete foul odour to attract them
- (4) Honey is made by bees by digesting pollen collected from flowers

Ans. [4]

Sol. **Students may find it in CP Exercise Sheet: [Chapter : Reproduction in flowering plant, Page no. 15]**

Honey is made by bees, not by digesting pollen but by nectar collected from flowers.

Q.117 Transmission tissue is characteristic feature of :

- (1) Hollow style
- (2) Solid style
- (3) Dry stigma
- (4) Wet stigma

Ans. [2]

Sol. Transmission tissue is characteristic feature of solid style. They are located in centre of style and cytoplasm of these cells are rich in organelles.

It is essential for pollen tube growth, because of the nutrients and guidance. It also regulates GSI (Gametophytic self – Incompatibility) in style.

Q.118 In ginger vegetative propagation occurs through :

- (1) Rhizome
- (2) Offsets
- (3) Bulbils
- (4) Runners

Ans. [1]



Sol. Students may find it in CP Sheet: [Chapter : Structural organisation in plant, Page no. 113]

Underground stem is present in ginger which is rhizome.

Q.119 Which of the following are the important floral rewards to the animal pollinators?

- (1) Colour and large size of flower
- (2) Nectar and pollen grains
- (3) Floral fragrance and calcium crystals
- (4) Protein pellicle and stigmatic exudates

Ans. [2]

Sol. Students may find it in CP Exercise Sheet: [Chapter : Reproduction in flowering plant, Page no. 27]

Presence of nectar and pollen grains in flowers acts as reward to the animal pollinators.

Q.120 How many pairs of contrasting characters in pea plants were studied by Mendel in his experiments?

- (1) Five
- (2) Six
- (3) Eight
- (4) Seven

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Genetics, Page No. 5]

Q.121 Which is the most common mechanism of genetic variation in the population of a sexually reproducing organism?

- (1) Transduction
- (2) Chromosomal aberrations
- (3) Genetic drift
- (4) Recombination

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Genetics, Page No. 2]

Q.122 A technique of micropropagation is :

- (1) Somatic hybridization
- (2) Somatic embryogenesis
- (3) Protoplast fusion
- (4) Embryo rescue

Ans. [2]

Sol. Students may find it in CP Exercise Sheet: [Chapter : Economic Botany (Tissue culture), Page no. 97]

Micropropagation or PTC (Plant tissue culture) is a technique of producing thousands of plantlets from explant in aseptic environment, it can be performed by callus culture or somatic embryogenesis.

Q.123 The movement of a gene from one linkage group to another is called :

- (1) Inversion
- (2) Duplication
- (3) Translocation
- (4) Crossing over



Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Genetics, Page No. 18]

Gene transfer from one linkage group (gene present on same chromosome). To another by translocation.

Q.124 Multiple alleles are present :

- (1) On different chromosomes
- (2) At different loci on the same chromosome
- (3) At the same locus of the chromosome
- (4) On non-sister chromatids

Ans. [3]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Genetics, Page No. 21]

Q.125 Which body of the Government of India regulates GM research and safety of introducing GM organisms for public services?

- (1) Bio-safety committee
- (2) India Council of Agricultural Research
- (3) Genetic Engineering Approval Committee
- (4) Research Committee on Genetic Manipulation

Ans. [3]

Sol. NCERT - Class-XII (Chapter : Genetics), Page no. 213]

Q.126 In Bt cotton, the Bt toxin present in plant tissue as pro-toxin is converted into active toxin due to :

- (1) alkaline pH of the insect gut
- (2) acidic pH of the insect gut
- (3) action of gut micro-organisms
- (4) presence of conversion factors in insect gut

Ans. [1]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Biotechnology, Page no. 123]

Q.127 The crops engineered for glyphosate are resistant/tolerant to :

- (1) Fungi
- (2) Bacteria
- (3) Insects
- (4) Herbicides

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Genetics, Class Notes (Topic – Uses of genetically modified crop)]

Transgenic tobacco plant contain GAT (Glyphosate acetyl transferase) gene, which make it herbicides resistant.

Q.128 DNA is **not** present in :

- (1) Chloroplast
- (2) Ribosomes
- (3) Nucleus
- (4) Mitochondria



Ans. [2]

Sol. Students may find it in CP Sheet: [Chapter : Cell biology, Page no. 29]

RNA is present in ribosome rather than DNA.

Q.129 Which of the following enhances or induces fusion of protoplasts?

- (1) Sodium chloride and potassium chloride
- (2) Polyethylene glycol and sodium nitrate
- (3) IAA and Kinetin
- (4) IAA and gibberellins

Ans. [2]

Sol. Students may find it in CP Exercise Sheet: [Chapter : Economic Botany (Tissue culture), Page no. 99]

Protoplast can be enhanced or induced to fuse by the help of PEG (Poly ethylene glycol), sodium nitrate or by electrofusion.

Q.130 The UN Conference of Parties on climate change in the year 2011 was held in :

- (1) Poland
- (2) South Africa
- (3) Peru
- (4) Qatar

Ans. [2]

Sol. UN conference of parties on climate change (2011) was held at Durban South Africa.

Q.131 Vertical distribution of different species occupying different levels in a biotic community is known as :

- (1) Divergence
- (2) Stratification
- (3) Zonation
- (4) Pyramid

Ans. [2]

Sol. Students may find it in CP Sheet: [Ecology (Chapter : Population and Community), Page no. 53]

Vertical distribution of different species occupying different levels in a community is called as stratification.

Q.132 In which of the following both pairs have **correct** combination?

- (1) *In situ* conservation : National Park
Ex situ conservation : Botanical Garden
- (2) *In situ* conservation : Cryopreservation
Ex situ conservation : Wildlife Sanctuary
- (3) *In situ* conservation : Seed Bank
Ex situ conservation : National Park
- (4) *In situ* conservation : Tissue culture
Ex situ conservation : Sacred groves

Ans. [1]

Sol. Students may find it in CP Sheet: [Ecology (Chapter : Biodiversity), Page no. 144]

In situ conservation : National Park

Ex situ conservation : Botanical Garden



Q.133 Secondary succession takes place on/in :

- (1) Bare rock
- (2) Degraded forest
- (3) Newly created pond
- (4) Newly cooled lava

Ans. [2]

Sol. **Students may find it in CP Sheet: [Ecology (Chapter : Population and Community), Page no. 55]**

Secondary succession occurs on deforested site. As secondary succession follows primary succession.

Q.134 The mass of living material at a trophic level at a particular time is called :

- (1) Gross primary productivity
- (2) Standing state
- (3) Net primary productivity
- (4) Standing crop

Ans. [4]

Sol. **Students may find it in CP Sheet: [Ecology (Chapter : Ecosystem), Page no. 90]**

The of living material at a trophic level at a particular time is called as standing crop.

Q.135 In an ecosystem the rate of production of organic matter during photosynthesis is termed as :

- (1) Net primary productivity
- (2) Gross primary productivity
- (3) Secondary productivity
- (4) Net productivity

Ans. [2]

Sol. **Students may find it in CP Sheet: [Ecology (Chapter : Ecosystem), Page no. 91]**

Gross primary productivity is the rate of production of organic matter by total photosynthesis of producers.

Q.136 Which of the following characteristics is mainly responsible for diversification of insects on land?

- (1) Segmentation
- (2) Bilateral symmetry
- (3) Exoskeleton
- (4) Eyes

Ans. [3]

Sol. **Students may find it in CP Sheet: [Chapter : Animal Diversity, Page no. 35]**

Chitinous exoskeleton is one of the most formidable character of insects which helped them to spread most successfully on the earth.

Q.137 Which of the following endoparasites of humans does show viviparity?

- (1) *Ancylostoma duodenale*
- (2) *Enterobius vermicularis*
- (3) *Trichinella spiralis*
- (4) *Ascaris lumbricoides*

Ans. [3]

Sol. **Students may find it in CP Sheet: [Chapter : Animal Diversity, Page no. 29]**

Trichinella spiralis is a nematode parasite in men, found in skeletal muscles. It shows viviparity.



Q.138 Which of the following represents the **correct** combination without any exception?

| | Characteristics | Class |
|-----|--|----------------|
| (1) | Mammary gland; hair on body; pinnae; two pairs of limbs | Mammalia |
| (2) | Mouth ventral; gills without operculum; skin with placoid scales; persistent notochord | Chondrichthyes |
| (3) | Sucking and circular mouth; jaws absent, integument without scales; paired appendages | Cyclostomata |
| (4) | Body covered with feathers; skin moist and glandular; fore-limbs form wings; lungs with air sacs | Aves |

Ans. [2]

Sol. **Students may find this concept in CP Sheet: [Chapter : Animal diversity, Page no. 104, 105]**

Chondrichthyes (as per NCERT) are group of fishes which shows features such as ventrally located mouth, gills without operculum, skin covered with placoid scales and notochord remains persistent throughout life.

Q.139 Which of the following animals is **not** viviparous?

- (1) Flying fox (Bat)
- (2) Elephant
- (3) Platypus
- (4) Whale

Ans. [3]

Sol. **Students may find this concept in CP Sheet: [Chapter : Animal Diversity, Page no. 134]**

Animal duck billed platypus (ornithorhynchus) is an egg laying mammal belonging to subclass prototheria.

Q.140 Erythropoiesis starts in :

- (1) Kidney
- (2) Liver
- (3) Spleen
- (4) Red bone marrow

Ans. [4]*

Sol. **Students will find similar matter in CP Sheet: [Chapter : Animal physiology-I, Page no. 34]**

In adults erythropoiesis starts in red bone marrow only.

* However in foetal stage yolk sac and later liver and spleen produce blood much before the red bone marrow.

* But it is to be asamed according to the condition of options in the question that the question refers to adult erythropoiesis.

Q.141 The terga, sterna and pleura of cockroach body are joined by :

- (1) Cementing glue
- (2) Muscular tissue
- (3) Arthroial membrane
- (4) Cartilage

Ans. [3]



Sol. Students may find this concept in CP Sheet: [Chapter : Lower animal, Page No. 80]

The terga, sterna and pleura are chitinous plates which covers cockroach body. These three are linked together by thin arthroal membrane.

Q.142 Nuclear envelope is a derivative of :

- (1) Smooth endoplasmic reticulum
- (2) Membrane of Golgi complex
- (3) Microtubules
- (4) Rough endoplasmic reticulum

Ans. [4]

Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Cell biology, Q.No. 103, Page no. 66]

Rough endoplasmic reticulum form the nuclear envelope during karyokinesis.

Q.143 Cytochromes are found in :

- (1) Matrix of mitochondria
- (2) Outer wall of mitochondria
- (3) Cristae of mitochondria
- (4) Lysosomes

Ans. [3]

Sol. Students may find it in CP Sheet: [Plant Physiology (Chapter : Cell respiration), Page no. 75]

Cytochromes are found on cristae, which are present on inner mitochondrial membrane.

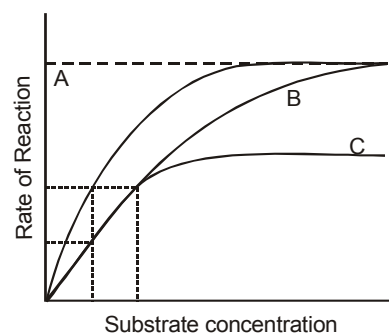
Q.144 Which one of the following statements is incorrect?

- (1) A competitive inhibitor reacts reversibly with the enzyme to form an enzyme-inhibitor complex.
- (2) In competitive inhibition, the inhibitor molecule is not chemically changed by the enzyme.
- (3) The competitive inhibitor does not affect the rate of breakdown of the enzyme-substrate complex.
- (4) The presence of the competitive inhibitor decreases the K_m of the enzyme for the substrate.

Ans. [4]

Sol. Students may find it in CP Sheet: [Plant Physiology (Chapter : Enzyme), Page no. 123]

Presence of competitive inhibitor, increase the K_m constant of enzyme (not decrease) while does not affects the V_{max} as the competitive inhibitor binds at active site, so decrease the affinity of enzyme for its substrate, so K_m constant increase. If substrate concentration is increased, inhibition over comes and attains normal V_{max} .



A - Normal Reaction
 B - Competitive inhibitor
 C - Non Competitive inhibitor

**Q.145** Select the **correct** option :

| | I | | II |
|-----|--|-------|-----------------------|
| (a) | Synapsis aligns homologous chromosomes | (i) | Anaphase-II |
| (b) | Synthesis of RNA and protein | (ii) | Zygotene |
| (c) | Action of enzyme recombinase | (iii) | G ₂ -phase |
| (d) | Centromeres do not separate but chromatids move towards opposite poles | (iv) | Anaphase-I |
| | | (v) | Pachytene |

- (a) (b) (c) (d)
- (1) (ii) (i) (iii) (iv)
- (2) (ii) (iii) (v) (iv)
- (3) (i) (ii) (v) (iv)
- (4) (ii) (iii) (iv) (v)

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Cell Biology, Page no. 74 (Q.258)]**

Synapsis of homologous chromosome – Zygotene

Synthesis of RNA & protein – G₂ phase

Action of enzyme recombinase – pachytene

Centromere do not separate but chromatid move towards opposite pole – Anaphase-I

Q.146 A somatic cell that has just completed the S phase of its cell cycle, as compared to gamete of the same species, has :

- (1) Twice the number of chromosomes and twice the amount of DNA
- (2) Same number of chromosomes but twice the amount of DNA
- (3) Twice the number of chromosomes and four times the amount of DNA
- (4) Four times the number of chromosomes and twice the amount of DNA

Ans. [3]

Sol. **Students may find similar question in CP DPPS : [Chapter : The basic unit of life-3, Page no. 3 (Q.15)]**

DNA replication occurs in s phase but number of chromosome does not change

If a cell is diploid than after s phase DNA content in cell will be 4 C and Chromosome in cell = 2 N

While in gamete

DNA content in gamete = C

Chromosome in gamete = N

Number of chromosome in somatic cell will be twice than gamete while DNA content will be four times

Q.147 Which of the following statements is **not correct** ?



- (1) Brunner's glands are present in the submucosa of stomach and secrete pepsinogen
- (2) Goblet cells are present in the mucosa of intestine and secrete mucus
- (3) Oxyntic cells are present in the mucosa of stomach and secrete HCl.
- (4) Acini are present in the pancreas and secrete carboxypeptidase

Ans. [1]

Sol. **Students may find it in CP Exercise Sheet:**
[Chapter : Animal physiology-I, Digestive system, Page no. 137]

Brunner's glands are found in submucosa of duodenum & secretes non enzymatic part of intestinal juice.

Reference : NCERT Class-XIth chapter 16 – digestion & absorption page number 262

Q.148 Gastric juice of infants contains :

- (1) Maltase, pepsinogen, rennin
- (2) Nuclease, pepsinogen, lipase
- (3) Pepsinogen, lipase, rennin
- (4) Amylase, rennin, pepsinogen

Ans. [3]

Sol. Gastric juice of infants primarily has the ability to digest milk protein by enzyme rennin, however small amounts of pepsinogen & lipase are also present.

Reference (a) NCERT Class XIth, Chapter number 16, digestion & absorption, Page no. 262

Q.149 When you hold your breath, which of the following gas changes in blood would first lead to the urge to breathe?

- (1) Falling O₂ concentration
- (2) Rising CO₂ concentration
- (3) Falling CO₂ concentration
- (4) Rising CO₂ and falling O₂ concentration

Ans. [2]

Sol. **Students may find this matter in CP Sheet:**
[Chapter : Animal Physiology-II, Page no. 61]

Respiratory centre is not directly sensitive to oxygen concentration & desire to breath is induced by rise in CO₂ concentration of blood.

Q.150 Blood pressure in the mammalian aorta is maximum during :

- (1) Systole of the left atrium
- (2) Diastole of the right ventricle
- (3) Systole of the left ventricle
- (4) Diastole of the right atrium

Ans. [3]



Sol. Students will find similar matter in CP Sheet: [Chapter : Animal physiology-II, Page no. 106]

B.P. in Aorta will be maximum when left ventricle pumps the stroke volume into its lumen during its systole.

Q.151 Which one of the following is **correct**?

- (1) Plasma = Blood – Lymphocytes
- (2) Serum = Blood + Fibrinogen
- (3) Lymph = Plasma + RBC + WBC
- (4) Blood = Plasma + RBC + WBC + Platelets

Ans. [4]

Sol. Students may find this matter in CP Sheet: [Chapter : Animal Physiology-I, Animal Tissue, Page no. 29]

Blood is liquid connective tissue which contains plasma, RBCs, WBCs & Platelet.

Reference : NCERT Chapter-7, Structural organization in animals, Page No. 104

Q.152 Removal of proximal convoluted tubule from the nephron will result in :

- (1) More diluted urine
- (2) More concentrated urine
- (3) No change in quality and quantity of urine
- (4) No urine formation

Ans. [1]*

Sol. Students will find similar matter in CP Sheet: [Chapter : Animal Physiology-II, Page no. 20]

The question is wrongly framed in concept. Hence no appropriate answer can be found. Still the least incorrect answer can be (1) because maximum reabsorption of filtrate (70%) occurs from P.C.T.

Hence removal of PCT will increase the urine volume

Q.153 Sliding filament theory can be best explained as :

- (1) When myofilaments slide past each other Actin filaments shorten while Myosin filament do not shorten
- (2) Actin and Myosin filaments shorten and slide past each other
- (3) Actin and Myosin filaments do not shorten but rather slide past each other
- (4) When myofilaments slide past each other, Myosin filaments shorten while Actin filaments do not shorten

Ans. [3]

Sol. Students may find it in CP Exercise Sheet: [Chapter : Animal physiology-I, Muscle contraction Page no. 198]

As per sliding filament theory of muscle contraction during muscle contraction actin & myosin filaments do not shorten, rather actin filaments slide over myosin filaments.

Ref. NCERT XIth, Chapter 20, locomotion & movement, Page no. 307



Q.154 Glenoid cavity articulates :

- (1) Clavicle with acromion
- (2) Scapula with acromion
- (3) Clavicle with scapula
- (4) Humerus with scapula

Ans. [4]

Sol. **Students will find this matter in CP Sheet: [Chapter : Animal physiology-I, Page no. 102]**

Glenoid cavity is found in scapula which articulates with head of the humerus to form shoulder joint.

Q.155 Which of the following regions of the brain is incorrectly paired with its function

- (1) Medulla oblongata – Homeostatic control
- (2) Cerebellum – language comprehension
- (3) Corpus callosum – communication between the left and right cerebral cortices
- (4) Cerebrum – calculation and contemplation

Ans. [2]

Sol. **Students may find it in CP Exercise Sheet: [Chapter : Animal physiology-II, Nervous system, Page no. 217]**

Cerebellum in hind brain is primarily responsible for maintaining body posture & equilibrium (not for language comprehension)

Ref.: NCERT XIth, Chapter 21, Neural control & Coordination, Page no. 321

Q.156 A gymnast is able to balance his body upside down even in the total darkness because of

- (1) Cochlea
- (2) Vestibular apparatus
- (3) Tectorial membrane
- (4) Organ of corti

Ans. [2]

Sol. **Students may find it in CP Exercise Sheet: [Chapter : Animal Physiology-II, Sensory system]**

The part of internal ear responsible for maintaining balance is vestibular apparatus.

Ref.: NCERT XIth, Chapter 21, Neural control & coordination, Page no. 326

Q.157 A chemical signal that has both endocrine and neural roles is

- (1) Melatonin
- (2) Calcitonin
- (3) Epinephrine
- (4) Cortisol

Ans. [3]

Sol. **Students may find it in CP Exercise Sheet: [Chapter : Animal Physiology-II, Nervous system, Page no. 233]**

Epinephrine (Adrenaline) can act both like a neurotransmitter as well as a hormone



Q.158 Which of the following does not favour the formation of large quantities of dilute urine

- (1) Alcohol
- (2) Caffeine
- (3) Renin
- (4) Atrial-natriuretic factor

Ans. [3]

Sol. Students will find similar matter in CP Sheet: [Chapter : Animal Physiology-II, Page no. 26]

Renin released by JG apparatus in response to control increased GFR, while alcohol, caffeine & ANF are directly or indirectly diuretics

Q.159 Capacitation refers to changes in the

- (1) Sperm before fertilization
- (2) Ovum before fertilization
- (3) Ovum after fertilization
- (4) Sperm after fertilization

Ans. [1]

Sol. Students may find it in CP Exercise Sheet: [Chapter : Reproduction system, Page no. 26]

Capacitation is a process that occurs in female genital tract and makes the sperm capable of fertilization of egg.

This phenomenon is found only in mammals

Q.160 Which of these is **not** an important component of initiation of parturition in humans ?

- (1) Increase in estrogen and progesterone ratio
- (2) Synthesis of prostaglandins
- (3) Release of oxytocin
- (4) Release of prolactin

Ans. [4]

Sol. Students may find it in CP Exercise Sheet: [Chapter : Reproductive system, Page no. 27]

Release of prolactin has no direct role in expulsion of foetus during parturition

Q.161 Which of the following viruses is **not** transferred through semen of an infected male

- (1) Hepatitis B virus
- (2) Human immunodeficiency virus
- (3) Chikungunya virus
- (4) Ebola virus

Ans. [3]

Sol. Students will find similar matter in CP Sheet: [Chapter : Immunity and Disease, Page no. 152]

Chikungunya virus transmitted through ades or tiger mosquito.



Q.162 Which of the following cells during gametogenesis is normally diploid

- (1) Primary polar body
- (2) Spermatid
- (3) Spermatogonia
- (4) Secondary polar body

Ans. [3]

Sol. **Students will find similar matter in CP Sheet: [Chapter : Embryology, Page no. 46]**

Spermatogonia is a diploid cell while all other cells are formed in later steps of spermatogenesis during mitotic cell division.

Q.163 Hysterectomy is surgical removal of

- (1) Uterus
- (2) Prostate gland
- (3) Vas-deference
- (4) Mammary glands

Ans. [1]

Sol. **Students will find similar matter in CP Sheet: [Chapter : Reproductive system, Page no. 24]**

Hystero is the term used for uterus

Q.164 Which of the following is **not** a sexually transmitted disease ?

- (1) Syphilis
- (2) Acquired Immuno Deficiency Syndrome (AIDS)
- (3) Trichomoniasis
- (4) Encephalitis

Ans. [4]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Immunity and Disease, Page no. 152]**

Encephalitis is mostly viral (Rabbies, Polio, Herps virus) not S.T.D.

Q.165 An abnormal human baby with 'XXX' sex chromosomes was born due to :

- (1) Formation of abnormal sperms in the father
- (2) Formation of abnormal ova in the mother
- (3) Fusion of two ova and one sperm
- (4) Fusion of two sperms and one ovum

Ans. [2]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Immunity and Disease, Page no. 147]**

Cromosomal non disjunction in ova (abnormal egg)

Q.166 Alleles are :

- (1) Different phenotype
- (2) True breeding homozygotes
- (3) Different molecular forms of a gene
- (4) Heterozygotes

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Genetics, Page no. 6]**



Q.167 A man with blood group 'A' marries a woman with blood group 'B'. What are all the possible blood groups of their offsprings ?

- (1) A and B only
- (2) A, B and AB only
- (3) A, B, AB and O
- (4) O only

Ans. [3]

Sol. **Students may find similar question in CP Exercise Sheet: [Chapter : Genetics, multiple allele question in class notes]**

| | | |
|---|-------------|------|
| | A × B | |
| | (AO) | (BO) |
| | A | O |
| B | AB | BO |
| O | AO | OO |
| | A, B, AB, O | |

Q.168 Gene regulation governing lactose operon of *E.coli* that involves the lac I gene product is

- (1) Positive and inducible because it can be induced by lactose
- (2) Negative and inducible because repressor protein prevents transcription.
- (3) Negative and repressible because repressor protein prevents transcription
- (4) Feedback inhibition because excess of β-galactosidase can switch off transcription

Ans. [2]

Sol. XII NCERT page – 117 (Lac operon)

Q.169 In sea urchine DNA, which is double stranded, 17% of the bases were shown to be cytosine. The percentages of the other three bases expected to be present in this DNA are

- (1) G34%, A24.5%, T24.5%
- (2) G17%, A16.5%, T32.5%
- (3) G17%, A33%, T33%
- (4) G8.5%, A50%, T24.5%

Ans. [3]

Sol. **Students may find similar question in CP Class notes : [Chapter : Protoplasm & Biomolecule]**

According to Chargaff's principle

$$A = T \text{ \& \ } G = C$$

so if C = 17% then G = 17%

and A + T + G + C = 100%

so A = T = 33%

Q.170 Which of the following had the smallest brain capacity ?

- (1) *Homo erectus*
- (2) *Homo sapiens*
- (3) *Homo neanderthalensis*
- (4) *Homo habilis*

Ans. [4]



Sol. Students may find similar question in CP
Exercise Sheet: [Chapter : Origin evolution of life, Page no. 42]

Homo habilis is considered to be the first human which evolved from Australopithecus its cranial capacity was smallest (650 – 800cc) among humans

Q.171 A population will **not** exist in Hardy-Weinberg equilibrium if

- (1) Individuals mate selectively
- (2) There are no mutations
- (3) There is no migration
- (4) The population is large

Ans. [1]

Sol. Students may find similar question in CP
Class Notes : [Chapter : Protoplasm]

Non random mating which may also be called selective mating violates Hardy Weinberg equilibrium law and brings genetic variation in a population by disturbing its genetic equilibrium

Q.172 Match each disease with its correct type of vaccine

- | | |
|--------------------|------------------------|
| (a) Tuberculosis | (i) Harmless virus |
| (b) Whooping cough | (ii) Inactivated toxin |
| (c) Diphtheria | (iii) Killed bacteria |
| (d) Polio | (iv) Harmless bacteria |

- | | | | | |
|-----|-------|-------|-------|-------|
| | (a) | (b) | (c) | (d) |
| (1) | (ii) | (i) | (iii) | (iv) |
| (2) | (iii) | (ii) | (iv) | (i) |
| (3) | (iv) | (iii) | (ii) | (i) |
| (4) | (i) | (ii) | (iv) | (iii) |

Ans. [3]

Sol. Students may find similar question in CP
Exercise Sheet: [Chapter : Immunity and disease, Page no. 127]

- (a) Tuberculosis vaccine BCG is live bovine tuberculosis is bacillus or harmless bacteria.
- (b) Whooping cough or pertussis vaccine is killed bacteria
- (c) Diphtheria vaccine is Diphtheria toxoid (inactivated toxin) (In D.P.T. contains Diphtheria and Tetanus toxoid)
- (d) Polio vaccine or O.P.V. (Oral polio vaccine) is live attenuated virus or harmless virus)

Q.173 HIV that causes AIDS, first starts destroying

- (1) B-Lymphocytes
- (2) Leucocytes
- (3) Helper T-Lymphocytes
- (4) Thrombocytes

Ans. [3]



Sol. Students may find similar question in CP Exercise Sheet: [Chapter : Immunity and disease, Page no. 153]

Q.174 The active form of *Entamoeba histolytica* feeds upon

- (1) Erythrocytes; mucosa and submucosa of colon
- (2) Mucosa and submucosa of colon only
- (3) Food in intestine
- (4) Blood only

Ans. [2]

Sol. The sarcodin parasite *E. histolytica* invades colonic mucosa & submucosa & causes amoebic dysentery

Q.175 High value of BOD (Biochemical Oxygen Demand) indicates that

- (1) Water is pure
- (2) Water is highly polluted
- (3) Water is less polluted
- (4) Consumption of organic matter in the water is higher by the microbes

Ans. [2]

Sol. Students may find it in CP Sheet: Ecology [Chapter : Environmental issue, Page no. 179]

If pollution increase, BOD high, as microbes requires more O₂ for biochemical oxidation of organic pollutant.

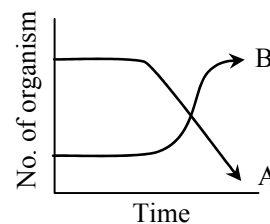
Q.176 Most animals are tree dwellers in a

- (1) Coniferous forest
- (2) thorn woodland
- (3) Temperate deciduous forest
- (4) Tropical rain forest

Ans. [4]

Sol. Most tree dweller animal like monkeys are maximally found in tropical rain forest.

Q.177 The following graph depicts changes in two populations (A and B) of herbivores in a grassy field. A possible reason for these changes is that :



- (1) Both plant populations in this habitat decreased
- (2) Population B competed more successfully for food than population A
- (3) Population A produced more offspring than population B
- (4) Population A consumed the members of population B

Ans. [2]

Sol. In given graph population A is decreasing with time while population B is increasing, which indicates that population B competed more successfully for food than population A



Q.178 Cryopreservation of gametes of threatened species in viable and fertile condition can be referred to as :

- (1) *In situ* conservation of biodiversity
- (2) advanced *ex-situ* conservation of biodiversity
- (3) *In situ* conservation by sacred groves
- (4) *In situ* cryo-conservation of biodiversity

Ans. [2]

Sol. **Students may find it in CP Sheet: Ecology [Chapter : Biodiversity, Page no. 147]**

Cryopreservation is a advanced *ex-situ* conservation strategy for conservation of gametes of threatened species in viable and fertile condition.

Q.179 Rachel Carson's famous book "Silent-Spring" is related to

- (1) Pesticide pollution
- (2) Noise pollution
- (3) Population explosion
- (4) Ecosystem management

Ans. [1]

Sol. Rachel Carson's famous book "Silent-spring" is related to pesticide pollution.

Silent spring is an environmental science book published on 27 sept. 1962.

This book documented the detrimental effects on birds due to indiscriminate use of pesticides.

This book leads to ban on DDT for agriculture throughout America & creation of U.S. environmental protection agency.

Q.180 Which of the following is **not** one of the prime health risks associated with greater UV radiation through the atmosphere due to depletion of stratospheric ozone ?

- (1) Increased skin cancer
- (2) Reduced Immune system
- (3) Damage to eyes
- (4) Increased liver cancer

Ans. [4]

Sol. U.V. radiations due to stratospheric ozone depletion does not cause increased chances of liver cancer