Aggarwal CLASSES
A Division of Aggarwal Educare

NEET TEST PAPER

TEST CODE : PNEETT05

PHYSICS, CHEMISTRY & BIOLOGY

[TIME : 3 HRS]   **SOLUTIONS**   **[MARKS : 720]**

Instructions

1. *The test paper consists of 180 questions . The maximum marks are 720.*

2. *Each question is allotted 4 (four) marks for each correct response.*

3. *¼ (one fourth) marks will be deducted for indicating incorrect response of each questions.No deduction from the total score will be made if no response is indicated for an item in the answer sheet.*

4. *There is only one correct response for each question. Filling up more than one response in any question will treated as wrong response and marks for wrong response will be deducted accordingly as per given instruction.*

PHYSICS

Q.1 An instrument having five display screen, where first two and last two show the final value of the quantity and middle screen displays the mean value. If 1st and 5th screen both display a value of 35 ºC; 2nd and 3rd screen display 20 ºC and 75 ºC respectively then, what value will be displayed by 4th screen ?

(a) 150 ºC   (b) 210 ºC   (c) 285 ºC   (d) 20 ºC

Ans: (b)

Sol: Mean $= \dfrac{a_1 + a_2 + a_3 + a_4}{4}$ .... ($\because n = 4$)

$75 = \dfrac{35 + 20 + 35 + a_4}{4}$ $a_4 = 210$ ºC

Q.2 Consider three vectors $\vec{A} = \hat{i} - \hat{j} + \hat{k}$, $\vec{B} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{C} = 2\hat{i} - 3\hat{j} + 4\hat{k}$. A vector $\vec{X}$ of the form $\alpha\vec{A} + \beta\vec{B}$ (α and β are number) is perpendicular to $\vec{C}$. The ratio of α and β is

(a) 1 : 1   (b) 2 : 1   (c) -1 : 1   (d) 3 : 1
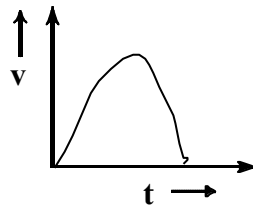
Ans: (a)

Sol: $(\alpha\vec{A} + \beta\vec{B})\vec{C} = 0$, $\left[\alpha\left(\hat{i} - \hat{j} + \hat{k}\right) + \beta\left(\hat{i} + \hat{j} - 2\hat{k}\right)\right] \cdot \left[\left(2\hat{i} - 3\hat{j} + 4\hat{k}.\right)\right] = 0$

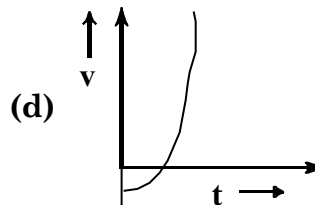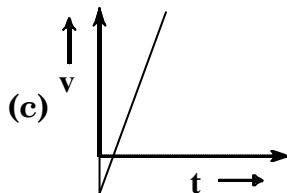$\Rightarrow$ $2(\alpha + \beta) - 3(\beta - \alpha) + 4(\alpha - 2\beta) = 0$
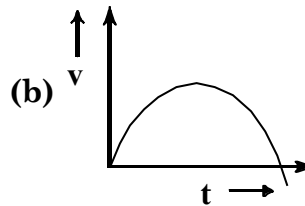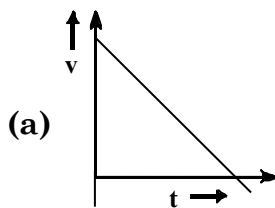
$\Rightarrow \quad 9\alpha - 9\beta = 0$

$\Rightarrow \quad \alpha:\beta = 1:1$

Q.3 **The graph of displacement v/s time is shown in figure.**

Its corresponding velocity-time graph will be

(a)

(b)

(c)

(d)

Ans: (a)

Sol: Velocity of body is given by the slope of displacement - time. graph. So it is clear that initially slope of the graph is positive and after some time it becomes zero (corresponding to the peak of graph) and then it will become negative.

Q.4 **A vessel at rest explodes into three pieces. Two pieces having equal masses fly-off perpendicular to one another with the same velocity 40 meter per second. The third piece has two times mass of each of other piece. The magnitude and direction of the velocity of the third piece will be**

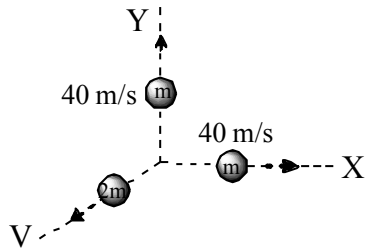**(a) $20\sqrt{2}$ m/second and 135° from either**

(b) $20\sqrt{2}$ m/second and 45° from either

(c) $\dfrac{20}{\sqrt{2}}$ m/second and 135° from either

(d) $\dfrac{20}{\sqrt{2}}$ m/second and 45° from either

Ans: (a)

Sol: Let Two pieces have equal mass m and third pieces has a mass of 2m.

According to law of conservation of linear momentum, $p_1 + p_2 = p_3$

If two particles possess same momentum and angle between them is 90°C, then resultant will be given by

$$p\sqrt{2} = mv\ \sqrt{2} = 40\sqrt{2}\,m.$$

Let the velocity of mass 2m be v. So, $2mv = 40m\sqrt{2}$

∴ $v = 20\sqrt{2}\ m/s$ and angle 135° from either.

Q.5 **An object is projected with a velocity u_1 from point A as shown in the figure. If, at the same time, another object is projected from point B with a velocity u_2, then for the two bodies to collide, the ratio u_2/u_1 should be**
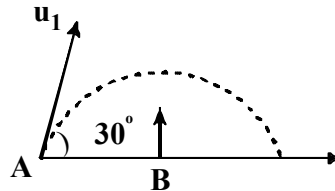
(a) 0.5   **(b) 1**   **(c) 1.5**   **(d) 2**

Ans: (a)

Sol: The two objects would collide at the highest point if they cover the same vertical height in same time.

∴ $$\frac{u_1^2 \sin^2 30°}{2g} = \frac{u_2^2}{2g}$$

∴ $$\frac{u_2}{u_1} = \sin 30° = 0.5$$

Q.6 **A box of mass m is projected up an inclined plane by a constant force F. The coefficient of kinetic friction between the box and plane is μ. Power delivered by the external agent after a time t measured from the beginning of action of the force is**
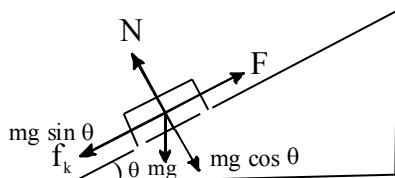
(a) $\dfrac{F(F - \mu mg)t}{m}$

(b) $\dfrac{F(F - mg\sin\theta - \mu mg)t}{m}$

(c) $\dfrac{F(F + \mu mg)t}{m}$

(d) $\dfrac{F(F - mg\sin\theta + \mu mg)t}{m}$

Ans: (b)

Sol:

$$P_{ext} = \vec{F} \cdot \vec{v} = Fv \qquad ....(i)$$

Resultant force acting on box,

$$F_R = (F - mg \sin\theta - f_k) \qquad ....(ii)$$

Acceleration of Box,

$$a = \frac{F_R}{m} = \frac{F - mg\sin\theta - f_k}{m} \qquad .....(iii)$$

Velocity $v = \int a \, dt \qquad .....(iv)$

∴ From equations (i), (iii) and (iv) we have

$$P_{ext} = Fv$$

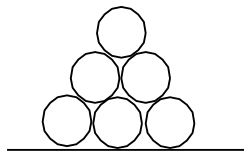$$= F\left[\int \frac{(F - mg\sin\theta - f_k)}{m} \, dt\right]$$

$$= \frac{F(F - mg\sin\theta - f_k)t}{m}$$

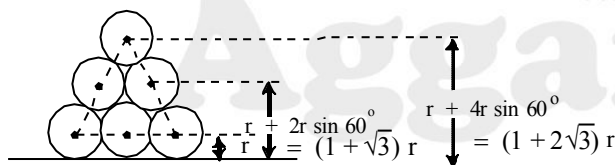$$\therefore \quad P_{ext} = \frac{F(F - mg\sin\theta - \mu mg)t}{m}$$

Q.7 **Six discs of same mass M and same radius r are placed as shown in the figure on a horizontal surface. How high does the centre of mass of the 6 disce system lie above the horizontal surface ?**

(a) $\left(\dfrac{2 + \sqrt{3}}{\sqrt{3}}\right) r$ 　　(b) $\left(\dfrac{1 + \sqrt{3}}{\sqrt{3}}\right) r$ 　　(c) $\dfrac{\sqrt{3}}{2} r$ 　　(d) **None of these**

Ans: (a)

Sol:

$$Y_{CM} = \frac{1}{6M} \times \left[3(Mr) + 2(1 + \sqrt{3})Mr + (1 + 2 + \sqrt{3})Mr\right]$$

$$= \frac{\left(6 + 4\sqrt{3}\right)}{6} r = \left(1 + \frac{2}{\sqrt{3}}\right) r = \left(\frac{\sqrt{3} + 2}{\sqrt{3}}\right) r$$

**Q.8** **The relay satellite transmits the T.V. programme continuously from one part of the world to another becuase its**
(a) A period is greater than the priod of rotation of the earth.
(b) Period is less than the priod of rotation of the earth about its axis.
(c) Period has no ralation with the priod of the earth about its axis
(d) Period is equal to the period of rotation of the earth about its axis.

Ans: (d)

Sol: Period is equal to the period of rotation of the earth about its axis.

Q.9 A solid block is studied under application of increasing force. As the force is applied, dimension of the block change3 After certain value of force is crossed. It shows non-linear change in length and surface area with respect to force. But it still can regain its original dimensions if force is removed. After cerain time, it suddenly collapses and fractures. These observations are most appropriately depicted in plot
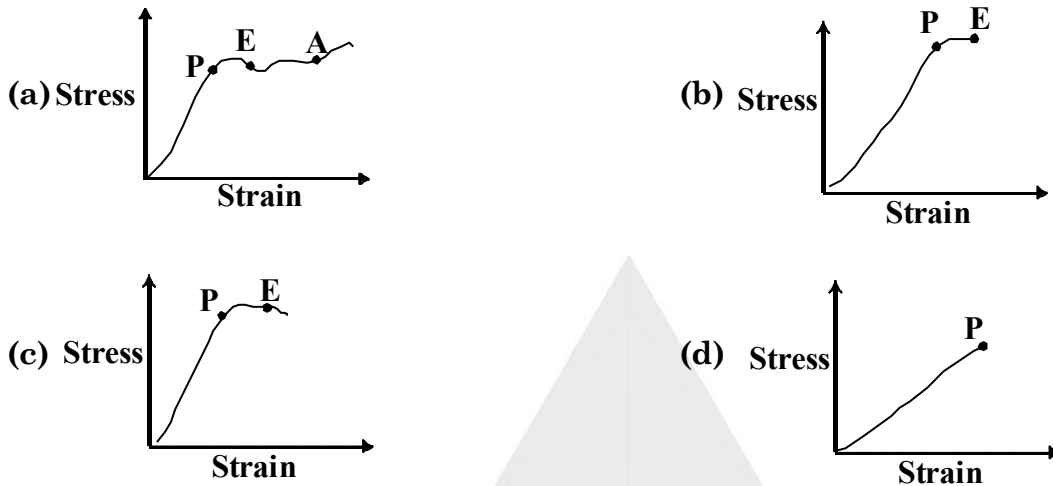
Ans: (c)

Sol: The block shows change in dimensions upon application of force. This change is linear and obeys Hooke's law. This decides proportional limit (P) in stress - strain graph.
Upon furthre application of force, it shows non-linear change in dimensions indicating Hook's law is not obeyed but body is within elestic limit (E).
Once elastic region is crossed, It fractures abruptly due to increased force. This elaboration is correctly depicted by plot (C).

Q.10 In which one of the following cases will the liquid flow in a pipe be most stremlined ?
(a) Liquid of low viscosity and low density flowing through a pipe of large radius
(b) Liquid of low viscosity and high density flowing through a pipe of large radius
(c) Liquid of high viscosity and low density flowing through a pipe of small radius
(d) Liquid of high viscosity and high density flowing through a pipe of small radius.

Ans: (c)

Sol: For streamline flow, Reyond's number, $N_R \propto \dfrac{r\rho}{\eta}$ should be small, For small value of N_R, radius and density should be small and viscosity should be high.

Q.11 The raddi of two colums in a U-tube are 0.2 mm and 0.5 mm. When water is filled in it, the level difference of water in the two arms is 3.2 cm. The surface tension of water is (Take g = 10 m/s^2)
(a) 0.065 N/m　　(b) 0.078 N/m　　(c) 0.048 N/m　　(d) 0.053 N/m

Ans: (d)

Sol: $h_1 = \dfrac{2T\cos\theta}{r_1 \rho g}; h_2 = \dfrac{2T\cos\theta}{r_2 \rho g}$

Now, $h_1 - h_2 = \dfrac{2T\cos\theta}{\rho g}\left[\dfrac{1}{r_1} - \dfrac{1}{r_2}\right]$

$\therefore \quad T = \dfrac{\rho g(h_1 - h_2)}{2\cos\theta\left[\dfrac{1}{r_1} - \dfrac{1}{r_2}\right]} = \dfrac{10^3 \times 10 \times 3.2 \times 10^{-2} \times 10^{-4}}{2 \times 1 \times \left[\dfrac{1}{2} - \dfrac{1}{5}\right]}$

$= \dfrac{3.2 \times 10^{-2}}{2 \times 0.3} = 0.053\, N/m$

Q.12 The excess pressure inside a soap bubble is thrice the excess pressure inside a second soap bubble. The volume of the first bubble is n times the volums of the second, where n is

(a) 3.7   (b) 2.7   (c) 0.027   (d) 0.037

Ans: (d)

Sol: $P_1 = \dfrac{4T}{R_1}, P_2 = \dfrac{4T}{R_2}$ .....(i)

Now, $P_1 = 3P_2$

$\therefore \quad \dfrac{1}{R_1} = \dfrac{3}{R_2}$ ...From (i)

$\therefore \quad \dfrac{R_1}{R_2} = \dfrac{1}{3}$

Now, $V_1 = \dfrac{4}{3}\pi R_1^3 \ and \ V_2 = \dfrac{4}{3}\pi R_2^3$

But $\quad V_1 = nV_2$ ....(Given)

$\therefore \quad \dfrac{4}{3}\pi R_1^3 = n\,\dfrac{4}{3}\pi R_2^3$

$\therefore \quad R_1^3 = n\,R_2^3$

$\therefore \quad n = \left(\dfrac{R_1}{R_2}\right)^3 = \left(\dfrac{1}{3}\right)^3 = \dfrac{1}{27} = 0.037$

Q.13 A sphere of mass 0.5 kg falls freely from a height of 25 m and bounces to a height of 6.2 m from the ground. If the energy dissipated in this process is absorbed by the sphere, then the rise in its temperature is (specific heat of sphere = 300 J/kg °C; g = 10 m/s²

(a) 0.51 °C   (b) 0.63 °C   (c) 0.72 °C   (d) 0.77 °C

Ans: (b)

Sol: From law of conservation of energy

$mg\Delta h = mc\Delta\theta$

$\therefore \quad \Delta\theta = \dfrac{g\Delta h}{c} = \dfrac{10(25 - 6.2)}{300} = 0.63\,^oC$

Q.14 The power radiated by a black body is P and it radiates maximum energy around the wavelength λ_0. The temperature of black body is now changed such that is radiates maximum energy near $\dfrac{3\lambda_0}{5}$. The power radiated by it will increase by a factor of

(a) $\dfrac{225}{9}$ (b) $\dfrac{225}{27}$ (c) $\dfrac{225}{81}$ (d) $\dfrac{625}{81}$

Ans: (d)

Sol: Using Stefan's law and Wien's displacement law,

$$P \propto T^4 \propto \propto \frac{1}{\lambda^4}$$

$$\therefore \quad \frac{P_1}{P_2} = \left(\frac{\lambda_2}{\lambda_1}\right)^4 \ or \ \frac{P_1}{P_2} = \left(\frac{\frac{\lambda_2}{5}}{\lambda_0}\right)^4 = \frac{81}{625}$$

$$\text{or} \quad P_2 = \frac{625}{81} P_1$$

Q.15 The temperature of a hypotetical gas increases to $\sqrt{2}$ times its original value when compressed adiabatically to half the volume. Its equation can be written as

(a) $PV^{3/2}$ = constant   (b) $PV^{5/2}$ = constant
(c) $PV^{7/3}$ = constant   (d) $PV^{4/3}$ = constant

Ans: (a)

Sol: Given : $T_2 = \sqrt{2}\,T_1,\ V_2 = \dfrac{V_1}{2}$ for adiabatic process,

$$PV^\gamma = \text{constnt} \qquad\qquad ....(i)$$

and $TV^{\gamma-1}$ = constant

$$\Rightarrow \quad \left(\frac{T_1}{T_2}\right) = \left(\frac{V_2}{V_1}\right)^{\gamma-1}$$

$$\therefore \quad \frac{T_1}{\sqrt{2}\,T_1} = \left(\frac{V_1}{2V_2}\right)^{\gamma-1}$$

$$\therefore \quad (2)^{\gamma-1} = \sqrt{2}$$

$$\therefore \quad \gamma - 1 = \frac{1}{2}$$

$$\therefore \quad \gamma = \frac{3}{2}$$

Substituting in equation (i), $PV^{\frac{3}{2}}$ = constant

Q.16 Which one of the following properties of a body remians a non-zero constant during a reversible adiabatic process ?

(a) Enthalpy   **(b) Temperature**
(c) Specific heat   **(d) Change in entropy**

Ans: (a)

Sol: –––––––

Q.17 The pressure of CO gas in a container is given by $P = \dfrac{RT}{\left(\dfrac{V}{2} - b\right)} - \dfrac{4a}{b^2}$.

The mass of the gas in the container is
(a) 40 g   (b) 56 g   (c) 44 g   (d) 88 g

Ans: (b)

Sol: Carbon-monoxide is a real gas, therefore it obeys Van der Waal's equation;

$$\left(P + \frac{n^2 a}{V^2}\right)(V - nb) = nRT$$

$$\Rightarrow \qquad P = \frac{nRT}{V - nb} - \frac{n^2 a}{V^2} \qquad \qquad ...(i)$$

Comparing the given eqution with equation (i) we get $n = 2$

$$n = \frac{m}{M} \Rightarrow m = nM$$

$$= 2 \times (12 + 16) = 56\,g$$

Q.18 A mixture of one mole of helium and one mole of oxygen gas is maintained in equilibrium at temperature T. Assuming the gases are ideal, the incorrect statment is
(a) Equivalent degrees of freedom for the gas mixture is 4.
(b) Total energy per mole of mixture is 2 RT.
(c) Specific heat of mixture at constant volume is 2R
(d) Ratio of r.m.s velocity of oxygen molecules to the r.m.s velocity of helium molecules is $\dfrac{1}{2}$.

Ans: (d)

Sol: For a mixture of gases, the equivalent degrees of freedom,

$$f_{eq} = \frac{n_1 f_1 + n_2 f_2}{n_1 + n_2} = \frac{(1)(3) + (1)(5)}{1 + 1} = 4$$

T.E of mixture per mole $= \dfrac{f}{2}RT = 2RT$

For mixture of gases,

$$\gamma_{eq} = 1 + \frac{2}{f_{eq}} = 1 + \frac{2}{4} = \frac{3}{2}$$

Specific heat at constant valume is ,

$$C_v = \frac{R}{\gamma - 1} = \frac{R}{\dfrac{3}{2} - 1} = 2R$$

Now, $\dfrac{(c_{rms})_{O_2}}{(c_{rms})_{He}} = \sqrt{\dfrac{M_{He}}{M_{o2}}} = \sqrt{\dfrac{4}{32}} = \dfrac{1}{2\sqrt{2}}$

Q.19 A particle of executing S.H.M with amplitude of 6 cm and time period 8 s. The time taken by the particle to reach displacement of 3 cm from its mean position is T_1. The time taken from this displaced position of 3 cm to reach the extreme position is T_2. T_1/T_2 will be

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

Ans: (c)

Sol: $y = 6\sin\dfrac{2\pi}{8}t$

Now, $y_1 = 3\,cm$

$\therefore$ $3 = 6\sin\dfrac{\pi}{4}t_1 \ or \ \dfrac{1}{2} = \sin\dfrac{\pi}{4}t_1$

$\therefore$ $\dfrac{\pi}{4}t_1 = \dfrac{\pi}{6} \ or \ t_1 = \dfrac{2}{3}s$

$\therefore$ $T_1 = t_1 - 0 = \dfrac{2}{3}s$

Again, $y_2 = 6\ cm$

$\therefore$ $6 = 6\sin\dfrac{\pi}{4}t_2 \ or \ \dfrac{\pi}{4}t_2 = \dfrac{\pi}{2} \ or \ t_2 = 2s$

$\therefore$ $T_2 = t_2 - t_1 = 2/3 = \dfrac{4}{3}s$

$\therefore$ $T_1 : T_2 = 1 : 2$

Q.20 The frequency of oscillation of a particle of mass m suspended at the end of a vertical spring having a spring constant K is directly proportional to

(a) mk   (b) m/k   (c) m²k   (d) $\left(\dfrac{k}{m}\right)^{1/2}$

Ans: (d)

Sol: $F = ma = -kx$ .....(i)

A$_5$ $x = A\sin\omega t,$

$\therefore$ $a = -\omega^2 A\sin\omega t = -\omega^2 x$

Substituting $a = -\omega^2 x$ in equation (i) we get

$-m\omega^2 x = -kx \ or \ \omega^2 = \dfrac{k}{m}$

Now, $\omega = 2\pi n = \left(\dfrac{k}{m}\right)^{1/2}$

$\therefore$ $n = \dfrac{1}{2\pi}\left(\dfrac{k}{m}\right)^{1/2} \ or \ n \propto \left(\dfrac{k}{m}\right)^{1/2}$

Q.21 The ratio of the speed of sound in oxygen gas to that helium gas at 300 K is

(a) $\sqrt{2/7}$　　　　(b) $1\sqrt{7}$　　　　(c) $\sqrt{3}/5$　　　　(d) $\dfrac{\sqrt{42}}{20}$
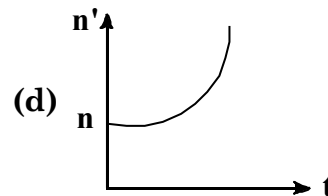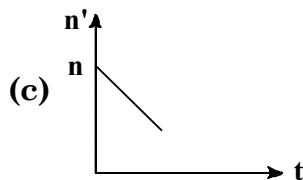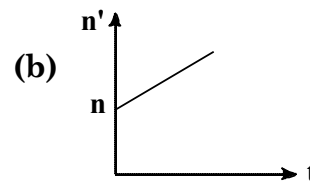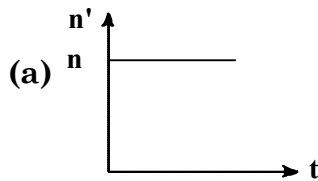
Ans: (d)

Sol: Velocity of sound in gas $v = \sqrt{\dfrac{\gamma RT}{M}}$

$\therefore$　　　　　　　$v = \infty \sqrt{\dfrac{\gamma T}{M}}$　　　　　　...(R = constant)

$\therefore$　　　　　　$\dfrac{v_{N_2}}{v_{He}} = \sqrt{\dfrac{\gamma_{N_2}}{\gamma_{He}} \times \dfrac{M_{He}1}{M_{N_2}}}$

$\qquad = \sqrt{\dfrac{\dfrac{7}{5}R \times 4}{\dfrac{5}{3}R \times 32}}$　　　　$= \dfrac{\sqrt{42}}{20}$

Q.22 An observer starts moving with uniform acceleration 'a' towards a stationary sound source emitting a whistle of frequency 'n'. As the observer apporaches source, the apparent frequency heard by the observer varies with time as

Ans: (b)

Sol: For an observer approaching a stationary source,

$$n' = \left(\dfrac{v + v_0}{v}\right)n$$

$$v_0 = at \Rightarrow n' = \left(\dfrac{an}{v}\right)t + n$$

This is the equation of straight line with positve intercept n and positive slope

$$\left(\dfrac{n}{v}\right).$$

**Q.23** Two electric charges 16 μC and –8 μC are placed 20 cm apart in air. There will be a point P on the line joining these charges and outside the rigion between them, at which the electric potential is zero. The distance of P from – 8 μC charge is

(a) 0.10 m　　　　(b) 0.15 m　　　　(c) 0.20 m　　　　(d) 0.25 m

(a) 0.10 m   **(b) 0.15 m**   **(c) 0.20 m**   **(d) 0.25 m**

Ans: (c)

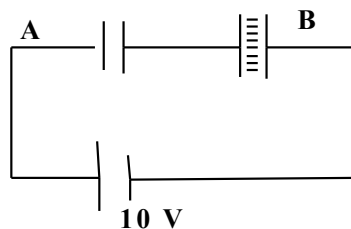**Sol:** Point P will lie near the charge which is smaller in magnitude i.e. $-8\,\mu C$. Hence potential at P
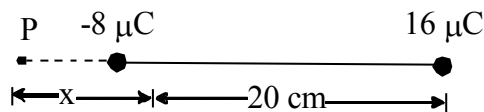
$$V = \frac{1}{4\pi\varepsilon_0}\frac{(-8\times10^{-6})}{x} + \frac{1}{4\pi\varepsilon_0}\frac{(16\times10^{-6})}{(0.2+x)} = 0$$

$$\therefore \qquad 0 = \frac{8}{4\pi\varepsilon_0}\times10^{-6}\left[-\frac{1}{x} + \frac{2}{(0.2+x)}\right]$$

$$\therefore \qquad \left[-\frac{1}{x} + \frac{2}{(0.2+x)}\right] = 0 \qquad \therefore \quad x = 0.2\,m$$

Q.24 In figure, capacitors A and B have identical geometry but a material of dielectric constant 3 is present between the plates of B. The potential difference across A and B are respectively,

(a) 2.5 V, 7.5 V   **(b) 2 V**   **(c) 7.5 V, 2.5 V**   **(d) 8 V, 2 V**

Ans: (c)

Sol: $\dfrac{C_1}{C_2} = \dfrac{1}{3}$

In series, charge on each capacitor is same,

$$\therefore \qquad \frac{V_1}{V_2} = \frac{q/C_1}{q/C_2} = \frac{C_2}{C_1} = \frac{3}{1}$$

Dividing 10 V in the ratio 3 : 1, we get

$V_1 = 7.5\ V,\ \ V_2 = 2.5\ V$

Q.25 Given a current carrying wire of non-uniform cross-section. Which of the following is constant throughout the length of the wire ?
(a) Current and drift speed   (b) Electric field and drift speed
(c) Current only   (d) Drift speed only.
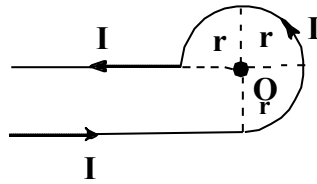
Ans: (c)

Sol: I = constant, $J = \dfrac{I}{A}$ $\Rightarrow$ As A changes, current density J changes

$E = J\rho \Rightarrow \rho$ is constant. As J changes, electric field E changes.

$I = neAv_d \Rightarrow I$ is constant. So as A changes, drift speed v_d changes
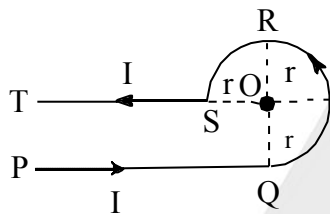
Q.26 Current I is flowing in a conductor shaped as shown in the figure. If the radius of the curved part is r and the length of straight portion is very large then, the value of the magnetic field at the centre O will be

(a) $\dfrac{\mu_0 I}{4\pi r}\left(\dfrac{\pi}{2}+\dfrac{1}{3}\right)$ **(b)** $\dfrac{\mu_0 I}{8r}$ **(c)** $\dfrac{\mu_0 I}{4\pi r}\left(\dfrac{3\pi}{2}+1\right)$ **(d)** $\dfrac{\mu_0 I}{4\pi r}\left(\dfrac{3\pi}{2}-1\right)$

Ans: (c)

Sol: For the circular part QRS the angle subtended at the centre O is $3\pi/2$.

Total magnetic field at O is

$= B_{PQ} + B_{QRS} + B_{ST}$

$= \dfrac{\mu_0 I}{4\pi r}[\sin 90^o + \sin 0^o] + \dfrac{\mu_0}{4\pi}\dfrac{I}{r}\times\dfrac{3\pi}{2}+0$

$= \dfrac{\mu_0 I}{4\pi r}+\left(\dfrac{\mu_0}{4\pi}\dfrac{I}{r}\times\dfrac{3\pi}{2}\right)=\dfrac{\mu_0}{4\pi}\dfrac{I}{r}\left(1+\dfrac{3\pi}{2}\right)$

Q.27 A magnet is suspended in the magnetic meridian with an untwisted wire. The upper end of wire rotated through 180° to deflect the mangnet by 30° form magnetic meridian. When this magnet is replaced by another magnet, the upper end of wire is rotated through 270° to deflect the magnet 30° from magnetic meridian. the ratio of magnetic moments of magnets is

(a) 1 : 5   (b) 1 : 8   (c) 5 : 8   (d) 8 : 5

Ans: (c)

Sol: Let M_1 and M_2 be the magnetic moments of magnetic and BH be the horizontal component of earth's field.

If α is the twist of wire, then $\tau = k\,\alpha$, k being restoring couple per unit twist of wire.

$k\alpha = M\,B_H \sin\theta$ .....$(\because \tau = M\,B_H \sin\theta)$

Here $\alpha_1 = (180-30^o) = 150^o = 150\times\dfrac{\pi}{180} rad$

$\alpha_2 = (270^o - 30^o) = 240^o = 240\times\dfrac{\pi}{180} rad$

So, $k\alpha_1 = M_1 B_H \sin\theta$

(For deflection $\theta = 30^o$ of 1st magnet)   ....(i)

$k\alpha_2 = M_2 B_H \sin\theta$

(For deflection $\theta = 30^o$ of IInd magnet)   ...(ii)

Dividing equation (i) by equation (ii),

$$\frac{M_1}{M_2} = \frac{\alpha_1}{\alpha_2} = \frac{150 \times \left(\dfrac{\pi}{180}\right)}{240 \times \left(\dfrac{\pi}{180}\right)} = \frac{15}{24} = \frac{5}{8}$$

$\therefore \qquad M_1 : M_2 = 5 : 8$

Q.28 **A coil of inductance 600 mH and resistance 4Ω is connected to a source of voltage 2 V. The current reaches half of its steady state value in**
(a) 0.15 s **(b) 0.3 s** **(c) 0.05 s** **(d) 0.1 s**

Ans: (d)

Sol: The instantaneous growth of current in L - R circuit is given by,

$I = I_0 [1 - e^{-Rt/L}]$

$\dfrac{I_0}{2} = I_0 [1 - e^{-Rt/L}]$ or $e^{-Rt/L} = \dfrac{1}{2}$ or $e^{Rt/L} = 2$ or $\dfrac{Rt}{L} = \log_e 2$

$\therefore \qquad t = \dfrac{L}{R} \log_e 2$

$\qquad = \dfrac{600 \times 10^{-3}}{4} \times 0.693$

$\therefore \qquad t = 0.1 s$

Q.29 **When charge on capacitor connected to a battery is maximum, then**
(a) The conduction current in ideal case through a circuit is unity
(b) The displacement current in ideal case through a circuit is zero
(c) The conduction current in ideal case through a circuit is zero
(d) The displacement current in ideal case through a circuit is unity.

Ans: (c)

Sol:
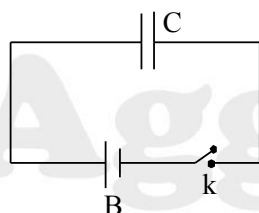
When key is pressed, conduction current (I_c) flows through connecting wires and capacitor starts storing charge. As the charge on capacitor grows, conduction current in the wires decreases.
When capacitor is charged fully, conduction current between plates of capacitor becomes zero.

Q.30 **Light with an energy flux of 16 W/cm² falls on a perfectly reflecting surface at normal incidence. If the surface has an area of 10 cm², what is the average force exerted on the surface during a 50 minute time span ?**

(a) 0.36×10^{-6} N **(b) 0.72×10^{-6} N** **(c) 10^{-6} N** **(d) 2×10^{-6} N**

Ans: (c)

Sol: The total energy falling on the surface is

U = Energy falling per unit area × area × time

$$= 16 \times 10 \times (50 \times 60)$$

$$= 4.8 \times 10^5 \ \text{J}$$

Therefore the total momentum delivered for complete reflection is

$$\text{p} = \frac{2U}{c} = \frac{2 \times 4.8 \times 10^5}{3 \times 10^8} = 3.2 \times 10^{-3} \ \text{kg} \, m/s$$

The average force excerted on the surface is

$$F = \frac{p}{t} = \frac{3.2 \times 10^{-3}}{50 \times 60} = 1.07 \times 10^{-6} N$$

Q.31 **A square wire of side 3 cm is placed 25 cm away from a concave mirror of focal length 10 cm. What is the area enclosed by the image of the wire ? (The centre of the wire lies on the axis of the mirror, with its two sides normal to the axis)**

(a) 2 cm²   (b) 4 cm²   (c) 6 cm²   (d) 8 cm²

Ans: (b)

Sol:
$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-10} - \frac{1}{-25} = -\frac{3}{50}$$

$$\therefore \quad v = -\frac{50}{3} = -16.67 \, cm$$

$$m = \frac{h_2}{h_1} = -\frac{v}{u}$$

$$\therefore \quad \frac{h_2}{+3} = -\frac{\dfrac{-50}{3}}{-25} = -\frac{2}{3}$$

$$\therefore \quad h_2 = -2 \, cm$$

Negative sign for real inverted image.

$$\therefore \text{ Area enclosed by image} = 4 cm^2.$$

Q.32 **A prism of refractive index 1.5 is completely immersed in an oil $\mu_0 = 1.6$ as shown in fig. A rey of light is incident on the air-oil interface with angle of incidence 30°. Choose the correct statement.**
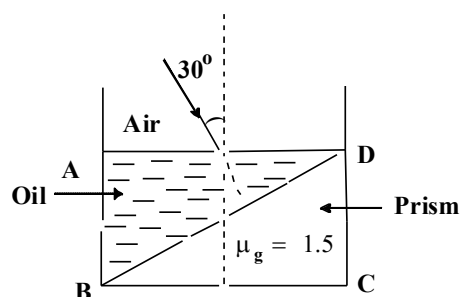
(a) **It is not possible for the given incident light ray to emerge out from face AB of container.**

(b) **The light ray will suffer minimum deviation only if it is monochromatic and angle of incidence is greater than 30°.**

(c) **The ray will suffer dispersion without deviation because $\mu_0 > \mu_g$**

(d) **Given data is insufficient to predict any of the above statement.**

Ans: (a)

Sol: As given in figure, $i_1 = 30^o$, $\mu_0 = 1.6$

$\therefore$ $r_1 \approx 18^o$

Now, The critical angle for oil-prism interface will be,

$$\sin i_c = \frac{1}{_r\mu_d} = \frac{\mu_r}{\mu_d}$$

$\therefore$ $\sin i_c = \frac{_a\mu_g}{_a\mu_o} = \frac{1.5}{1.6}$

$\therefore$ $i_c = \sin^{-1}\left(\frac{15}{16}\right)$

As, $\frac{15}{16} > \frac{\sqrt{3}}{2}$ $\quad i_c > 60^o$

Also from fig, the angle of incidence from oil to prism (i_2) cannot have value greater that 60°. i.e. $i_c > i_2$

Hence, there will not be total internal reflection possible at the oil-prism interface for given angle of incidence.

Hence option (A) is correct

Whereas the angle of minimum deviation for given prism is,

$$\delta_m = A(_1\mu_2 - 1)$$

$$= 60^o\left(\frac{15}{16} - 1\right)$$

$$\approx -3.75^o$$

$\therefore$ $i = \frac{A + \delta_m}{2} \approx 28^o$

$\therefore$ The ray will suffer minimum deviation even if the ray is polychromatic with angle of incidence less than 30°.

Also, condition for dispersion without deviation is, $\mu' > \mu$

But here, $\mu_g < \mu_o$

$\therefore$ Option (B) and (C) are incorrect

Q.33 Consider two needles S_1 and S_2 moving periodically up and down in an identical fashion in a through of water. If I_0 represents the intensity of waves produced by each one of the individual needle S_1 and S_2, then the intensity at any point on the perpendicular bisector of S_1S_2 will be
(a) I_0 (b) $2I_0$ (c) $4I_0$ (d) 0

Ans: (c)

Sol: The 2 sources interfere constractively at any point on the perpendicular bisector of S_1S_2

$\therefore$ $I = 4I_0$ on any point on the perpendicular bisector of S_1S_2.

Q.34 A monochromatic source is kept at a very large distance from a card board sheet having a small hole which has dimensions not much larger than the wavelength of source. The wave from the source approching the hole will become more like a -----wave on the other side of the cardboard.
(a) Plane   (b) Cylindrical   (c) Spherical   (d) Cubical

become more like a -----wave on the other side of the cardboard.
(a) Plane   (b) Cylindrical   (c) Spherical   (d) Cubical

Ans: (c)

Sol: –––––

Q.35 **Diffraction pattern is obtained by using a beam of yellow light. What will happen if yellow light is replaced by red light ?**
(a) Band will be narrower and crowded together ?
(b) Bands become broader and further apart.
(c) No change will take place
(d) Bands will disappear.

Ans: (b)

Sol: Bandwidth ∞ λ.

$\therefore$ λ_{yellow} < red λ_{red} Hence for red light diffraction bands become broader andf further apart.

Q.36 **Consider a light beam incident on the surface of a transparent medium of refractive index μ from air. The plane of inciden is X-Y plane. The electric field vector will always be perpendicular to incident ray AB as shown in fig, This vector can be resolved in two components, one in X-Y plane (indicated by double arrows) and another in Z-direction (indicated by dot) Here, if size of the narrow or dot determines the magnitude of the $\vec{E}$ component, then**
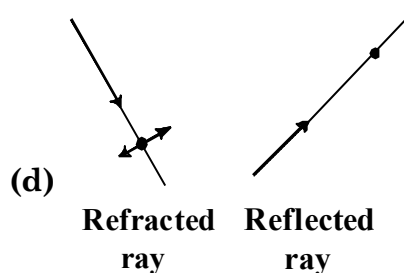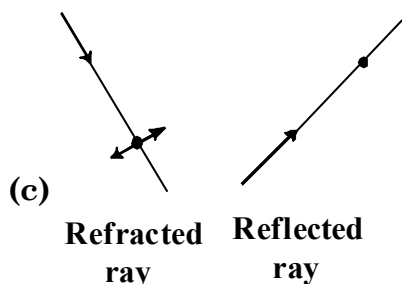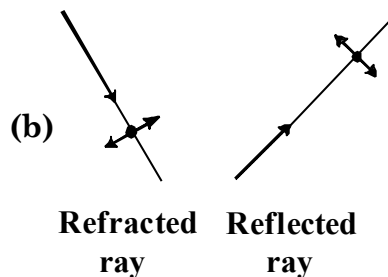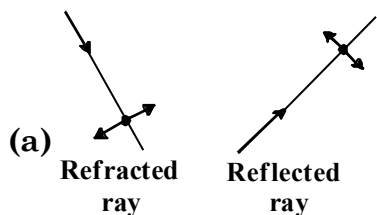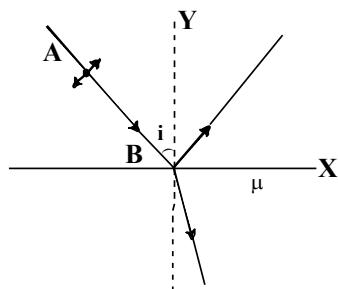
Ans: (a)

Sol: When unpolarised light is incident on surface of denser medium, the reflected ray will have large component of along $\vec{E}$ Z-direction after polarisation. Similarly, the light is refracted in X-Y plane more strongly.As, the angle of incidence is not given as polarising angle, there will be small amount of X-Y component in reflected ray and small amount of Z component in refracted ray.

Q.37 The momentum of a photon of energy 10^3 eV in kg m/s will be

(a) 5×10^{-25} (b) 0.33×10^6 (c) 7×10^{-24} (d) 10^{-22}

Ans: (a)

Sol: $E = 10^3\, eV$, $p = \dfrac{E}{c} = \dfrac{10^3 \times 1.6 \times 10^{-19}}{3 \times 10^8}$

$$= 0.53 \times 10^{-24}$$

$$= 5 \times 10^{-25}\, \text{k}g\, m/s$$

Q.38 The energy flux of sunlight reaching the surface of earth is 1.388×10^3 Watt/m². If 4×10^{21} photons are incident on the earth per second, then calculate the wavelength of the incident photon.

(a) 800 nm   (b) 421 nm   (c) 573 nm   (d) 475 nm

Ans: (c)

Sol: Energy of each photon $= \dfrac{\text{Energy flux}}{\text{Number of Photon}}$

$$= \dfrac{1.388 \times 10^3}{4 \times 10^{21}}$$

$$= 3.47 \times 10^{19}\, \text{J}$$

Now, $E = \dfrac{hc}{\lambda}$

$\therefore$ $\lambda = \dfrac{hc}{E} = \dfrac{6.63 \times 10^{-34} \times 3 \times 10^8}{3.47 \times 10^{-19}} = 573 \times 10 - 9\, m$

$$= 573\, nm$$

Q.39 An electron jumps from the 3rd orbit to the 2nd orbit of hydrogen atom. Given the Rydberg's constant R = 10^5 cm⁻¹, The frequency in Hz of the emitted radiation will be

(a) $\dfrac{5}{12} \times 10^5$ (b) $\dfrac{5}{12} \times 10^{15}$ (c) $\dfrac{3}{4} \times 10^{15}$ (d) $\dfrac{3}{4} \times 10^5$

Ans: (b)

Sol: $\dfrac{1}{\lambda} = R\left(\dfrac{1}{2^2} - \dfrac{1}{3^2}\right) = \dfrac{5R}{36} \Rightarrow \lambda = \dfrac{36}{5} \times 10^{-5}\, cm$

Frequency, $v = \dfrac{c}{\lambda} = \dfrac{3 \times 10^{10}}{\left(\dfrac{36}{5} \times 10^{-5}\right)} = \dfrac{5}{12} \times 10^{15}\, \text{Hz}$

Q.40 Intensity of gamma rays falls to one sixteenth of its value after passing through 24 mm of lead. What should be the thickness of the lead sheet to reduce the intensity to half ?

(a) 16 mm   (b) 12 mm   (c) 18 mm   (d) 20 mm

Ans: (a)

Sol: $I = I_0 e^{-\lambda t} \ OR \ I = I_0 \left(\dfrac{1}{2}\right)^n$

$\therefore \quad \dfrac{I'}{I_0} = \dfrac{1}{2} = \dfrac{1}{16} \Rightarrow n = 4$

$\therefore \quad \dfrac{I'}{I_0} = \dfrac{1}{2} \qquad \Rightarrow n = 1$

$\qquad\qquad t = nT$

$\therefore \quad 24 = 4T \qquad \Rightarrow T = 6\,mm \ \therefore$

Q.41 Assume that the silicon diode in the circuit as a shown in fig, requires a minimum current of 2.7 mA to be above the knee point (0.7 V) of its I-V characteristics. If $R = 1.5 K\Omega$, the minimum voltage V_B required to keep the diode above the knee point is
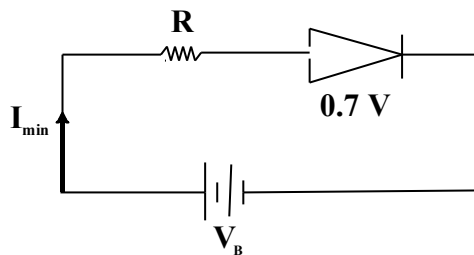
(a) 4.75 V   (b) 4.5 V   (c) 2.9 V   (d) 2.75 V

Ans: (a)

Sol: $V_B = IR + 0.7 = 2.7 \times 10^{-3} \times 1500 + 0.7 = 4.75\ V$

Q.42 A junction diode of negligible forward resistance is used as half-wave rectifier to rectify a sinusoidal voltage supply 30 V (rms), 50 Hz. The output is obtained across a load resistance R_L of $10 K\Omega$. The reading of d.c. voltmeter connected across the capacitor of $16\,\mu F$ connected in parallel to R_L is

(a) 30 V   (b) $30\sqrt{2}$ V   (c) 60 V   (d) $60\sqrt{2}$ V

Ans: (b)

Sol: When a capacitance is connected across, R_L, capacitor charges at peak supply and when diode is not conducting, it discharges through R_L,

Now, time period of supply voltage,

$$T = \dfrac{1}{f} = \dfrac{1}{50} = 0.02s$$

Time constant of CR circuit,

$CR = 16 \times 10^{-6} \times 10 \times 10^3 = 0.16\ s$

Since, CR >> T, the output voltage across capacitor will practically remain equal to the peak value of supply voltage and hence output will be as shown in figure.

Hence, reading of d.c. voltmeter connected across C is V

Also,

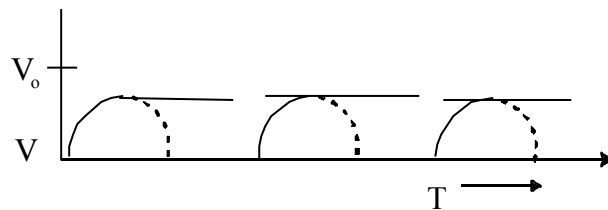$$V_{rms} = \frac{V_o}{\sqrt{2}}$$

$$\therefore \qquad V_0 = V_{rms}\sqrt{2} = 30\sqrt{2}$$

Q.43 **An F.M radio transmitter uses a tower of height 60 m for its antenna. What is the maximum distance coverage of the transmitter ?**
(a) 25.29 km　　(b) 27.71 km　　(c) 28.71 km　　(d) 80 km

Ans: (b)

Sol: $d = \sqrt{2Rh} = \sqrt{2 \times 6.4 \times 10^6 \times 60}$

$d = 27.71 \times 10^3\, m$

$d = 27.71\, km$

Q.44 **What is the gain of a 3 m paraboloid antenna using 0.03 in signal ?**

(a) 30000　　(b) 1000　　(c) 60000　　(d) 10000

Ans: (c)

Sol: The relation for power gain is

$$P = 6\left(\frac{D}{\lambda}\right)^2 \qquad\qquad \therefore \qquad P = 6\left(\frac{3}{0.03}\right)^2 = 60000$$

Q.45 **The maximum range (d_{max}) of radar is proportional**
(a) to the cube root of the peak transmitted.
(b) to the fourth root of the peak transmitted power
(c) to the square root of the peak transmitted power
(d) None of the above

Ans: (b)

Sol: Maximum Range of the radar is given by $R_{max} = \left(\dfrac{P_t A^2 S}{4\pi\lambda^2 P_{min}}\right)$

Where, P_t : peak value of transmitted power

$\therefore \qquad R_{max} \propto (P_t)^{1/4}$

CHEMISTRY

Q.46 **5.00 g sample containing NaCl and CaCl$_2$ was treated with appropriate reagents to precipitate all the Ca-atoms as CaCO$_3$. This CaCO$_3$ precipitate was heated and quantitatively coverted to CaO. The amount of CaO obtained was 1.0 g, The percentage of NaCl in the mixture is _____**
(a) 30.2 % **(b) 39.6 %** **(c) 60.4 %** **(d) 79.2 %**

Ans: (c)

Sol: $$CaCl_2 \xrightarrow{} CaCO_3 \xrightarrow{} \underset{(1.0\,g)}{CaO}$$
$\underset{x\,g}{}$
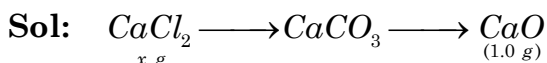
Moles of C$_a$ in ClCl$_2$ = Moles of Ca in CaO   [∴ Ca -atoms are consrved]
Molar mass of CaCl$_2$ = 111
Molar mass of CaO = 56
Molar of Ca in CaCl$_2$

$$= x\,g\,CaCl_2 \times \frac{1\,mol\,CaCl_2}{111\,g\,CaCl_2} \times \frac{1mol\,Ca}{1mol\,CaCl_2} = \frac{x}{111}$$

Similarly, moles of Ca in CaO

$$= 1.0\,g\,CaO \times \frac{1mol\,CaO}{56\,g\,CaO} \times \frac{1mol\,Ca}{1mol\,CaO} = \frac{1}{56}$$

∴ $$\frac{x}{111} = \frac{1}{56}$$

Amount of Nacl in the mixture $x = 1.98g$

∴   = 5.00 − 1.98 g = 30.2 g

∴   % of NaCl in the mixture $= \dfrac{3.02}{5.00} \times 100 = 60.4\%$

Q.47 **Arrange the following transition metals in increasing order of number of unpaired electrons in the ground state.**
(a) V < Cr < Mn   (b) Cr < Mn < V   (c) Mn < Cr < V   (d) V < Mn < Cr

Ans: (d)

Sol:

Element	Configuration	No. of unpaired electrons
V	[Ar]3d^{3}4s^2	3
Mn	[Ar]3d^{5}4s^2	5
Cr	[Ar]3d^{5}4s^1	6

Q.48 **The graph below chart the first five ionization energies of an unknown atom "Y" Assuming that the highest principal quantum number of the element Y is 3, which of the following element is most likely to be chemically similar to "Y".**
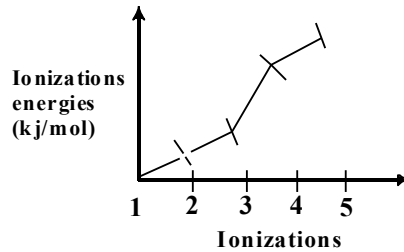
(a) Ga   **(b) As**   **(c) Si**   **(d) Mg**

Ans: (a)

Sol: $Y = Al$; $1s^2 2s^2 2p^6 3s^2 3p^1$ Greatest jump in ionizatio energies is observed between IE_3 and IE_4

'Al' is chemically similar to 'Ga' since they belong to the same group.

Q.49 **Bond enthalpies of $N \equiv N$, $H-H$ and $Cl-Cl$ bonds are 946, 436 and 243 kJ mol⁻¹ resepectively. Arrange them in the increasing order of their reactively.**
(a) $N_2 < H_2 < Cl_2$ (b) $H_2 < N_2 < Cl_2$
(c) $H_2 < Cl_2 < N_2$ (d) $Cl_2 < H_2 < N_2$

Ans: (a)

Sol: ————

Q.50 **For one mole of a van der Waals gas when b = 0 and T = 298 K, the PV vs 1/V plot is shown below. The value of van der Waals constant 'a' in atm L mol⁻² is_____**
(graph not be scale).
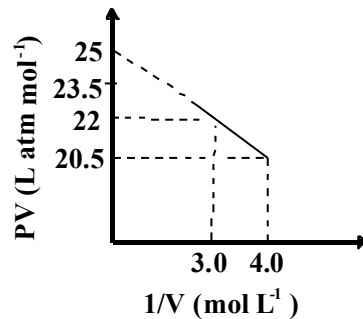
(a) 1   **(b) 1.5**   **(c) 2**   **(d) 2.5**

Ans: (b)

Sol: The van der Waals equation for real gases can be given as

$$\left(P + \frac{n^2 a}{V^2}\right)(V - nb) = nRT \qquad ....(i)$$

For one mole of a real gas when b = 0 equation (i) change to

$$\left(P + \frac{a}{V^2}\right)V = RT$$

$$PV = RT - \frac{a}{V} \qquad ...(ii)$$

Equation (ii) is a straight line equation between PV and 1/V whose slope is given by -a.

$$\therefore \quad -a = \frac{20.5 - 22}{4 - 3} = -1.5$$

$$a = 1.5$$

Q.51 What is the difference in mass of two metals M_1 and M_2, if both are heated through same temperature difference and supplied with same amount of energy ? Given for M_1, specific heat capacity is 0.65 J $(°C)^{-1}g^{-1}$, for M_2 specific, heat capacity is 0.22 J $(°C)^{-1}$ g^{-1} and temperature raised for 20 g of M_1 is 35°C to 400°C.

(a) 39.09 g   (b) 59.09 g   (c) 79.09 g   (d) 99.09 g

Ans: (a)

Sol: Energy needed for ; (M_1) $= q_1 = m_1 \times c_1 \times \Delta T_1$

$$= 20 \times 0.65 \times (400 - 35)$$

$$= 4745 \text{ J}$$

Energy needed for (M_2) $= q_2 = m_2 \times c_2 \times \Delta T_2$

$$4745 = m_2 \times 0.22 \times (400 - 35) \qquad (\because q_1 = q_2)$$

$$m_2 = \frac{4745}{80.3} = 59.09\, g$$

$\therefore$ Mass of M_1 $= 20\, g$

Mass of M_2 $= 59.09\ g$

$\therefore$ Mass of M_2 - Mass of M_1 $= 59.09 - 20$

$$= 39.09\, g$$

Q.52 Equilibrium constant for the reaction represented below is 50 at 448°C :

$H_{2(g)} + I_{2(g)} \rightleftharpoons 2\ HI_{(g)}$ When 1.0 moel of H_2 is mixed with 1.0 mole of I_2 in a 0.50 L flask and allowed to react, at the end of the reaction, how many moles of I_2 are left unreacted ?

(a) 0.18   (b) 0.22   (c) 0.44   (d) 0.56

Ans: (b)

Sol: $H_{2(g)} + I_{2(g)} \rightleftharpoons 2\ HI_{(g)}$

(M)	H_2	I_2	HI
I	2	2	0
C	$-x$	$-x$	$+2x$
E	$(2-x)$	$(2-x)$	$2x$

$$K_c = \frac{[H]^2}{[H_2][I_2]} \qquad K_c = \frac{(2x)^2}{(2-x)^2}$$

$$\sqrt{50} = \frac{2x}{2-x} \qquad x = 1.56$$

$[I_2]_{eq} = 2 - 1.56 = 0.44\ M = 0.22$ moles left ureacted = Moles at equilibrium = 0.22

Q.53 Photosynthesis is the process by which plants, some bacteria, and some protistans use the energy from sunlight to produce sugar, which cellular respiration convert into ATP, the "fuel" used by all living things.

$6CO_2 + 6H_2O \xrightarrow{\text{Sunlight}} C_6H_{12}O_6 + 6O_2$ How does the oxidation number of carbon change during photosynethesis ?

(a) Increases from +2 to 0
(b) Decreases 0 to -2
(c) Decreaes from+4 to 0
(d) Increases +4 to 0

Ans: (c)

Sol:

$$6CO_2 + 6H_2O \xrightarrow{\text{sunlight}} C_6H_{12}O_6 + 6O_2$$

$+4 \quad 2 \qquad\qquad\qquad 0 \quad +1 \quad -2$
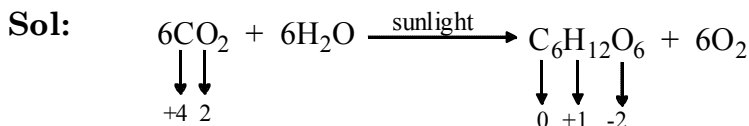
Q.54 According to the modern periodic table, hydrogen acts as a/an_____ and hence resembles_____.
(a) Oxidizing agent, alkali metals
(b) reducing agent, halogens
(c) reducting agent, alkali metals
(d) oxidizing agent, transition element

Ans: (c)

Sol: ————–

Q.55 Step of Solvay process are given below :
Two gases 'A' and 'B' react with water and form compound 'C'. This compound 'C' react with brine and form compound 'D' along with ammonium chloride. Compound 'D' after heating produce soda ash (final product) along with CO_2 and water vapour. Find the INCORRECT statement with reference to the above process.
(a) Byproduct of the above process is $CaCl_2$.
(b) Compound 'A' and 'B' are NH_3 and CO_2 respectively
(c) Compound 'D' is washing soda.
(d) The above process is based on the low solubility of $NaHCO_3$.

Ans: (c)

Sol: Solvey Process for preparation of Na_2CO_3 (soda ash) :

$$\underset{(A)}{NH_3} + \underset{(B)}{CO_2} + H_2O \longrightarrow \underset{(C)}{NH_4HCO_3}$$

Ammonium carbonate

$$NH_4HCO_3 + \underset{Brine}{NaCl} \longrightarrow \underset{(D)}{NaHCO_3} + NH_4Cl$$
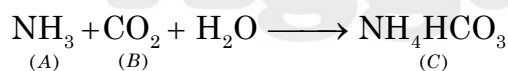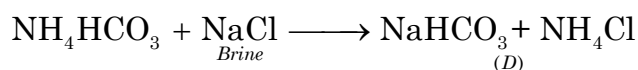
sodium bicarbonate
(Baking soda)

$$\underset{(D)}{2NaHCO_3} \xrightarrow{\Delta} \underset{(D)}{Na_2CO_3} + H_2O + CO_2$$
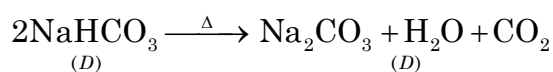
sodium carbonate
(Soda ash)

Q.56 Lead dissolve in cone . HCl to form_____
(a) $PbCl_4$ (b) $HPbCl_3$ (c) H_2PbCl_4 (d) H_2PbCl_6

Ans: (c)

Sol: $Pb + 2HCl \longrightarrow PbCl_2 + H_2$

$PbCl_2 + 2HCl \longrightarrow \underset{\substack{(Chloropumbous) \\ (acid)}}{H_2PbCl_4}$
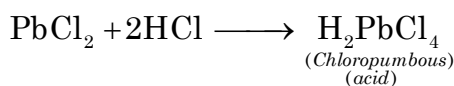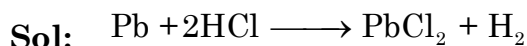
Q.57 The following compounds DO NOT show keto-enol tautomerism, except :

(a)
CH₃
|
C = 3
(benzene ring)

(b) CHO (benzene ring)

(c)
O
||
(Ph)—C—(Ph)

(d) O=⟨benzene⟩=O
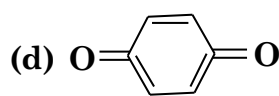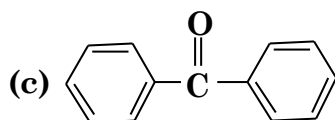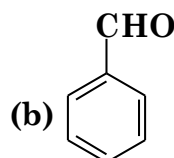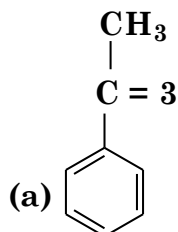
Ans: (a)

Sol: For keto-enol tautomerism, a compound must have at least one acidic α – hydrogen. So acetophenone (A) shows tautomerism, Benzaldehyde (B) and benzophenone (C) do not show tautomerism due to lack of α – hydrogen. p-Benzoquinone (D) contain α – hydrogens but they are not acidic because they are present on a double bond. Therefore, it does not show keto-enol tautomerism.

$$O = \underset{\substack{\alpha \quad \alpha \\ H \quad H}}{\overset{\substack{H \quad H \\ \alpha \quad \alpha}}{\bigcirc}} = O$$

p-Benzoquinone
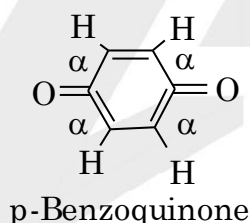
Q.58 PhMgBr on reaction with CH₃OH gives _____
(a) Toluene + Mg (OH) Br
(b) Benzene + Mg (OMe) Br
(c) Anisole + Mg (OH) Br
(d) Phenol + Mg (OMe) Br

Ans: (b)

Sol:

$$\underset{\substack{\text{Phenyl} \\ \text{magnesium} \\ \text{bromide}}}{\langle Ph \rangle - MgBr} + \underset{\text{Methanol}}{CH_3O-H} \xrightarrow[\text{ether}]{\text{dry}} \underset{\text{Benzene}}{\langle Ph \rangle} + Mg \overset{OCH_3}{\underset{Br}{\diagdown}}$$
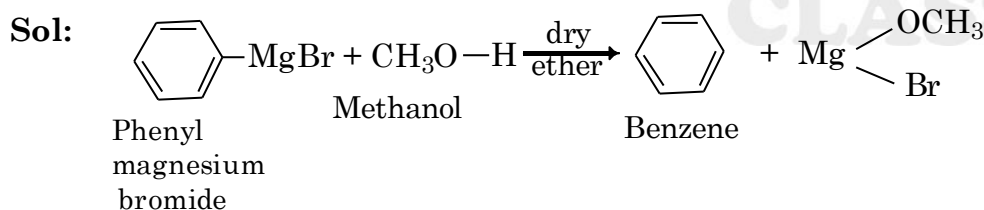
Q.59 n-hexane and isohexane can be distinguished using _____
(a) $Cl_2/h\upsilon$
(b) O_2
(c) $KmnO_4$
(d) Anhydrous $AlCl_3$/HCl gas

Ans: (c)

Sol: n-hexane may not undergoes oxidation under normal conditions but undergoes oxidation under vigourous conditions and gives 1° alcohol.

$$CH_3-\underset{n-hexane}{(CH_2)_4}-CH_3 \xrightarrow[\text{[O]}]{KMnO_4} CH_3-\underset{1^o\ alcohol}{(CH_2)_4}-CH_2-OH$$

Isohexane readily undergos oxidation and gives 3° alcohol.

$$\underset{\text{isohexane}}{H_3C-\overset{\overset{\displaystyle CH_3}{|}}{CH}-CH_2-CH_2-CH_3} \xrightarrow[\text{[O]}]{KMnO_4} \underset{3^o\ \text{alcohol}}{H_3C-\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle OH}{|}}{C}}-CH_2-CH_2-CH_3}$$

Q.60 **One mole of hydrogen in presence of Pt catalyst reacts with a hydrocarbon 'X' and forms n-octane. When 'X' is oxidized vigorously with $KMnO_4$, a single carboylic acid containing four carbon atoms is isolated What is the structure of 'X' ?**
(a) $CH_3CH = CHCH_2CH_2CH_2CH_2CH_3$ **(b) $CH_3CH_2CH_2CH = CHCH_2CH_2CH_3$**
(c) $CH_3CH_2CH_2CH_2CH_2CH_2CH = CH_2$ **(d) $CH_3CH_2CH = CHCH_2CH_2CH_2CH_3$**

Ans: (b)

Sol: Compound ''X' $\xrightarrow{one\ mole\ H_2|Pt}$ n – Octane'

So, in compound 'X' carbon atoms are present in straight chain, After vigorous oxidation, compound 'X' forms a 4-carbon single carboxylic acid which that means the hydrocarbon is a symmetrical alkene i.e. Oct - 4-ene.

Q.61 **Assertion : conc. HCl or conc. HNO_3 is preffered over conc, H_2SO_4 for dehydration of alcohols to form alkenes.**
Reason : Conc. H_2SO_4 aids in the formation of carbocation.
(a) Assertion and Reason are true. Reason is the correct explanation of Assertion
(b) Assertion and Reason are true. Reason is not the correct exaplanation of Assertion.
(c) Assertion is true. Reason is false.
(d) Assertion is false. Reason is true.

Ans: (d)

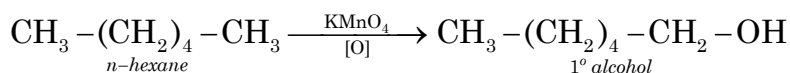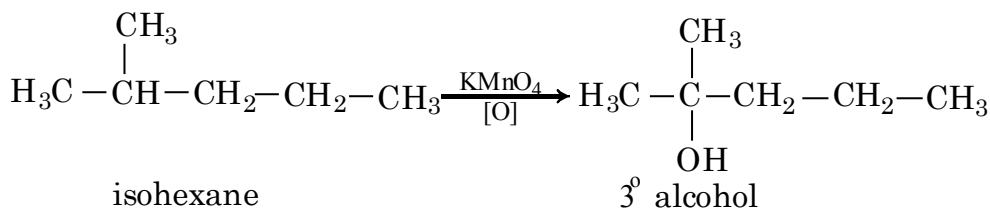**Sol:** If conc. HCl is used, Cl : being a good nucleophile brings about substitution reaction to give alkyl halide and conc. HNO_3 being a strong oxidizing agent convert alcoholes to aldehydes/carboxylic acids. However, if conc, H_2SO_4 is used,

HSO_4^- being non-nucleophilic, acids in the formation of carbocation which then loses a proton to form an alkene.

Q.62 **Treatment of C_2H_5MgBr with prop-1-yn ein dry ether produces_____**
(a) CH_3 - CH = CH - C_2H_5   **(b) $CH_3 - C \equiv C - C_2H_5$**
(c) $CH_3 - CH_3$ **(d) $CH_3 - CH = CH - CH_3$**

Ans: (c)

Sol: $\underset{\text{Prop-1-yne}}{CH_3 - C \equiv C - H} + C_2H_5MgBr \xrightarrow[ether]{dry} CH_3 - C \equiv C - Mg - Br + \underset{\text{Ethane}}{CH_3 - CH_3}$

Q.63 **A chemist analyses 50 samples of aliphatic hydrocarbons. Based on the various reactions, he sorted these compound into Group A, group B and group C. Group A and B together includes 28 compounds that gave positive**

Q.63 A chemist analyses 50 samples of aliphatic hydrocarbons. Based on the various reactions, he sorted these compound into Group A, group B and group C. Group A and B together includes 28 compounds that gave positive test with alkaline $KMnO_4$ and Group C includes remaining compounds. Group B includes 14 compounds that react with sodamide to form ammonia. Which of the following statements is INCORRECT ?
(a) Compounds of group A are unsaturated hydrocarbons
(b) Compounds of group C are alkanes.
(c) Compounds of group A will decolourise a solution of Br_2 in CCl_4.
(d) Compounds of group B are non-terminal alkynes.

Q.64 Which of the following will undergo meta substitution on monochlorination
(a) Ethoxybenzene   (b) Chlorobenzene
(c) Ethyl benzoate   (d) Phenol

Ans: (c)

Sol:

Ethyl benzoate $+ \ Cl_2 \xrightarrow[\text{310-320 K, dark}]{\text{anhydrous } AlCl_3}$ m-Chloroetheyl benzoate $+ \ HCl$
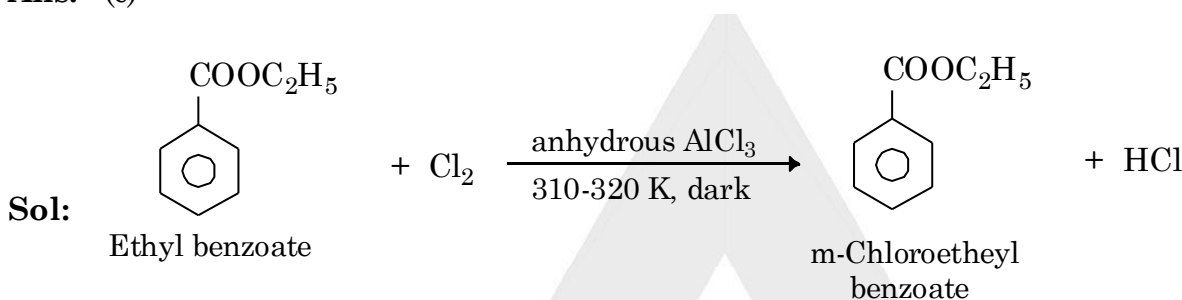
$-COOC_2H_5$ ($-COOR$) group directs the incoming group to meta position.

Q.65 The ratio of σ and π bonds in benzene molecule is _____
(a) 2 : 1   (b) 4 : 1   (c) 6 : 1   (d) 8 : 3

Ans: (b)

Sol: $\text{Ratio} = \dfrac{\sigma \, \text{bond}}{\pi \, \text{bond}} = \dfrac{12}{3} = 4 : 1$

Q.66 On a hot summer afternoon, a person parked his four wheeler (with closed transparent window) in a lane hot meant for parking. While he was driving, he had kept his AC on and so he did not feel the heat outside. After a while when he returned, he felt uneasy and restless because of the heat inside the vehicle. This phenomenon is similar to that of _____
(a) Photosynthesis   (b) Greenhouse effect
(c) Photochemical reaction (d) Eutrophication

Ans: (b)

Sol: After returning back the person felt uneasy because of the heat which was trapped inside the car while he had left the car on a 'no parking' lane [with no roof or tree shade] with its glass window closed. This situation is similar to the greenhouse effect wherin CO_2 and H_2O trap the heat causing global warming.

Q.67 The fuel gases coming from power plants containing NO_2 and SO_2 are freed from these gases by scrubbing them with one of the following compound, EXCEPT_____
(a) H_2SO_4 (b) $Ca(OH)_2$ (c) $CaCO_3$ (d) $Mg(OH)_2$

Ans: (c)

Sol: The fuel gases coming from power plants or industrial units and containing NO_2

and SO_2 are freed from these gases by scrubbing them with sulphuric acid. The reactions takes place are :

$$NO_2 + SO_2 + H_2O \longrightarrow H_2SO_4 + NO$$

$$NO + NO_2 \longrightarrow N_2O_3$$

$$N_2O_3 + 2H_2SO_4 \longrightarrow 2NOHSO_4 + H_2O$$
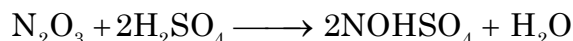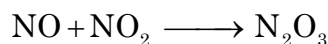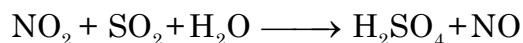
The reaction product $NOHSO_4 + H_2O$ is decomposed to get H_2SO_4 which is then used again for scrubbing. As $NO2$ and SO_2 are acidic oxides scrubbing can also be done with alkaline solution of $Ca(OH)_2$ or $Mg(OH)_2$.

Q.68 **Which of the following is INCORRECT regarding the ABAB type, two-dimensional arrangement ?**
(a) The coordination number of each sphere is 6.
(b) This arrangement forms hexagonal close packed structure
(c) A regular hexagon is formed when the centres of six neighbouring spheres, surroundings a centreal sphere, are joined.
(d) The spheres of successive liayers have horizontal and vertical alignment.

Ans: (d)

Sol: ––––––––

Q.69 **What is the ratio of relative lowering of vapour pressure if 0.6 g solute dissolve in 195 g of benzene and 1.8 g of solute dissolve in 780 g of benzene? (M. W. solute = 60/ g/mol)**
(a) 1.11 : 1   **(b) 1.22 : 1**   **(c) 1.33 : 1**   **(d) 1.44 : 1**

Ans: (c)

Sol:

$$\frac{P_A^o - P_T}{P_A^o} = \frac{n_B}{n_A + n_B} = \frac{W_B / M_B}{\frac{W_B}{M_B} + \frac{W_A}{M_A}}$$

$$\text{For 1}^{st}\text{ condition} = \frac{\frac{0.6}{60}}{\frac{0.6}{60} + \frac{195}{78}} = 0.003984$$

$$\text{For 2}^{nd}\text{ condition} = \frac{\frac{1.8}{60}}{\frac{1.8}{60} + \frac{780}{78}} = 0.002991$$

$$\text{Ratio} = \frac{\text{Relative lowering in 1}^{st}\text{ condition}}{\text{Relative lowering in 2}^{nd}\text{ condition}}$$

$$= \frac{0.003984}{0.002991} = 1.33 : 1$$

Q.70 **The standard reduction potential for the half cell-reaction**

$$NO_{3(aq)}^- + 2H_{(aq)}^- + e^- \longrightarrow NO_{2(g)} + H_2O_{(l)}$$ **is 0.82 V. What will be the reduction potential of the half cell in a neutral solution ? Assume all the other species have unit concentration and temperature is 298 K.**
(a) –0.0272 V   **(b) – 0.0474 V**   **(c) – 0.421 V**   **(d) – 0.827 V**

(a) -0.0272 V (b) -0.0474 V (c) -0.421 V (d) -0.827 V

Ans: (d)

Sol: pH is 7 for a neutral solution.

As $pH = -\log[H^+]$ $[H^+] = 10^{-7}$

$$E^\circ = \frac{0.0591}{n}\log\frac{[NO_2][H_2O]}{[NO_3^-][H^+]^2}$$

$$= \frac{0.0591}{n}\log\frac{1}{(10^{-7})^2}$$

$$= 0.0591 \times (\log 1 - \log 10^{-14})$$

$$= 0.0591 \times (14) = 0.827 \text{ V}.$$

Q.71 **In the decomposition of ammonia, when concentration of ammonia is plotted as a function of time, the following linear graph is obtained. Concentration of ammonia at 200 seconds is measured to be 0.32 M. Calculate the first half-life of this reaction using the information provided.**
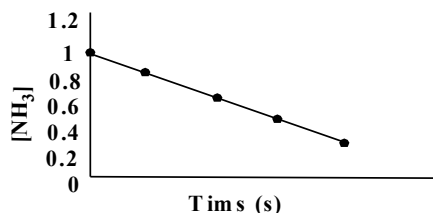
(a) 46 s (b) 100 s (c) 147 s (d) 313 s

Ans: (c)

Sol: The plot indicates a zero order reaction

$$[A]_t = -kt + [A]_0$$

$$y = mx + c$$

$$[A]_t = 0.32 \text{ M}$$

$$[A]_0 = 1 \text{ M (from plot)}$$

$$t = 20 \text{ seconds}$$

$$t_{1/2} = ? \qquad t_{1/2} = \frac{[A]_0}{2k}$$

$$k = \frac{[A]_0 - [A]_t}{t} = \frac{1 - 0.32}{200} = 3.4 \times 10^{-3}\text{ s}^{-1}$$

Now, $t_{1/2} = \dfrac{1}{2 \times 3.4 \times 10^{-3}} = 147$ seconds.

Q.72 **When dilute NaI solution is added to the excess of $AgNO_3$ solution, the resultant colloid can be represented as _____**

(a) $[AgI]\ Ag^+ : NO_3^-$

(b) $[AgI]\ I^- : Na^+$

(c) $[AgI]\ Na^+ : NO_3^-$

(d) $[AgI]\ NO_3^- : Na^+$

Ans: (a)

Sol: Ag^+ ions form fixed layer around AgI particles. The NO_3^- ions form the mobile layer around the positive charge.

Q.73 Which of the following statements is INCORRECT for the exraction of iron using a blast furnace ?
(a) Iron oxides are reduced to iron metal by C and CO.
(b) Quicklime acts as a flux and combines with the impurities such as SiO_2, Al_2O_3 and phosphate to form slag.
(c) The charge introduced in the blast furnace consists of roasted ore, coke and silica,
(d) The end product obtained from blast furnace is a pig iron which contains 4% carbon.

Ans: (c)

Sol: ———
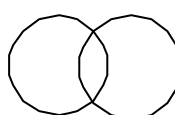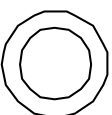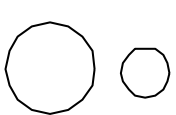
Q.74 Which of the following does NOT contain a bond between nitrogen atoms ?
(a) N_2O_5 (b) N_2O (c) N_2O_4 (d) N_2O_3

Ans: (a)

Sol: $N_2O_5 =$
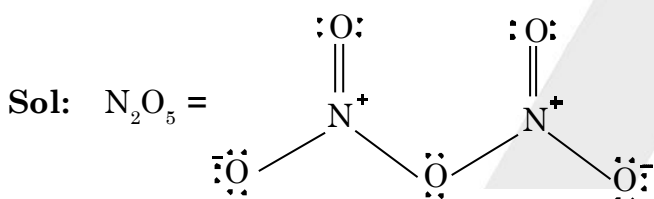
Q.75 Which of the following Venn diagram CORRECTLY illustrate the statements 'All transition elements are d-block elements but all d-block elements are not transition elements ?

(a) (b) (c) (d) None of these

Ans: (b)

Sol: Zn, Cd and Hg are d-block elements but not considered as transition elements. Thus, all transition elements are d-block elements but all d-block elements are not transition elements. The Venn diagram that represents this statements is :

d-Block elements
Transition elements
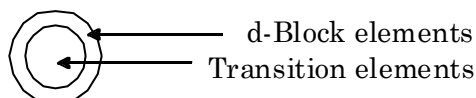
Q.76 If an atom of chromium with charge +2 forms a coordinatio compound with a strong field ligand resulting in a octahedral geometry, how many unpaired electrons would it have ?
(a) 1 (b) 2 (c) 3 (d) 4

Ans: (b)

Sol: Cr^{2+}: d^4 In precence of strong-field ligand, four electrons occupy lower t_{2g} levels as below :

t_{2g}
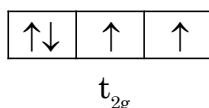
Q.77 **Chlorobenzene is_____**
(a) less reactive than benzyl chloride
(b) more reactive than benzyl chloride
(c) neraly as reactive as benzyl chloride
(d) more reactive than any alkyl halide

Ans: (a)

Sol: Chloriobenzene is less reactive than benzyl chloride.

CH_2 - Cl
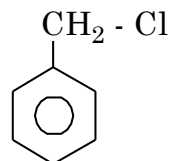
Benzyl chloride

In chlorobenzene, the lone pair present on Cl atom gets involved in resonance with π electrons of benzene due to which $C-Cl$ bond acquires double bond character. Hence reactivity decreases.

Q.78 **Consider the following reactions,**

i. $C_6H_5N_2^+Cl^- \longrightarrow C_6H_5I$

ii. $CH_3(CH_2)_3CH_2Cl \longrightarrow CH_3(CH_2)_3CH_2I$
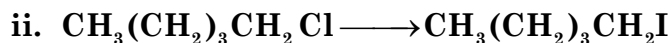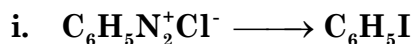
With reference to the above reactions, pick up a CORRECT statements from the following.
(a) Reaction (i) is a recversible reaction and is carried out in presence of strong oxidizing agents.
(b) Reaction (ii) is and electrophilic substitution reaction
(c) Reaction (ii) precipitates sodium halides which can reverse the reaction if not separated.
(d) Reaction (i) involves the use of copper iodides in presence of hydroiodic acid.

Ans: (c)

Sol: ————

Q.79 **Which of the following is NOT the product of the following reaction ?**

OH $\xrightarrow[443 \text{ K}]{95\% H_2SO_4}$
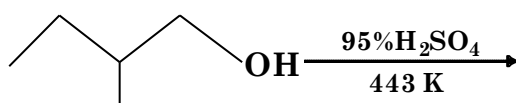
(a) **(b)** **(c)** **(d) Both (B) and (C)**

Ans: (a) B & C arr the product of the elemination wherear A is not.

Sol: **(i)**

(ii)
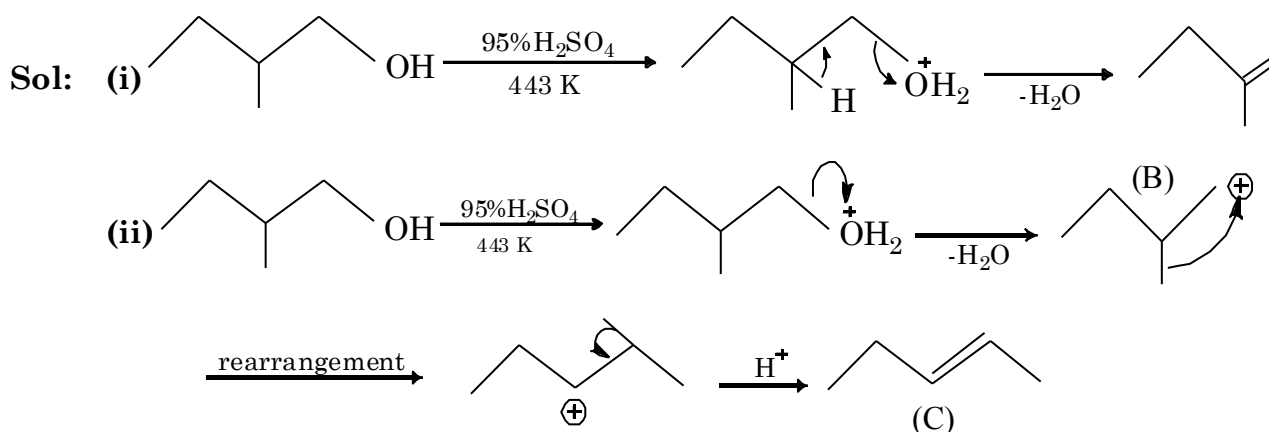
Q.80 Assertion : Phenols react with bromine water to form a trisubstituted product.
Reasons : Ionization of phenols occurs in aqueous solutions.
(a) Assertion and Reason are true. Reason is the correct explanation of Assertion
(b) Assertion and Reason are true. Reason is not the correct explanation of Assertion
(c) Assertion it true. Reasons is false.
(d) Assertion is false. Reason is true

Ans: (b)

Sol: Phenol ionize in aqueous solutions to form phenoxide ion, where in the oxygen atom donates electrons to the benzene ring thereby activating the benzene ring to great extend to form a trisubstituted product.

Q.81 The reagent which CANNOT be used for the synthesis of 2-cyclopentylbutan-2-ol is_____
(a) Cyclopentyl methyl ketone, ethyl magnesium bromide/ dry ether, H_3O^+
(b) Cyclopentyl ethyl ketone, methyl magnesium bromide/dry ether, H_3O^+
(c) Ethyl methyl ketone, cyclopentyl magnesium bromide dry/ether H_3O^+
(d) Diethyl ketone, cyclopentyl magnesium bromide/dry ether, H_3O^+

Ans: (d)

Sol: Different combination of ketons and Grignard reagents react in presence of dry ether, [mentioned in options (A), (B) and (C)] followed by hydrolysis to produce the following alcohol.

2- Cyclopentylbutan-2-ol
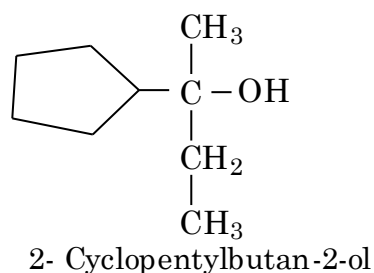
Q.82 Which of the following anion is a strongest base ?
(a) $C_6H_5COO^-$ (b) $HCOO^-$ (c) CH_3COO^- (d) $(CH_3)_2CHCOO^-$

Ans: (d)

Sol: Weak acid can give strong conjugate base.

Q.83 **p-Anisidine is _____**
(a) 4-methylbenzenamine   (b) N-methylbenznamine
(c) 4-methoxybenzenamine   (d) N-Methoxybenzenamine

Ans: (c)

Sol:

NH_2

CH_3
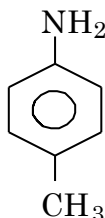
4-Methoxybenzenamine
(p-Anisidine)

Q.84 **An organic compound 'A' having molecular formula $C_5H_{11}N$ can decolourize bromine present in carbon tetrachloride. This compound is heated with alcoholic KOH and chloroform and then treated with H_2/Pt. The molecular formula of final product is_____**
(a) $C_6H_{13}N$ (b) $C_5H_{11}N$ (c) $C_6H_{13}N$ (d) $C_6H_{15}N$

Ans: (d)

Sol:

$$CH_3-CH_2-CH=CH-CH_2-CH_2 \xrightarrow[\Delta]{\text{alc.KOH/CHCl}_3} CH_3-CH_2-CH=CH-CH_2-NC$$

Pent-2-en-1-amine
($C_5H_{11}N$)
(A)

Pent-2-en isocyanide

$\downarrow H_2/Pt$

$$CH_3-CH_2-CH_2-CH_2-CH_2-NH-CH_3$$

N-Methylpentanamine
Product ($C_6H_{15}N$)
($2°$ Amine)
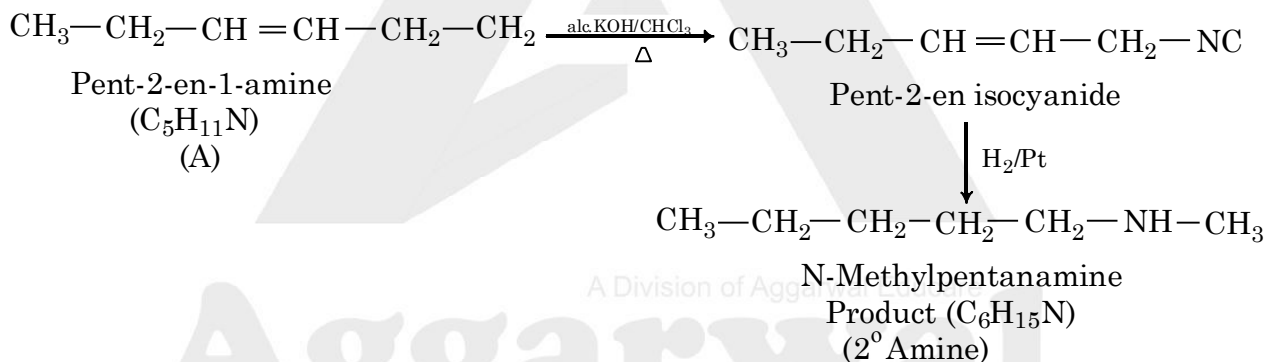
Compound 'A' can decolourize bromine in CCl4 due to presence of double bond, (which can be between any two carbon atoms) and it gets reduced by catalytic hydrogenation.

Q.85 **The number of chiral carbons in a single nucleotide or RNA is _____**
(a) 3   (b) 4   (c) 5   (d) 6

Ans: (b)

Sol: Single nucleotide or RNA contains one cyclic pentose (furanose) which has 4 chiral carbons.

Q.86 **Assertion : Denaturation disrupts the natural structure of prtoein.**
Reason : Denaturation is an irreversible process.
(a) Assertion and Reason are true. Reason is the correct explanation of Assertion
(b) Assertion and Reason are true. Reason is not the correct explanation of Assertion
(c) Assertion is true. Reason is false.
(d) Assertion is false. Reason is true.

(c) Assertion is true. Reason is false.
(d) Assertion is false. Reason is true.

Ans: (b)

Sol: Denaturation changes physical and biological properties. It does not change primary structure of proteins but the rearrangement of secondary and tertiary structures take place.

Q.87 An organic compound (monomer) having molecular formula $C_6H_5O_2N$ undergoes polymerization in presence of alkali. The monomer contains a methyl ester, a nitrile and an alkene as functional groups. The product formed is _____
(a) nylon-6   **(b)** glyptal   **(c)** PMMA   **(d)** superglue

Ans: (d)

Sol:

$$CH_2 = C \begin{matrix} CH \\ COOCH_3 \end{matrix} \xrightarrow{OH^-} \left[CH_2 - \underset{\underset{COOCH_3}{|}}{\overset{\overset{CN}{|}}{C}} \right]_n$$

Methyl α-Cyano   Superglue
acrylate
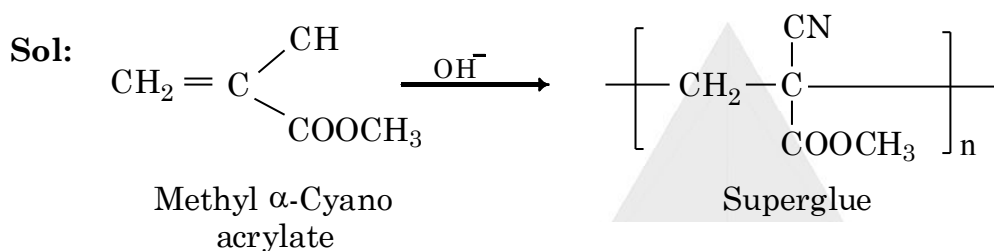
Q.88 Predict the IUPAC name of the following polymer.
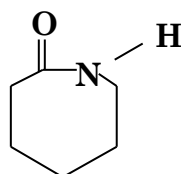
(a) 1-Oxo-2-aminocycloheptane   **(b)** 2-Azacyclohexanone
(c) 1-Amino -2-ketocycclohexane   **(d)** 1-Aza-2-cycloheptanone

Ans: (d)

Sol:
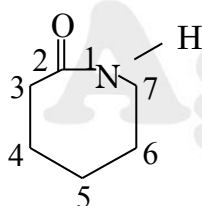
1-Aza-2-cycloheptanone
or Azepan-2-one or 1-Azacycloheptan
-2-one

Q.89 The antacide used to control stomach acidity are_____
(a) $Mg(OH)_2$, MgO_2, $NaHCO_3$ and ranitidine
(b) Zantac, cimetidine, centrizine and Mgo
(c) $Mg(OH)_2$, $Al(OH)_3$, NaCl and centrizine
(d) $MgCO_3$, $KHCO_3$, KCl and cimetidine

Ans: (a)

Sol: ————

Q.90 The amount of glyceryl triester of stearic acid required to prepare 153 g of sodium stearate soap is_____ mole (S).
(M.W. of sodium stearate = 306 g mol^{-1})
(a) 0.17   (b) 0.34   (c) 1.5   (d) 0.5

Ans: (a)

Sol: $153g = \dfrac{153}{306} = 0.5$ mole of sodium stearate 1 mole glyceryl triester produces 3

moles of sodium stearatae $= 0.5 \times \dfrac{1}{3} = 0.17$ mole

BIOLOGY

Q.91 Which one of the following aspects is an exclusive characteristic of living things ?
(a) Isolated metabolic reactions accur in vitro
(b) Increases in mass from inside only.
(c) Perception of events happening in the environment and their memory.
(d) Increase in mass by accumulation of material both on surface as well as internally.

Ans: (c)

Sol: ————————

Q.92 The species (man, housefly, mango, wheat, dog, cat, lion, tiger, potato, brinjal and leopard) give here belong to how many different families ?
(a) 4   (b) 7   (c) 5   (d) 6

Ans: (b)

Sol:

No.	Family	Example
i.	Hominidae	Man
ii.	Muscidae	Housefly
iii.	Anacardiacease	Mango
iv.	Poaceae	Wheat
v.	Felidae	Cat, lion, tiger, leopard
vi	Canidae	Dog,
vii	Solanaccae	Potato, brinjal

Q.93 Which of the following is correct regarding sexual cycle of different fungi ?
(a) Sexual reproduction is by condiay or sporangiospores.
(b) A sexual reproduction occurs by means of ascospores.
(c) Fusion of gametes i.e. plasmogamy gives rise to basidium.
(d) In ascomycycetes, dikaryophase is an intervening phase wherein karyogamy is delayed.

Ans: (d)

Sol: Condia are asexual spores. Ascospores are sexual spores. Two vegetative or somatic cells of different strain fuse to form basidium.

Q.94 Which of the following is not a characteristic feature of Kingdom Protista ?
(a) Well defined nucleus
(b) Membrane bound organelles
(c) Includes eubacteria containing chlorophyll
(d) Autotrophic as well as Heterotrophic nutrition.

Ans: (c)

Sol: Eubacteria are placed in Kingdom Monera.

Q.95 Read the given parts of plant body of *Marchantia.* Antheridiophore, Gemma cup, Rhizoids, Sporophyte, Spores, Archegonium. Among these, the number of haploid parts is_____
(a) 2   (b) 6   (c) 0   (d) 5

Ans: (d)

Sol: In Marchantia, the main plant body, i.e. gametophyte is haploid, Only sporophyte is diploid.

Q.96 Needle like foliage leaves are found in ‘X’ whereas ‘Y’ is the leaf like photosynthetic organ found in brown algae. Identify ‘X’ and ‘Y’

	‘X’	‘Y’
(A)	Mosses	Sporophylls
(B)	Gymnosperms	Frond
(C)	Bryophytes	Stipe
(D)	Ferns	Pyrenoids

Ans: (b)

Sol: ————

Q.97 Which out of the following is not the fundamental feature common to various individuals of Kingdom Animalia ?
(a) Body symmetry   (b) Nature of coelom
(c) Complexity of systems   (d) Morphology

Ans: (d)

Sol: Animals differ in structure and thus, exist in various forms,

Q.98 Identify the characteristic which is mainly responsible for diversification of insects on the land ?
(a) Bilateral symmetry   (b) Eyes
(c) Segmentation   (d) Exoskeleton

Ans: (d)

Sol: Exoskeleton made of cuticle has enabled insects to live on land and to diversify to almost all the possible habitats. It gives them protection, support and also helps to prevent in desiccation.

Q.99 How many plants in the list given below have inferior ovary ? Sweet pea, Aloe, Tulip, Cucumber, Trifolium, Gram, Potato, Tomato, Chilli, Brinjal, Guava.
(a) 2   (b) 4   (c) 6   (d) 8

Ans: (a)

Sol: Only cucumber and guava have inferior ovary, while the rest of the plant have superior ovary.

Q.100 If each pollen sac produces 20 pollen mother cells, then total number of pollen grains produced by single flower of pea is _____
(a) 2000   (b) 2400   (c) 3200   (d) 4800

Ans: (c)

Sol: In pea, androecium is (9 + 1) diadelphous, dithecous.

Hence, total number of pollen sac = 40

Total number of pollen mother cells = 40 × 20 = 800

∴   Each pollen mother cell divides meiotically to produce 4 pollen grains.

∴   Total number of pollen grains = 800 × 4 = 3200

Q.101 In the given figure of secondary growth in dicot stem, identify the INCORRECT label.
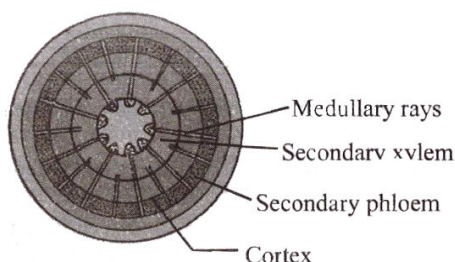
(a) Secondary phloem   (b) Secondary xylem
(c) Cortex   (d) Medullary rays

Ans: (c)

Sol: In the figure, cambium ring is incorrectly labelled as Cortex.

Q.102 The common bottle cork is the product of
(a) Phelloderm   (b) Phellogen
(c) Periderm   (d) Phellem

Ans: (b)

Sol: The cell of phellogen (cork combium) divide to produce an outer corky tissue (cork or phellem).

Q.103 The intercelluar materia of carilage is __(P)__ and __(Q)__ and resists __(R)__. Identify P, Q, and R
(a) P - Solid; Q - non-pliable; R - compression
(b) P - Solid; Q - pliable; R - elongation
(c) P - semi-Solid; Q - pliable; R - compression
(d) P - Solid; Q - pliable; R - compression

Ans: (d)

Sol: –––––––

Q.104 Read the following statements and selects the correct option.
i. Smooth muscle fibres taper at both ends and show striations.
ii. The scientific name of cockroach is *Pheretima omericana.*
iii. Cokroach is hermaphrodite.
iv. Mast cell is a found in Areolar tissue.
(a) Statement (iv) is correct
(b) Statement (i) and (ii) are correct
(c) Statement (i), (ii) and (iii) are incorrect

(d)Statement (i), (ii) and (iii) are correct.

Ans: (c)

Sol: i. Smooth muscle fibres do not show striations.
ii. The scientific name of cocroach is Periplaneta americana.

iii. Cokroach is dioecious, i.e. unisexual.

Q.105 In the figure of animal cell give below, four parts (P, Q, R, S) have been marked, Identify the part which is involved in protein synthesis and secretion.
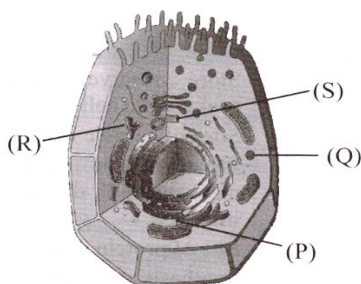
(a) P   **(b) Q**   **(c) R**   **(d) S**

Ans: (a)

Sol: P – Rough ER
Q – Lysosomes
R – Smooth ER
S – Centriole

Q.106 A student studies cell structure under compound microscope and concludes that the cell is animal cell. Out of the given below which observation might have helped him to conclude it ?
(a) The cell had its nucleus toward periphery.
(b) The cell had only cell membrane as the limiting membrane
(c) Mitochondria and chloroplast were brightly stained.
(d) The cell had pili arising from basal body.

Ans: (b)

Sol: ———

Q.107 The molecules in the insoluble fraction are polymeric substances except

(a) Proteins   **(b) Nucleic acids**
(c) Polysaccharides   **(d) Lipids**

Ans: (d)

Sol: Proteins, nucleic acid and polysaccharides are polymers but lipids are not polymer.

Q.108 Given below is the graph of effect of change is substrats concentration of enzyme activity. Choose the correct option for the values of (i) and (ii).

Q.108 Given below is the graph of effect of change is substrats concentration of enzyme activity. Choose the correct option for the values of (i) and (ii).
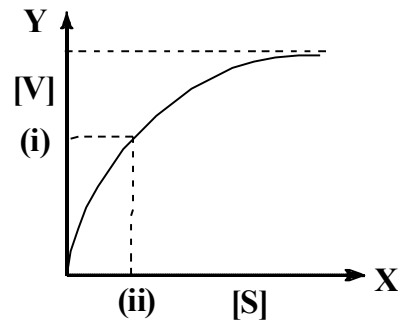
(a) i - K_m, ii. - $V_{max}/2$ (b) i - $V_{max}/2$, ii. - K_m

(c) i - $V_{max}/2$, ii - S_m (d) i - $2V_{max}$, ii - K_m

Ans: (b)

Sol: ————

Q.109 What would be the consequence if spindle fibres does not attach to kinetochores of chromosomes ?

I. There would be failure chromatid separation during Anaphase.

II. Chromosome will not be able to replicate.

III.Chromosomes will not be able to align on equatorial plate.

IV.Spindle fibres will not be formed.

(a) Only I is correct   (b) Only IV is correct

(c) Both I and III are correct   (d) Both I and IV correct.

Ans: (c)

Sol: ————

Q.110 Among the following statements, which are NOT true for meiosis ?

i. It increases the genetic variability in the population of organisms.

ii. It helps in conservation of specific chromosome number of each species.

iii. It helps in restoring the nucleocytoplasmic ratio of the cell.

iv. It results in continuous division of the meristematic cells.

(a) iii and iv   (b) i and ii

(c) i and iii   (d) ii and iv

Ans: (a)

Sol: Restoring the nucleo-cytoplasmic ratio and the continuous division of the meristematic cells is achieved by the process of mitosis.

Q.111 Are_____ the two main components that determine water potential.

(a) Solute potential and osmotic potential

(b) Pressure potential and force potential

(c) Solute potential and pressure potential

(d) Solvent potential and turgidity potential

Ans: (c)

Sol: Water potential (Ψ_W) is a fundamental concept to understand water movement.

Solute potential (Ψ_S) and pressure potential (Ψ_P) are the two main components that determine water potential.

Q.112 Select the INCORRECT statement about cohesion-tension-transpiration-pull model of water transport.

Q.112 Select the INCORRECT statement about cohesion-tension-transpiration-pull model of water transport.

(a) Water flows along its concentration gradient and increase the pressure inside the xylem.

(b) Water is pulled upwards through the plant.

(c) Transpiration from the leaves provides the driving force for the transpiration pull

(d) Most plants meet their water need by transpiration pull.

Ans: (a)

Sol: In the transpirational pull, water moves against the concentration gradient.

Q.113 Which of the following is the correct role of potassium in cells ?

i. Regulates cell proliferation.

ii. To maintain anion - cation balance.

iii. Maintenance of turgidity of cells.

iv. Maintains ribosome structure.

(a) iii and iv   (b) i and iii   (c) ii and iii   (d) ii and iv

Ans: (c)

Sol: ————

Q.114 Which of the following is INCORRECT regarding enzyme nitrogenase ?

i. Highly sensitive to molecular oxygen

ii. Catalyses conversion of NO_2^- to NO_3^-

iii. Not operational in anaerobic conditions

iv. Biochemical component of bacterium *Rhizobium*

(a) i and iii   (b) iii and iv

(c) ii and iv   (d) ii and iii

Ans: (d)

Sol: Nitrogenase catalyses conversion on N_2 into NH_3. It is not operational in aerobic conditions.

Q.115 Obseve the given diagrammatic representation of chloroplast. Which part of the chloroplast is labelled correctly ?
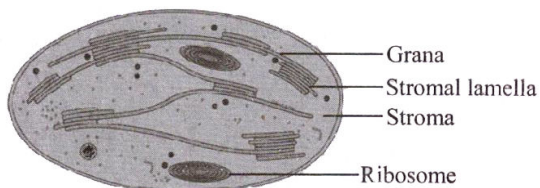
(a) Stroma   (b) Grana

(c) Stromal lamella   (d) Ribosome

Ans: (a)

Sol: ————

Q.116 Chemiosmosis is _____

(a) Movement of ions across selectively permeable membrane up their electrochemical gradient

(b) Movement of ions down their electrochemical gradient through a permeable mambrane

(c) Movement of ions up their electrochemical gradient through a permeable membrane

(d) Movement of ions across selectively permeable membrane down their electrochemical gradient.

Ans: (d)

Sol: Movement of ions across selectively permeable membrane down their electrochemical gradient.

Q.117 Which of the following constitutes celluar repiration ?
i.   Synthesis of important metabolites.
ii. Synthesis of ATP.
iii. Release of energy.
iv. Breakdown of food materials within the cell.
(a) i, ii, iii   (b) ii, iii, iv   (c) i, iii, iv   (d) all of the above

Ans: (b)

Sol: The process of celluar respiration involves the machanism of breakdown of food

materials within the cell to release energy, and the trapping of this released energy for synthesis of ATP (energy rich molecules).

Q.118 What is the ratio of ATP produced in anaerobic and aerobic respiration ?
(a) 1 : 18   (b) 1 : 8   (c) 18 : 1   (d) 1 : 36

Ans: (a)

Sol: Ratio of ATP $= \dfrac{\text{Anaerobic respiration}}{\text{Aerobic respiration}} = \dfrac{2}{36} = \dfrac{1}{18}$

Q.119 Which of the following formed from fully differentiated parenchyma cells ?
(a) Xylem vessels and sieve tubes.
(b) Cork cambium and interfascicular
(c) Secondary Xylem and secondary phloem
(d) Secondary cortex

Ans: (b)

Sol: ————

Q.120 A man was travelling from Kashmir to Mumbai. He packed together nearly ripe apples below and green tomatoes above them. Two days after reaching. Mumbai, he opened the box and found all tomatoes turned red. The tomatoes would have not turned red, if
(a) They were kept at the bottom layer in the box.
(b) They were mixed with nearly ripe apples.
(c) There were no ripe apples in the box.
(d) Some hay had been put in the box, while packing.

Ans: (c)

Sol: Nearly ripe apples release ethylene which caused the ripening of green tomatoes. If the apples had not been packed, The tomatoes would not have ripened so early.

Q.121 If the gall bladder is surgically removed in a person, it would lead to
(a) impairment of the digestion of fats
(b) increase acidity of intentine
(c) jaundice
(d) no physiological problem in digestion

Ans: (a)

Sol: ————

Q.122 Identify among the following, the components that reach stomach totally undigested.
(a) Starch and fat   (b) Fat and cellulose
(c) Starch and cellulose   (d) Protein and starch

Ans: (b)

Sol: Fats are digested in small intestine while cellulose is not digested in human at all.

Q.123 Inspiratory reserve volume is more than expiratory reserve volume because of
(a) residual volume   (b) inspiratory capacity
(c) expiratory capacity   (d) vital capacity

Ans: (a)

Sol: Residual volume is the volume of air that remains in the lungs even after forcible expiration. Lungs cannot be deflated totally hence, the total air that is forcefully inspired cannot be expired out therefore, IRV is more than ERV,

Q.124 Which of the following blood vessels will lose maximum O$_2$?
(a) Arteries of the body
(b) Capillaries of the body
(c) Left atrium of the body
(d) Capillaries surrounding the lung alveoli

Ans: (b)

Sol: In capillaries of tissues there is low pO$_2$ high pCO$_2$ and high H$^+$ concentration which favours dissociation of O
tissue.

Q.125 Pathogenic bacteria enter human body whenever there is a small cut or injury on skin. To prevent an individual from any diseases caused by these bacteria, which of the following play major role in defence mechanism ?
(a) Globulins   (b) Fibrinogens   (c) Albumins   (d) Lymph

Ans: (a)

Sol: –––––––––

Q.126 Which of the following carries blood from intestine to the liver before it is delivered to the systemic circulation ?
(a) Hepatic vein   (b) Hepatic artery
(c) Hepatic portal vein   (d) Systematic aorta

Ans: (c)

Sol: –––––––––

Q.127 Read the following statements and choose the correct option.
Statement X : The renal tubule begins with a double walled cup-like structure called athe vasa recta.
Statement Y : Glomerulus is a tuft of capillaries formed by the efferent arteriole.
(a) Statement X is correct, while statement Y is incorrect
(b) Statement X is incorrect, while statement Y is correct
(c) Both statement X and Y are correct
(d) Both statement X and Y are incorrect.

Ans: (d)

Sol: The renal tubule begins with a double walled cup-like structure called Bowman's capsule. Glomerulus is a tuft of capillaries formed by the afferent arteriole.

Q.128 Which of the following function is NOT carried out by kidney ?
(a) Regulation of blood pressure
(b) Removal of urea
(c) Maintain pH and sodium-potassium balance in blood
(d) Secretion of antibiotics

Ans: (d)

Sol: Antibiotic is not secreted by kidney but can be excerted.

Q.129 Which out of the following is INCORRECT regarding muscles ?
(a) Skeletal muscles are involved in locomotion and changing body postures.
(b) Visceral muscles are located in the heart.
(c) Cardiac muscles are not under direct control of nervous system.
(d) Muscles are derived from mesoderm

Ans: (b)

Sol: Cardiac muscles are located in the heart.

Q.130 While coming down from the staircase, Raju's grandma slips and breaks her ankle bone. Identify the bone/s involved in this injury.
(a) Tibia   (b) Tarsals   (c) Femur   (d) Metatarsals

Ans: (b)

Sol: ———–

Q.131 Identify the CORRECT statement and select the correct option.
i. Unless a stimulus acts along the nerve fibre, the neural membrane remains depolarised.
ii. Different types of ion channels are present on the neural membrane
iii. neural membrane is exclusively permeable to Na^+ ions.
iv. Pre and post synaptic neurons in chemical synapse are separated by synaptic cleft.
(a) i and i cleft   (b) ii and iii   (d) ii and iv   (c) i and iii

Ans: (c)

Sol: Neural membrane is in polarised state. When a stimulus acts along the nerve fibre, the polarity of the membrane is reversed and hence get depolarised.
Neural mambrane is permeable to K
the membrane.

Q.132 Given below is the diagram of human eye. Identify the labelllings (a - d) and select the correct option
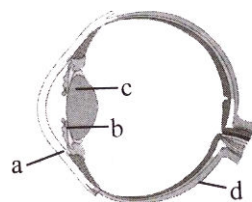
	a.	b.	c.	d.
(A)	Cornea	Choroid	Lese	Optic nerve
(B)	Retina	Sclera	Cornea	Choroid
(C)	Cornea	Iris	Lens	Sclera
(D)	Choroid	Sclera	Iris	Retina

Ans:

Sol: ————

Q.133 Read the following statments and select the correct option.
Statment I : Luteinizing hormone is required only for ovulation of graafian follicles.
Statement II : After ovulation, ruptured graafian follicle gets converted to corpus luteum that mainly secretes estrogen.
(a) Statement I is correct and II is incorrect.
(b) Statement I is incorrect and II is correct.
(c) Both Statement I and II are correct
(d) Both Statement I and II are incorrect.

Ans: (d)

Sol: Ovulation is not the only function of LH. Besides this it also maintains corpus luteum and stimulates synthesis of androgens from testis.
Corpus luteum secretes mainly progesterone.

Q.134 Identify the INCORRECT statement.
(a) Hormones of adrenal medulla are catecholamines.
(b) Adrenal medulla secretes aldosterone which helps in carbohydrate metabolism
(c) Adrenaline and noradrenaline are emergency hormones.
(d) Adrenal gland secretes small amounts of steroid hormones that plays an important role in development of secondary sexual characters.

Ans: (b)

Sol: Adrenal cortex secretes mineralocorticoids which regulate balance of water and electrolytes.

Q.135 Gonadotropins differ from gonadal hormones in that
(a) The former are proteins, whereas the latter are steroids.
(b) The former are steroids, whereas the latter are proteins
(c) The former are glycoproteins, whereas tha latter are amino acids
(d) The former are produced by gonads while the latter are produced by pituitary glands.

Ans: (a)

Sol: FHS and LH are gonadotropines released from pituitary gland while estrogen, progesterone, testosterone are gonadal hormone.

Q.136 Assertion : Marchantia is a dioecious plant.
Reason : In Marchantia, bisexual condition is observed in which single plant bears both male and female sex organs.
(a) Both assertion and reason are true and reason is the correct explanation of assertion
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

Ans: (c)

Sol: *Marchantia* is a dioecious plant, where the male plant bears antherdiophore and female plant bears archegoniophore.

Q.137 i.   'X' is the vital link that ensures continuity of species between organisms of one generation and the next.

ii. Formation of 'X' is universal in all sexually reproducing organisms

iii. Every sexually reproducing organism begin life as a single cell - 'X'

The 'X' in the given statements is

(a) Gamete   (b) Embryo   (c) Zygote   (d) Seed

Ans: (c)

Sol: ———

Q.138 All the below given statements are true about pollen grains, except

(a) Pollen grains are rich in nutrients.

(b) Not all pollen grains are beneficial for human, some of them oftern lead to chronic repiratory disorders

(c) Pollen grains loose their viability after shedding from anther, thus they cannot be stored for longer period.

(d) In western countries people use pollen tablets as food supplements.

Ans: (c)

Sol: It is possible to store pollen grains of a large number of species for years in liquid nitrogen (196 ^{o}C).

Q.139 Which is the most logical sequence with reference to the life cycles of an angiosperm ?

(a) Cleavage - fertilization - grafting - fruit formation

(b) Pollination - fertilization - seed formation - germination

(c) Maturation - mitosis - differentiation - fertilization

(d) Germination - endosperm formation seed dispersal - double fertilization

Ans: (b)

Sol: ————

Q.140 What is the common between Sertoli cells and interstitial cells ?

(a) Both are present outside seminiferous tubules

(b) Both the cells are present in testis.

(c) Both synthesize and secrete androgens

(d) Both provide nutrition to germ cells.

Ans: (b)

Sol: ————

Q.141 Read the following statements (i - iv) about embryonic development in different months of pregnancy.

i.   The first movments of the foetus are usually observed during the 3rd month

ii. The foetus develops limbs and digits by the end of 6th month of pregnancy.

iii. The embryo's heart is formed after the 1st month of pregnancy.

iv. Appearaance of hair on the head usually during 5th month of the pregnancy.

Which of the stements given above are INCORRECT ?

(a) ii and iii (b) i and iv   (c) i and ii   (d) ii and iv

Ans: (c)

Sol: The first movements of the foetus are usually observed during the 5th month. The foetus develops limbs and digit by the end of 2nd month of pregnancy.

Q.142 Read the given statements and select the correction option.
Statement I : Mechanical barrier methods of contraception prevent physical meeting of ovum and sperm.
Satement II : Natural methods of contraception work on the principle of avoiding chances of meeting of sperm and ovum.
(a) Statement I is correct
(b) Statements II is correct
(c) Both statement I and statement II are correct
(d) Both statments I and statement II are incorrect.

Ans: (c)

Sol: ——————————

Q.143 Which of the follwoing is NOT true about MTPs ?
(a) They are performed to get rid of unwanted pregnancies due to casual unprotected intercourse or failure of contraceptives.
(b) It is performed when pregnancy could be harmful either to the mother or foetus or both
(c) MTPs are considered safe upto 30 weeks of pregnancy.
(d) Majority of the MTPs are performed illegally.

Ans: (c)

Sol: ——————————

Q.144 ZIFT is
i. zygote intra fallopian transfer.
ii. the technique in which gametes are implanted into fallopian tube for further development.
iii. the technique in which zygote is transferred into fallopian tube.
iv. transfer of ovum into fallopian tube.
(a) i and iii   (b) only i   (c) ii and iv   (d) only ii

Ans: (a)

Sol: ——————————

Q.145 If a cross made between the two pea plants homozygous for the colour of seed coat, then what would be the genotypic ratio of the individuals in F generation ?
(a) 3 YY : 1 yy   (b) 1 YY : 3yy   (c) 2 YY : 2 yy   (d) 1 YY : 2 Yy : 1 yy

Ans: (d)

Sol: ——————————

Q.146 Total 344 plants were obtained in F_2 generation of pure tall pea plant possessing round seeds crossed with a dwarf plant possessing wrinkled seeds. Out of 344 plants, how many plants would be of non-parental combination ?
(a) 21   (b) 193   (c) 129   (d) 96

Ans: (c)

Sol: In dihybrid cross out of 16 individuals, 6 are non parental type.

∴ Number of non parental individual out of 344

$$= \frac{6}{16} \times 344 = 129$$

Q.147 A colour blind man marries a female with normal vision. 50% of their offsprings are colour blind and 50% are normal visioned. What is the genotype of female ?
(a) She is heterozygous for colour blindness
(b) She is homozygous normal
(c) She is homozygous for colour blindness
(d) None of these

Ans: (a)

Sol:

Parents	Colour blind male	Normal vision female

Genotypes X^cY X^cX^c

Gemetes X^c Y X^c X^c

Offsprings	X^cX^c	X^cX^c	X^cY	X^cY
	normal vision (carrier) female	colour blind female	normal vision male	colour blind male
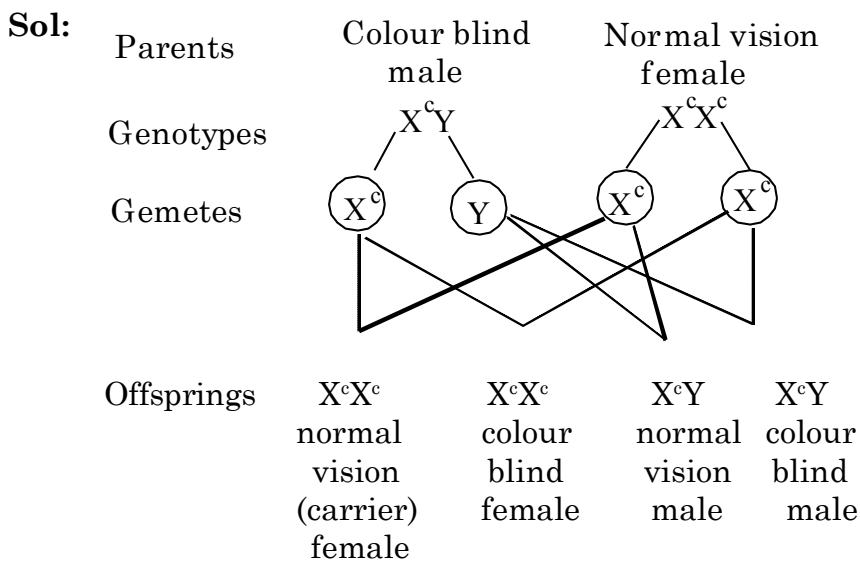
Q.148 Prokaryotes, such as *E. coli*, do not have a defined nucleus, yet their DNA is not scattered, this is because
(a) DNA in prokaryotes is circular
(b) DNA due tot its negative charge is held by some positive proteins
(c) Hitones packes the DNA in a nucleoid
(d) DNA wraps around the histone octamer to form nucleoid.

Ans: (b)

Sol: ————

Q.149 In double stranded DNA adenine are 120 and guanine are 60 what would be the total number of nitrogen bases ?
(a) 180 (b) 630 (c) 360 (d) 200

Ans: (c)

Sol: ————

Q.150 Which of the following is the function of enzyme permease ?
(a) Hydrolysis of lactose
(b) Transportation of lactose into the cell
(c) Acting as inducer
(d) Acting as s repressor

Ans: (b)

Sol: –––––––

Q.151 Which of the following were the conditions created in a laboratory scale by S.L. Miller during his experiment based on origin of life ?
(a) High temperature, volcanic, storms reducign atmosphere containing free O_2, H_2 and CH_4.
(b) Sterilised apparetus, low temperature reducing atmosphere containing CH_4, NH_3, etc
(c) High temperature , volcanic storms, reducing atmosphere containing CH_4, NH_3, etc.
(d) Water vapour, solar radiation, intense heat, atmosphere rich in oxygen

Ans: (c)

Sol: –––––––

Q.152 Identify the ODD one out.
(a) Genetic drift.　　　　　　　　　(b) Mutation
(c) Gene migration　　　　　　　　 (d) Fragmentation.

Ans: (d)

Sol: Genetic drift, mutation, gene migration alter the gene frequency whereas fragmentation is a method of asexual reproduction wherein the offsprings form the clones of the original organism and thus, do not contribute to the alternation of gene frequency.

Q.153 Genetic equilibrium descibes that
(a) the gene pool in a population remains stable and constant from generation to generation.
(b) during inbreeding, the gene flow from one generation to another is random
(c) allellic freqquencies in a population are unstable.
(d) disturbance in genetic equilibrium result in saltation.

Ans: (a)

Sol: –––––––

Q.154 Read the following statements (i - iv) about pneumonia and select the correct option.
i.　It is bacterial disease.
ii.　In severe cases of pneumonia, the lips and finger nails may turn yellow in colour.
iii. The alveoli of lungs get filled with fluid leading to severe repiratory problems
iv. A person cannot acquire the infection by sharing utensils with the infected person
(a) iii and iv are correct　　　　　　(b) i and ii are correct
(c) ii and iv are incorrect　　　　　 (d) i and iv are incorrect

Ans: (c)

Sol: In severe cases of pneumonia, the lips and fingre nails may turn grey to bluish in colour, A healty person can acquire the infection by sharing utensile with the infection person.

Q.155 Fill the blanks (P and Q) in the statement given below and select the correct option. Indivduals taking drugs intravenously are much more likely to

acquire serious infections like __(P)__ and __(Q)__

(a) P - AIDS, Q - Typhoid   (b) P - Hepatitis A, Q - Filariasis

(c) P - Hepatitis B, Q - AIDS   (d) P - Lung cancer, Q - Hepatitis B

Ans: (c)

Sol: ————

Q.156 Consider the following statement :

I. Cancer can be detected by using radiation therapy.

II. T-cells release antibody.

III. Cocaine has a potent stimulating action on CNS.

Which of the statement(s) given above are correct ?

(a) Only III   (b) I and II   (c) I and III   (d) Only I

Ans: (a)

Sol: I. Radiation therepy is method of cancer treatment.

II. B-cells release antibody.

Q.157 Superior female in case of cattle, is the cow or buffalo that

(a) belongs to superior species.

(b) produce more offsprings at a given time

(c) produces milk with more fats

(d) produces more milk per lactation.

Ans: (d)

Sol: ———

Q.158 Which of the following is included in cross hybridization step of plant breeding ?

(a) Selection of plants having desired character combination.

(b) Combining two different plants with desirable characters.

(c) Collection and preservation of different wild varieties.

(d) Evaluation of plants for their yield and other agronomic traits.

Ans: (b)

Sol: ————

Q.159 Select the INCORRECT pair from the following

(a) Totipotency - capacity to generate a whole plant from explant.

(b) Apical meristem - Always free from virus.

(c) Somatic hybrids - Genetically identical with explant.

(d) Micropropagation - Production of large number of plants from tissue culture.

Ans: (c)

Sol: Somatic hybrids produced by protoplast fusion to two different varieties of plants are not genetically identical.

Q.160 Lactobacillus mediates the conversion of milk to curd because of the

(a) coagulation and partial digestion of milk fats

(b) coagulation and partial digestion of milk proteins

(c) coagulation of milk proteins and complete digestion of milk fats

(d) coagulation of milk fats and complete digestion of milk proteins

Ans: (b)

Sol: During Lactobacillus mediated conversion of milk to curd, acids produced by Lactobacillus coagulate and partially digest milk proteins.

Q.161 Which of the following processes is NOT included in the primary treatment of sewage ?
(a) Sequential filtration
(b) Removal of grit
(c) Sedimentation of flocs
(d) Both (A) and (C)

Ans: (c)

Sol: Sedimentation of flocs is a part of the secondary treatment of sewage.

Q.162 Which of the following is INCORRECT with respect to cyanobacteria ?
(a) It is an important biofertilizer used in paddy fields.
(b) Increases the organic matter present in soil.
(c) It is a heterotrophic microbe widely distributed in aquatic and terrestrial environments.
(d) *Anabaena, Nostoc, and Oscillatoria* are nitrogen fixing cyanobacteria.

Ans: (c)

Sol: Cyanobacteria are autotrophic in nature.

Q.163 Limitation of traditional hybridisation can be overcome by
(a) recominant DNA or use of gene cloning
(b) carrying out self pollination for 4-5 generation.
(c) traditional hybridization with superior plant.
(d) developing pure lines.

Ans: (a)

Sol: ──────────

Q.164 When the same restriction enzyme is used on two different genomes, the resultant DNA fragments have
(a) the same kind of 'sticky ends' and can be joined by ligase
(b) the same kind of 'stcky ends' and can be joined by nuclease.
(c) the different kinds of 'sticky ends' that cannot be joined by ligase.
(d) the different kinds of 'sticky ends' that can be developed by DNA polymerase.

Ans: (a)

Sol: ────────

Q.165 The use of continuous culture system,
(a) maintains cells in physiologically most active stage
(b) maintains cells at lag phase of cell division to optimise growth.
(c) do not allow cells to attain exponential phase.
(d) cannot produce larger yield of desired proteins in culture medium.

Ans: (a)

Sol: ────────

Q.166 Which of the following statements is/are true with respect of ELISA ?
i. It is based on the principle of antigen antibody interaction.
ii. Infection by the pathogen can be detected by presence of proteins, glycoproteins as antigens.
iii. It also makes use of detection of antibodies synthesized against pathogen.
iv. In this technuque ssDNA or ssRNA is tagged with radioactive probe.

(a) Only i   (b) i, ii and iii

(c) Only iv   (d) None of the above statements are true.

Ans: (b)

Sol: —————

Q.167 Read the given statements and select the correct option

Statements I : Gene therapy cannot be used to correct defect diagnosed in an embryo.

Statement II : Introduction of functional gene in an embryo may prove to be a permanent solution.

(a) Statement I is correct and Statement II is incorrect

(b) Statment I is incorrect and Statement II is Incorrect

(c) Both Statment I and II are correct.

(d) Both Statement I and II are correct.

Ans: (b)

Sol: Gene therapy can be used to correct defects diagnosed in an embryo.

Q.168 Identify the transgenic food crop which helps in solving the problem of night blindness

(a) Bt soyabean   (b) Flavr savr tomatoes

(c) Golden rice   (d) Bt Brinjal

Ans: (c)

Sol: Vitamin A plays significant role in providing normal vision. Vitamin A deficiency causes night blindness. Golden rice is genetically engineered rice with greater pro-vitamin A (beta carotene) content.

Q.169 Which of the following statment are INCORRECT

i. Our intestine is an example of a habitat.

ii. Tundra is one of the major biomes of India.

iii. Boiling thermal springs and compost pits are habitat without life.

iv. Physico-chemical factor alone characterise the habitat of an organism.

v. To optimise its survival the organisms evolve through natural selection.

(a) i and iii   (b) i, ii, iv   (c) ii, iii, iv   (d) ii and v

Ans: (c)

Sol: ii. The major biomes of India include the tropical rainforest. decidous forest, desert and sea coast.

iii. Boiling themal springs and compost pits are habits inhabiting life.

iv Abiotic physio-chemical factores along with biotic factors characterize the habitat of an organism.

Q.170 In a farm there were 500 birth of goats in the last yeat. The current population of goats is 5500. Calculate the birth rate of offsprings per goat per year.

(a) 0.01   (b) 0.09   (c) 0.1   (d) 0.9

Ans: (c)

Sol: Current population = 5500

No. of new births last year = 500

∴ Population of goats last year = 5500 − 500 = 5000

$$\text{Birth rate} = \frac{\text{Number of new goats}}{\text{Total no. of goats}} = \frac{500}{5000} = \frac{1}{10} = 0.1 \text{ offspring/goat/year}$$

Q.171 Consider the graph of population density (N) versus time (t).
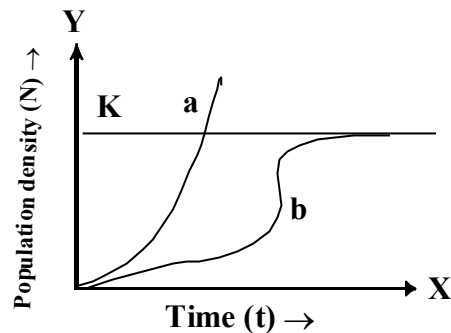
Choose the correct condition and plot represented by lines a and b in the graph.
(a) a - unlimited resources, exponential plot
   b - unlimited resources, logistic plot
(b) a - unlimited resources, logistic plot
   b -limited resources, exponential plot
(c) a - limited resources, exponential plot
   b - unlimited resources, logistic plot
(d) a - limited resources, logistic plot
   b - unlimited resources, expontential plot

Ans: (a)

Sol: ―――――

Q.172 Which of the following event will NOT occur in the absence of bacteria, fungi and flagellates in the bottom of the pond ?
(a) Conversion of inorganic to organic material.
(b) Decomposition and mineralisation of dead matter.
(c) Trapping of radiant energy.
(d) Consumption of primary producers by primary consumers.

Ans: (b)

Sol: Bacteria, fungi and flagellates in the bottom of the pond are decomposers.

Q.173 The Net Primary Productivity (NPP) of an ecosystem is approximately 1700kg of biomass and the Gross Primary Productivity (GPP) is 2300kg of biomass. Then what is the biomass available for the primary consumer ?
(a) 600 kg   (b) 1700 kg
(c) 2300 kg   (d) more than 2300kg

Ans: (b)

Sol: The available biomass for the consumption to heterotroph (herbivores and decomposers) is known as NPP

Q.174 Removal of CO_2 from the biosphere will have immediate effect on which of the following ?
(a) Recycling of nutrition.
(b) Biomass available for primary consumers.
(c) Large carnivores
(d) Biomass available for primary carnivores.

Ans: (b)

Sol: ———

Q.175 According to May's global estimates, only 22% of the total species have been recorded so far. If this proportion is applied to India's diversity fig, then how many species are yet to be discovered and described ?
(a) 3, 00,000 plant and animal species
(b) 3, 00,000 plant species and 1, 00, 000 animal species
(c) 3, 00,000 animal species and 1, 00, 000 plant species
(d) Almost 2, 00,000 plant species and double the amount of animal species.

Ans: (c)

Sol: ————

Q.176 Bees, bumblebees, birds and bats carry out pollination of plant. This can be considered as
(a) narrowly utilitarian value of biodiversity
(b) broadly utilitarian value of biodiversity
(c) ethical value of biodiversity
(d) aesthetic value of biodiversity

Ans: (b)

Sol: ————

Q.177 Which of the following is NOT one of the recent advances in the *ex situ* method of conservation of species ?
(a) Preservation of gametes of threatened species by using cryopreservation
(b) Using in vitro methods for propagation of plants and for the fertilization of eggs.
(c) Storing seeds in seed banks
(d) Conservation of species through biodiversity hotspots.

Ans: (d)

Sol: ————

Q.178 Identify the INCORRECT statement/s regarding electrostatic precipitator.
i. The precipitato contains electrode wires maintained at high volts that produce a corona to release protons.
ii. The collection plate attached at the base attracts the dust particles from the dirty air.
iii. The voltage of electrodes must be high and velocity of air between the collection plates must be maintained low.
(a) i, is incorrect   (b) i, ii and iii, incorrect
(c) ii, is incorrect   (d) i, and iii, are incorrect

Ans: (a)

Sol: ————

Q.179 The only solution for treatment of e-waste is
(a) decomposition by genetically engineered bacteria
(b) recycling the e-waste in an environment friendly manner.
(c) making use in manufacturing of polyblend.
(d) using it in sanitary landfills.

Ans: (b)

Sol: ——————

Q.180 Which award the Government of India has instituted for individuals or communities from rural areas that have shown dedication in protecting wild life ?
(a) Joint Forest Management Award
(b) Chipko Movement Award
(c) Amrita Devi Bishnoi Wildlife Protection Award
(d) Montreal Award

Ans: (c)

Sol: —————

****