Q.1 In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows : $P = \frac{a^3b^2}{cd}$. % error in P is -

(1) 14% (2) 10%

(3) 7% (4) 4%

Ans. **[1]**

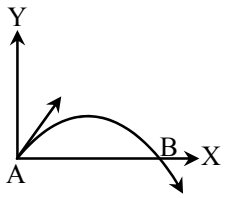
Sol. **Students find this question in CP Class Notes : [Topic : Errors & Measurement]**

$P = \frac{a^3b^2}{cd}$

Error in $\left(\frac{\Delta P}{P}\right) = 3\left(\frac{\Delta a}{a}\right) + 2\left(\frac{\Delta b}{b}\right) + \left(\frac{\Delta c}{c}\right) + \left(\frac{\Delta d}{d}\right)$

= 3(1%) + 2(2%) + 3% + 4% = 14%

Q.2 The velocity of a projectile at the initial point A is $(2\hat{i} + 3\hat{j})$ m/s. It's velocity (in m/s) at point B is -

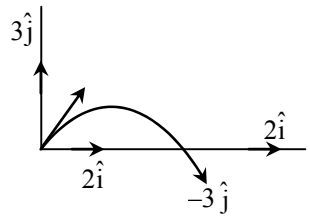


(1) $-2\hat{i} - 3\hat{j}$ (2) $-2\hat{i} + 3\hat{j}$

(3) $2\hat{i} - 3\hat{j}$ (4) $2\hat{i} + 3\hat{j}$

Ans. **[3]**

Sol. **Students find this question in CP Class Notes : [Topic : Projectile Motion]**



So, $v_f = 2\hat{i} - 3\hat{j}$

Q.3 A stone falls freely under gravity. It covers distances h_1, h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is -

(1) $h_1 = 2h_2 = 3h_3$ (2) $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$

(3) $h_2 = 3h_1$ and $h_3 = 3h_2$ (4) $h_1 = h_2 = h_3$

Ans. **[2]**

Sol. **Students find similar question in CP Sheet at : Ex. 1, Q.28 (One dimensional motion).**

Distance covered in first 5 sec.

$$h_1 = 0 + \frac{1}{2}a(5)^2$$

$$h_1 = \frac{25a}{2} \qquad \ldots(1)$$

distance covered in first 10 sec

$$S_2 = 0 + \frac{1}{2}a(10)^2 = \frac{100a}{2}$$

So distance covered in second 5 sec.

$$h_2 = S_2 - h_1 = \frac{100a}{2} - \frac{25a}{2} = \frac{75a}{2} \qquad \ldots(2)$$

distance covered in first 15 sec.

$$S_3 = 0 + \frac{1}{2}a(15)^2 = \frac{225a}{2}$$

so distance covered in last 5 sec.

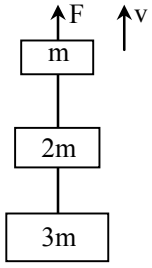
$$h_3 = S_3 - S_2 = \frac{225a}{2} - \frac{100a}{2} = \frac{125a}{2} \qquad \ldots(3)$$

using (1), (2) and (3) equation.

$$\frac{h_1}{\frac{25a}{2}} = \frac{h_2}{\frac{75a}{2}} = \frac{h_3}{\frac{125a}{2}}$$

$$h_1 = \frac{h_2}{3} = \frac{h_3}{5}$$

Q.4 Three blocks with masses m, 2m and 3m are connected by strings, as shown in the figure. After an upward force F is applied on block m, the masses move upward at constant speed v. What is the net force on the block of mass 2m ? (g is the acceleration due to gravity)



(1) zero (2) 2 mg

(3) 3 mg (4) 6 mg

Ans. **[1]**

Sol. **Students find similar question in CP Sheet at : Ex. 1, Q.53 (Newton's Laws of motion).**

Blocks are moving with constant speed so net force on each block will be zero.

Here F = ma a = 0

So F = 0

Q.5 The upper half of an inclined plane of inclination θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between the block and lower half of the plane is given by -

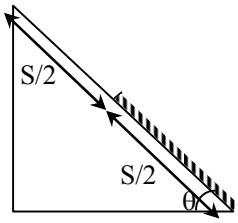
(1) $\mu = \frac{1}{\tan\theta}$ (2) $\mu = \frac{2}{\tan\theta}$

(3) $\mu = 2\tan\theta$ (4) $\mu = \tan\theta$

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : similar Q.8, Ex. 3B, Page. 56 (Laws of motion)**

Gain of kinetic energy = loss of KE due to friction in lower half.



$mg\sin\theta\, S = \mu mg\cos\theta\, S/2$

$\mu = 2\tan\theta$

Q.6 A uniform force of $(3\hat{i}+\hat{j})$ newton acts on a particle of mass 2 kg. Hence the particle is displaced from position $(2\hat{i}+\hat{k})$ meter to position $(4\hat{i}+3\hat{j}-\hat{k})$ meter. The work done by the force on the particle is -

(1) 9 J (2) 6 J

(3) 13 J (4) 15 J

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : similar Q.4, Ex. 1, Page. 90 (Work, Power & Energy)**

Displacement = $\vec{r}_2 - \vec{r}_1 = (4\hat{i}+3\hat{j}-\hat{k}) - (2\hat{i}+\hat{k})$

$= 2\hat{i}+3\hat{j}-2\hat{k}$

Force $\vec{F} = 3\hat{i}+\hat{j}$

Work W = $\vec{F}.\vec{d} = (3\hat{i}+\hat{j}).(2\hat{i}+3\hat{j}-2\hat{k})$

= 6 + 3 = 9J

Q.7 An explosion breaks a rock into three parts in a horizontal plane. Two of them go off at right angles to each other. The first part of mass 1 kg moves with a speed of 12 ms^{-1} and the second part of mass 2 kg moves with 8 ms^{-1} speed. If the third part files off with 4 ms^{-1} speed, then its mass is -

(1) 3 kg (2) 5 kg

(3) 7 kg (4) 17 kg

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : similar Q.31, Ex. 3A, Page. 101 (Work, Power & Energy)**

Using law of conservation of linear momentum

$\vec{P}_1 + \vec{P}_2 + \vec{P}_3 = 0$

$m_1\vec{v}_1 + m_2\vec{v}_2 + m_3\vec{v}_3 = 0$

$|m_3\vec{v}_3| = |-(m_1\vec{v}_1 + m_2\vec{v}_2)|$ $\qquad \vec{v}_1 \perp \vec{v}_2$

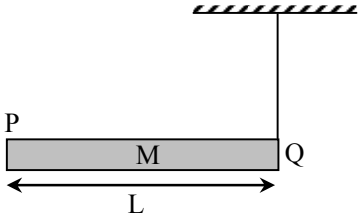
$m_3v_3 = \sqrt{m_1^2v_1^2 + m_2^2v_2^2}$

$m_34 = \sqrt{1^2 \times 12^2 + 2^2 \times 8^2}$

$m_34 = 20$

$m_3 = \frac{20}{4} = 5kg$

Q.8 A rod PQ of mass M and length L is hinged at end P. The rod is kept horizontal by a massless string tied to point Q as shown in figure. When string is cut, the initial angular acceleration of the rod is -

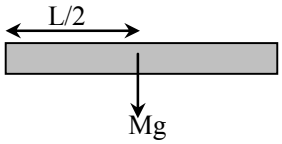


(1) $\frac{3g}{2L}$ (2) $\frac{g}{L}$ (3) $\frac{2g}{L}$ (4) $\frac{2g}{3L}$

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : similar Q.24, Ex. 3A, Page. 160 (Rotational Motion)**

$\tau = I\alpha$



$\frac{L}{2}Mg = \frac{ML^2}{3}\alpha$

$\alpha = \frac{3g}{2L}$

Q.9 A small object of uniform density rolls up a curved surface with an initially velocity 'v'. It reaches upto a maximum height of $\frac{3v^2}{4g}$ with respect to the initial position. The object is -

(1) Ring (2) Solid sphere

(3) Hollow sphere (4) Disc

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : similar Q.32, Ex. 2, Page. 154 (Work, Power & Energy)**

Using mechanical energy conservation

$$\frac{1}{2}mv^2\left(1+\frac{k^2}{R^2}\right)=mg\left(\frac{3v^2}{4g}\right)$$

$$1+\frac{k^2}{R^2}=\frac{3}{2}$$

$$\frac{k^2}{R^2}=\frac{1}{2}$$

So, body is disc or solid cylinder.

Q.10 A body of mass 'm' is taken from the earth's surface to the height equal to twice the radius (R) of the earth. The change in potential energy of body will be -

(1) mg 2R (2) $\frac{2}{3}$ mgR

(3) 3 mgR (4) $\frac{1}{3}$mgR

Ans. **[2]**

Sol. **Students find similar question in CP Sheet at : Ex. 2A, Q.9 (Gravitation).**

$$\Delta U=\frac{mgh}{1+\frac{h}{R}}=\frac{mg2R}{1+2}=\frac{2}{3}mgR$$

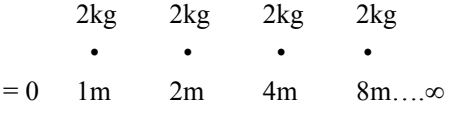
h = 2R

Q.11 Infinite number of bodies, each of mass 2 kg are situated on x-axis at distances 1m, 2m, 4m, 8m, … , respectively, from the origin. The resulting gravitational potential due to this system at the origin will be -

(1) – G (2) $-\frac{8}{3}$G (3) $-\frac{4}{3}$G (4) – 4 G

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : [Topic : Gravitation]**



$$V_g=-\frac{G(2)}{1}-\frac{G(2)}{2}-\frac{G(2)}{4}-\frac{G(2)}{8}....\infty$$

$$V_g=-2G\left[1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+....\infty\right]$$

$$=-2G\left[\frac{1}{1-\frac{1}{2}}\right]=-2G(2)=-4G$$

Q.12 The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied ?

(1) length = 50 cm, diameter = 0.5 mm (2) length = 100 cm, diameter = 1 mm

(3) length = 200 cm, diameter = 2 mm (4) length = 300 cm, diameter = 3 mm

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : similar Q.9, CP Study material Sheet (Elasticity)**

$$Y = \frac{MgL}{\Delta L.A}$$

$$\Delta L = \frac{mgL}{Y.A}$$

$$\Delta L \propto \frac{L}{A}$$

Q.13 The wettability of a surface by a liquid depends primarily on -

(1) viscosity

(2) surface tension

(3) density

(4) angle of contact between the surface and the liquid

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : Page no. 195, Theory Notes CP Study material (Surface Tension)**

The wettability of a surface by a liquid depends on angle of contact between the surface and the liquid.

Q.14 The molar specific heats of an ideal gas at constant pressure and volume are denoted by C_p and C_v, respectively. If $\gamma = \frac{C_p}{C_v}$ and R is the universal gas constant, then C_v is equal to -

(1) $\frac{1+\gamma}{1-\gamma}$ (2) $\frac{R}{(\gamma-1)}$ (3) $\frac{(\gamma-1)}{R}$ (4) γR

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : similar Q.9, Ex. 3A (Calorimatry)**

$C_p - C_v = R$

$$\Rightarrow \frac{C_p}{C_v} - \frac{C_v}{C_v} = \frac{R}{C_v}$$

$$\gamma - 1 = \frac{R}{C_v}$$

$$\therefore C_v = \frac{R}{\gamma - 1}$$

Q.15 A piece of iron is heated in a flame. It first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observation is possible by using -

(1) Stefan's law (2) Wien's displacement law

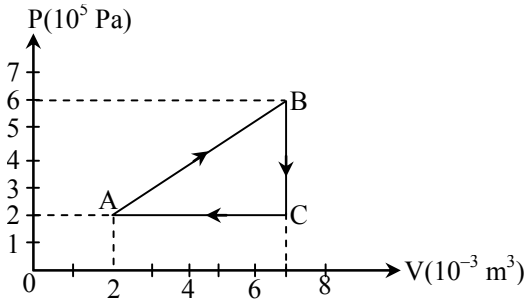
(3) Kirchoff's law (4) Newton's law of cooling

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : [Topic : Radiation]**

We know Wien's displacement law $\lambda_m \propto \frac{1}{T}$

Q.16 A gas is taken through the cycle A → B → C → A, as shown. What is the net work done by the gas ?



(1) 2000 J (2) 1000 J

(3) zero (4) – 2000 J

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : [Topic : Thermodynamics]**

We know work done

= Area under P-V curve.

$= \frac{1}{2} \times 4 \times 10^5 \times 5 \times 10^{-3}$

$= 10 \times 10^5 \times 10^{-3} = 1000$ J

Q.17 During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its temperature. The ratio of $\frac{C_p}{C_v}$ for the gas is -

(1) $\frac{4}{3}$ (2) 2 (3) $\frac{5}{3}$ (4) $\frac{3}{2}$

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : similar Q.25, Ex. 3A, Page. 172 (Thermodynamic)**

In adiabatic process

$P \propto T^{\gamma/\gamma-1}$

and $P \propto T^3$

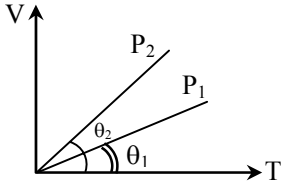
$\frac{\gamma}{\gamma-1} = 3$

$\therefore \gamma = 3\gamma - 3$

$-2\gamma = -3$

$\gamma = 3/2$

Q.18 In the given (V – T) diagram, what is the relation between pressures P_1 and P_2 ?



(1) $P_2 = P_1$ (2) $P_2 > P_1$

(3) $P_2 < P_1$ (4) cannot be predicted

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : similar Q.32, Ex. 2, Page. 133 (K.T.G)**

Ideal gas equation

$PV = nRT$

and $\frac{V}{T} \propto \frac{1}{P}$ by equation

and by graph $\frac{V}{T} = \tan\theta$

$\therefore \frac{1}{P} \propto \tan\theta$

$\theta\uparrow$, $\tan\theta\uparrow$, $P\downarrow$

$\therefore P_1 > P_2$

Q.19 The amount of heat energy required to raise the temperature of 1 g of Helium at NTP, from T_1 K to T_2 K is -

(1) $\frac{3}{8}N_ak_B(T_2 - T_1)$ (2) $\frac{3}{2}N_ak_B(T_2 - T_1)$

(3) $\frac{3}{4}N_ak_B(T_2 - T_1)$ (4) $\frac{3}{4}N_ak_B\left(\frac{T_2}{T_1}\right)$

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at :**

$E = \frac{f}{2}nRT$ OR

$= \frac{f}{2}NkT$

$\because N = n.N_A$

$= \frac{3}{2}.n.N_A.k_B.T$

$= \frac{3}{8}N_A.k_B.T$

$n = \frac{m}{M} = \frac{1}{4}$

where N_A = Avagadro's number

k_B = Boltzmann const.

Q.20 A wave travelling in the +ve x-direction having displacement along y-direction as 1m, wavelength 2πm and frequency of $\frac{1}{\pi}$Hz is represented by -

(1) y = sin (x – 2t) (2) y = sin (2πx – 2πt)

(3) y = sin (10πx – 20πt) (4) y = sin (2πx + 2πt)

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : similar Q.29, Ex. 3A, Page. 54 (Wave)**

$y = a \sin(\omega t - kx)$

OR

$y = a \sin(kx - \omega t)$

$\therefore y = \sin[x - 2t]$ …(1)

$k = \frac{2\pi}{\lambda} = \frac{2\pi}{2\pi}$

$\omega = 2\pi.\nu = 2\pi.\frac{1}{\pi} = 2$

a = 1m

Q.21 It we study the vibration of a pipe open at both ends, then the following statement is not true -

(1) Open end will be antinode

(2) Odd harmonics of the fundamental frequency will be generated

(3) All harmonics of the fundamental frequency will be generated

(4) Pressure change will be maximum at both ends

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : [Topic : Waves]**

When pipe is open at both ends then ratio of frequency

(i) $\nu : 2\nu : 3\nu : 4\nu : 5\nu$

where $\nu = \frac{v}{2L}$

odd and even both harmonics will present

So, option (1), (2) and (3) are correct.

$\therefore$ pressure variation is minimum at antinode

$\therefore$ (4) is wrong option.

Q.22 A source of unknown frequency gives 4 beats/s, when sounded with a source of known frequency 250 Hz. The second harmonic of the source of unknown frequency gives five beats per second, when sounded with a source of frequency 513 Hz. The unknown frequency is -

(1) 254 Hz (2) 246 Hz

(3) 240 Hz (4) 260 Hz

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : similar Q.26, Ex. 2, Page. 50 (Wave)**

$\nu' = 250 \pm 4 = 254$ OR 246

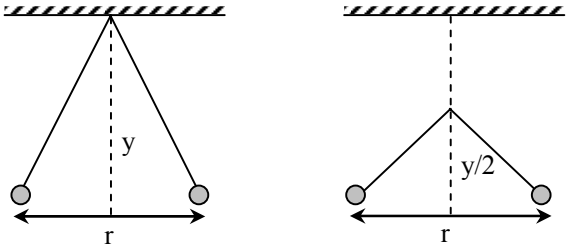
$\nu'' = 2.\ \nu'$ and $\nu'' = 513 \pm 5 = 518$ OR 508

So, $508 = 2.(254)$

OR $\nu'' = 2.(\nu')$

Answer is (254 Hz).

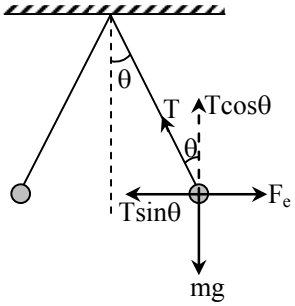
Q.23 Two pith balls carrying equal charges are suspended from a common point by strings of equal length, the equilibrium separation between them is r. Now the strings are rigidly clamped at half the height. The equilibrium separation between the balls now become -



(1) $\left(\frac{1}{\sqrt{2}}\right)^2$ (2) $\left(\frac{r}{\sqrt[3]{2}}\right)$ (3) $\left(\frac{2r}{\sqrt{3}}\right)$ (4) $\left(\frac{2r}{3}\right)$

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Similar to Ex.2, Q.13. (Electrostatics)**



At balance

$T \cos\theta = mg$

$T \sin\theta = F_e = \frac{Kq^2}{r^2}$

$\tan\theta = \frac{Kq^2}{r^2 mg} = \frac{r/2}{y}$

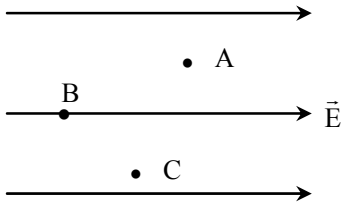
$y = \frac{mgr^3}{2kq^2}$ ....(1)

$y \propto r^3$

$r \propto y^{1/3}$

$r' \propto (y/2)^{1/3} \propto \frac{r}{2^{1/3}}$

Q.24 A, B and C are three points in a uniform electric field. The electric potential is -



(1) maximum at A (2) maximum at B

(3) maximum at C (4) same at all the three points A, B and C

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Q.64, Ex 3B (Electrostatics).**

Electric field is from high potential to low potential.

So, potential is maximum at B.

Q.25 A wire of resistance 4Ω is stretched to twice its original length. The resistance of stretched wire would be -

(1) 2Ω (2) 4Ω (3) 8Ω (4) 16Ω

Ans. **[4]**

Sol. **Students may find similar question in CP Sheet at : Q.7, Ex. 2 (Electrostatics).**

At constant volume

$R \propto \ell^2$

$\Rightarrow R' = 4R = 16\Omega$

Q.26 The internal resistance of a 2.1 V cell which gives a current of 0.2A through a resistance of 10Ω is -

(1) 0.2Ω (2) 0.5Ω (3) 0.8Ω (4) 1.0Ω

Ans. **[2]**

Sol. **Students may find this question in CP Class Notes : [Topic : Current Electricity]**

$$I = \frac{E}{R + r}$$

$$0.2 = \frac{2.1}{10 + r}$$

$2 + 0.2\,r = 2.1$

$0.2\,r = 2.1$

$r = 0.5\Omega$

Q.27 The resistances of the four arms P, Q, R and S in a Wheatstone's bridge are 10 ohm, 30 ohm, 30 ohm and 90 ohm, respectively. The e.m.f. and internal resistance of the cell are 7 volt and 5 ohm respectively. If the galvanometer resistance is 50 ohm, the current drawn from the cell will be -

(1) 1.0 A (2) 0.2 A (3) 0.1 A (4) 2.0 A

Ans. **[2]**

Sol. **Students may find similar question in CP Sheet at : Q.22, Ex.3(A) (Current Electricity).**

$\because \frac{P}{Q} = \frac{P}{S} \Rightarrow$ Balanced bridge

Equivalent resistance of bridge

$= \frac{40 \times 120}{40 + 120} = 30\ \Omega$

$\therefore I_{battery} = \frac{7}{30 + 5} = 0.2\ A$

Q.28 When a proton is released from rest in a room, it starts with an initial acceleration a_0 towards west. When it is projected towards north with a speed v_0 it moves with an initial acceleration $3a_0$ toward west. The electric and magnetic fields in the room are -

(1) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ up

(2) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ down

(3) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ up

(4) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ down

Ans. **[2]**

Sol. **Discussed in CP Class Notes : [Topic : Magnetic Effect of Current]**

$\vec{F}_L = \vec{F}_e + \vec{F}_m = q\vec{E} + q(\vec{v} \times \vec{B})$

$ma_0 = qE + 0$ ....(1)

$E = \frac{ma_0}{q}$ so $\vec{E} = \frac{ma_0}{e}$ in west

$\vec{F}_L = \vec{F}_e + \vec{F}_m$

$3\ ma_0 = qE + q(\vec{v} \times \vec{B}) \Rightarrow q(\vec{v} \times \vec{B}) = 2\ ma_0$ (west)

$\vec{F}_m = q\vec{v} \times \vec{B}$

$-\hat{i} = (+\hat{j}) \times$ .....

$B = \frac{2ma_0}{qv}$ in vertically downward

Q.29 A current loop in a magnetic field -

(1) experiences a torque whether the field is uniform or non-uniform in all orientations

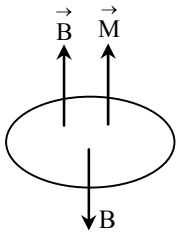
(2) can be in equilibrium in one orientation

(3) can be in equilibrium in two orientations, both the equilibrium states are unstable

(4) can be in equilibrium in two orientations, one stable while the other is unstable

Ans. **[4]**

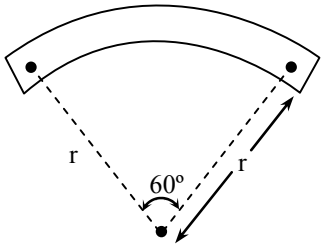
Sol. **Students find this question in CP Class notes : [Topic : Magnetism]**



$\theta = 0^\circ$ stable equilibrium

$\theta = 180^\circ$ unstable equilibrium

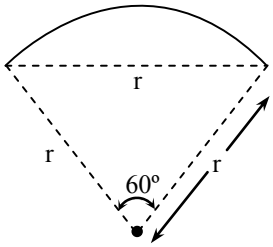
Q.30 A bar magnet of length 'l' and magnetic dipole moment 'M' is bent in the form of an arc as shown in figure. The new magnetic dipole moment will be –



(1) M (2) $\frac{3}{\pi}$M (3) $\frac{2}{\pi}$M (4) $\frac{M}{2}$

Ans. **[2]**

Sol. **Students find this question in CP Sheet : Q.10, Ex. 3(B) (Magnetic field).**



$l = \frac{\pi}{3}r$

$r = \frac{3l}{\pi}$

$M' = m(r) = m\left(\frac{3l}{\pi}\right) = \frac{3M}{\pi}$

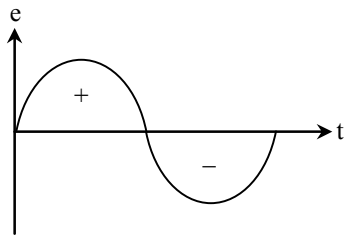
Q.31 A wire loop is rotated in a magnetic field. The frequency of change of direction of the induced e.m.f. is -

(1) once per revolution (2) twice per revolution

(3) four times per revolution (4) six times per revolution

Ans. **[2]**

Sol. **Students find this question in CP Sheet at : Q.15, Ex. 1 (Alternating Current)**



$e = N\omega AB \sin \omega t$

direction of e.m.f. changed two times

Q.32 A coil of self-inductance L is connected in series with a bulb B and an AC source. Brightness of the bulb decreases when -

(1) frequency of the AC source is decreased

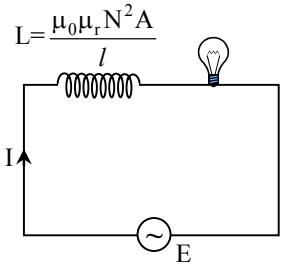
(2) number of turns in the coil is reduced

(3) a capacitance of reactance $X_C = X_L$ is included in the same circuit

(4) an iron rod is inserted in the coil

Ans. **[4]**

Sol. **Students find this question in CP Class notes : [Topic : Alternating Current]**



$$\downarrow I = \frac{E}{\sqrt{\omega^2 L^2 + R^2}} = \frac{E}{\sqrt{\omega^2 L^2 \uparrow + R^2}}$$

$L \propto \mu_r$

L is increased when iron rod inserted

So current decreased

Q.33 The condition under which a microwave oven heats up a food item containing water molecules most efficiently is -

(1) The frequency of the microwaves must match the resonant frequency of water molecules

(2) The frequency of the microwaves has no relation with natural frequency of water molecules

(3) Microwaves are heat waves, so always produce heating

(4) Infra-red waves produce heating in a microwave oven

Ans. **[1]**

Sol. **Students find this question in CP Class notes.**

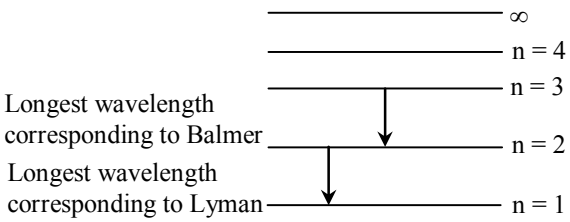
In the presence of microwave water molecules oscillates the frequency of microwave and large heat is developed.

Q.34 Ratio of longest wave lengths corresponding to Lyman and Balmer series in hydrogen spectrum is -

(1) $\frac{5}{27}$ (2) $\frac{3}{23}$ (3) $\frac{7}{29}$ (4) $\frac{9}{31}$

Ans. **[1]**

Sol. **Students find this question in CP Class notes : [Topic : Atomic Structure]**



$$\frac{1}{\lambda_\ell} = R(1)^2\left[\frac{1}{1^2} - \frac{1}{2^2}\right] = \frac{3R}{4}$$

$$\lambda_\ell = \frac{4}{3R} \quad \ldots.(1)$$

$$\frac{1}{\lambda_b} = R(1)^2\left[\frac{1}{2^2} - \frac{1}{3^2}\right] = \frac{5R}{36}$$

$$\lambda_b = \frac{36}{5R} \quad \ldots.(2)$$

$$\frac{\lambda_\ell}{\lambda_b} = \frac{4}{3R} \times \frac{5R}{36} = \frac{5}{3\times 9} = \frac{5}{27}$$

Q.35 The half-life of a radioactive isotope 'X' is 20 years. It decays to another element 'Y' which is stable. The two elements 'X' and 'Y' were found to be in the ratio 1 : 7 in a sample of a given rock. The age of the rock is estimated to be -

(1) 40 years (2) 60 years (3) 80 years (4) 100 years

Ans. **[2]**

Sol. **Students may find similar question in CP Sheet at : Page no. 45, Q.9 (Radioactivity)**

Half-life of X $\Rightarrow T_X = 20$ years

Active Stable

$$\underset{1}{X} \longrightarrow \underset{7}{Y}$$

$$\frac{N}{N_0} = \frac{1}{1+7} = \frac{1}{8} = \frac{1}{2^n} = \frac{1}{2^3}$$

$$n = 3 = \frac{t}{T} = \frac{t}{20}$$

$t = 60$ years

Q.36 A certain mass of Hydrogen is changed to Helium by the process of fusion. The mass defect in fusion reaction is 0.02866 u. The energy liberated per u is – (Given 1 u = 931 MeV)

(1) 2.67 MeV (2) 26.7 MeV (3) 6.675 MeV (4) 13.35 MeV

Ans. **[3]**

Sol. **Students may find similar question in CP Class notes : [Topic : Nuclear Physics]**

$_1H^2 + {}_1H^2 \longrightarrow {}_2He^4$

Mass defect = $\Delta m = 0.02866$ u

Total energy = $E = \Delta mc^2 = 0.02866 \times 931$ MeV

$= 26.68$ MeV

Energy liberated per u = $\frac{E}{A} = \frac{26.68}{4} = 6.678$ MeV

Q.37 For photoelectric emission from certain metal the cutoff frequency is ν. If radiation of frequency 2ν impinges on the metal plate, the maximum possible velocity of the emitted electron will be (m is the electron mass) -

(1) $\sqrt{h\nu/(2m)}$ (2) $\sqrt{h\nu/m}$ (3) $\sqrt{2h\nu/m}$ (4) $2\sqrt{h\nu/m}$

Ans. **[3]**

Sol. **Students may find this question in CP Class notes : [Topic : Photoelectric Effect]**

Cutoff frequency = ν

Work function = $\phi = h\nu$

Use, E = K.E. + ϕ

$2h\nu = \frac{1}{2}mv^2 + h\nu$

$\frac{1}{2}mv^2 = 2h\nu - h\nu = h\nu$

$v = \sqrt{\frac{2h\nu}{m}}$

Q.38 The wavelength λ_e of an electron and λ_p of a photon of same energy E are related by -

(1) $\lambda_p \propto \lambda_e^2$ (2) $\lambda_p \propto \lambda_e$ (3) $\lambda_p \propto \sqrt{\lambda_e}$ (4) $\lambda_p \propto \frac{1}{\sqrt{\lambda_e}}$

Ans. **[1]**

Sol. **Students may find similar question in CP Sheet at : Page no. 103, Q.21 (Matter Waves)**

de-Broglie wavelength for an electron

$$\lambda_e = \frac{h}{\sqrt{2mE}} \quad \text{or } \lambda_e \propto \frac{1}{\sqrt{E}}$$

or $\lambda_e^2 \propto \frac{1}{E}$ ….(1)

Wavelength of photon $\Rightarrow \lambda_p = \frac{hc}{E}$

or $\lambda_p \propto \frac{1}{E}$ ….(2)

From equation (1) and (2)

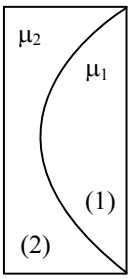
$\lambda_e^2 \propto \lambda_p$

Q.39 A plano convex lens fits exactly into a plano concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of refractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then the focal length of the combination is -

(1) $\frac{R}{2(\mu_1+\mu_2)}$ (2) $\frac{R}{2(\mu_1-\mu_2)}$ (3) $\frac{R}{(\mu_1-\mu_2)}$ (4) $\frac{2R}{(\mu_2-\mu_1)}$

Ans. **[3]**

Sol. **Students find this question in CP Class notes : [Topic : Ray Optics]**



Focal length of first lens $\frac{1}{f_1} = (\mu_1 - 1)\left(\frac{1}{\infty} - \frac{1}{-R}\right) = \frac{\mu_1 - 1}{R}$

Focal length of second lens $\frac{1}{f_2} = (\mu_2 - 1)\left(\frac{1}{-R} - \frac{1}{\infty}\right) = -\frac{(\mu_2 - 1)}{R}$

So focal length of the combination

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} = \frac{\mu_1 - 1}{R} - \frac{(\mu_2 - 1)}{R}$$

$$\frac{1}{f} = \frac{\mu_1 - \mu_2}{R}$$

$$f = \frac{R}{\mu_1 - \mu_2}$$

Q.40 For a normal eye, the cornea of eye provides a converging power of 40D and the least converging power of the eye lens behind the cornea is 20D. Using this information, the distance between the retina and the cornea-eye lens can be estimated to be -

(1) 5 cm (2) 2.5 cm (3) 1.67 cm (4) 1.5 cm

Ans. **[3]**

Sol. **Students find this question in NCERT and in CP Class notes : [Topic : Ray Optics]**

(lens + cornea) should form image of distance object at retina

Converging power (40 + 20) D = 60 D

Using lens equation

$$\frac{1}{v} - \frac{1}{\infty} = \frac{60}{100}$$

$$v = \frac{5}{3}\text{ cm} = 1.67\text{ cm}$$

So distance between retina and cornea should be 1.67 cm.

Q.41 In Young's double slit experiment, the slits are 2mm apart and are illuminated by photons of two wavelengths λ_1 = 12000 Å and λ_2 = 10000 Å. At what minimum distance from the common central bright fringe on the screen 2m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other ?

(1) 8 mm (2) 6 mm (3) 4 mm (4) 3 mm

Ans. **[2]**

Sol. **Students find this question in CP Class notes : [Topic : Wave Optics]**

d = 2 mm ; D = 2 m

Fringe width for first wave length 12000 Å

$$\beta_1 = \frac{\lambda_1 D}{d} = \frac{12000\times10^{-10}\times2}{2\times10^{-3}} = 1.2\times10^{-3}\text{ m} = 1.2\text{ mm}$$

For second wave length

$$\beta_2 = \frac{\lambda_2 D}{d} = \frac{10000\times10^{-10}\times2}{2\times10^{-3}} = 1\text{ mm}$$

At 6 mm distance from center bright fringe 5^{th} fringe of first coincides with 6^{th} of second.

Q.42 A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statements is correct ?

(1) Diffraction pattern is not observed on the screen in the case of electrons

(2) The angular width of the central maximum of the diffraction pattern will increase

(3) The angular width of the central maximum will decrease

(4) The angular width of the central maximum will be unaffected

Ans. **[3]**

Sol. **Students may find this question in CP Class notes : [Topic : Wave Optics]**

As speed of an electron increases.

Its de-Broglie wavelength decreases

$$\left\{\lambda = \frac{h}{mv}\right\}$$

and angular width for central maxima is $\omega = \frac{2\lambda}{d}$

$$\omega \propto \lambda \propto \frac{1}{v}$$

Q.43 In a n-type semiconductor, which of the following statements is true -

(1) Electrons are majority carriers and trivalent atoms are dopants

(2) Electrons are minority carriers and pentavalent atoms are dopants

(3) Holes are minority carriers and pentavalent atoms are dopants

(4) Holes are majority carriers and trivalent atoms are dopants

Ans. **[3]**

Sol. **Students may find similar question in CP Sheet at : Page no. 198, Q.53, Ex. 3(A) (Electronics)**

In n-type – Minority are hole and dopant are pentavalent.

Q.44 In a common emitter (CE) amplifier having a voltage gain G, the transistor used has transconductance 0.03 mho and current gain 25. If the above transistor is replaced with another one with transconductance 0.02 mho and current gain 20, the voltage gain will be -

(1) $\frac{2}{3}$ G (2) 1.5G (3) $\frac{1}{3}$ G (4) $\frac{5}{4}$ G

Ans. **[1]**

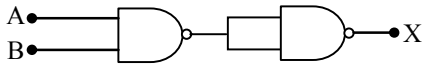
Sol. **Students may find this question in CP Class notes : [Topic : Electronics]**

$$\text{Voltage gain} = \frac{V_o}{V_i} = \frac{I_o R_o}{V_i} = g_m R_0$$

$A \propto g_m$

$$\frac{G}{G'} = \frac{g_{m_1}}{g_{m_2}} \Rightarrow G' = \frac{2}{3}G$$

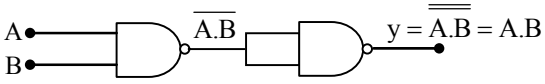
Q.45 The output (X) of the logic circuit shown in figure will be -



(1) $X = \overline{A} . \overline{B}$ (2) $X = \overline{A.B}$ (3) X = A.B (4) $X = \overline{A + B}$

Ans. **[3]**

Sol. **Students may find similar question in CP Sheet at : Page no. 195, Q.16 (Electronics)**



NAND + NOT = AND

Q.46 The value of Planck's constant is 6.63×10^{-34} Js. The speed of light is 3×10^{17} nm s^{-1}. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of 6×10^{15} s^{-1} ?

(1) 10 (2) 25 (3) 50 (4) 75

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Atomic structure- same as to Page 33, Ex.-3(A) Q.27.**

$h = 6.63 \times 10^{-34}$ Js.

$C = 3 \times 10^{17}$ nm/sec.

$\lambda = 6 \times 10^{`15}$ sec^{-1}

$$\lambda = \frac{C}{\nu} = \frac{3\times10^{17}}{6\times10^{15}} = 50 \text{ nm}$$

Q.47 What is the maximum numbers of electrons that can be associated with the following set of quantum numbers ?

$n = 3$, $\ell = 1$ and $m = -1$.

(1) 10 (2) 6 (3) 4 (4) 2

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : Atomic structure- similar to Page 22, Ex.-1 Q.42.**

$n = 3 \quad \ell = 1 \quad m = -1$

$3p_x$ or $3p_y$ no of $e^{-1} = 2$

Q.48 What is the activation energy for a reaction if its rate doubles when the temperature is raised from 20ºC to 35ºC ? ($R = 8.314$ J mol^{-1} K^{-1})

(1) 342 kJ mol^{-1} (2) 269 kJ mol^{-1} (3) 34.7 kJ mol^{-1} (4) 15.1 kJ mol^{-1}

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Chemical kinetics- similar to Page 186, Ex.-1 Q.93.**

$$\log \frac{k_2}{k_1} = \frac{Ea}{2.303 \times R}\left(\frac{1}{293} - \frac{1}{308}\right)$$

$$\log 2 = \frac{Ea}{2.303R}\left(\frac{308 - 293}{293 \times 308}\right)$$

$E_a = 34673$ J $= 34.67$ kJ

Q.49 A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl of pH = 10 and by passing hydrogen gas around the platinum wire at one atm pressure. The oxidation potential of electrode would be ?

(1) 0.059 V (2) 0.59 V (3) 0.118 V (4) 1.18 V

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Electrochemistry- similar to Page 26, Ex.-2 Q.19.**

$H_2 \longrightarrow 2H^+ + 2e^-$

$$E_{oxi} = E^o_{oxi} - \frac{0.059}{2} \log \frac{[H^+]^2}{P_{H_2}}$$

$$= 0 - \frac{0.059}{2} \log \frac{[10^{-10}]^2}{1}$$

$$= -\frac{0.059}{2} \times (-20)$$

$= 0.59$ V

Q.50 A reaction having equal energies of activation for forward and reverse reactions has -

(1) $\Delta S = 0$ (2) $\Delta G = 0$ (3) $\Delta H = 0$ (4) $\Delta H = \Delta G = \Delta S = 0$

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Chemical kinetics- similar to Page 184, Ex.-1 Q.77.**

$\Delta H = (E_a)_f - (E_a)_b$

Given $(E_a)_f = (E_a)_b$

so $\Delta H = 0$

Q.51 At 25ºC molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is 9.54 ohm^{-1} cm^2 mol^{-1} and at infinite dilution its molar conductance is 238 ohm^{-1} cm^2 mol^{-1}. The degree of ionisation of ammonium hydroxide at the same concentration and temperature is -

(1) 2.080 % (2) 20.800 % (3) 4.008 % (4) 40.800 %

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Electrochemistry- similar to Page 15, Ex.-1 Q.24.**

$$\alpha = \frac{\pi_m}{\pi_m^\infty} = \frac{9.54}{238} = 0.04008$$

or 4.008 %

Q.52 Based on equation $E = -2.178 \times 10^{-18}\ J \left(\frac{Z^2}{n^2}\right)$, certain conclusions are written. Which of them is not correct ?

(1) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus.

(2) Larger the value of n, the larger is the orbit radius.

(3) Equation can be used to calculate the change in energy when the electron changes orbit.

(4) For n = 1, the electron has a more negative energy that it does for n = 6 which means that the electron is more loosely bound in the smallest allowed orbit.

Ans. **[4]**

Sol. **Same discussed in CP Class Theory Notes.**

As we move nearer to the nucleus e^- are more strongly bonded.

Q.53 A button cell used in watches functions as following

$Zn(s) + Ag_2O(s) + H_2O(\ell) \rightleftharpoons 2Ag(s) + Zn^{2+}(aq) + 2OH^-(aq)$

If half cell potentials are

$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$; $E^o = -0.76$ V

$Ag_2O(s) + H_2O(l) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq)$, $E^o = 0.34$ V

The cell potential will be -

(1) 1.10 V (2) 0.42 V (3) 0.84 V (4) 1.34 V

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : Electrochemistry, Page 20, Ex.-1 Q.87.**

Cell rep $Zn/Zn^{+2} \,||\, Ag^+ \,|\, Ag$

$E^o_{Cell} = 0.76 + (0.34) = 1.1$ V

Q.54 How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO_3 ? The concentrated acid is 70 % HNO_3.

(1) 45.0 g conc. HNO_3 (2) 90.0 g conc. HNO_3 (3) 70.0 conc. HNO_3 (4) 54.0 g conc. HNO_3

Ans. **[1]**

Sol. **Similar Question discussed in CP Class Theory Notes.**

$$\frac{w}{E} = NV$$

$$\frac{w}{63} = 2 \times \frac{250}{1000}$$

$$w = \frac{63}{2} = 31.5 \text{ g}$$

but 70 % solution

70 g is used the wt. of solution is 100 g

31.5 g is used the wt. of solution is ?

$$\frac{100}{70} \times 31.5 = 45 \text{ g}$$

Q.55 The number of carbon atoms per unit cell of diamond unit cell is -

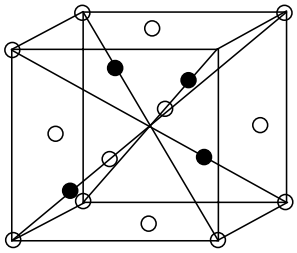
(1) 4 (2) 8 (3) 6 (4) 1

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Solid state- similar to Page 123, Ex.-3(A) Q.26.**

Effective atoms

$$= \frac{1}{8} \times 8 + \frac{1}{2} \times 6 + 4 = 8$$



Q.56 Maximum deviation from ideal gas is expected from :

(1) $H_2(g)$ (2) $N_2(g)$ (3) $CH_4(g)$ (4) $NH_3(g)$

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : Gaseous state- similar to Page 115, Ex.-2 Q.25.**

NH_3 is polar molecule

$\therefore$ intermolecular force of attraction are very high

$\therefore$ a is maximum and deviation is maximum.

Q.57 A metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72 g cm^{-3}. The molar mass of the metal is :

[N_A Avogadro's constant = 6.02×10^{23} mol^{-1}]

(1) 40 g mol^{-1} (2) 30 g mol^{-1} (3) 27 g mol^{-1} (4) 20 g mol^{-1}

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Solid state- similar to Page 116, Ex.-1 Q.24.**

$\rho = \frac{Z \times M_w}{N_A \times V}$ $V = a^3$

$2.72 = \frac{4 \times M_w}{6.02 \times 10^{23} \times 6.6 \times 10^{-23}}$ $V = (404 \times 10^{-10})^3$

$M_w = \frac{2.72 \times 6.023 \times 6.6}{4}$ $= 6.6 \times 10^{-23}$

$= 27$ g/mol.

Q.58 Dipole - induced dipole interactions are present in which of the following pairs :

(1) H_2O and alcohol (2) Cl_2 and CCl_4 (3) HCl and He atoms (4) SiF_4 and He atoms

Ans. **[3]**

Sol. **Students may find similar question in CP Sheet at : Chemical bonding-Page 238-Q.95).**

Dipole - induced dipole interaction present in HCl & He atom. Because HCl molecule is polar and induces dipole in He atom.

Q.59 A magnetic moment of 1.73 BM will be shown by one among the following -

(1) $[Cu(NH_3)_4]^{2+}$ (2) $[Ni(CN)_4]^{2-}$ (3) $TiCl_4$ (4) $[CoCl_6]^{4-}$

Ans. **[1]**

Sol. **Students may find similar question in CP Sheet at : Coordination Compound-Page 77-Q.129).**

$[Cu(NH_3)_4]^{2+}$

$Cu^{+2} = [Ar]\ 3d^9$ $n = 1$

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

$\mu = \sqrt{1(1+2)}$

$\mu = \sqrt{3}$

$\mu = 1.73$ B.M.

Q.60 Roasting of sulphides gives the gas X as a byproduct. This is colorless gas with choking smell of burnt sulphur and causes great damage to respiratory organs as a result of acid rain. Its aqueous solution is acidic, acts as a reducing agent and its acid has never been isolated. The gas X is -

(1) H_2S (2) SO_2 (3) CO_2 (4) SO_3

Ans. **[2]**

Sol. **Students may find this question in CP Class Notes.**

Roasting process carried out in reverberatory furnace. It is used for sulphide ore's to convert in metal oxide.

$MS + O_2 + \xrightarrow{\Delta} MO + SO_2$

Colourless gas

Q.61 Which is the strongest acid in the following ?
(1) H_2SO_4 (2) $HClO_3$ (3) $HClO_4$ (4) H_2SO_3

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Acid-Base- similar to Page 157, Ex.-1(B) Q.120.**
According to relative acid base strength, $HClO_4$ has maximum acidic strength.

Q.62 Which of the following is paramagnetic ?
(1) CO (2) O_2^- (3) CN^- (4) NO^+

Ans. **[2]**

Sol. **Students may find similar question in CP Sheet at : Chemical Bonding -Page 239-Q.113).**
$O_2^- \Rightarrow \sigma 1s^2\ \sigma^*\ 1s^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2p_z^2\ (\pi 2p_x^2 = \pi 2p_y^2)$
$(\pi^* 2p_x^2 = \pi^* 2p_y^1)$
One unpaired electron present in π^* abmo.

Q.63 Which of the following structure is similar to graphite ?
(1) BN (2) B (3) B_4C (4) B_2H_6

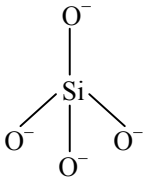
Ans. **[1]**

Sol. **Similar question discussed in CP Class Notes.**
BN(Inorganic graphite) and graphite have hexagonal structure (sp^2)

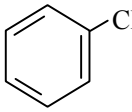
Q.64 The basic structural unit of silicates is -
(1) SiO^- (2) SiO_4^{4-} (3) SiO_3^{2-} (4) SiO_4^{2-}

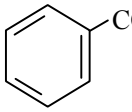
Ans. **[2]**

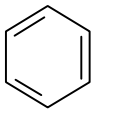
Sol. **Student can find similar question in CP class Theory Notes.**
Basic unit of silicate is tetrahedral SiO_4^{-4}

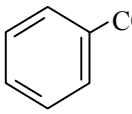


Q.65 Reaction by which Benzaldehyde cannot be prepared-

(1)  + CrO_2Cl_2 in CS_2 followed by H_3O^+

(2)  + H_2 in presence of $Pd\text{-}BaSO_4$

(3)  + CO + HCl in presence of anhydrous $AlCl_3$

(4)  + Zn/Hg and conc. HCl

Ans. **[4]**

Sol. **Students may find this question in CP Class Theory Notes.**

Zn-Hg/conc.HCl is Clemmenson reduction. It can be used for $-\overset{\overset{O}{\|}}{C}-$ only.

Q.66 Which of the following does not give oxygen on heating ?

(1) $KClO_3$ (2) $Zn(ClO_3)_2$ (3) $K_2Cr_2O_7$ (4) $(NH_4)_2Cr_2O_7$

Ans. **[4]**

Sol. **Similar Questions from CP Class Theory Notes.**

$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_3 + 2H_2O$

$2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$

$Zn(ClO_3)_2 \xrightarrow{\Delta} ZnCl_2 + 3O_2$

$K_2Cr_2O_7 \xrightarrow{\Delta} 2\,K_2CrO_4 + Cr_2O_3 + \frac{3}{2}O_2$

Q.67 Which of the following lanthanoid ions is diamagnetic ? (At. No. Ce = 58, Sm = 62, Eu = 63, Yb = 70)

(1) Ce^{2+} (2) Sm^{2+} (3) Eu^{2+} (4) Yb^{2+}

Ans. **[4]**

Sol. **Similar Questions from CP Class Theory Notes.**

$_{70}Yb = [Xe]\ \ 4f^{14}5d^0\ 6s^2$

$Yb^{+2} = [Xe]\ \ 4f^{14}$

$n = 0\ \ \therefore$ Diamagnetic

Q.68 Identify the correct order of solubility in aqueous medium-

(1) $CuS > ZnS > Na_2S$ (2) $ZnS > Na_2S > CuS$ (3) $Na_2S > CuS > ZnS$ (4) $Na_2S > ZnS > CuS$

Ans. **[4]**

Sol. **Similar concept discussed in CP Class Theory Notes.**

IA group elements sulphide are highly soluble, Zn^{+2} is IV group radical and Cu^{+2} is II group radical

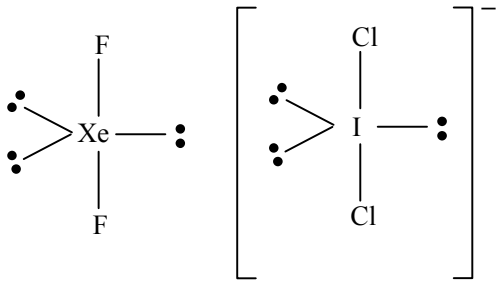
$\therefore\ Na_2S > ZnS > CuS$

Q.69 XeF_2 is isostructural with-

(1) TeF_2 (2) ICl_2^- (3) $SbCl_3$ (4) $BaCl_2$

Ans. **[2]**

Sol. **Students may find this question in CP Sheet : Topic-Chemical bonding at Page no.230, Q.No.48**



sp^3d linear

Q.70 An excess of $AgNO_3$ is added to 100 mL of a 0.01 M solution of dichlorotetraaquachrominum (III) chloride. The number of moles of AgCl precipitated would be-

(1) 0.001 (2) 0.002 (3) 0.003 (4) 0.01

Ans. **[1]**

Sol. **Similar Question in CP Class Theory Notes.**

$AgNO_3 + [Cr(H_2O)_4Cl_2]Cl \rightarrow AgCl$

Excess mole $= MV_{(lit)}$

$$= 0.01 \times \frac{100}{1000}$$

$$= 0.001$$

Q.71 Which of these is least likely to act as a Lewis base ?

(1) CO (2) F^- (3) BF_3 (4) PF_3

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : Topic-Acid-Base at Page no.158, Ex.1(B) Q.No.122**

BF_3 is electron deficient so act as Lewis acid.

Q.72 $KMnO_4$ can be prepared from K_2MnO_4 as per the reaction : $3MnO_4^{2-} + 2H_2O \rightleftharpoons 2MnO_4^- + MnO_2 + 4OH^-$. The reaction can go to completion by removing OH^- ions by adding-

(1) HCl (2) KOH (3) CO_2 (4) SO_2

Ans. **[3]**

Sol. **Students may find this question in CP Class Notes.**

MnO_4^- oxidizes HCl and SO_2 to Cl_2 and SO_3 respectively.

MnO_4^- does not oxidizes H_2CO_3 (maximum oxidation state of C)

Q.73 Which of the following is electron-deficient ?

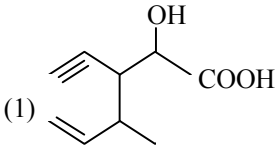
(1) $(CH_3)_2$ (2) $(SiH_3)_2$ (3) $(BH_3)_2$ (4) PH_3

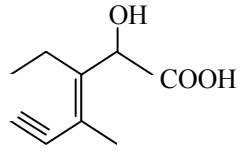
Ans. **[3]**

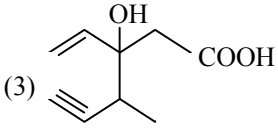
Sol. **Students may find this question in CP Sheet : Topic-Chemical bonding at Page no.229, Q.No.37**

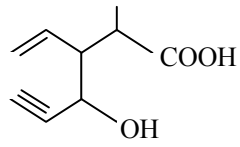
$CH_3 - CH_3$, $SiH_3 - SiH_3$ and PH_3 contain eight electron in valence shell. In B_2H_6 molecule sufficient electron are not available for bonding and it contain tricentric bond. So B_2H_6 molecule is electron deficient.

Q.74 Structure of the compound whose IUPAC name is 3-Ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid is-

(1) 

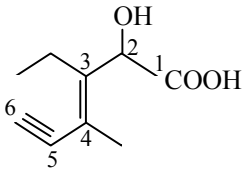
(2) 

(3) 

(4) 

Ans. **[2]**

Sol. **Students may find similar question in CP Class Theory Notes at GOC-I**



3-Ethyl-2-hydroxy-4-methyl hex-3-en-5-ynoic acid

Q.75 Which of these is not a monomer for a high molecular mass silicone polymer ?

(1) $MeSiCl_3$ (2) Me_2SiCl_2 (3) Me_3SiCl (4) $PhSiCl_3$

Ans. **[3]**

Sol. **Similar question from CP Class Theory Notes.**

Linear chain silicone form by hydrolysis of Me_2SiCl_2 followed by condensation.

Cross link silicone form by hydrolysis of $MeSiCl_3$.

Me_3SiCl is used to stop chain length

$$Me_3SiCl \xrightarrow{HOH} Me_3SiOH$$

$$Me_3SiOH + HOSiMe_3 \rightarrow Me_3Si - O - OSiMe_3$$

Q.76 Which of the following statements about the interstitial compounds is incorrect ?

(1) They retain metallic conductivity

(2) They are chemically reactive

(3) They are much harder than the pure metal

(4) They have higher melting points than the pure metal

Ans. **[2]**

Sol. **Similar question from CP Class Theory Notes.**

Interstitial compound are chemically inert.

Q.77 Which one of the following molecules contains no π bond ?

(1) CO_2 (2) H_2O (3) SO_2 (4) NO_2

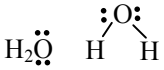
Ans. **[2]**

Sol. **Similar question from CP Class Theory Notes.**

CO_2 O = C = O

SO_2 O = S = O

NO_2 



H_2O molecule does not contain π bond.

Q.78 Antiseptics and disinfectants either kill or prevent growth of microrganisms. Identify which of the following statements is not true-
(1) A 0.2 % solution of phenol is an antiseptic while 1 % solution acts as a disinfectant
(2) Chlorine and Iodine are used as strong disinfectants
(3) Dilute solutions of boric acid and hydrogen peroxide are strong antiseptics
(4) Disinfectants harm the living tissues

Ans. **[2]**

Sol. **Students may find theory of this question in CP Sheet at Page No.201 of Topic-Chemistry in everyday life.**
Chlorine is disinfectants but Iodine is antiseptics.

Q.79 Among the following ethers, which one will produce methyl alcohol on treatment with hot concentrated HI ?
(1) $CH_3 - CH_2 - CH_2 - CH_2 - O - CH_3$
(2) $CH_3 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - O - CH_3$
(3) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - O - CH_3$
(4) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - O - CH_3$

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Topic Ether (page no.56)**

$$CH_3 - \overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}} - O - CH_3 \xrightarrow[SN^1]{HI} CH_3 - \overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}} - I + CH_3 - OH$$

Q.80 Nylon is an example of-
(1) Polyester (2) Polysaccharide (3) Polyamide (4) Polythene

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Topic-Polymers (page no.194)**
Nylon is polyamide.

Q.81 The structure of isobutyl group in an organic compound is-
(1) $\begin{matrix} CH_3 \\ CH_3 \end{matrix}\!\!>\!CH - CH_2 -$
(2) $CH_3 - \underset{\displaystyle |}{CH} - CH_2 - CH_3$
(3) $CH_3 - CH_2 - CH_2 - CH_2 -$
(4) $CH_3 - \overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}} -$

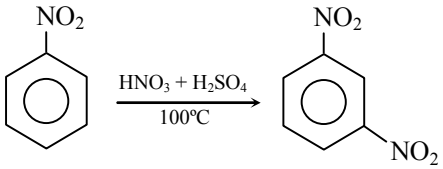
Ans. **[1]**

Sol. **Students may find this question in CP Class Theory Notes at GOC-I**
$CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 -$ is isobutyl group.

Q.82 Nitrobenzene on reaction with conc. HNO_3/H_2SO_4 at 80 – 100ºC forms which one of the following products?
(1) 1,2-Dinitrobenzene (2) 1,3-Dinitrobenzene
(3) 1,4-Dinitrobenzene (4) 1,2,4-Trinitrobenzene

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Topic-Nitrogen compounds (Page no.121)**



$\because$ $-NO_2$ group is meta directing group.

Q.83 Some meta - directing substitution in aromatic substitution are given. Which one is most deactivating ?
(1) $-C\equiv N$ (2) $-SO_3H$ (3) $-COOH$ (4) $-NO_2$

Ans. **[4]**

Sol. **Students may find this question in CP Class Theory Notes at GOC-II**
$-NO_2$ is strong deactivating group.

Q.84 6.02×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of solution is-
(1) 0.02 M (2) 0.01 M (3) 0.001 M (4) 0.1 M

Ans. **[2]**

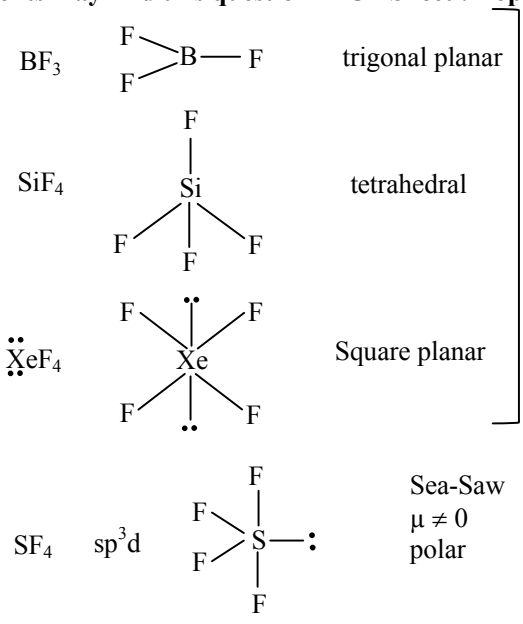
Sol. **Similar Question in CP Class Theory Notes.**

$$M = \frac{\text{mole}}{V_{(ml)}} \times 1000 = \frac{0.001}{100} \times 1000 = 0.01 \text{ M}$$

Q.85 Which of the following is a polar molecule ?
(1) BF_3 (2) SF_4 (3) SiF_4 (4) XeF_4

Ans. **[2]**

Sol. **Students may find this question in CP Sheet : Topic-Chemical bonding at Page no.229, Q.No.35**



Q.86 Which is the monomer of Neoprene in the following ?

(1) $CH_2 = CH - CH = CH_2$

(2) $CH_2 = \underset{\displaystyle CH_3}{\overset{|}{C}} - CH = CH_2$

(3) $CH_2 = \underset{\displaystyle Cl}{\overset{|}{C}} - CH = CH_2$

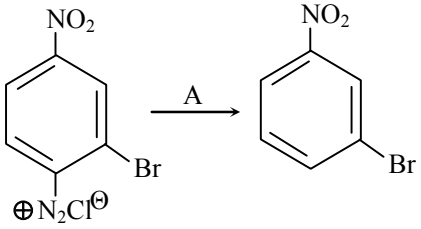
(4) $CH_2 = CH - C \equiv CH$

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Topic-Polymer (Page no.192)**

$$n\left[CH_2 = \underset{\displaystyle Cl}{\overset{|}{C}} - CH = CH_2\right] \xrightarrow{\text{Polymerisation}} \left[CH_2 - \underset{\displaystyle Cl}{\overset{|}{C}} = CH - CH_2\right]_n$$

chloroprene (monomer) → Neoprene (polymer)

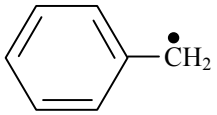
Q.87 In the reaction  ; A is-

(1) $HgSO_4/H_2SO_4$ (2) Cu_2Cl_2 (3) H_3PO_2 and H_2O (4) H^+/H_2O

Ans. **[3]**

Sol. **Students may find similar question in CP Sheet at : Topic-Nitrogen compounds (Page no. 139)**

H_3PO_2 and H_2O works as a reducing agent.

Q.88 The radical,  is aromatic because it has-

(1) 6 p-orbitals and 6 unpaired electrons

(2) 7 p-orbitals and 6 unpaired electrons

(3) 7 p-orbitals and 7 unpaired electrons

(4) 6 p-orbitals and 6 unpaired electrons

Ans. **[1]**

Sol. **Students may find similar question in CP Sheet at : Topic-GOC-II (Exercise-II)**

Only benzene is considered in aromatic.

$\therefore$ 6p-orbitals (π-electrons) and 6 unpaired electrons are present.

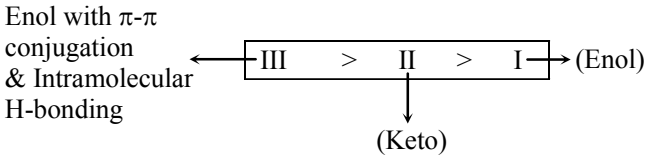
Q.89 The order of stability of the following tautomeric compounds is-

$$\underset{\text{(I)}}{CH_2 = \overset{OH}{\overset{|}{C}} - CH_2 - \overset{O}{\overset{||}{C}} - CH_3} \rightleftharpoons \underset{\text{(II)}}{CH_3 - \overset{O}{\overset{||}{C}} - CH_2 - \overset{O}{\overset{||}{C}} - CH_3} \rightleftharpoons \underset{\text{(III)}}{CH_3 - \overset{OH}{\overset{|}{C}} = CH - \overset{O}{\overset{||}{C}} - CH_3}$$

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

Ans. **[2]**

Sol. **Students may find similar question in CP Sheet at : GOC-I (Page no. 51)**



Q.90 Which of the following compounds will not undergo Friedal-Craft reaction easily-

(1) Cumene (2) Xylene (3) Nitrobenzene (4) Toluene

Ans. **[3]**

Sol. **Students may find this question in CP Class Theory Notes at GOC-II.**

$-NO_2$ group is strong deactivating.

$\therefore$ It inhibits F.C.R.

Q.91 Select the **wrong** statement :

(1) Isogametes are similar in structure, function and behavior

(2) Anisogametes differ either in structure, function of behaviour

(3) In Oomycetes female gamete is smaller and motile, while male gamete is larger and non-motile

(4) *Chlamydomonas* exhibits both isogamy and anisogamy and *Fucus* shows oogamy

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Plant diversity page no. 80**

In oomycetes sexual reproduction occur by Isogamy or Oogamy. In isogamy both the fusing gametes are similar in structure, while in oogamy in oomycetes male gamete and female gamete both are nonmotile and female gamete is large while male gamete is small.

Q.92 Which one of the following is not a correct statement ?

(1) Herbarium houses dried, pressed and preserved plant specimens

(2) Botanical gardens have collection of living plants for reference

(3) A museum has collection of photographs of plants and animals

(4) Key is a taxonomic aid for identification of specimens

Ans. **[3]**

Sol. **Students may find this question in NCERT page no. 12 (XIth Class)**

Museum is the collection of dead and preserved specimen of animals generally.

Q.93 Isogamous condition with non-flagellated gametes is found in:

(1) *Chlamydomonas* (2) *Spirogyra* (3) *Volvox* (4) *Fucus*

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Lower Plant page no. 19**

In spirogyra isogamy occur by nonomotile gametes.

Q.94 Besides paddy fields, cyanobacteria are also found inside vegetative part of :
(1) *Pinus* (2) *Cycus* (3) *Equisetum* (4) *Psilotum*

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Plant Diversity page no. 47**
Coralloid root of cycas plant possess cyanobacteria

Q.95 Megasporangium is equivalent to :
(1) Embryo sac (2) Fruit (3) Nucellus (4) Ovule

Ans. **[4]**

Sol. **Students may find this question in CP Sheet : Reproduction in flowering plants page no. 15**
Ovule is megasporangium and have sporogenous cells which produce megaspore by meiosis

Q.96 Read the following statements (A– E) and answer the question which follows them :
(A) In liverworts, mosses and ferns gametophytes are free-living
(B) Gymnosperms and some ferns are heterosporous
(C) Sexual reproduction in *Fucus*, *Volvox* and *Albugo* is oogameous
(D) The sporophytes in liverworts is more elaborate than that in mosses
(E) Both, *Pinus* and *Marchentia* are dioecious
How many of the above statements are correct ?
(1) One (2) Two (3) Three (4) Four

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Plant Diversity**
Statement A, B and C are correct

Q.97 Among bitter gourd, mustard, brinjal, pumpkin, china rose, lupin, cucumber, sunnhemp, gram, guava, bean, chilli, plum, petunia, tomato, rose, withania, potato, onion, aloe and tulip how many plants have hypogynous flower ?
(1) Six (2) Ten (3) Fifteen (4) Eighteen

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Structural organization in plant at page no. 134, 137, 140, 143.**
Mustard, brinzal, chinarose, chili, petunia, tomato, withania, Potato, onion, aloe, tulip, lupin, sunnhemp, gram and bean. Fifteen plant have hypogynous flower.

Q.98 Interfascicular cambium develops from the cells of :
(1) Medullary rays (2) Xylem parenchyma (3) Endodermis (4) Pericycle

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : Structural organization in plant at page no. 36**
Interfascicular cambium is developed from the cells of medullary ray

Q.99 In china rose the flowers are :
(1) Actinomorphic, hypogynous with twisted aestivation
(2) Actinomorphic, epigynous with valvate aestivation
(3) Zygomorphic, hypogynous with imbricate aestivation
(4) Zygomorphic, epigynous with twisted aestivation

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : Structural organization in plant at page no. 137**
Malvaceae family

Q.100 Lenticels are involved in
(1) Transpiration (2) Gaseous exchange (3) Food transport (4) Photosynthesis

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Structural organization in plant at page no. 40.**
Lenticels are involved in gaseous exchange of tree trunk and environment

Q.101 Age of a tree can be estimated by :
(1) Its height and girth
(2) Biomass
(3) Number of annual rings
(4) Diameter of its heartwood

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Structural organization in plant at page no. 39**
Generally one annual ring is formed in one year due to secondary growth. Thus by counting annual ring, age of tree can be determined

***Q.102** Seed coat is not thin membranous in :
(1) Maize (2) Coconut (3) Groundnut (4) Gram

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : Structural organization in plant at page no. 14**
Seed coat of legume (gram) is hard and thick due to presence of sclereids

Q.103 Transition state structure of the substate formed during an enzymatic reaction is
(1) Transient but stable
(2) Permanent but unstable
(3) Transient and unstable
(4) Permanent and stable

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Plant physiology Eng. page no. 117**
Transition state is intermediate state produced during enzymatic biochemical reaction which is transition state and unstable state

Q.104 A phosphoglyceride is always made up of :

(1) Only a saturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached

(2) Only an unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached

(3) A saturated or unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached

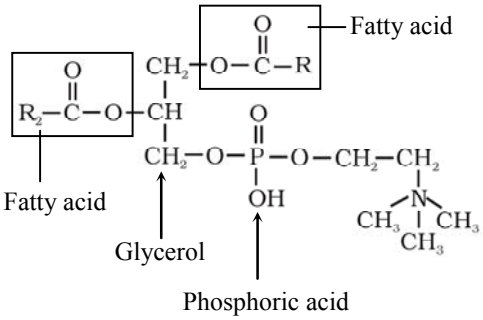
(4) A saturated or unsaturated fatty acid esterified to a phosphate group which is also attached to a glycerol molecule

Ans. **[3]**

Sol. **Students may find this question in NCERT page 144**

Fatty acid can be saturated or unsaturated. Here fatty acid are found esterified with glycerol which is attached with phosphate group

Ex. Lecithin



Q.105 Pigment-containing membranous extensions in some cyanobacteria are

(1) Heterocysts (2) Basal bodies (3) Pneumatophores (4) Chromatophores

Ans. **[4]**

Sol. **Students may find this question in NCERT page no 129 XI class**

Photosynthetic pigment are present in membranous extension chromatophore in cyanobacteria

Q.106 A major site for synthesis of lipids is :

(1) RER (2) SER (3) Symplast (4) Nucleoplasm

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Cell biology page no. 36**

The site for lipid synthesis is SER

Q.107 The complex formed by a pair of synapsed homologous chromosomes is called :

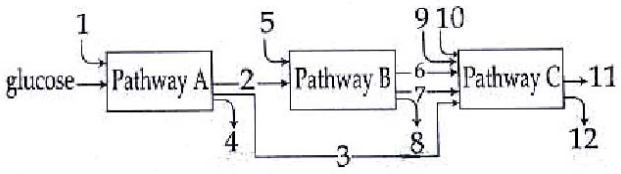
(1) Equatorial plate (2) Kinetochore (3) Bivalent (4) Axoneme

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Cell biology page no. 54**

Homologous chromosome are paired and synapsed during zygotene stage of meiosis-I and known as bivalent

Q.108 The three boxes in this diagram represent the three major biosynthetic pathways in aerobic respiration. Arrows represent net reactants or products



Arrows numbered 4, 8, and 12 can all be

(1) NADH (2) ATP (3) H_2O (4) FAD^+ or $FADH_2$

Ans. **[2]**

Sol. Pathway-A is glycolysis

Pathway-B is Krebs cycle

Pathway-C is Electron transport system

1, 5 are respiratory substrates like protein and fats

6,7,3,9,10 are $NADH_2$, $FADH_2$

*** 4, 8, 12 are ATP produced**

Q.109 The most abundant intracellular cation is :

(1) Na^+ (2) Ca^{++} (3) H^+ (4) K^+

Ans. **[4]**

Sol. **Students may find this question in CP Sheet : Animal physiology-II page no. 202**

K^+ is most abundant ion of intracellular fluid while Na+ is extra cellular fluid.

Q.110 During seed germination its stored food is mobilized by :

(1) Ethylene (2) Cytokinin (3) ABA (4) Gibberellin

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : Plant physiology English page no 147**

Gibberellin have characteristic function breaking of seed dormancy by activating stored food hydrolyzing enzymes amylase, lipase, protease.

Q.111 Which of the following criteria does not pertain to facilitated transport ?

(1) Requirement of special membrane proteins

(2) High selectivity

(3) Transport saturation

(4) Uphill transport

Ans. **[4]**

Sol. **Students may find this question in CP class notes plant physiology (mineral nutrition)**

NCERT Bio 11th English page no. 178 table 11.1

Facilitated transport means transport with help of carrier proteins which may be both uphill i.e. against the concentration gradient and down hill i.e. in order of concentration gradient which is also called as facilitated diffusion or passive facilitated transport

Q.112 The first stable product of fixation of atmospheric nitrogen in leguminous plants is :
(1) NO_2^- (2) Ammonia (3) NO_3^- (4) Glutamate

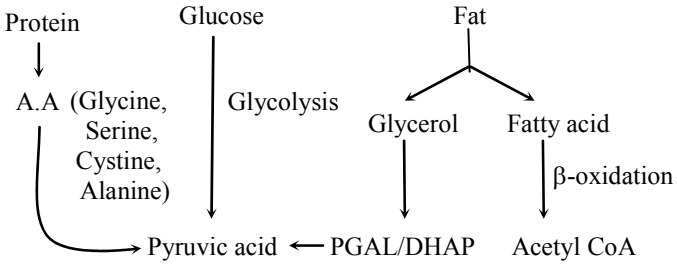
Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Plant physiology English page no. 224**
NCERT 11th class English page no 202
Product of fixation of N_2 in leguminous plants by it's symbiotic associate Rhizobium bacteria, in root nodules is NH_3 (ammonia)

***Q.113** Which of the metabolites is common to respiration mediated breakdown of fats, carbohydrates and proteins ?
(1) Glucose-6-phosphate (2) Fructose1, 6-bisphosphate
(3) Pyruvic acid (4) Acetyl CoA

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Plant physiology English page no. 68**
NCERT XIth class English page no. 235
Pyruvic acid is intermediate compound which is produced during oxidation of all types of respiratory substrates carbohydrates, fats, proteins



* option (4) Acetyl CoA may also be answer but more appropriate is pyruvic acid as it formed directly by all these respiratory substrates.

Q.114 Which one of the following statements is correct ?
(1) Hard outer layer of pollen is called intine
(2) Sporogenous tissue is haploid
(3) Endothecium produces the microspores
(4) Tapetum nourishes the developing pollen

Ans. **[4]**

Sol. **Students may find this question in CP Sheet at : Reproduction in Flowering plant English page no. 7**
Tapetum is innermost layer of anther provide nutrition to developing microspore / pollens.

Q.115 Product of sexual reproduction generally generates :
(1) Longer viability of seeds
(2) Prolonged dormancy
(3) New genetic combination leading to variation
(4) Large biomass

Ans. **[3]**

Sol. Sexual reproduction leads to new genetic combination leading to variation as it involves mixing of gametes to two different parents which are produced (gametes) by meiosis

Q.116 Meiosis takes place in :

(1) Meiocyte (2) Conidia (3) Gemmule (4) Megaspore

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : Cell biology page no. 56**

Meiocyte are the cells in which meiosis occur

Q.117 Advantage of cleistogamy is :

(1) Higher genetic variability (2) More vigorous offspring

(3) No dependence on pollinators (4) Vivipary

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Reproduction in flowering plant English page no. 23**

Cleistogamy means closed flower which are bisexual does not requires pollinator still have assured seed set.

Q.118 Monoecious plant of *Chara* shows occurrence of :

(1) Antheridiophore and archegoniophore on the same plant

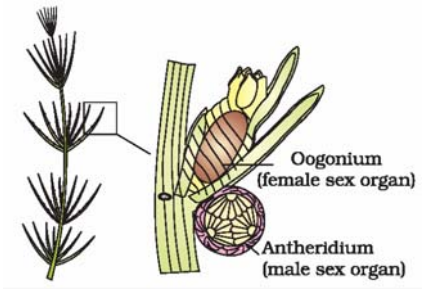
(2) Stamen and carpel on the same plant

(3) Upper antheridium and lower oogonium on the same plant

(4) Upper oogonium and lower antheridium on the same plant

Ans. **[4]**

Sol. **Students may find this question in NCERT fig 1.6 XII class**



Q.119 Perisperm differs from endosperm in :

(1) Being a haploid tissue

(2) Having no reserve food

(3) Being a diploid tissue

(4) Its formation by fusion of secondary nucleus with several sperms

Ans. **[3]**

Sol. Perisperm is persistent nucellus within seeds. It is not common as nucellus is nutritive tissue provide nutrition to embryosac. Nucellus is diploid tissue. In Beet, Piper it is persists within seed so it is diploid (2n) while endosperm is a triploid (3n) tissue

Q.120 Which of the following statements is not true of two genes that show 50% recombination frequency ?
(1) The genes may be on different chromosomes
(2) The genes are tightly linked
(3) The genes show independent assortment
(4) If the genes are present on the same chromosome, they undergo more than one crossovers in every meiosis.

Ans. **[2]**

Sol. **Students may find this question in NCERT page 83**
If gene are present on same chromosome and tightly linked they show very few recombinant so they show 50% recombinant is wrong statement.

Q.121 Variation in gene frequencies within populations can occur by chance rather than by natural selection. This is referred to as :
(1) Genetic flow (2) Genetic drift (3) Random mating (4) Genetic load

Ans. **[2]**

Sol. **Students may find this question in NCERT page 137**
If gene migration due to gene flow happens multiple times this variation in gene frequency change occurs by chance is genetic drift.

Q.122 If two persons with 'AB' blood group marry and have sufficiently large number of children, these children could be classified as 'A' blood group : 'AB' blood group : 'B' blood group in 1 : 2 : 1 ratio. Modern technique of protein electrophoresis reveals presence of both 'A' and 'B' type proteins in 'AB' blood group individuals. This is an example of :
(1) Codominance (2) Incomplete dominance (3) Partial dominance (4) Complete dominance

Ans. **[1]**

Sol. **Students may find this question in NCERT page 77**
I^A and I^B present together they both express their own type of sugar on the surface of RBC is codominance

Q.123 The process by which organisms with different evolutionary history evolve similar phenotypic adaptations in response to a common environmental challenge is called :
(1) Natural selection (2) Convergent evolution (3) Non-random evolution (4) Adaptive radiation

Ans. **[2]**

Sol. Due to common environmental changes different animals develop similar looking feature. This phenomenon is known as convergent evolution.

Q.124 The tendency of population to remain in genetic equilibrium may be disturbed by :
(1) random mating (2) lack of migration (3) lack of mutations (4) lack of random mating

Ans. **[4]**

Sol. **Students may find this question in NCERT page 136**
Gene frequency remain stable or constant from generation to generation in a random mating population is Hardy weinberg principle if population lack random mating than

Q.125 Which of the following Bt crops is being grown in India by the farmers ?
(1) Maize (2) Cotton (3) Brinjal (4) Soybean

Ans. **[2]**

Sol. Bt cotton is commonly grown Bt crop of India.

Q.126 A good product of citric acid is :
(1) *Aspergillus* (2) *Pseudomonas* (3) *Clostridium* (4) *Saccharomyces*

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Plant Diversity**
Aspergilus niger is used in formation of citric acid

Q.127 DNA fragments generated by the restriction endonucleases in a chemical reaction can be separated by :
(1) Centrifugation (2) Polymerase chain reaction
(3) Electrophoresis (4) Restriction mapping

Ans. **[3]**

Sol. **Students may find this question in NCERT page 198**
DNA fragment generated by restriction endonuclease is separated by Gel-electrophoresis.

Q.128 Which of the following is not corretly matched for the organism and its cell wall degrading enzyme ?
(1) Bacteria-Lysozyme (2) Plant cells- Cellulase (3) Algae-Methylase (4) Fungi - Chitinase

Ans. **[3]**

Sol. Methylase enzyme is used for methylation.

Q.129 The colonies of recombinat bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of :
(1) Non-recombinant bacteria containing betagalactosidase
(2) Insertional inactivation of alphagalactosidase in non-recombinant bacteria
(3) Insertional inactivation of alphagalactosidase in recombinant bacteria
(4) Inactivation of glycosidase enzyme in recombinant bacteria

Ans. **[3]**

Sol. **Students may find this question in NCERT page 200**
If insertion inactivation of α-galactosidase or z-gene of lac-operon in plasmid of E.Coli take place then it will not produce α-galactosidase or lactase enzyme (this enzyme convert x-gel chromogen into blue colour) due to lack of this enzyme this reaction does not take place so recombinant bacteria appears white in contrast to blue colonies.

Q.130 Which of the following are likely to be present in deep sea water ?
(1) Archaebacteria (2) Eubacteria (3) Blue-green algae (4) Saprophytic fungi

Ans. **[1]**

Sol. In deep sea water no light is reach the archaebacteria like sulphur bacteria methanomonas are present and their nutritional category is chemoautotrophs or chemosynthetic bacteria.

Q.131 Natural reservoir of phosphorus is :
(1) Sea water (2) Animal bones (3) Rock (4) Fossils

Ans. **[3]**

Sol. **Students may find this question in CP Sheet Ecology Eng. Page No. 104**
Phosphorous cycle is sedimentary cycle whose reservoir lies in Rocks and Sediments

Q.132 Secondary productivity is rate of formation of new organic matter by :
(1) Producer (2) Parasite (3) Consumer (4) Decomposer

Ans. **[3]**

Sol. **Students may find this question in CP Sheet Ecology Page NO. 95**
Secondary productivity is biomass assimilated by consumers.

Q.133 Which one of the following is not used for *ex situ* plant conservation?
(1) Field gene banks (2) Seed banks (3) Shifting cultivation (4) Botanical Gardens

Ans. **[3]**

Sol. **Students may find this question in CP Sheet Ecology Eng. Page No. 96**
Shifting cultivation or Jhum cultivation is a kind of deforestation not conservation.

Q.134 Kyoto-Protocol was endorsed at :
(1) CoP-3 (2) CoP-5 (3) CoP-6 (4) CoP-4

Ans. **[1]**

Sol. Kyoto protocol was endorsed at CoP-3
CoP – Confrence of Parties occurs before and after the endorsement of kyoto protocol.
CoP-1 : held at Berlin (Germany) also known as Berlin mendeate in 1995.
CoP-2 : held at Geneva (Switzerland) also known as Ministerial Declaration.
Cop-3 : held at kyoto, (Japan) in 1997 endorsed kyoto protocol.

Q.135 Which of the following represent maximum number of species among global biodiversity ?
(1) Algae (2) Lichens (3) Fungi (4) Mosses and Ferns

Ans. **[3]**

Sol. **Students may find this question in CP Sheet Ecology English Page No. 140**
Fungi has highest species diversity among all plant groups.

Q.136 Match the name of the animal (Column I), with one characteristics (Column II), and the phylum/class (column III) to which it belongs :

	Column I	**Column II**	**Column III**
(1)	*Petromyzon*	ectoparasite	Cyclostomata
(2)	*Ichthyophis*	terrestrial	Reptilia
(3)	*Limulus*	body covered by chitinous exoskeleton	Pisces
(4)	*Adamsia*	radially symmetrical	Porifera

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Page 104-105**
Petromyzone is a vertebrate belonging to cyclostomata (cyclo = Rounded, Stoma = mouth) They remain as an ectoparasite on merine fishes & turtles.

Q.137 Which of the following are correctly matched with respect of their taxonomic classification ?
(1) Flying fish, cuttlefish, silverfish – Pisces
(2) Centipede, millipede, spider, scorpion-Insecta
(3) House fly, butterfly, tsetsefly, silverfish-Insecta
(4) Spiny anteater, sea urchin, sea cucumber-Echinodermata

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : Page 37**
House fly, butterfly, tsetse fly, silverfish, all are Insects

Q.138 Which group of animals belong to the same phylum ?
(1) Malarial parasite, *Amoeba*, Mosquito
(2) Earthworm, Pinworm, Tapeworm
(3) Prawn, Scorpion, *Locusta*
(4) Sponge, Sea anemone, Starfish

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : Page 36-37**
Prawn, Scorpion & *Locusta all belong to phylum Arthropoda*

Q.139 One of the representatives of Phylum Arthropoda is :
(1) cuttlefish (2) silverfish (3) pufferfish (4) flying fish

Ans. **[2]**

Sol. **Students may find this question in CP Sheet : Page 36-37**
Silverfish (Book-worm) belongs is phylum arthropoda

Q.140 The H-zone in the skeletal muscle fibre is due to -
(1) the absence of myofibrils in the central portion of A-band
(2) the central gap between myosin filaments in the A-band
(3) the central gap between actin filaments extending through myosin filaments in the A-band
(4) extension of myosin filaments in the central portion of the A-band.

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : animal physiology-I on Page 43**
The edges of thin filament (Actin) on either side of thick filaments (myosin) partially overlap the free ends of the thick filaments (myosin) leaving the centralpart of thick filament (myosin). This central part of thick filament (myosin),not overlapped by thin filaments (Actin) is called the 'H'-zone.

Q.141 What external changes are visible after the last moult of a cockroach nymph ?
(1) Mandibles become harder
(2) Anal cerci develop
(3) Both fore wings and hind wings develop
(4) Labium develops

Ans. **[3]**

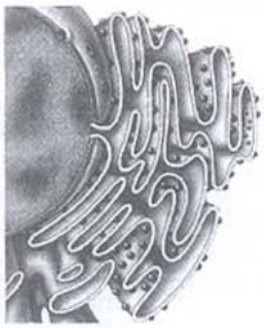
Sol. **Students may find this question in CP Sheet : lower animal on page No. 101**
The next to last nymphal stage has wing pads but only adult cockroaches have wings.

Q.142 The Golgi complex plays a major role :
(1) in trapping the light and transforming it into chemical energy
(2) in digensting proteins and carbohydrates
(3) as energy transferring organelles
(4) in post translational modification of proteins and glycosidation of lipids

Ans. **[4]**

Sol. **Students may find this question in CP Sheet : Cell Biology**
Golgi complex is involved in glycosidation of protein and lipid and formation of glycolipid and glycoprotein.

Q.143 Which one of the following organelle in the figure correctly matches with its function ?



(1) Rough endopolasmic reticulum, formation of glycoproteins
(2) Golgi apparatus, protein synthesis
(3) Golgi apparatus, formation of glycolipids
(4) Rough endoplasmic reticulum, protein synthesis

Ans. **[4]**

Sol. **Students may find this question in CP Sheet : Cell Biology page no. 24 & 26**
Given figure is RER, which is involved in protein synthesis

Q.144 Macro molecule chitin is :
(1) nitrogen containing polysaccharide
(2) phosphorus containing polysaccharide
(3) sulphur containing polysaccharide
(4) simple polysaccharide

Ans. **[1]**

Sol. **Students may find this question in NCERT XIth Class page 149**
Chitin is polymer of N-acetyl galactosamine (NAGA) so it is Nitrogen containing polysaccharide

Q.145 The essential chemical components of many coenzymes are :
(1) Proteins (2) Nucleic acids (3) Carbohydrates (4) Vitamins

Ans. **[4]**

Sol. **Students may find this question in CP Sheet : Plant physiology page no. 119**
Coenzymes are loosely attached organic parts of conjugated enzymes which are generally derivatives of vitamins.

Q.146 A stage in cell division is shown in the figure. Select the answer which gives correct identification of the stage with its characteristics.

(1)	Telophase	nuclear envelop reforms, golgi complex reforms
(2)	Late anaphase	chromosomes move away from equatorial plate, golgi complex not present
(3)	Cytokinesis	cell plate formed, mitochondria distributed between two daughter cells
(4)	Telophase	endoplasmic reticulum and nucleolus not reformed yet

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Cell Biology page no. 55**

Given figure is telophase stage in which nuclear envelope and golgi complex is reformed.

Q.147 Select the correct match of the digested products in humans given in colum I with their absorption site and mechanism in column II.

	Column I	**Column II**
(1)	Glycine, glucose	small intestine, active
(2)	Fructose, Na^+	small intestine, passive absorption
(3)	Glycerol, fatty acids	duodenum, move as chilomicrons
(4)	Cholesterol, maltose	large intestine, active absorption

Ans. **[1]**

Sol. **Reference - CP Study material Animal physiology-I on page no. 156**

Various nutrients like amino acids, glucose, electrolytes like Na^+ are absorbed into the blood by Active transport.

Q.148 A pregnant female delivers a baby who suffers from stunted growth, mental retardation, low intelligence quotient and abnormal skin.

This is the result of :

(1) Deficiency of iodine in diet (2) Low secretion of growth hormone

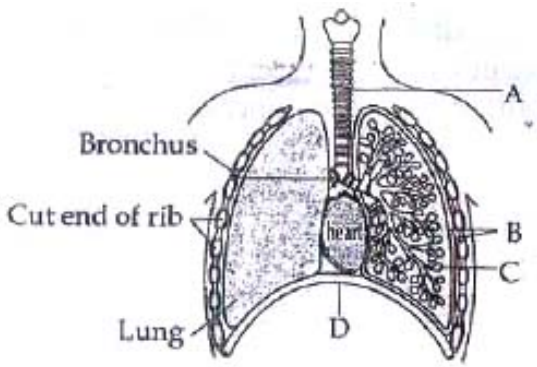
(3) Cancer of the thyroid gland (4) Over secretion of pars distalis

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Animal physiology-II on page no. 152**

Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to stunted growth, mental retardation low intelligence quotient abnormal skin.

Q.149 The figure shows a diagrammatic view of human respiratory system with labels A, B, C and D. Select the option which gives correct identification and main function and / or characteristic.



(1) A-trachea long tube supported by complete cartilaginous rings for conducting inspired air

(2) B-pleural membrane – surround ribs on both sides to provide cushion against rubbing.

(3) C-Alveoli – thin walled vascular bag like structures for exchange of gases.

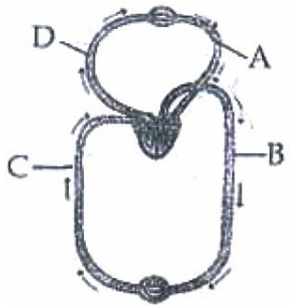
(4) D-Lower end of lungs – diaphragm pulls it down during inspiration.

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : Page 54-55**

Alveoli in lungs are thin walled air sacs where gaseous exchange takes place

Q.150 Figure shows schematic plant of blood circulation in humans with labels A to D. Identify the label and give its function/s.



(1) A-Pulmonary vein-takes impure blood from body parts, PO_2 = 60 mm Hg

(2) B-Pulmonary artery – takes blood from heart to lungs, PO_2 = 90 mm Hg

(3) C-Vena Cava-takes blood from body parts to right auricle, PCO_2 = 45 mm Hg

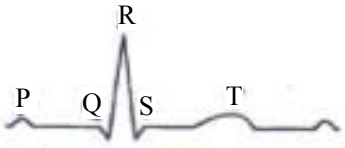
(4) D-Dorsal aorta – takes blood from heart to body parts, PO_2 = 95 mm Hg

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : Page No. 88**

Vena Cava takes blood from to body parts to right auricle. Partial pressure of CO_2 is 45 mmHg Hg under which CO_2 is taken form tissues.

Q.151 The diagram given here is the standard ECG of a normal person. The P-wave represents the :

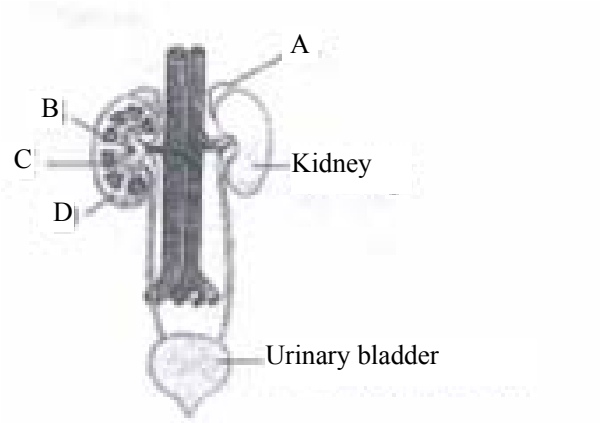


(1) Contraction of both the atria
(2) Initiation of the ventricular contraction
(3) Beginning of the systole
(4) End of systole

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Animal physiology Page - 102**
P wave in an ECG shows contraction of both the atria

Q.152 Figure shows human urinary system with structures labeled A to D. Select option which correctly identifies them and gives their characteristics and/or functions.



(1) A-Adrenal gland-located at the anterior part of Kidney. Secrete Catecholamines which stimulate glycogen breakdown
(2) B-Pelvis-broad funnel shaped space inner to hilum, directly connected to loops of Henle.
(3) C-Medulla-inner zone of kidney and contains complete nephrons.
(4) D-Cortex-outer part of kidney and do not contain any part of nephrons.

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Animal physiology Page – 159**
In the given answer function of adrenal gland is correctly given that it releases adrenaline & nor adrenaline (collectively known as catecholamine) that stimulates glycogen breakdown during emergencies.

Q.153 Select the correct statement with respect to locomotion in humans :
(1) A decreased level of progesterone causes osteoporosis in old people.
(2) Accumulation of uric acid crystals in joints causes their inflammation.
(3) The vertebral column has 10 thoracic vertebrae.
(4) The joint between adjacent vertebrae is a fibrous joint.

Ans. **[2]**

Sol. **Students may find this question in CP Sheet : Animal physiology-IPage – 119**
Gouty arthritis is cansed by excessive formation of uric acid. It gets deposited in joints as monosodium salts.

Q.154 The characteristics and an example of a synovial joint in humans is :

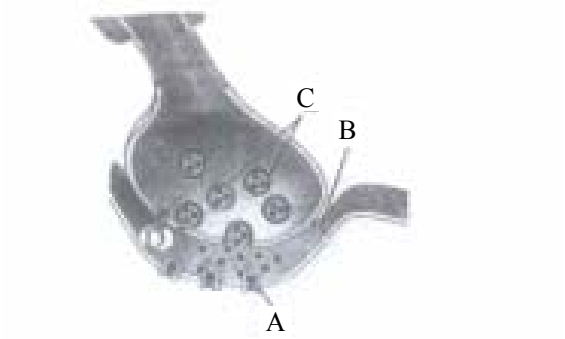
	Characteristics	Examples
(1)	Fluid cartilage between two bones, limited movements	Knee joint
(2)	Fluid filled between two joints, provides cushion	Skull bones
(3)	Fluid filled synovial cavity between two bones	Joint between atlas and axis
(4)	Lymph filled between two bones, limited movement	Gliding joint between carpals

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : Animal physiology-I Page – 115**

In between two bones a space is found called synovial space or cavity this space provides free movement to the bone.

Q.155 A diagram showing axon terminal and synapse is given. Identify correctly at least two of A-D.



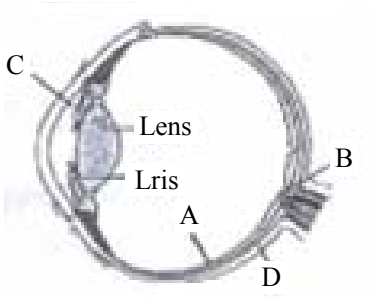
(1) A-Receptor ; C-Synaptic vesicles
(2) B-Synaptic connection ; D-K^+
(3) A-Neurotransmitter ; B- Synaptic cleft
(4) C-Neurotransmitter ; D-Ca^{++}

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : Animal Physiology-II on page no 205**

In this diagramatic question 'A' label is correct which represent receptor of neurotrans mitter and C lable represent synaptic vesicle

Q.156 Parts A, B, C and D of the human eye are shown in the diagram. Select the option which gives correct identification along with its functions/characteristics :



(1) A-Retina-contains photo receptors-rods and cones.
(2) B-Blind spot-has only a few rods and cones
(3) C-Aqueous chamber- reflects the light which does not pass through the lens
(4) D-choroid – its anterior part forms ciliary body

Ans. **[1]**

Sol. **Students may find this question in CP Sheet at : Animal physiology-II on page no 263**

In this diagramatic question 'A' label is correct with its function / Character because of Retina contain photosensory receptor – rod and cones

Q.157 Which of the following statements is correct in relation to the endocrine system ?

(1) Adenohypophysis is under direct neural regulation of the hypothalamus

(2) Organs in the body like gastrointestinal tract, heart, kidney and liver do not produce any hormones

(3) Non-nutrient chemicals produced by the body in trace amount that act as intercellular messenger are known as hormones

(4) Releasing and inhibitory hormones are produced by the pituitary gland

Ans. **[3]**

Sol. **Students may find this question in CP Sheet at : Animal physiology-II on page no. 134**

Hormones are non-nutritional chemical substances which produced by body / glands in tracess

Q.158 Select the answer which correctly matches the endocrine gland with the hormone it secretes and its function/deficiency symptom :

	Endocrine gland	**Hormone**	**Function/deficiency symptoms**
(1)	Anterior pituitary	Oxytocin	Stimulates uterus contraction during child birth
(2)	Posterior pituitary	Growth Hormone (GH)	Oversecretion stimulates abnormal growth
(3)	Thyroid gland	Thyroxine	Lack of iodine in diet results in goitre
(4)	Corpus luteum	Testosterone	stimulates spermatogenesis

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : Animal physiology-II Page – 148**

Thyroid gland synthesis thyroxine with the help of iodine and lack of iodine in diet results in goitre

Q.159 What is the correct sequence of sperm formation ?

(1) Spermatid, spermatocyte, spermatogonia, spermatozoa

(2) Spermatogonia, spermatocyte, spermatozoa, spermatid

(3) Spermatogonia, spermatozoa, spermatocyte, spermatid

(4) Spermatogonia, spermatocyte, spermatid, spermatozoa

Ans. **[4]**

Sol. **Students may find this question in CP Sheet : Reproductive system Page – 49**

The correct sequence of spermatogenesis is spermatogonia, spermatocyte, spermatid & spermatozoa

Q.160 Menstrual flow occurs due to lack of :

(1) Progesterone (2) FSH (3) Oxytocin (4) Vasopressin

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Reproductive system Page – 20-21**

Fall in the level of progesterone results in meustrual flow due to breaking of the blood vessels of uterine wall

Q.161 Which one of the following is not the function of placenta ? it :
(1) facilitates supply of oxygen and nutrients to embryo
(2) secretes estrogen
(3) Facilitates removal of carbon dioxide and waste material from embryo
(4) Secretes oxytocin during parturition

Ans. **[4]**

Sol. **Students may find this question in CP Sheet : Reproductive system Page – 28**
Oxytocin is released from the neurohypophysis of pituitary gland at the time of child birth

***Q.162** One of the legal methods of birth control is :
(1) abortion by taking an appropriate medicine
(2) by abstaining from coitus from day 10 to 17 of the menstrual cycle
(3) by having coitus at the time of day break
(4) by a premature ejaculation during coitus

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Reproductive system Page – 94**
MTP can be non surgically performed on prescription of mifepristone+Prostaglandins on the prescription of registered medical practitioner under his supervision.
This is legal method of termination of pregnancy.
Duration of menstrual cycle in all female is not fixed hence ovulation can occur anytime between 8 to 19th day hence this method of abstinence is not practically possible for birth control.

Q.163 Which of the following cannot be detected in a developing foetus by amniocentesis ?
(1) Klinefelter syndrome (2) Sex of the foetus
(3) Down syndrome (4) jaundice

Ans. **[4]**

Sol. Jaundice cant be detected by amniocentesis.

Q.164 Artificial insemination means :
(1) transfer of sperms of a healthy donor to a test tube containing ova
(2) transfer of sperms of husband to a test tube containing ova
(3) artificial introduction of sperms of a healthy donor into the vagina
(4) introduction of sperms of a healthy donor directly into the ovary

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : Reproductive system Page – 96**
Artificial insemination means artificially introduction of sperms of a healthy donor into the vagina.

Q.165 Which mendelian idea is depicted by a cross in which the F_1 generation resembles both the parents ?
(1) incomplete dominance (2) law of dominance
(3) inheritance of one gene (4) co-dominance

Ans. **[2]**

Sol. This is codominace but question is concern with mendel idea so it depicted with mendel idea of law of dominance.

Q.166 The incorrect statement with regard to Haemophilia is :
(1) It is a sex-linked disease
(2) It is a recessive disease
(3) It is a dominant disease
(4) A single protein involved in the clotting of blood is affected

Ans. **[3]**

Sol. **Students may find this question in NCERT Page No. 89**
Haemophilia is sex linked recessive disease

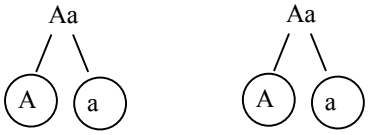
Q.167 If both parents are carriers for thalessemia, which is an autosomal recessive disorder, what are the chances of pregnancy resulting in an affected child ?

(1) no chance (2) 50% (3) 25% (4) 100%

Ans. **[3]**

Sol. Thalessemia is autosomal recessive disease if both parent are carrier then their genotype will be

Carrier × Carrier



	A	a
A	AA Normal	Aa Carrier
a	Aa Carrier	aa Thalessemic

So probability is 1/4 or 25%

Q.168 The diagram shows an important concept in the genetic implication of DNA. Fill in the blanks A to C.

DNA $\xrightarrow{A}$ mRNA $\xrightarrow{B}$ protein $\xrightarrow[C]{\text{Proposed by}}$

(1) A-transcription B-replication C-James Watson

(2) A-translation B-transcription C-Erevin Chargaff

(3) A-transcription B-translation C-Francis Crick

(4) A-translation B-extension C-Rosalind Franklin

Ans. **[3]**

Sol. **Students may find this question in NCERT Page No. 98**

This is central dogma in molecular biology proposed by Francis Crick

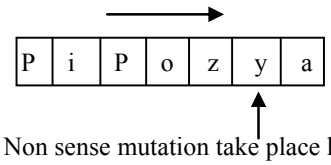
Q.169 Which enzyme/s will be produced in a cell in which there is a non-sense mutation in the *lac* Y gene ?

(1) b-galactosidase (2) Lactose permease

(3) Transacetylase (4) Lactose permease and transacetylase

Ans. **[1]**

Sol. Non sense mutation is point mutation which result in premature stop codon so transcription stop there.



Non sense mutation take place here then y and a gene will not transcribe so only β-galactosidase gene (z-gene) will transcribe.

Q.170 According to Darwin, the organic evolution is due to -
(1) Intraspecific competition
(2) Interspecific competition
(3) Competition within closely related species
(4) Reduced feeding efficiency in one species due to the presence of interfering species.

Ans. **[2]**

Sol. **Students may find this question in CP Sheet at : Origin & Evolution of Life Page - 31**
According to Darwinism competition between two different species is the key factor for organic evolution Since it results in divergent evolution.

Q.171 The eye of octopus and eye of cat show different patterns of structure, yet they perform similar function, This is an example of :
(1) Homologous organs that have evolved due to convergent evolution
(2) Homologous organs that have evolved due to divergent evolution
(3) Analogous organs that have evolved due to convergent evolution
(4) Analogous organs that have evolved due to divergent evolution

Ans. **[3]**

Sol. **Students may find this question in CP Sheet : Ecology Page No. – 31**
Eye of octopus & cat are analogous organs since they are different in structure but perform same function.

Q.172 Infection of *Ascaris* usually occurs by :
(1) drinking water containing eggs of *Ascaris* (2) eating imperfectly cooked pork
(3) Tse-tse fly (4) mosquito bite

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Lower Animals Page No. 38**
Contaminated water and soil (with eggs of *Ascaris*) is the source of infection with *Ascasis*

Q.173 The cell-mediated immunity inside the human body is carried out by :
(1) T- lymphocytes (2) B-lymphocytes (3) Thrombocytes (4) Erythrocytes

Ans. **[1]**

Sol. **Students may find this question in NCERT Page No. 151**
T-Lymphocytes mddiate C.M.I (cell-mediated immunity.)

Q.174 In plant breeding programmes, the entire collection (of plants/seeds) having all the diverse alleles for all genes in a given crop is called :
(1) selection of superior recombinants (2) cross-hybridisation among the selected parents
(3) evaluation and selection of parents (4) germplasm collection

Ans. **[4]**

Sol. **Students may find this question in CP Sheet : Reproduction in flowering plant and Economic Botany Eng. Page – 84**
Entire collection of plants / seeds having all diverse alleles for all genes in a given crop is called as germplasm collection.

Q.175 During sewage treatment, biogases are produced which include :
(1) methane, hydrogensulphide, carbon dioxide (2) methane, oxygen, hydrogensulphide
(3) hydrogensulphide, methane, sulphur dioxide (4) hydrogensulphide, nitrogen, methane

Ans. **[1]**

Sol. **Students may find this question in CP Class notes : Ecology**
During sewage treatment in secondary treatment the biogas is produced in anaerotric sludge digestor have anaerobic bacteria which produce gases like CO_2, H_2S, CH_4

Q.176 A biologist studied the population of rats in a barn, He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. The net increase in population is :
(1) 10 (2) 15 (3) 05 (4) zero

Ans. **[4]**

Sol. **Students may find this question in CP Sheet : Ecology Eng. Md Page – 52**
Natality = 250, Immigration = 20
Mortality = 240, Emigration = 30
Increase in Popolution size
P.D = [(Natality + Immigration) – (Mortality + Emigration)]
= [(250 + 20) – (240 + 30)]
= 0

Q.177 Which one of the following processes during decomposition is correctly described ?
(1) Fragmentation –Carried out by organisms such as earthworm
(2) Humification – Leads to the accumulation of a dark coloured substance humus which undergoes microbial action at a very fast rate
(3) Catabolism – Last step in the decomposition under fully anaerobic condition
(4) Leaching – Water soluble inorganic nutrients rise to the top layers of soil

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Ecology Eng. Md. Page No. 96**
Fragmentation is break down of detritous into small fragments by detrivores like earthworm.

Q.178 A sedentary sea anemone gets attached to the shell lining of hermit crab. The association is :
(1) Ectoparasitism (2) Symbiosis (3) Commensalism (4) Amensalism

Ans. **[2]**

Sol. **Students may find this question in CP Sheet : Ecology Eng. Md. Page – 69**
The association between sea anemone and hermit crab is symbiosis as both live together for very long duration

Q.179 Global warming can be controlled by :
(1) Reducing deforestation, cutting down use of fossil fuel
(2) Reducing reforestation, increasing the use of fossil fuel
(3) Increasing deforestation, slowing down the growth of human population
(4) Increasing deforestation, reducing efficiency of energy usage

Ans. **[1]**

Sol. **Students may find this question in CP Sheet : Ecology Eng. Md. Page – 180**
Global warming can be controlled by reducing the concentration of green house gases which can be achived by decreasing deforestation and reducing the use of fossil fuels.

Q.180 The Air Prevention and control of pollution Act came into force in :
(1) 1975 (2) 1981 (3)1985 (4) 1990

Ans. **[2]**

Sol. **Students may find this question in CP Sheet : Ecology Eng. Md. Page – 185**
Air prevention and control of pollution act came into existence in 1981