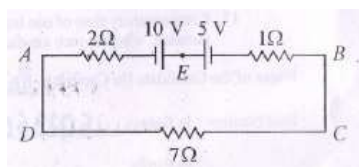


NEET UG ANSWER & SOLUTION (07-05-23)

Section-A (Physics)

1. The magnitude and direction of the current in the following circuit is



- (1) $\frac{5}{9}$ A from A to B through E (2) 1.5 A from B to A through E
(3) 0.2 A from B to A through E (4) 0.5 A from A to B through E

Sol. (4)

$$i = \frac{10 - 5}{10} = \frac{5}{10} \text{ A} = 0.5 \text{ A (from A to B through E)}$$

2. The net magnetic flux through any closed surface is :

- (1) Infinity (2) Negative (3) Zero (4) Positive

Sol. (3)

Magnetic field exist in closed Loops (Monopoles do not exist)

$$\oint \vec{B} \cdot d\vec{A} = 0 \quad (\text{Gauss law for magnetism})$$

3. The amount of energy required to form a soap bubble of radius 2 cm from a soap solution is nearly : (surface tension of soap solution = 0.03 m^{-1})

- (1) $3.01 \times 10^{-4} \text{ J}$ (2) $50.1 \times 10^{-4} \text{ J}$ (3) $30.16 \times 10^{-4} \text{ J}$ (4) $5.06 \times 10^{-4} \text{ J}$

Sol. (1)

$$E = 2T(4\pi R^2) = 2(0.03)(4)(3.14)(2 \times 10^{-2})^2 = 3.01 \times 10^{-4} \text{ J}$$

4. A 12 V, 60 W lamp is connected to the secondary of a step down transformer, whose primary is connected to ac mains of 220 V. Assuming the transformer to be ideal, what is the current in the primary winding?

- (1) 3.7 A (2) 0.37 A (3) 0.27 A (4) 2.7 A

Sol. (3)

$$V_s I_s = V_p I_p \quad (\text{Ideal transformer})$$

$$\Rightarrow P_{\text{out}} = P_{\text{in}} \quad \Rightarrow 60 = 220 \times I_p \quad I_p = \frac{60}{220} = 0.27 \text{ A}$$

5. In a series LCR circuit, the inductance L is 10 mH, capacitance C is $1\mu\text{F}$ and resistance R is 100Ω . The frequency at which resonance occurs is :

(1) 1.59 rad/s (2) 1.59 kHz (3) 15.9 rad/s (4) 15.9 kHz

Sol. (2)

$$L = 10 \times 10^{-3} \text{H}$$

$$C = 1 \times 10^{-6} \text{F}$$

$$R = 100 \Omega$$

$$\text{At resonance } X_L = X_C$$

$$\omega L = \frac{1}{\omega C} \quad f = \frac{1}{2\pi\sqrt{LC}} \quad f = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{10 \times 10^{-3} \times 10^{-6}}} = 1.59 \text{ KHz}$$

6. Given below are two statements:

Statement I : Photovoltaic devices can convert optical radiation into electricity,

Statement II : Zener diode is designed to operate under reverse bias in breakdown region.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) **Statement I** is correct but **Statement II** is incorrect
 (2) **Statement I** is incorrect but **Statement II** is correct
 (3) Both **Statement I** and **Statement II** are correct
 (4) Both **Statement I** and **Statement II** are incorrect

Sol. (3)

Statement I : Photocell/solar cell convert light energy into electric energy/current.

Statement II : We use zener diode in reverse biased condition, when reverse biased voltage more than breakdown voltage than it act as stablizer.

7. The temperature of a gas is -50°C . To what temperature the gas should be heated so that the rms speed is increased by 3 times ?

(1) 3097 K (2) 223 K (3) 669°C (4) 3295°C

Sol. (4)

$$v_{\text{rms}} \propto \sqrt{T} \quad \frac{v_1}{v_2} = \sqrt{\frac{T_1}{T_2}}$$

Let initial speed is v

As speed is increased by 3 times so final speed become $4v$

$$\Rightarrow \frac{v}{4v} = \sqrt{\frac{223}{T}}$$

$$T = 3568 \text{ K} = 3295^\circ\text{C}$$

8. The venturi-metar work on :

- (1) The principle of parallel axes (2) The principle of parallel axes
(3) Huygen's principle (4) Bernoulli's principle

Sol. (4)

Venturimeter works on Bernoulli's principle.

9. A vehicle travels half the distance with speed v and the remaining distance with speed $2v$. Its average speed is :

- (1) $\frac{4v}{3}$ (2) $\frac{3v}{4}$ (3) $\frac{v}{3}$ (4) $\frac{3v}{4}$

Sol. (1)

$$v_{\text{avg}} = \frac{2v_1v_2}{v_1 + v_2} = \frac{4v}{3}$$

10. An ac source is connected to a capacitor C . Due to decrease in its operating frequency :

- (1) displacement current decreases (2) capacitive reactance remains constant
(3) capacitive reactance decreases (4) displacement current increases.

Sol. (1)

$$i_c = i_D = \frac{V_0}{X_c} \sin \omega t$$

$$i_c = i_D = (V_0 \omega C) \sin \omega t$$

On decreasing frequency $\omega \downarrow$ $X_c \uparrow$ $i_d \downarrow$

11. Light travels a distance x in time t_1 in air and $10x$ in time t_2 in another denser medium. What is the critical angle for this medium?

- (1) $\sin^{-1}\left(\frac{t_1}{10t_2}\right)$ (2) $\sin^{-1}\left(\frac{10t_1}{t_2}\right)$ (3) $\sin^{-1}\left(\frac{t_2}{t_1}\right)$ (4) $\sin^{-1}\left(\frac{10t_2}{t_1}\right)$

Sol. (2)

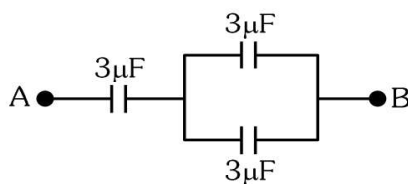
$$\text{Speed of light in air } V_1 = \frac{x}{t_1}$$

$$\text{Speed of light in a medium } V_2 = \frac{10x}{t_2}$$

$$\sin \theta_c = \frac{V_2}{V_1} = \frac{10x}{t_2} \times \frac{t_1}{x}$$

$$\theta_c = \sin^{-1}\left(\frac{10t_1}{t_2}\right)$$

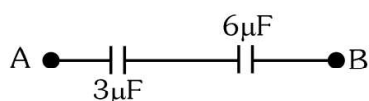
12. The equivalent capacitance of the system shown in the following circuit is :



- (1) $6 \mu\text{F}$ (2) $9 \mu\text{F}$ (3) $2 \mu\text{F}$ (4) $3 \mu\text{F}$

Sol. (3)

$$C_{AB} = \frac{3 \times 6}{3 + 6} = 2 \mu\text{F}$$



13. The magnetic energy stored in an inductor of inductance $4 \mu\text{H}$ carrying a current of 2A is :

- (1) 8 mJ (2) $8 \mu\text{J}$ (3) $4 \mu\text{J}$ (4) 4 mJ

Sol. (2)

$$\text{Energy} = \frac{1}{2} Li^2 = \frac{1}{2} 4 \times 10^{-6} \times 2^2 = 8 \times 10^{-6} \text{ J} = 8 \mu\text{J}$$

14. A full wave rectifier circuit consists of two p-n junction diodes, a centre-tapped transformer, capacitor and a load resistance. Which of these components remove the ac ripple from the rectified output? .

- (1) Capacitor (2) Load resistance
(3) A centre-tapped transformp (4) p-n junction diodes

Sol. (1)

Capacitor used to remove AC ripples from Rectifier output.

15. In a plane electromagnetic wave travelling in free space, the electric field component oscillates sinusoidally at a frequency of $2.0 \times 10^{10} \text{ Hz}$ and amplitude 48 V m^{-1} . Then the amplitude of oscillating magnetic field is :

(Speed of light in free space $= 3 \times 10^8 \text{ m s}^{-1}$)

- (1) $1.6 \times 10^{-7} \text{ T}$ (2) $1.6 \times 10^{-6} \text{ T}$ (3) $1.6 \times 10^{-9} \text{ T}$ (4) $1.6 \times 10^{-8} \text{ T}$

Sol. (1)

$$C = \frac{E_0}{B_0} \quad B_0 = \frac{E_0}{C} = \frac{48}{3 \times 10^8} = 1.6 \times 10^{-7} \text{ T}$$

16. The errors in the measurement which arise due to unpredictable fluctuations in temperature and voltage supply are :

- (1) Least count errors (2) Random errors (3) Instrumental errors (4) Personal errors

Sol. (2)

Error arise due to unpredictable fluctuation in temperature and voltage supply are known as random errors.

17. Let a wire be suspended from the ceiling (rigid support) and stretched by a weight W attached at its free end. The longitudinal stress at any point of cross-sectional area A of the wire is :

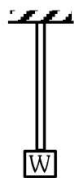
(1) $W/2A$ (2) Zero (3) $2W/A$ (4) W/A

Sol. (4)

$$\text{Stress} = \frac{IRF}{A}$$

$$\text{Stress} = \frac{W}{A}$$

(Here A is Cross-sectional Area)



18. Resistance of a carbon resistor determined from colour codes is $(22000 \pm 5\%) \Omega$. The colour of third band must be :

(1) Orange (2) Yellow (3) Red (4) Green

Sol. (1)

$$R = [22 \times 10^3 \pm 5\%] \Omega$$

According to color code

Third Band \rightarrow Orange

(color code for digit 3 is orange)

19. The work functions of Caesium (Cs), Potassium (K) and Sodium (Na) are 2.14 eV, 2.30 eV and 2.75 eV respectively. If incident electromagnetic radiation has an incident energy of 2.20 eV, which of these photosensitive surfaces may emit photoelectrons?

(1) K only (2) Na only (3) Cs only (4) Both Na and K

Sol. (3)

Given energy of photon $E = 2.20 \text{ eV}$

We know that e^- emits when $h\nu > \phi_0$

Here, in case of Cs only $h\nu > \phi_0$

20. For Young's double slit experiment, two statements are given below:

Statement I : If screen is moved away from the plane of slits, angular separation of the fringes remains constant.

Statement II : If the monochromatic source is replaced by another monochromatic source of larger wavelength, the angular separation of fringes decreases.

In the light of the above statements, choose the correct answer from the options given below:

(1) **Statement I** is true but **Statement II** is false (2) **Statement I** is false but **Statement II** is true
(3) Both **Statement I** and **Statement II** are true (4) Both **Statement I** and **Statement II** are false

Sol. (1)

$$\text{Angular width, } \theta_w = \frac{\lambda}{d}$$

θ_w independent of D but depends on λ

21. The half life of a radioactive substance is 20 minutes. In how much time, the activity of substance drops to $\left(\frac{1}{16}\right)^{\text{th}}$ of Its initial value ?
- (1) 60 minutes (2) 80 minutes (3) 20 minutes (4) 40 minutes

Sol. (2)

Half life $T = 20$ min

Left fraction of activity $\frac{1}{16}$

$$\therefore \frac{R}{R_0} = \left(\frac{1}{2}\right)^{t/T} \quad \frac{1}{16} = \left(\frac{1}{2}\right)^{t/20} \quad \left(\frac{1}{2}\right)^4 = \left(\frac{1}{2}\right)^{t/20}$$

$$4 = \frac{t}{20} \quad t = 80 \text{ min}$$

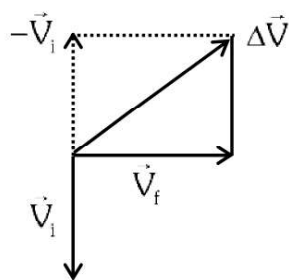
22. A football player is moving southward and suddenly turns eastward with the same speed to avoid an opponent. The force that acts on the player while turning is :
- (1) along north-east (2) along south-west (3) along eastward (4) along northward

Sol. (1)

$$\vec{V}_i = (V) \text{ Southward}$$

$$\vec{V}_f = (V) \text{ Eastward}$$

$$\Delta \vec{V}_i = \vec{V}_f - \vec{V}_i \text{ (Along North-East)}$$



23. In hydrogen spectrum, the shortest wavelength in the Balmer series is λ . The shortest wavelength in the Bracket series is :
- (1) 9λ (2) 16λ (3) 2λ (4) 4λ

Sol. (4)

Shortest wavelength in Balmer series when transition of e^- from ∞ to $n = 2$

$$\therefore \frac{1}{\lambda} = RZ^2 \left[\frac{1}{2^2} - \frac{1}{\infty^2} \right]$$

$$\frac{1}{\lambda} = \frac{R}{4} \quad \dots(1)$$

Shortest wavelength is Bracket series when transition of e^- from ∞ to $n = 4$

$$\frac{1}{\lambda'} = R(1)^2 \left[\frac{1}{4^2} - \frac{1}{\infty^2} \right] \Rightarrow \frac{1}{\lambda'} = \frac{R}{16} \quad \dots(2)$$

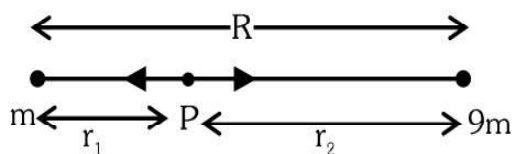
Eq. (1)/Eq. (2)

$$\frac{\lambda'}{\lambda} = \frac{R}{4} \times \frac{16}{R} \Rightarrow \lambda' = 4\lambda$$

24. Two bodies of mass m and $9m$ are placed a distance R . The gravitational potential the line joining the bodies where to gravitational field equals zero, will (G = gravitational constant).

(1) $-\frac{16Gm}{R}$ (2) $-\frac{20Gm}{R}$ (3) $-\frac{8Gm}{R}$ (4) $-\frac{12Gm}{R}$

Sol. (1)



Position of Neutral point (Zero Gravitational Field)

$$r_1 = \frac{\sqrt{m_1}R}{\sqrt{m_1} + \sqrt{m_2}} = \frac{\sqrt{m}R}{\sqrt{m} + \sqrt{9m}} = \frac{R}{4}$$

$$r_2 = R - R/4 = 3R/4$$

Now Gravitational potential at point P

$$V_p = -\frac{GM}{R/4} - \frac{9(GM)}{3R/4} = \frac{-16GM}{R}$$

25. The minimum wavelength of X-ray produced by an electron accelerated through a potential difference of V volts proportional to :

(1) $\frac{1}{\sqrt{V}}$ (2) V^2 (3) \sqrt{V} (4) $\frac{1}{V}$

Sol. (4)

Minimum wavelength of X-rays is

$$\lambda_{\min} = \frac{hc}{eV} \quad \text{hence } \lambda_{\min} \propto \frac{1}{V}$$

26. The ratio of radius of gyration of a solid sphere of mass M and radius R about its own axis to the radius of gyration of the thin hollow sphere of same mass and radius about its axis is :

(1) 2:5 (2) 3:5 (3) 5:2 (4) 5:3

Sol. (Bonus)

$$\text{Radius of gyration : } K = \sqrt{\frac{1}{m}}$$

$$\frac{k_{\text{solid sphere}}}{k_{\text{hollow sphere}}} = \sqrt{\frac{2mR^2/5m}{2mR^2/3m}} = \sqrt{3} : \sqrt{5}$$

27. A metal wire has mass (0.4 ± 0.002) g, radius (0.3 ± 0.001) mm and length (5 ± 0.02) cm . The maximum possible percentage error in the measurement of density will nearly be :

(1) 1.6% (2) 1.4% (3) 1.2% (4) 1.3%

Sol. (1)

$$\frac{\Delta \rho}{\rho} = \frac{\Delta M}{M} + \frac{2\Delta r}{r} + \frac{\Delta \ell}{\ell}$$

$$\frac{\Delta \rho}{\rho} \% = \left[\frac{0.002}{0.4} + \frac{2(0.001)}{(0.3)} + \frac{0.02}{5} \right] \times 100\% = \frac{1}{2}\% + \frac{2}{3}\% + \frac{2}{5}\% = 1.6\%$$

28. If $\oint \vec{E} \cdot d\vec{S} = 0$ over a surface, then :

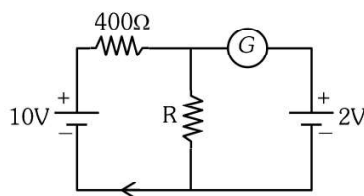
(1) all the charges must necessarily be inside the surface.
 (2) the electric field inside the surface is necessarily uniform
 (3) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.
 (4) the magnitude of electric field on the surface is constant.

Sol. (3)

$$\phi_{\text{closed}} = 0 \quad \text{So } \phi_{\text{in}} = \phi_{\text{out}}$$

Number of field lines entering is equal number of field lines leaving.

29. If the galvanometer G does not show any deflection in the circuit shown, the value of R is given by :



(1) 100Ω (2) 400Ω (3) 200Ω (4) 50Ω

Sol. (1)

For no reading galvanometer. Potential across it is same.

$$i_{400\Omega} \Rightarrow \frac{10-2}{400} = \frac{8}{400} = \frac{1}{50} = i_R$$

$$i_R \Rightarrow \frac{V_R}{R} \Rightarrow \frac{2}{R} = \frac{1}{50} \Rightarrow R = 100\Omega$$

30. The potential energy of a long spring when stretched by 2 cm is U. If the spring is stretched by 8 cm, potential energy stored in it will be :

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

Sol. (2)

$$U = \frac{1}{2}k(2)^2 \quad \dots(1)$$

$$U' = \frac{1}{2}k(8)^2 \quad \dots(2)$$

Eq. (2)/eq. (1)

$$\Rightarrow \frac{U'}{U} = \left(\frac{8}{2}\right)^2 \Rightarrow \boxed{U' = 16U}$$

31. A Carnot engine has an efficiency of 50% when its source is at a temperature 327°C . The temperature of the sink is :

- (1) 100°C (2) 200°C (3) 27°C (4) 15°C

Sol. (3)

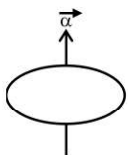
$$\text{Efficiency } \% \eta = \left(1 - \frac{T_{\text{sink}}}{T_{\text{source}}}\right) \times 100$$

$$\frac{1}{2} = 1 - \frac{T_{\text{sink}}}{600} \quad T_{\text{Sink}} = 300\text{K} = 27^\circ\text{C}$$

32. The angular acceleration of a body, moving along the circumference of a circle, is :

- (1) along the tangent to its position (2) along the axis of rotation
(3) along the radius, away from centre (4) along the radius towards the centre

Sol. (2)



Along the axis of rotation.

33. The ratio of frequencies of fundamental harmonic produced by an open pipe to that of closed pipe having the same length is :

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

Sol. (4)

$$\frac{n_{\text{oop}}}{n_{\text{cop}}} = \frac{\frac{v}{2l}}{\frac{v}{4l}} = \frac{2}{1}$$

34. A bullet is fired from a gun at the speed of 280 m s^{-1} in the direction 30° above the horizontal. The maximum height attained by the bullet is ($g = 9.8 \text{ m s}^{-2}$, $\sin 30^\circ = 0.5$)

- (1) 1000 m (2) 3000 m (3) 2800 m (4) 2000 m

Sol. (1)

$$H_{\text{max}} = \frac{u^2 \sin^2 \theta}{2g} = \frac{(280)^2 (\sin 30^\circ)^2}{2(9.8)} = 1000 \text{ m}$$

35. An electric dipole is placed at an angle of 30° with an electric field of intensity $2 \times 10^5 \text{ NC}^{-1}$. It experiences a torque equal to 4 N m . Calculate the magnitude of charge on the dipole, if the dipole length is 2 cm .

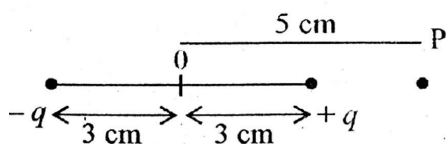
- (1) 4 mC (2) 2 mC (3) 8 mC (4) 6 mC

Sol. (2)

$$\tau = pE \sin \theta \quad 4 = q \times 2 \times 10^{-2} \times 2 \times 10^5 \times \frac{1}{2} \quad q = 2 \times 10^{-3} \text{ C} = 2 \text{ mC}$$

Section-B (Physics)

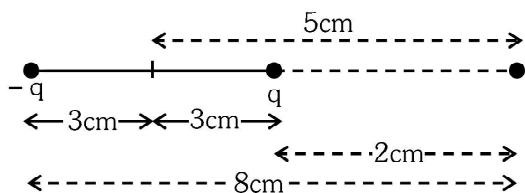
36. An electric dipole is placed as shown in the figure.



The electric potential (in 10^2 V) at point P due to the dipole is ($\epsilon_0 =$ permittivity of free space and $\frac{1}{4\pi\epsilon_0} = K$):

- (1) $\left(\frac{8}{5}\right)qK$ (2) $\left(\frac{8}{3}\right)qK$ (3) $\left(\frac{3}{8}\right)qK$ (4) $\left(\frac{5}{8}\right)qK$

Sol. (3)



$$V = \frac{Kq}{2 \times 10^{-2}} - \frac{Kq}{8 \times 10^{-2}} = Kq \left[\frac{3}{8} \right] \times 10^2$$

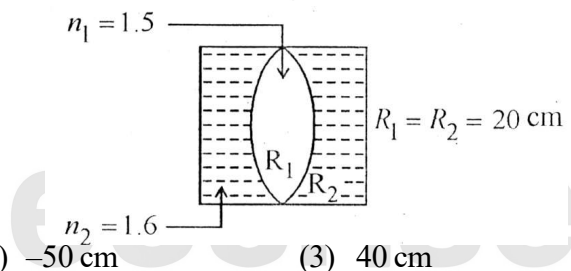
37. Two thin lenses are of same focal lengths (f), but one is convex and the other one is concave. When they are placed in contact with each other, the equivalent focal length of the combination will be :

- (1) $f/2$ (2) infinite (3) Zero (4) $f/4$

Sol. (2)

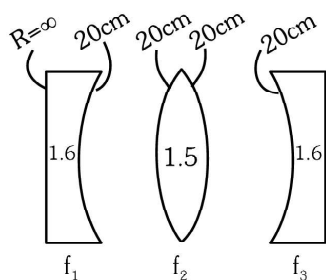
$$\frac{1}{f_{eq}} = \frac{1}{f_1} + \frac{1}{f_2} \quad \frac{1}{f_{eq}} = \frac{1}{f} - \frac{1}{f} \quad f_{eq} = \infty$$

38. In the figure shown here, what is the equivalent focal length of the combination of lenses (Assume that all layers are thin)?



- (1) -100 cm (2) -50 cm (3) 40 cm (4) -40 cm

Sol. (1)



$$\text{Use } \frac{1}{f} = [\mu - 1] \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$$

$$\frac{1}{f_1} = [1.6 - 1] \left[\frac{1}{\infty} - \frac{1}{20} \right] = \frac{-3}{100}$$

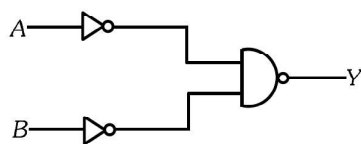
$$\frac{1}{f_2} = [1.5 - 1] \left[\frac{1}{20} + \frac{1}{20} \right] = \frac{1}{20}$$

$$\frac{1}{f_3} = \frac{-3}{100}$$

$$\frac{1}{f_{eq}} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3} \quad \frac{1}{f_{eq}} = -\frac{3}{100} + \frac{1}{20} - \frac{3}{100} = \frac{-1}{100}$$

$$f_{eq} = -100 \text{ cm}$$

39. For the following logic circuit, the truth table is :



(1)

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

(2)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(3)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(4)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

Sol. (4)

$$y = \overline{\overline{A} \cdot \overline{B}} = \overline{\overline{A}} + \overline{\overline{B}}$$

$= (A + B)$ OR Gate

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

40. The resistance of platinum wire at 0°C is 2Ω and 6.8Ω at 80°C . The temperature coefficient of resistance of the wire is :

(1) $3 \times 10^{-2} \text{ }^\circ\text{C}^{-1}$

(2) $3 \times 10^{-1} \text{ }^\circ\text{C}^{-1}$

(3) $3 \times 10^{-4} \text{ }^\circ\text{C}^{-1}$

(4) $3 \times 10^{-3} \text{ }^\circ\text{C}^{-1}$

Sol. (1)

$$R_T = R_0 [1 + \alpha(T - T_0)]$$

$$6.8 = 2 [1 + \alpha(80 - 0)]$$

$$\alpha = \frac{2.4}{80} = 0.03 / ^\circ\text{C} = 3 \times 10^{-2} / ^\circ\text{C}$$

41. A horizontal bridge is built across a river. A student standing on the bridge throws a small ball vertically upwards with a velocity 4 m s^{-1} . The ball strikes the water surface after 4 s. The height of bridge above water surface is (Take $g = 10 \text{ m s}^{-2}$)

(1) 64 m

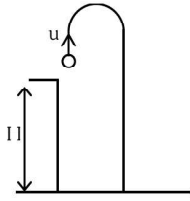
(2) 68 m

(3) 56 m

(4) 60 m

Sol. (1)

$$S = ut + \frac{1}{2}at^2$$



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

$$-H = 16 - 80$$

$$-H = -64$$

$$H = 64 \text{ m}$$

42. A satellite is orbiting just above the surface of the earth with period T . If d is the density of the earth and G is the universal constant of gravitation, the quantity $\frac{3\pi}{Gd}$ represents :

- (1) T^3 (2) \sqrt{T} (3) T (4) T^2

Sol. (4)

$$T = \frac{2\pi}{\sqrt{GM}} r^{3/2} \Rightarrow T^2 = \frac{4\pi^2 R^3}{G \left(\frac{4}{3} \pi R^3 d \right)} (r = R) \quad T^2 = \frac{3\pi}{Gd}$$

43. The radius of inner most orbit of hydrogen atom is $5.3 \times 10^{-11} \text{ m}$. What is the radius of third allowed orbit of hydrogen atom ?

- (1) 1.59 \AA (2) 4.47 \AA (3) 0.53 \AA (4) 1.06 \AA

Sol. (2)

Radius of n^{th} orbit in Hydrogen Atom

$$r_n = 0.53 \times \frac{n^2}{Z} \text{ \AA}$$

So, radius of third orbit

$$r_3 = 0.53 \times \frac{(3)^2}{(1)} \text{ \AA} = 4.77 \text{ \AA}$$

44. A wire carrying a current I along the positive x -axis has length L . It is kept in a magnetic field $\vec{B} = (2\hat{i} + 3\hat{j} - 4\hat{k})$ T. The magnitude of the magnetic force acting on the wire is :

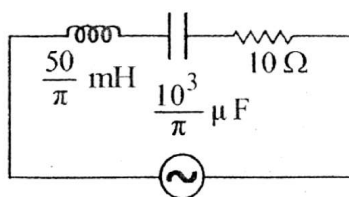
- (1) $5 IL$ (2) $\sqrt{3} IL$ (3) $3 IL$ (4) $\sqrt{5} IL$

Sol. (1)

$$\vec{F} = I(\vec{\ell} \times \vec{B}) = I \left[(L\hat{i}) \times (2\hat{i} + 3\hat{j} - 4\hat{k}) \right] = I(4L\hat{j} + 3L\hat{k})$$

$$|\vec{F}| = 5IL$$

45. The net impedance of circuit (as shown in figure) will be :



220 V, 50 Hz

- (1) $5\sqrt{5}\Omega$ (2) 25Ω (3) $10\sqrt{2}\Omega$ (4) 15Ω

Sol. (1) $X_L = \frac{50}{\pi} \times 10^{-3} \times 2\pi \times 50 = 5\Omega$

$$X_C = \frac{1}{2\pi \times 50 \times \frac{10^3}{\pi} \times 10^{-6}} = 10\Omega$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$= \sqrt{(10)^2 + (5)^2} = 5\sqrt{5}\Omega$$

46. 10 resistors, each of resistance R are connected in series to a battery of emf E and negligible internal resistance. Then those are connected in parallel to the same battery, the current is increased n times. The value of n is :

- (1) 1 (2) 1000 (3) 10 (4) 100

Sol. (4)

$$I_s = \frac{E}{10R} \quad \dots(1)$$

$$I_p = \frac{E}{R/10} = \frac{10E}{R} \quad \dots(2)$$

$$n = \frac{I_p}{I_s} = 100 \Rightarrow n = 100$$

47. Calculate the maximum acceleration of a moving car so that a body lying on the floor of the car remains stationary. The coefficient of static friction between the body and the floor is 0.15 ($g = 10 \text{ ms}^{-2}$).

- (1) 1.5 m s^{-2} (2) 50 m s^{-2} (3) 1.2 m s^{-2} (4) 150 m s^{-2}

Sol. (1)

$$F_s = ma$$

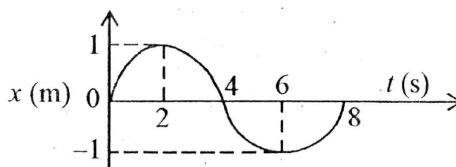
$$f_L = ma_{\max}$$

$$\mu mg = ma_{\max}$$

$$a_{\max} = \mu g$$

$$= 0.15(10) = 1.5 \text{ m/s}^2$$

48. The x-t graph of a particle performing simple harmonic motion is shown in the figure. The acceleration of the particle at $t = 2$ s is :



- (1) $\frac{\pi^2}{16} \text{ m s}^{-2}$ (2) $-\frac{\pi^2}{16} \text{ m s}^{-2}$ (3) $\frac{\pi^2}{8} \text{ m s}^{-2}$ (4) $-\frac{\pi^2}{8} \text{ m s}^{-2}$

Sol. (2)

$$x = A \sin(\omega t)$$

$$\frac{dx}{dt} = v = A\omega \cos(\omega t)$$

$$\frac{dv}{dt} = a = -\omega^2 A \sin(\omega t)$$

$$a = -\left(\frac{2\pi}{8}\right)^2 \times 1 \sin\left(\frac{2\pi}{8} \times 2\right)$$

$$\Rightarrow a = -\frac{\pi^2}{16} \times \sin\left(\frac{\pi}{2}\right)$$

$$\therefore a = -\frac{\pi^2}{16} \text{ m/s}^2$$

49. A bullet from a gun is fired on a rectangular wooden block with velocity u . When bullet travels 24 cm. through the block along its length horizontally, velocity of bullet becomes $\frac{u}{3}$. Then it further penetrates into the block in the same direction before coming to rest exactly at the other end of the block. The total length of the block is :

- (1) 28 cm (2) 30 cm (3) 27 cm (4) 24 cm

Sol. (3)

$$\text{By } v^2 = u^2 + 2as$$

$$\left(\frac{u}{3}\right)^2 = u^2 - 2ax$$

$$2ax = u^2 - \frac{u^2}{9}$$

$$2ax = \frac{8u^2}{9} \quad \dots(1)$$

Similarly from starting

$$v^2 = u^2 + 2ax$$

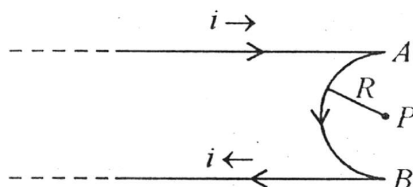
$$0 = u^2 - 2ax_2$$

$$2ax_2 = u^2 \quad \dots(2)$$

$$\frac{24}{x_2} = \frac{8}{9}$$

$$x_2 = 27 \text{ cm}$$

50. A very long conducting wire is bent in a semi-circular shape from A to B as shown in figure. The magnetic field at point P for steady current configuration is given by:



- (1) $\frac{\mu_0 i}{4R} \left[1 - \frac{2}{\pi} \right]$ pointed away from page (2) $-\frac{\mu_0 i}{4R} \left[1 - \frac{2}{\pi} \right]$ pointed into the page
(3) $\frac{\mu_0 i}{4R}$ pointed into the page (4) $\frac{\mu_0 i}{4R}$ pointed away from the page

Sol. (1)

$$B = \frac{\mu_0}{4\pi} \frac{I}{R} (\pi) - \frac{\mu_0}{4\pi} \frac{2I}{R} = \frac{\mu_0 I}{4R} \left[1 - \frac{2}{\pi} \right] \text{ outward i.e away from page.}$$

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Section-A (Chemistry)

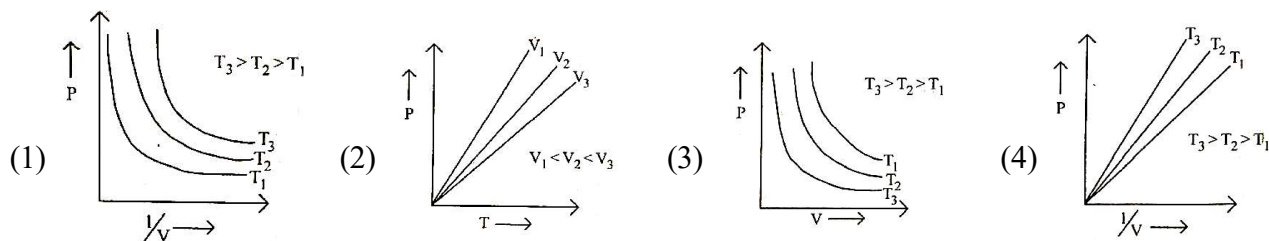
51. Amongst the given options which of the following molecules/ion acts as a Lewis acid ?

- (1) BF_3 (2) OH (3) NH_3 (4) H_2O

Sol. (1)

due to presence of vacant orbital in boron

52. Which amongst the following options is correct graphical representation of Boyle's



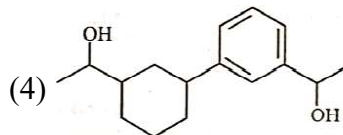
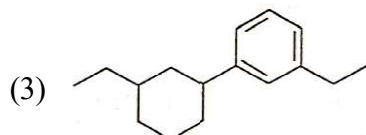
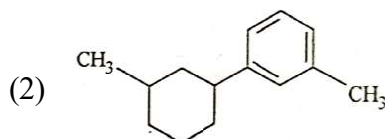
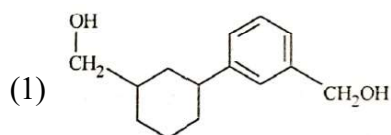
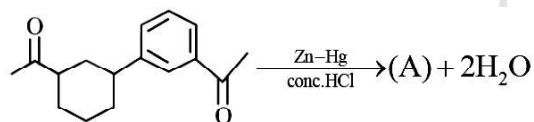
Sol. (4)

Boyle's law is defined at constant temperature for an ideal gas.

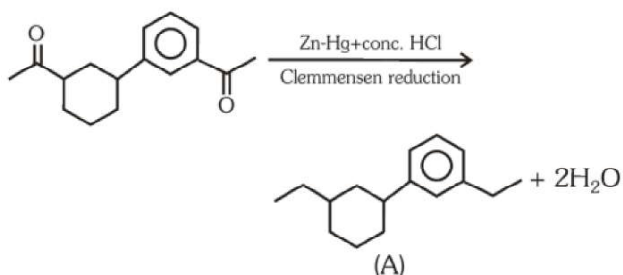
$$P \propto \frac{1}{V} \quad P = (nRT) \left(\frac{1}{V} \right) \text{ [straight line equation]}$$

$$\Rightarrow \text{Slope} \uparrow \Rightarrow T \uparrow \therefore T_3 > T_2 > T_1$$

53. Identify product (A) in the following reaction :



Sol. (3)



54. Which of the following statements are NOT correct ?

- (A) Hydrogen is used to reduce heavy metal oxides to metals.
- (B) Heavy water is used to study reaction mechanism.
- (C) Hydrogen is used to make saturated fats from oils.
- (D) The H–H bond dissociation enthalpy is lowest as compared to a single bond between two atoms of any element.
- (E) Hydrogen reduces oxides of metals that are more active than iron.

Choose the most appropriate answer from the options given below :

- (1) D, E only (2) A, B, C only (3) B, C, D, E only (4) B, D only

Sol. (1)

- (D) H–H bond is one of the strongest bond due to its smaller size of orbital participating in bond formation.
- (E) Reduces oxide of metal having less reactivity.

55. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion A : In equation $\Delta_r G = -nFE_{\text{cell}}$, value of $\Delta_r G$ depends on n .

Reasons R : E_{cell} is an intensive property and $\Delta_r G$ is an extensive property.

In the light of the above statements, choose the correct answer from the options given below :

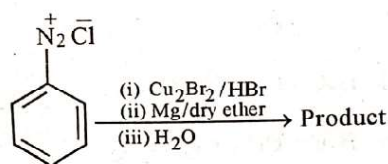
- (1) A is true but R is false.
- (2) A is false but R is true
- (3) Both A and R are true and R is the correct explanation of A.
- (4) Both A and R are true and R is NOT the correct explanation of A.

Sol. (3)

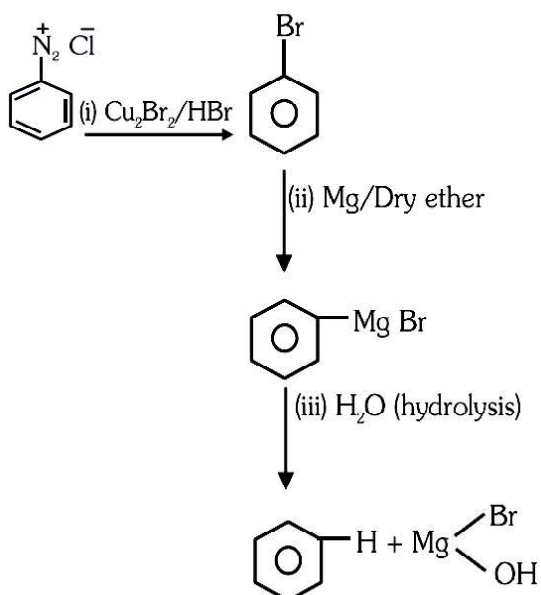
$$\Delta_r G = -nFE_{\text{cell}}$$

E_{cell} is an intensive property and $\Delta_r G$ is an extensive property as it depends on number of e^- transferred in cell reaction

56. Identify the product in the following reaction :



Sol. (4)



57. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion A : Helium is used to dilute oxygen in diving apparatus.

Reasons R : Helium has high solubility in O_2 .

In the light of the above statements, choose the correct answer from the options given below :

- (1) A is true but R is false.
- (2) A is false but R is true
- (3) Both A and R are true and R is the correct explanation of A.
- (4) Both A and R are true and R is NOT the correct explanation of A.

Sol. (1)

Assertion is true because He has low solubility in blood. (NCERT)

58. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion A : A reaction can have zero activation energy.

Reasons R : The minimum extra amount of energy absorbed by reactant molecules so that their energy becomes equal to threshold value, is called activation energy.

In the light of the above statements, choose the correct answer from the options given below :

- (1) A is true but R is false.
 (2) A is false but R is true
 (3) Both A and R are true and R is the correct explanation of A.
 (4) Both A and R are true and R is **NOT** the correct explanation of A.

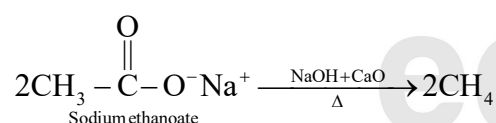
Sol. (2)

A reaction cannot have zero activation energy. E_a is minimum extra amount of energy absorbed by reactant molecules so that their energy becomes equal to threshold value.

59. Weight (g) of two moles of the organic compound, which is obtained by heating sodium ethanoate with sodium hydroxide in presence of calcium oxide is :

- (1) 30 (2) 18 (3) 16 (4) 32

Sol. (4)



$$\text{Weight} = 2 \times 16 = 32 \text{ g}$$

60. Amongst the following the total number of species NOT having eight electrons around central atom in its outer most shell, is NH_3 , AlCl_3 , BeCl_2 , CCl_4 , PCl_5 :

- (1) 4 (2) 1 (3) 3 (4) 2

Sol. (3)

AlCl_3 and BeCl_2 has 6 & 4 electron in valence shell respectively and PCl_5 has 10 electron So, these 3 compound has no 8 electron in valence shell of central atom.

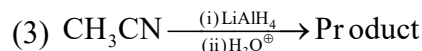
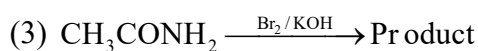
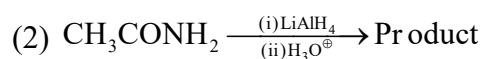
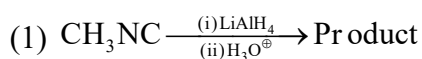
61. The relation between n_m , (n_m = the number of permissible values of magnetic quantum number (m) for a given value of azimuthal quantum number (l), is

- (1) $n_m = 2l^2 + 1$ (2) $n_m = l + 2$ (3) $l = \frac{n_m - 1}{2}$ (4) $l = 2n_m + 1$

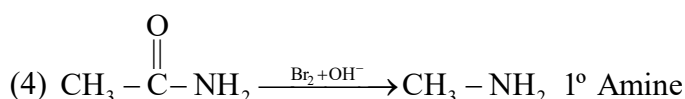
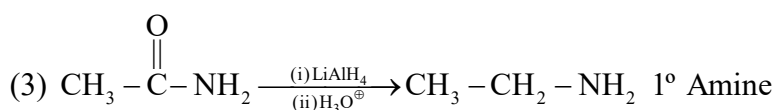
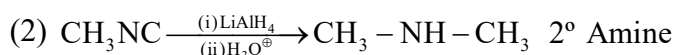
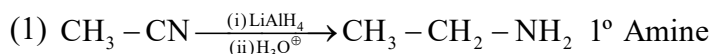
Sol. (3)

$$n_m = -l \text{ to } +l \quad \text{that is } n_m = 2l + 1 \quad l = \frac{n_m - 1}{2}$$

62. Which of the following reactions will **NOT** give primary amine as the product ?



Sol. (1)



63. Homoleptic complex from the following complexes is :

(1) Pentaamminecarbonatocobalt (III) chloride

(2) Triamminetriaquachromium (III) chloride

(3) Potassium trioxalatoaluminate (III)

(4) Diamminechloridonitrito - N-platinum (II)

Sol. (3)

Homoleptic complex are those complex containing only one type of ligand

64. Some tranquilizers are listed below. Which one from the following belongs to barbiturates ?

(1) Valium

(2) Veronal

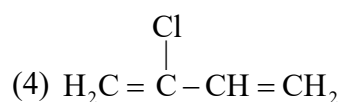
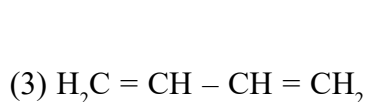
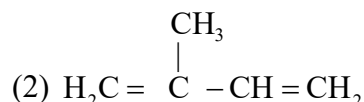
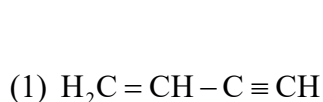
(3) Chlordiazepoxide

(3) Meprobamate

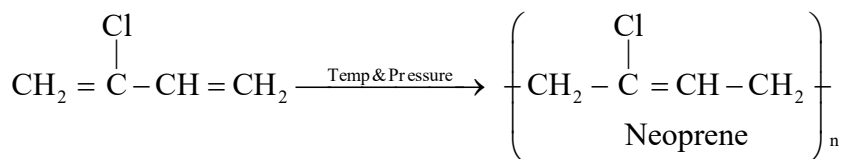
Sol. (2)

Veronal is an example of barbiturates.

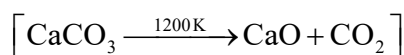
65. Which amongst the following molecules of polymerization produces neoprene :



Sol. (4)



66. The right option for the mass of CO_2 produced by heating 20 g of 20% pure limestone is (Atomic mass of Ca = 40)



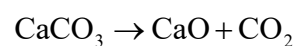
- (1) 2.64 g (2) 1.32 g (3) 1.12 g (4) 1.76 g

Sol. (4)

Weight of impure limestone = 20 g

Weight of pure limestone (CaCO_3) = 20% of 20 g

$$= \frac{20}{100} \times 20 = 4\text{g} \qquad n_{\text{CaCO}_3} = \frac{4}{100} = 0.04$$



$$n=0.04$$

$$n=0.04$$

$$n_{\text{CO}_2} = 0.04$$

$$W_{\text{CO}_2} = 0.04 \times 44 = 1.76 \text{ g}$$

67. Which one of the following statement is correct ?

- (1) The bone in human body is an inert and unchanging substance.
(2) Mg plays roles in neuromuscular function and interneuronal transmission.
(3) The daily requirement of Mg and Ca in the human body is estimated to the 0.2-0.3 g.
(4) All enzymes that utilise ATP in phosphate trnasfer require Ca as the cofactor.

Sol. (3)

The daily requirement in the human body has been estimated to be 200-300 mg (NCERT : s-block) Biological importance of magnesium and calcium.

68. Match List-I with List-II

List-I

- (A) Coke
(B) Diamond
(C) Fullerenes
(D) Graphite

List-II

- (I) Carbon atoms are sp^3 hybridised
(II) Used as a dry lubricant
(III) Used as a reducing agent
(IV) Cage like molecules

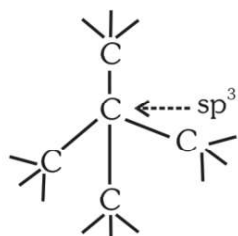
Choose the correct answer from the options given below :

- (1) A-III, B-I, C-IV, D-II (2) A-III, B-IV, C-I, D-II
(3) A-II, B-IV, C-I, D-III (4) A-IV, B-I, C-II, D-III

Sol. (1)

Coke : It is used as reducing agent in carbon reduction methods. (in metallurgical process)

Diamond : It is an allotrope of carbon in which each carbon is sp^3 hybridised.



Fullerenes : It contains pentagonal & hexagonal rings (cage like structure)

Graphite : It is a soft solid because graphite layers are bonded with weak Vander Wall attractions.

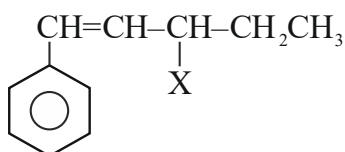
69. The stability of Cu^{2+} is more than Cu^+ salts in aqueous solution due to :

- (1) hydration energy (2) second ionisation enthalpy
(3) first ionisation enthalpy (4) enthalpy of atomization

Sol. (1)

Second ionization enthalpy of copper is compensated by hydration enthalpy because Cu^{2+} has much higher hydration enthalpy than Cu^+ .

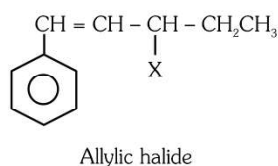
70. The given compound



is an example of

- (1) allylic halide (2) vinylic halide (3) benzylic halide (4) aryl halide

Sol. (1)



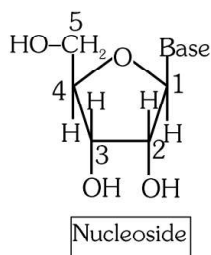
71. Given below are two statements :

Statement I : A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside**Statement II :** When nucleoside is linked to phosphorous acid at 5'-position of sugar moiety, we get nucleotide.

In the light of the above statements, choose the correct answer from the options given below :

- (1) **Statement I** is true but **Statement II** is false. (2) **Statement I** is false but **Statement II** is true.
 (3) Both **Statement I** and **Statement II** are true. (4) Both **Statement I** and **Statement II** are false.

Sol. (1)



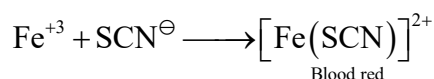
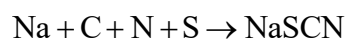
Base link with 1' position of sugar in nucleoside so statement I is correct

72. In Lassaigne's extract of an organic compound both nitrogen and sulphur are present, which gives blood red colour with Fe^{3+} due to the formation of

- (1) $[\text{Fe}(\text{CN})_5 \text{NOS}]^{4-}$ (2) $[\text{Fe}(\text{SCN})]^{2+}$ (3) $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3 \cdot x\text{H}_2\text{O}$ (4) NaSCN

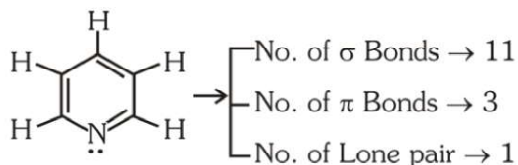
Sol. (2)

In case nitrogen and sulphur both are present in an organic compound, sodium thiocyanate is formed, it gives blood red colour and no prussian blue since there are no free cyanide ions

73. The number of σ bonds, π bonds and lone pair of electrons in pyridine, respectively are :

- (1) 11, 3, 1 (2) 12, 2, 1 (3) 11, 2, 0 (4) 12, 3, 0

Sol. (1)



74. A compound is formed by two elements A and B. The element B forms cubic close packed structure and atoms of A occupy $\frac{1}{3}$ of tetrahedral voids. If the formula of the compound is A_xB_y , then the value of $x + y$ is in option

(1) 3

(2) 2

(3) 5

(4) 4

Sol. (3)

A

B

$$\frac{1}{3} \text{ THV}$$

CCP

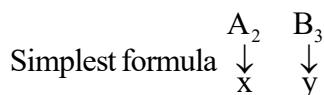
$$\Rightarrow Z_A = \frac{1}{3} \times 8 = \frac{8}{3}$$

$$Z_B = 4$$

$$\Rightarrow = \frac{8}{3} : 4$$

$$\Rightarrow \frac{2}{3} : 1$$

$$2 : 3$$



$$x + y = 5$$

75. The correct order of energies of molecular orbitals of N_2 molecule is :

$$(1) \sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < \sigma^* 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y)$$

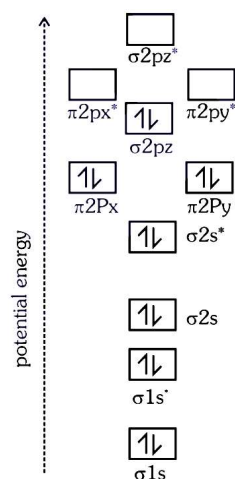
$$(2) \sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma 2p_z < \sigma^* 2p_z$$

$$(3) \sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < \sigma 2p_z < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$$

$$(4) \sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$$

Sol. (3)

Molecular orbital (energy) diagram/ sequence of N_2



76. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :
- Assertion A :** Metallic sodium dissolves in liquid ammonia giving a deep blue solution, which is paramagnetic.
- Reasons R :** The deep blue solution is due to the formation of amide.
- In the light of the above statements, choose the correct answer from the options given below :
- (1) A is true but R is false.
 - (2) A is false but R is true
 - (3) Both A and R are true and R is the correct explanation of A.
 - (4) Both A and R are true and R is **NOT** the correct explanation of A.

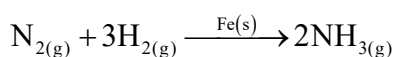
Sol. (1)

Assertion is correct because all Alkali metals give deep blue solution by giving electrons.

Reason : is incorrect because deep blue solution appears due to the presence of ammoniated electron or solvated electrons.

77. Which one is an example of heterogeneous catalysis ?
- (1) Decomposition of ozone in presence of nitrogen monoxide
 - (2) Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron.
 - (3) Oxidation of sulphur dioxide into sulphur trioxide in the presence of oxide of nitrogen.
 - (4) Hydrolysis of sugar catalysed by H^+ ions.

Sol. (2)



(Reactants and catalyst are in different phase) It is heterogeneous reaction

78. For a certain reaction, the rate = $k[A]^2[B]$, when the initial concentration of A is tripled keeping concentration of B constant, the initial rate would

- (1) increase by a factor of nine (2) increase by a factor of three.
 (3) decrease by a factor of nine (4) increase by a factor of six

Sol. (1)

$$\text{Rate} = k[A]^2[B]$$

If [A] is tripled and [B] is kept constant.

$$r^1 = k[3A]^2[B] \quad r^1 = 9k[A]^2[B] \quad r^1 = 9r$$

Increased by a factor of nine

79. Select the correct statements from the following :

- (A) Atoms of all elements are composed of two fundamental particles.
 (B) The mass of the electron is 9.10939×10^{-31} kg.
 (C) All the isotopes of a given element show same chemical properties
 (D) Protons and electrons are collectively known as nucleons.
 (E) Dalton's atomic theory, regarded the atom as an ultimate particle of matter.

Choose the correct answer from the options given below :

- (1) A and E only (2) B, C and E only (3) A, B and C only (4) C, D and E only

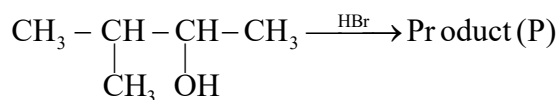
Sol. (2)

It is statement based question.

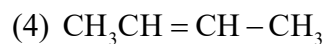
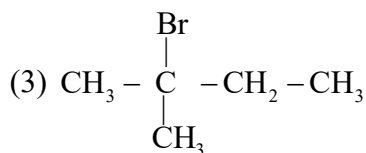
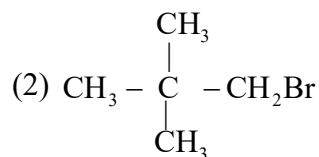
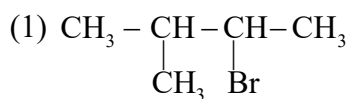
Statements B, C & E are correct.

- (B) Mass of the electron is 9.10939×10^{-31} kg
 (C) All the isotopes of given elements show same chemical properties.
 (E) Dalton's atomic theory, regarded the atom as an ultimate particle of matter.

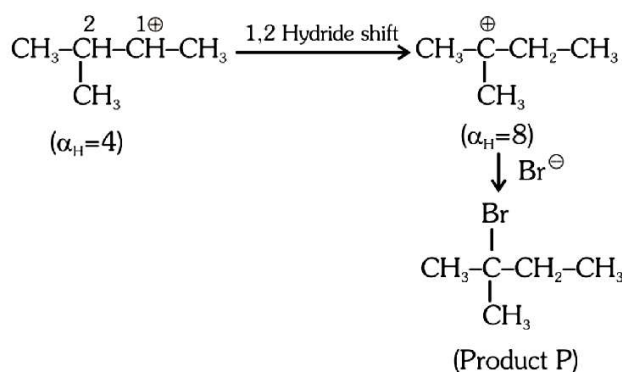
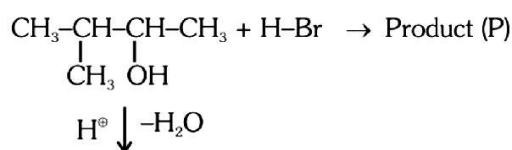
80. Consider the following reaction and identify the product (P).



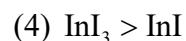
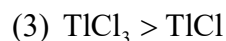
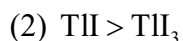
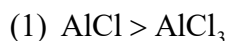
3-Methylbutan-2-ol



Sol. (3)

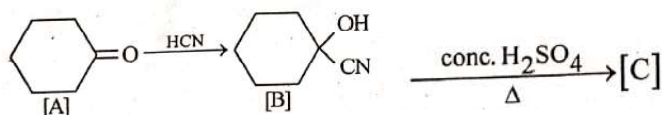


81. Taking stability as the factor, which one of the following represents correct relationship ?

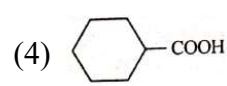
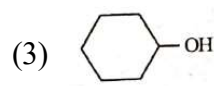
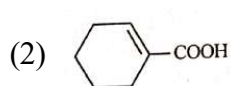


Sol. (2)

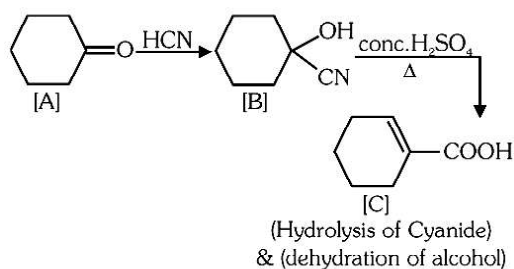
82. Complete the following reaction :



[C] is



Sol. (2)



83. The conductivity of centimolar solution of KCl at 25°C is $0.0210 \text{ ohm}^{-1} \text{ cm}^{-1}$ and the resistance of the cell containing the solution at 25°C is 60 ohm. The value of cell constant is

- (1) 1.26 cm^{-1} (2) 3.34 cm^{-1} (3) 1.34 cm^{-1} (4) 3.28 cm^{-1}

Sol. (1)

$$\text{Centimolar solution} = \frac{1}{100} \text{ M} = 0.01 \text{ M}$$

$$\text{Conductivity (k)} = 0.0210 \text{ ohm}^{-1} \text{ cm}^{-1}$$

$$\text{Resistance (R)} = 60 \text{ ohm}$$

$$k = \frac{1}{R} \left(\frac{\ell}{A} \right) \Rightarrow 0.0210 = \frac{1}{60} \left(\frac{\ell}{A} \right) \Rightarrow \frac{\ell}{A} = 1.26 \text{ cm}^{-1}$$

84. The element expected to form largest ion to achieve the nearest noble gas configuration is :

- (1) N (2) Na (3) O (4) F

Sol. (1)

After achieve the nearest noble gas configuration all species becomes isoelectronic so largest size will be poses by N due to its lowest atomic number.

85. Intermolecular forces are forces of attraction and repulsion between interacting particles that will include :

- (A) dipole–dipole forces. (B) dipole–induced dipole forces
(C) hydrogen bonding (D) covalent bonding
(E) dispersion forces.

Choose the most appropriate answer from the options given below :

- (1) A, B, C, E are correct (2) A, C, D, E are correct
(2) B, C, D, E are correct (4) A, B, C, D are correct

Sol. (1)

Intermolecular forces means force of attraction between two or more molecules
dipole-dipole (attraction between two or more polar molecules).

Dipole induced dipole (attraction between polar and non polar molecules)

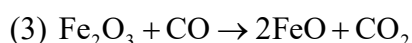
Hydrogen bonding (it is a special type of dipole-dipole and ion-dipole attraction)

Dispersion forces (mainly acts between non polar molecules).

Covalent bonding (acts between atom not between molecules)

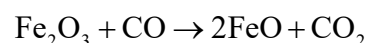
Section-B (Chemistry)

86. The reaction that does NOT take place in a blast furnace between 900 K to 1500 K temperature range during extraction of iron is :



Sol. (3)

Reaction



This reaction takes place at temperature (500 K–800K) not at (900 K to 1500 K)

87. Match List -I with List-II.

List-I (Oxoacids of sulphur)

(A) Peroxodisulphuric acid

(B) Sulphuric acid

(C) Pyrosulphuric acid

(D) Sulphurous acid

List-II (Bonds)

(I) Two S–OH, Four S=O, One S–O–S

(II) Two S–OH, One S=O

(III) Two S–OH, Four S=O, One S–O–O–S

(IV) Two S–OH, Two S=O

Choose the correct answer from the options given below :

(1) A–I, B–III, C–IV, D–II

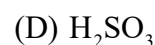
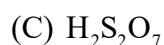
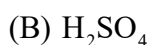
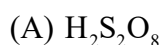
(2) A–III, B–IV, C–II, D–I

(3) A–I, B–III, C–II, D–IV

(4) A–III, B–IV, C–I, D–II

Sol. (4)

The given acid in list-I has following formula



88. Pumice stone is an example of

(1) solid sol

(2) foam

(3) sol

(4) gel

Sol. (1)

Pumice stone is an example of solid state

89. Given below are two statements :

Statement I : The nutrient deficient bodies lead to eutrophication.

Statement II : Eutrophication lead decrease in the level of oxygen in the bodies.

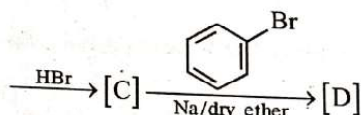
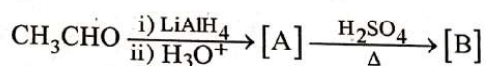
In the light of the above statements of the correct answer from the options below :

- (1) **Statement I** is correct but **Statement II** is false.
- (2) **Statement I** is incorrect but **Statement II** is true
- (3) Both **Statement I** and **Statement II** are true.
- (4) Both **Statement I** and **Statement II** are false.

Sol. (2)

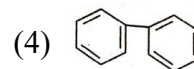
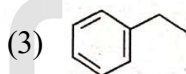
Nutrient enriched water bodies lead to eutrophication.

90. Identify the final product [D] obtained the following sequence of reactions

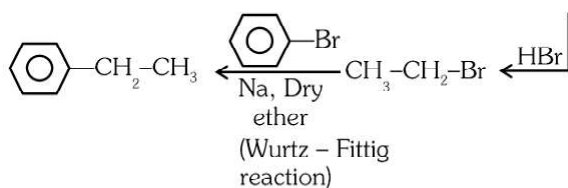
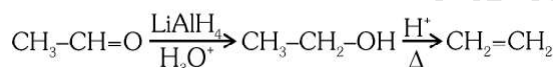


(1) C_4H_{10}

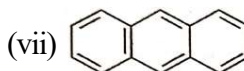
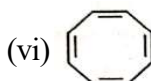
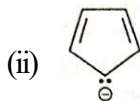
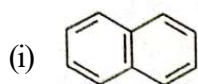
(2) $\text{HC} \equiv \text{C}^\ominus \text{Na}^+$



Sol. (3)



91. Consider the following compounds/species :



The number of compound/species which obey Huckel's rule is.....

(1) 2

(2) 5

(3) 4

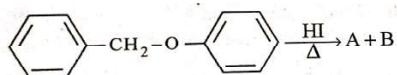
(4) 6

Sol. (3)

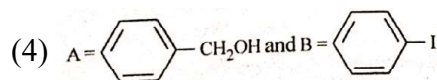
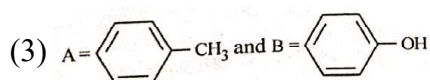
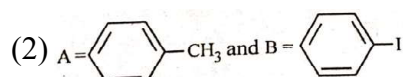
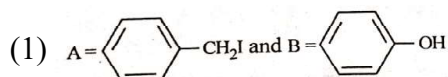
Huckle's rule = $(4n + 2) \pi$ electrons

Comp (i), (ii), (v), (vii) obey Huckle's rule

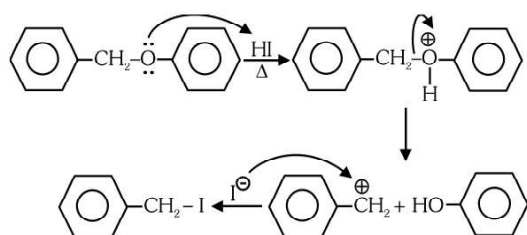
92. Consider the following reaction :



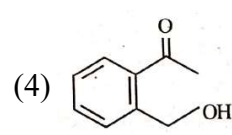
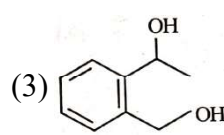
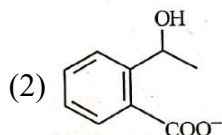
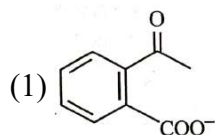
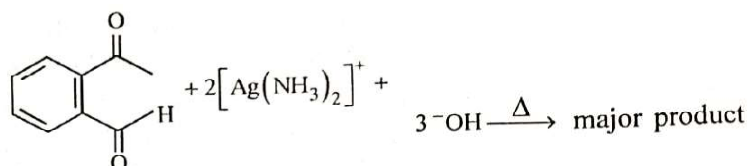
Identify products A and B.



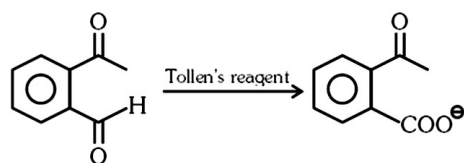
Sol. (1)



93. Identify the major product obtained in the following reaction :



Sol. (1)



94. Which complex compound is most stable ?

- (1) $[\text{CoCl}_2(\text{en})_2]\text{NO}_3$ (2) $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3$
 (3) $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Br}](\text{NO}_3)_2$ (4) $[\text{Co}(\text{NH}_3)_3(\text{NO}_3)_3]$

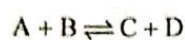
Sol. (1)

(en) is ligand produces chelating effect and hence increases the stability of complex .

95. The equilibrium concentrations of the species in the reaction $\text{A} + \text{B} \rightleftharpoons \text{C} + \text{D}$ are 2, 3, 10 and 6 mol L⁻¹, respectively at 300 K. ΔG° for the reaction is (R=2 cal/mol K)

- (1) -1381.80 cal (2) -13.73 cal (3) 1372.60 cal (4) -137.26 cal

Sol. (1)



$$[\text{A}] = 2 \text{ mol L}^{-1}$$

$$[\text{B}] = 3 \text{ mol L}^{-1}$$

$$[\text{C}] = 10 \text{ mol L}^{-1}$$

$$[\text{D}] = 6 \text{ mol L}^{-1}$$

$$\Delta G^\circ = -2.303 RT \log K_{\text{eq}}$$

$$= -2.303 RT \log \frac{[\text{C}][\text{D}]}{[\text{A}][\text{B}]}$$

$$= -2.303 \times 2 \times 300 \times \log \frac{10 \times 6}{2 \times 3} = -2.303 \times 2 \times 300 \times \log 10 = -1381.8 \text{ cal}$$

96. What fraction of one edge centred octahedral void lies in one unit cell of fcc?

- (1) 1/4 (2) 1/12 (3) 1/2 (4) 1/3

Sol. (1)

→ Edge centered octahedral void is shared between four unit cells

→ Per unit cell contribution is 1/4

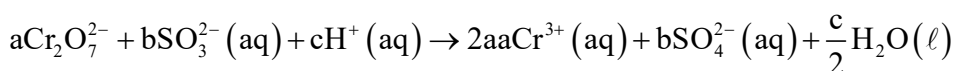
97. Which amongst the following options is the correct relation between change in enthalpy and change in internal energy ?

- (1) $\Delta H - \Delta U = -\Delta n_g RT$ (2) $\Delta H + \Delta U = \Delta n_g RT$ (3) $\Delta H = \Delta U - \Delta n_g RT$ (4) $\Delta H = \Delta U + \Delta n_g RT$

Sol. (4)

$$\Delta H = \Delta U + \Delta n_g RT$$

98. On balancing the given redox reaction,

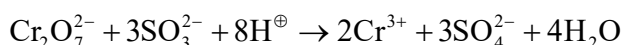
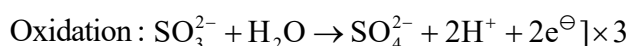


the coefficients a, b and c are found to be, respectively-

- (1) 1, 8, 3 (2) 8, 1, 3 (3) 1, 3, 8 (4) 3, 8, 1

Sol. (3)

Reaction has to be balanced in acidic medium 'O' atoms are balanced by adding H_2O and then H-atom is balanced by adding H^+ ions and charge is balanced by e^-



$$a = 1 \qquad b = 3 \qquad c = 8$$

99. Which of the following statements are **INCORRECT** ?

- (A) All the transition metals except scandium form MO oxides which are ionic.
 (B) The highest oxidation number corresponding to the group number in transition metal oxides is attained in Sc_2O_3 to Mn_2O_7 .
 (C) Basic character increases from V_2O_3 to V_2O_4 to V_2O_5 .
 (D) V_2O_4 dissolves in acids to give VO_4^{3-} salts.
 (E) CrO is basic but Cr_2O_3 is amphoteric

Choose the correct answer from the options given below :

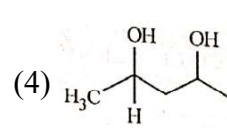
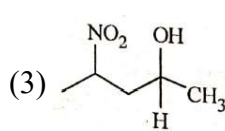
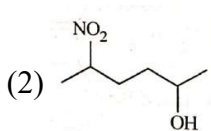
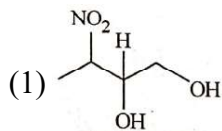
- (1) C and D only (2) B and C only (3) A and E only (4) B and D only

Sol. (1)

As oxidation number increases acid strength increases and basic character decreases so option C is incorrect.

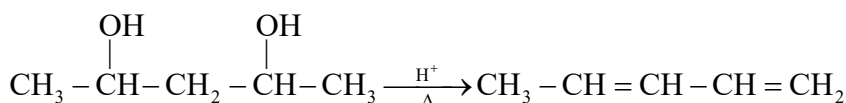
When V_2O_4 dissolves in acids gives salt having same oxidation number

100. Which amongst the following will be most readily dehydrated under acidic conditions ?



Sol. (4)

Due to presence of conjugation in product.



Section-A (Biology : Botany)

101. In tissue culture experiments. leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called as:

- (1) Development (2) Senescence (3) Differentiation (4) Dedifferentiation

Sol. (4)

NCERT (XII) Page No. 177

102. In the equation $GPP - R = NPP$ GPP is Gross Primary Productivity NPP is Net Primary Productivity R here is _____.

- (1) Respiratory loss (2) Reproductive allocation
(3) Photosynthetically active radiation (4) Respiratory quotient

Sol. (1)

NCERT (XII) Page No. 243

103. Given below are two statement :

Statement I : The forces generated by transpiration can lift a xylem-sized column of water over 130 meters height.

Statement II : Transpiration cools leaf surfaces sometimes 10 to 15 degrees, by evaporative cooling.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) **Statement I** is correct but **Statement II** is incorrect.
(2) **Statement I** is incorrect but **Statement II** is correct.
(3) Both **Statement I** and **Statement II** are correct.
(4) Both **Statement I** and **Statement II** are incorrect.

Sol. (3)

NCERT (XI) Page No. 188-189

104. In angiosperm the haploid, diploid and triploid structures of a fertilized embryo sac sequentially are :

- (1) Synergids, Zygote and Primary endosperm nucleus.
(2) Synergids, antipodals and Polar nuclei
(3) Synergids, Primary endosperm nucleus and zygote
(4) Antipodals, synergids, and primary endosperm nucleus

Sol. (1)

NCERT (XII) Page No. 34

105. Given below are two statement :

Statement I : Endarch and exarch are the terms often used for describing the position of secondary xylem in the plant body

Statement II : Exarch condition is the most common feature of the root system.

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) **Statement I** is correct but **Statement II** is false.
- (2) **Statement I** is incorrect but **Statement II** is true.
- (3) Both **Statement I** and **Statement II** are true.
- (4) Both **Statement I** and **Statement II** are false.

Sol. (2)

NCERT (XI) Page No. 87

106. How many ATP and NADPH_2 are required for the synthesis of one molecule of Glucose during Calvin cycle?

- (1) 12 ATP and 16 NADPH₂
- (2) 18 ATP and 16 NADPH₂
- (3) 12 ATP and 12 NADPH₂
- (4) 18 ATP and 12 NADPH₂

Sol. (4)

NCERT (XI) Page No. 218

107. Spraying of which of the following phytohormone on juvenile conifers helps in hastening the maturity period, that leads to early seed production?

- (1) Zeatin (2) Absciscic acid (3) Indole-3-butyric Acid (4) Gibberellic Acid

Sol. (4)

NCERT (XI) Page No. 249

108. Among eukaryotes replication of DNA takes place in -

- (1) G₁ phase (2) G₂ (3) M Phase (4) S phase

Sol. (4)

NCERT (XI) Page No. 163-164

109. Identify the **correct** statements :

- A. Detritivores perform fragmentation
- B. The humus is further degraded by some microbes during mineralization.
- C. Water soluble inorganic nutrients go down into the soil and get kprecipitated by a process called leaching.
- D. The detritus food chain begins with living organisms :
- E. Earthworms break down detritus into smaller particles by a process called catabolism.

Choose the **correct** answer from the options given below :

- (1) C, D, E only (2) D, E, A only (3) A, B, C only (4) B, C, D only

Sol. (3)

NCERT (XII) Page No. 243-244

110. Identify the pair of heterosporous pteridophytes among the following :

- (1) *Psilolum* and *Salvinia*
 (2) *Lycopodium* and *Selaginella*

Sol. (4)

NCERT (XI) Page No. 38

111. Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R** :

Assertion A : First ATP is used in converting glucose into glucose-6-phosphate and second ATP is used in conversion of fructose-6-phosphate into fructose-1,6-diphosphate.

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) **A** is true but **R** is false.
- (2) **A** is false but **R** is true.
- (3) Both **A** and **R** are true and **R** is the correct explanation of **A**.
- (4) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.

Sol. (3)

NCERT (XI) Page No. 229

112. Among 'The Evil Quartet', which one is considered the most important cause driving extinction of species?

- (1) Alien species invasions.
- (2) Co-extinctions
- (3) Habitat loss and fragmentation
- (4) Over exploitation for economic gain

Sol. (3)

NCERT (XI) Page No. 264-265

113. Unequivocal proof that DNA is the genetic material was first proposed by

- (1) Avery, Macleod and McCarthy
- (2) Wilkins and Franklin
- (3) Frederick Griffith
- (4) Alfred Hershey and Martha Chase

Sol. (4)

NCERT (XII) Page No. 102

114. The thickness of ozone in a column of air in the atmosphere is measured in terms of:

- (1) Decameter
- (2) Kilobase
- (3) Dobson units
- (4) Decibels

Sol. (3)

NCERT (XII) Page No. 282

115. Which micronutrient is required for splitting of water molecule during photosynthesis?

- (1) Magnesium
- (2) Copper
- (3) Manganese
- (4) Molybdenum

Sol. (3)

NCERT (XI) Page No. 198

116. Family Fabaceae differs from Solanaceae and Liliaceae. With respect to the stamens, pick out the characteristics specific to family Fabaceae but not found in Solanaceae or Liliaceae.

- (1) Monoadelphous and Monothealous anthers
- (2) Epiphyllous and Dithealous anthers
- (3) Diadelphous and Dithealous anthers
- (4) Polyadelphous and epipetalous stamens

Sol. (3)

NCERT (XI) Page No. 79

117. Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R**:

Assertion A : The first stage of gametophyte in the life cycle of moss is protonema stage.

Reason R : Protonema develops directly from spores produced in capsule.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) A is correct but R is not correct,
- (2) A is not correct but R is correct,
- (3) Both A and R are correct and R is the correct explanation of A.
- (4) Both A and R are correct but R is NOT the correct explanation of A.

Sol. (3)

NCERT (XI) Page No. 36

118. Expressed Sequence Tags (ESTs) refers to

- (1) All genes whether expressed or unexpressed.
- (2) Certain important expressed genes.
- (3) All genes that are expressed as RNA.
- (4) All genes that are expressed as proteins.

Sol. (3)

NCERT (XII) Page No. 119

119. Frequency of recombination between gene pairs on same chromosome as a measure of the distance between genes to map their position on chromosome, was used for the first time by

- (1) Alfred Sturtevant
- (2) Henking
- (3) Thomas Hunt Morgan
- (4) Sutton and Boveri

Sol. (1)

NCERT (XII) Page No. 83

120. Large, colourful, fragrant flowers with nectar are seen in :

- (1) Bat pollinated plants
- (2) Wind pollinated plants
- (3) Insect pollinated plants
- (4) Bird pollinated plants

Sol. (3)

NCERT (XII) Page No. 30

121. Movement and accumulation of ions across a membrane against their concentration gradient can be explained by

- (1) Passive Transport
- (2) Active Transport
- (3) Osmosis
- (4) Facilitated Diffusion

Sol. (2)

NCERT (XI) Page No. 178

122. Upon exposure to UV radiation, DNA stained with ethidium bromide will show

- (1) Bright yellow colour
- (2) Bright orange colour
- (3) Bright red colour
- (4) Bright blue colour

Sol. (2)

NCERT (XII) Page No. 198

123. Given below are two statements : One is Labelled as **Assertion A** and the other is labelled as **Reason R** :

Assertion A : Late wood has fewer xylary elements with narrow vessels.

Reason R : Cambium is less active in winters,

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) A is true but R is false.
- (2) A is false but R is true.
- (3) Both A and R are true and R is the correct explanation of A
- (4) Both A and R are true but R is NOT the correct explanation of A.

Sol. (3)

NCERT (XI) Page No. 96

124. Axile placentation is observed in

- (1) Tomato, Dianthus and Pea
- (2) China rose, Petunia and lemon
- (3) Mustard, Cucumber and Primrose
- (4) China rose, Beans and Lupin

Sol. (2)

NCERT (XI) Page No. 75

125. The phenomenon of pleiotropism refers to

- (1) A single gene affecting multiple phenotypic expression.
- (2) More than two genes affecting a single character.
- (3) Presence of several alleles of a single gene controlling a single crossover.
- (4) Presence of two alleles, each of the two genes controlling a single trait.

Sol. (1)

NCERT (XII) Page No. 85

126. During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out

- (1) Histones
- (2) Polysaccharides
- (3) RNA
- (4) DNA

Sol. (4)

NCERT (XII) Page No. 201

127. Which hormone promotes internode/petiole elongation in deep water rice?

- (1) Ethylene
- (2) 2, 4-D
- (3) GA₂
- (4) Pachytene

Sol. (1)

NCERT (XI) Page No. 250

128. The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis?

- (1) Diplotene
- (2) Diakinesis
- (3) Zygotene
- (4) Pachytene

Sol. (4)

NCERT (XI) Page No. 268

129. What is the role of RNA polymerase III in the process of transcription in Eukaryotes?

- (1) Transcription of precursor of mRNA (2) Transcription of only snRNAs
(3) Transcription of rRNAs (28S, 18S and 5.8S) (4) Transcription of tRNA, 5 srRNA and sn RNA

Sol. (4)

NCERT (XII) Page No. 111

130. What is the function of tassels in the corn cob?

- (1) To disperse pollen grains (2) To protect seeds
(3) To attract insects (4) To trap pollen grains

Sol. (4)

NCERT (XII) Page No. 29

131. In gene gun method used to introduce alien DNA into host cells, microparticles of _____ metal are used.

- (1) Tungsten or gold (2) Silver (3) Copper (4) Zinc

Sol. (1)

NCERT (XII) Page No. 201

132. Cellulose does not form blue colour with Iodine because

- (1) It does not contain complex helices and hence cannot hold iodine molecules.
(2) It breaks down when iodine reacts with it,
(3) It is a disaccharide.
(4) It is a helical molecule.

Sol. (1)

NCERT (XI) Page No. 148

133. Which of the following stages of meiosis involves division of centromere?

- (1) Anaphase II (2) Telophase (3) Metaphase I (4) Metaphase II

Sol. (1)

NCERT (XI) Page No. 169

134. The reaction centre in PS II has an absorption maxima at

- (1) 660 nm (2) 780 nm (3) 680 nm (4) 700 nm

Sol. (3)

NCERT (XI) Page No. 211

135. The historic Convention on Biological Diversity, 'The Earth Summit' was held in Rio de Janeiro in the year:

- (1) 1986 (2) 2002 (3) 1985 (4) 1992

Sol. (4)

NCERT (XII) Page No. 267

Section - B (Biology : Botany)

136. Match **List I** with **List II** :

List I	List II
A. M Phase	I. Proteins are synthesized
B. G ₂ Phase	II. Inactive phase
C. Quiescent stage	III. Interval between mitosis and initiation of DNA replication
D. G ₁ Phase	IV. Equational division

Choose the correct answer from the options given below :

- (1) A-IV, B-I, C-II, D-III (2) A-II, B-IV, C-I, D-III
(3) A-III, B-II, C-IV, D-I (4) A-IV, B-II, C-I, D-III

Sol. (1)

NCERT (XI) Page No. 163-164

137. Given below are two statements :

Statement I : Gause's 'Competitive Exclusion Principle' states that two closely related species competing for the same resources cannot co-exist indefinitely and competitively inferior one will be eliminated eventually

Statement II : In general, carnivores are more adversely affected by competition than herbivores

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) **Statement I** is correct but **Statement II** is false.
(2) **Statement I** is incorrect but **Statement II** is true.
(3) Both **Statement I** and **Statement II** are true.
(4) Both **Statement I** and **Statement II** are false.

Sol. (1)

NCERT (XII) Page No. 235

138. How many different proteins does the ribosome consist of?

- (1) 40 (2) 20 (3) 80 (4) 60

Sol. (3)

NCERT (XII) Page No. 115

139. Match **List I** with **List II** :

List I	List II
A. Oxidative decarboxylation	I. Citrate synthase
B. Glycolysis	II. Pyruvate dehydrogenase
C. Oxidative phosphorylation	III. Electron transport system
D. Tricarboxylic acid cycle	IV. EMP Pathway

Choose the correct answer from the options given below :

- (1) A-III, B-I, C-II, D-IV (2) A-II, B-IV, C-III, D-I
(3) A-III, B-IV, C-II, D-I (4) A-II, B-IV, C-I, D-III

Sol. (2)

NCERT (XI) Page No. 228-231-232

140. Which of the following statements are correct about Klinefelter's Syndrome?

- A. This disorder was first described by Langdon Down (1866).
B. Such an individual has overall masculine development. However, the feminine development is also expressed.
C. The affected individual is short statured
D. Physical, psychomotor and mental development is retarded.
E. Such individuals are sterile.

Choose the **Correct** answer form the options given below :

- (1) B and E only (2) A and E only (3) A and B only (4) C and D only

Sol. (1)

NCERT (XII) Page No. 92

141 Melonate inhibits the growth of pathogenic bacteria by inhibiting the activity of

- (1) Lipase (2) Dinitrogenase
(3) Succinic dehydrogenase (4) Amylase

Sol. (3)

NCERT (XI) Page No. 158

142. Which of the following combinations is required for chemiosmosis?

- (1) Proton pump, electron gradient, ATP synthase
(2) proton pump, electron gradient, NADP synthase
(3) membrane, proton, pump, proton gradient, ATP synthase
(4) proton gradient, NADP synthase

Sol. (3)

NCERT (XI) Page No. 233-234

143. Match **List I** with **List II** :

- | List I | List II |
|--------------------|---|
| A. Cohesion | I. More attraction in liquid phase |
| B. Adhesion | II. Mutual attraction among water molecules |
| C. Surface tension | III. Water loss in liquid phase |
| D. Guttation | IV. Attraction toward's polar surfaces |

Choose the **correct** answer from the options given below :

- (1) A-III, B-I, C-IV, D-II (2) A-II, B-I, C-IV, D-III
(3) A-II, B-IV, C-I, D-III (4) A-IV, B-III, C-II, D-I

Sol. (3)

NCERT (XI) Page No. 188

144. Match **List I** with **List II** :

List I	List II
A. Iron	I. Synthesis of auxin
B. Zinc	II. Component of nitrate reductase
C. Boron	III. Activator of catalase
D. Molybdenum	IV. Cell elongation and differentiation

Choose the **correct** answer from the options given below :

- (1) A-III, B-I, C-IV, D-II (2) A-II, B-IV, C-I, D-III
(3) A-III, B-II, C-I, D-IV (4) A-II, B-III, C-IV, D-I

Sol. (1)

NCERT (XI) Page No. 197-198

145. Main steps in the formation of Recombinant DNA are given below. Arrange these steps in a correct sequence.

- A. Insertion of recombinant DNA into the host cell.
B. Cutting of DNA at specific location by restriction enzyme
C. Isolation of desired DNA fragment.
D. Amplification of gene of interest using PCR.

Choose the **correct** answer from the options given below :

- (1) C,B,D,A (2) B,D,A,C (3) B,C,D,A (D) C,A,B,D

Sol. (3)

NCERT (XII) Page No. 201-203

146. Match **List I** with **List II** :

List I (Interaction)	List II (Species A and B)
A. Mutualism	I. +(A), O(B)
B. Commensalism	II. -(A), O(B)
C. Amensalism	III. +(A), -(B)
D. Parasitism	IV. +(A), +(B)

Choose the **correct** answer from the options given below :

- (1) A-IV, B-III, C-I, D-II (2) A-III, B-I, C-IV, D-II
(3) A-IV, B-II, C-I, D-III (4) A-IV, B-I, C-II, D-III

Sol. (4)

NCERT (XII) Page No. 232

147. Given below are two statements: One is labelled as **Assertion A** and the other is labelled as **Reason R**:

Assertion A : A flower is defined as modified shoot wherein the shoot apical meristem changes to floral meristem.

Reason R : Internode of the shoot gets condensed to produce different floral appendages laterally at successive nodes instead of leaves.

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) **A** is true but **R** is false.
- (2) **A** is false but **R** is true.
- (3) Both **A** and **R** are true and **R** is the correct explanation of **A**
- (4) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.

Sol. (3)

NCERT (XI) Page No. 71

148. Which one of the following statements is **NOT** correct:

- (1) Water hyacinth grows abundantly in eutrophic water bodies and leads to an imbalance in the ecosystem dynamics of the water body.
- (2) The amount of some toxic substances of industrial waste water increases in the organisms at successive trophic levels.
- (3) The micro-organisms involved in biodegradation of organic matter in a sewage polluted water body consume a lot of oxygen causing the death of aquatic organisms.
- (4) Algal blooms caused by excess of organic matter in water improve water quality and promote fisheries.

Sol. (4)

NCERT (XII) Page No. 275-276

149. Identify the **correct** statements :

- A. Lenticels are the lens-shaped openings permitting the exchange of gases.
- B. Bark formed early in the season is called hard bark.
- C. Bark is a technical term that refers to all tissues exterior to vascular cambium.
- D. Bark refers to periderm and secondary phloem.
- E. Phellogen is single-layered in thickness

Choose the **correct** answer from the options given below :

- (1) A, B and D only
- (2) B and C only
- (3) B, C and E only
- (4) A and D only

Sol. (4)

NCERT (XI) Page No. 96-97

150. Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R**:

Assertion A : In gymnosperms the pollen grains are released from the microsporangium and carried by air currents

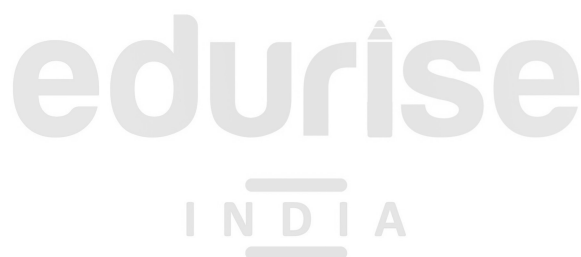
Reason R : Air currents carry the pollen grains to the mouth of the archegonia when the male gametes are discharged and pollen tube is not formed.

In the light of the above statements, choose the **correct** answer from the options given below :

- (1) **A** is true but **R** is false.
- (2) **A** is false but **R** is true.
- (3) Both **A** and **R** are true and **R** is the correct explanation of **A**.
- (4) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

Sol. (1)

NCERT (XI) Page No. 39



Section - A (ZOOLOGY)

151. Match **List I** with **List II**.

List I	List II
A. Heroin	I. Effect on cardiovascular system
B. Marijuana	II. Slow down body function
C. Cocaine	III. Painkiller
D. Morphine	IV. Interfere with transport of dopamine

Choose the correct answer from the options given below :

- | | |
|----------------------------|----------------------------|
| (1) A-IV, B-III, C-II, D-I | (2) A-III, B-IV, C-I, D-II |
| (3) A-II, B-I, C-IV, D-III | (4) A-I, B-II, C-III, D-IV |

Sol. (3)

NCERT (XII) Page no. 158-159

152. Given below are two statements:

Statement I: RNA mutates at a faster rate.**Statement II:** Viruses having RNA genome and shorter life span mutate and evolve faster.In the light of the above statements, choose the **correct** answer from the options given below:

- (1) **Statement I** is true but **statement II** is false.
(2) **Statement I** false but **Statement II** is true.
(3) Both **Statement I** and **Statement II** are true.
(4) Both **Statement I** and **Statement II** are false.

Sol. (3)

NCERT (XII) Page No. 103

153. Given below are two statements:

Statement I : Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct.**Statement II :** The cavity of the cervix is called cervical canal which along with vagina forms birth canal.In the light of the above statements, choose the **correct** answer from the options given below:

- (1) **Statement I** is correct but **Statement II** is false.
(2) **Statement I** incorrect but **Statement II** is true.
(3) Both **Statement I** and **Statement II** are true.
(4) Both **Statement I** and **Statement II** are false.

Sol. (3)

NCERT (XII) Page No. 46

154. Which of the following functions is carried out by cytoskeleton in a cell?

- (1) Motility (2) Transportation (3) Nuclear division (4) Protein synthesis

Sol. (1)

NCERT (XI) Page No. 136

155. Which of the following statements are correct regarding female reproductive cycle?

- A. In non-primate mammals cyclical changes during reproduction are called oestrus cycle.
 B. First menstrual cycle begins at puberty and is called menopause
 C. Lack of menstruation may be indicative of pregnancy.
 D. Cyclic menstruation extends between menarche and menopause.

Choose the **most appropriate** answer from the options given below:

- (1) A, B and C only (2) A, C and D only (3) A and D only (4) A and B only

Sol. (2)

NCERT (XII) Page No. 49-59

156. Match **List I** with **List II**.

List I

- A. Vasectomy
 B. Coitus interruptus
 C. Cervical caps
 D. Saheli

List II

- I. Oral method
 II. Barrier method
 III. Surgical method
 IV. Natural method

Choose the **correct** answer from the options given below:

- (1) A-II, B-III, C-I, D-IV (2) A-IV, B-II, C-I, D-III
 (3) A-III, B-I, C-IV, D-II (4) A-III, B-IV, C-II, D-I

Sol. (4)

NCERT (XII) Page No. 60-61

157. Which one of the following symbols represents mating between relatives in human pedigree analysis?

- (1)  (2)  (3)  (4) 

Sol. (4)

NCERT (XII) Page No. 88

158. Which of the following are NOT considered as the part of endomembrane system?

- A. Mitochondria B. Endoplasmic C. chloroplasts D. Golgi complex
 E. Peroxisomes

Choose the **most appropriate** answer from the options given below:

- (1) A and D only (2) A, D and E only (3) B and D only (4) A, C and E only

Sol. (4)

NCERT (XI) Page No. 133

159. Match **List I** with **List II** with respect to human eye.

List I	List II
A. Fovea	I. Visible coloured portion of eye that regulates diameter of pupil.
B. Iris	II. External layer of eye formed of dense connective tissue.
C. Blind spot	III. Point of great visual acuity or resolution.
D. Sclera	IV. Point where optic nerve leaves the eyeball and photoreceptor cells are absent.

Choose the correct answer from the options given below:

- | | |
|----------------------------|----------------------------|
| (1) A-I, B-IV, C-III, D-II | (2) A-II, B-I, C-III, D-IV |
| (3) A-III, B-I, C-IV, D-II | (4) A-IV, B-III, C-II, D-I |

Sol. (3)

NCERT (XI) Page No. 323-324

160. Match **List I** with **List II**

List I	List II
A. P-wave	I. Beginning of systole
B. Q-wave	II. Repolarisation of ventricles
C. QRS complex	III. Depolarisation of atria
D. T-wave	IV. Depolarisation of ventricles

Choose the correct answer from the options given below:

- | | |
|----------------------------|-----------------------------|
| (1) A-II, B-IV, C-I, D-III | (2) A-I, B-II, C-III, D-IV |
| (3) A-III, B-I, C-IV, D-II | (4) A-IV, B-III, C-III, D-I |

Sol. (3)

NCERT (XI) Page No. 286

161. Match **List I** with **List II**.

List I	List II
A. CCK	I. Kidney
B. GIP	II. Heart
C. ANF	III. Gastric gland
D. ADH	IV. Pancreas

Choose the correct answer from the options given below:

- | | |
|----------------------------|----------------------------|
| (1) A-II, B-IV, C-I, D-III | (2) A-IV, B-II, C-III, D-I |
| (3) A-IV, B-III, C-II, D-I | (4) A-III, B-II, C-IV, D-I |

Sol. (3)

NCERT (XI) Page No. 333,337,338

162. Match **List I** with **List II**.

List I	List II
A. Gene 'a'	I. β -galactosidase
B. Gene 'y'	II. Transacetylase
C. Gene 'i'	III. Permease
D. Gene 'z'	IV. Repressor protein

Choose the correct answer from the options given below :

- | | |
|----------------------------|----------------------------|
| (1) A-III, B-IV, C-I, D-II | (2) A-III, B-I, C-IV, D-II |
| (3) A-II, B-I, C-IV, D-III | (4) A-II, B-III, C-IV, D-I |

Sol. (4)

NCERT (XII) Page No.117

163. Vital capacity of lung is _____.

- | | |
|-------------------------|-------------------------|
| (1) IRV + ERV + TV – RV | (2) IRV + ERV + TV |
| (3) IRV + ERV | (4) IRV + ERV + TV + RV |

Sol. (2)

NCERT (XI) Page No. 272

164. Select is correct group/set of Australius Marsupials exhibiting adaptive radiation.

- (1) Mole, Flying squirrel, Tasmanian tiger cat
(2) Lemur, Anteater, Wolf
(3) Tasmanian wolf, Bobcat, Marsupial mole
(4) Numbat, Spotted cuscus, Flying phalanger

Sol. (4)

NCERT (XII) Page No. 113

165. Match **List I** with **List II**.

List I	List II
A. Ringworm	I. <i>Haemophilus influenzae</i>
B. Filariasis	II. <i>Trichophyton</i>
C. Malaria	III. <i>Wuchereria bancrofti</i>
D. Pneumonia	IV. <i>Plasmodium vivax</i>

Choose the correct answer from the options given below:

- | | |
|----------------------------|----------------------------|
| (1) A-III, B-II, C-I, D-IV | (2) A-III, B-II, C-IV, D-I |
| (3) A-II, B-III, C-IV, D-I | (4) A-II, B-III, C-I, D-IV |

Sol. (3)

NCERT (XII) Page No. 147-149

166. Match **List I** with **List II**.

List I	List II
(Type of Joint)	(Found between)
A. Cartilaginous Joint	I. Between flat skull bones
B. Ball and Socket Joint	II. Between adjacent vertebrae in vertebral column
C. Fibrous Joint	III. Between carpal and metacarpal of thumb
D. Saddle Joint	IV. Between Humerus and Pectoral girdle

Choose the correct answer from the options given below:

- | | |
|----------------------------|----------------------------|
| (1) A-I, B-IV, C-III, D-II | (2) A-II, B-IV, C-III, D-I |
| (3) A-III, B-I, C-II, D-IV | (4) A-II, B-IV, C-I, D-III |

Sol. (4)

NCERT (XI) Page No. 312

167. Given below are statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : Nephrons are of two types: Cortical & Juxta medullary. based on their relative position in cortex and medullal.

Reason R: Juxta medullary nephrons have short loop of Henle whereas, cortical nephrons have longer loop of Henle.

In the light of the above statements, choose the correct answer from the options given below:

- (1) **A** is true but **R** is false.
(2) **A** is false but **R** is true.
(3) Both **A** and **R** are true and **R** is the correct explanation of **A**.
(4) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.

Sol. (1)

NCERT (XI) Page No. 293

168. Which one of the following techniques does not serve the purpose of early diagnosis of a disease for its early treatment?

- (1) Polymerase Chain Reaction (PCR) technique
(2) Enzyme Linked Immuno-Sorbent Assay (ELISA) technique
(3) Recombinant DNA Technology
(4) Serum and Urine analysis

Sol. (4)

NCERT (XII) Page No. 212

169. Which one of the following common sexually transmitted diseases is completely curable when detected early and treated properly?

- (1) Hepatitis-B (2) HIV Infection (3) Genital herpes (4) Gonorrhoea

Sol. (4)

NCERT (XII) Page No. 63

170. Given below are two statements :

Statement I: Electrostatic precipitator is most widely used in thermal power plant.

Statement II: Electrostatic precipitator in thermal power plant removes ionising radiations

In the light of the above statements, choose the *most appropriate* answer from the options given below:

- (1) **Statement I:** is correct but **Statement II:** incorrect.
- (2) **Statement I** incorrect but **Statement II** are correct.
- (3) Both **Statement I** and **Statement II** are correct.
- (4) Both **Statement I** and **Statement II** are incorrect.

Sol. (1)

NCERT (XII) Page No. 271

171. Which of the following is not a cloning vector?

- (1) pBR322
- (2) Probe
- (3) BAC
- (4) YAC

Sol. (2)

NCERT (XII) Page No. 199,119

172. Radial symmetry is NOT found in adults of phylum_____.

- (1) Coelenterata
- (2) Echinodermata
- (3) Ctenophora
- (4) Hemichordata

Sol. (4)

NCERT (XI) Page No. 47

173. Match **List I** with **List II**

List I	List II
(Cells)	(Secretion)
A. Peptic cells	I. Mucus
B. Goblet cells	II. Bile juice
C. Oxyntic cells	III. Proenzyme pepsinogen
D. Hepatic cells	IV. HCl and intrinsic factor for absorption of vitamin B_{12}

Choose the correct answer from the options given below:

- (1) A-III, B-I, C-IV, D-II
- (2) A-II, B-IV, C-I, D-III
- (3) A-IV, B-III, C-II, D-I
- (4) A-II, B-I, C-III, D-IV

Sol. (1)

NCERT (XI) Page No. 262

174. Once the undigested and unabsorbed substances enter the caecum, their backflow is prevented by-

- (1) Gastro - oesophageal sphincter
- (2) Pyloric sphincter
- (3) Sphincter of Oddi
- (4) Ileo - caecal valve

Sol. (4)

NCERT (XI) Page No. 264

175. Given below are two statements:

Statement I: In prokaryotes, the positively charged DNA is held with some negatively charged proteins in a region called nucleoid.

Statement II: In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form nucleosome.

In the light of the above statements, choose the correct answer from the options given below:

- (1) **Statement I** is correct but **Statement II** is false.
- (2) **Statement I** incorrect but **Statement II** is true.
- (3) Both **Statement I** and **Statement II** are true.
- (4) Both **Statement I** and **Statement II** are false.

Sol. (2)

NCERT (XII) Page No. 99

176. Given below are two statements:

Statement I : Ligaments are dense irregular tissue.

Statement II: Cartilage is dense regular tissue.

In the light of the above statements, choose the correct answer from the options given below:

- (1) **Statement I** is true but **Statement II** is false.
- (2) **Statement I** is false but **Statement II** is true.
- (3) Both **Statement I** and **Statement II** are true.
- (4) Both **Statement I** and **Statement II** are false.

Sol. (4)

NCERT (XI) Page No. 103,104

177. Given below are two statements:

Statement I : Low temperature preserves the enzyme in a temporarily inactive state whereas high temperature destroys enzymatic activity because proteins are denatured by heat.

Statement II: When the inhibitor closely resembles the substrate in its molecular structure and inhibits the activity of the enzyme, it is known as competitive inhibitor. In the light of the above statements, choose the correct answer from the options given below:

- (1) **Statement I** is true but **Statement II** is false.
- (2) **Statement I** is false but **Statement II** is true.
- (3) Both **Statement I** and **Statement II** are true.
- (4) Both **Statement I** and **Statement II** are false.

Sol. (3)

NCERT (XI) Page No. 157

178. Which of the following statement is correct

- (1) Presence of large amount of nutrients in water restricts 'Algal Bloom'
- (2) Algal Bloom decreases fish mortality
- (3) Eutrophication refers to increase in domestic sewage and waste water in lakes.
- (4) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.

Sol. (4)

NCERT (XII) Page No. 275,276

179. Given below are two statements:

Statement I: A protein is imagined as a line, the left end represented by first amino acid (C-terminal) and the right end represented by last amino acid (N-terminal)

Statement II: Adult human haemoglobin, consists of 4 subunits (two subunits of α type and two subunits of β type.)

In the light of the above statements, choose the correct answer from the options given below:

- (1) **Statement I** is true but **Statement II** is false.
- (2) **Statement I** is false but **Statement II** is true.
- (3) Both **Statement I** and **Statement II** are true.
- (4) Both **Statement I** and **Statement II** are false.

Sol. (2)

NCERT (XI) Page No. 149,151

180. In which blood corpuscles, the HIV undergoes replication and produces progeny viruses?

- (1) Basophils
- (2) Eosinophils
- (3) T_H cells
- (4) B-lymphocytes

Sol. (3)

NCERT (XII) Page No. 156

181. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A: Endometrium is necessary for implantation of blastocyst.

Reason R: In the absence of fertilization, the corpus luteum degenerates that causes disintegration of endometrium.

In the light of the above statements, choose the correct answer from the options given below:

- (1) **A** is true but **R** is false.
- (2) **A** is false but **R** is true.
- (3) Both **A** and **R** are true and **R** is the correct explanation of **A**.
- (4) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.

Sol. (4)

NCERT (XII) Page No. 51- 53

182. Match **List I** with **List II**.

List I	List II
A. <i>Taenia</i>	I. Nephridia
B. Paramoecium	II. Contractile vacuole
C. <i>Periplaneta</i>	III. Flame cells
D. <i>Pheretima</i>	IV. Urecose gland

Choose the correct answer from the options given below:

- (1) A-III, B-II, C-IV, D-I (2) A-II, B-I, C-IV, D-III
 (3) A-I, B-II, C-III, D-IV (4) A-I, B-II, C-IV, D-III

Sol. (1)

NCERT (XI) Page No. 134,114,291

183. Match **List I** with **List II**

List I (interacting species)	List II (Name of Interaction)
A. A Leopard and a Lion in a forest/grassland	I. Competition
B. A Cuckoo laying egg in a Crow's nest	II. Brood parasitism
C. Fungi and root of a higher plant in Mycorrhizae	III. Mutualism
D. A cattle egret and a Cattle in a field	IV. Commensalism

Choose the correct answer from the options given below:

- (1) A-III, B-IV, C-I, D-II (2) A-II, B-III, C-I, D-IV
 (3) A-I, B-II, C-III, D-IV (4) A-I, B-II, C-IV, D-III

Sol. (3)

NCERT (XII) Page No. 236- 237

184. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : Amniocentesis for sex determination is one of the strategies of Reproductive and Child Health Care Programme.

Reason R: Ban on amniocentesis checks increasing menace of female foeticide.

In the light of the above statements, choose the correct answer from the options given below:

- (1) **A** is true but **R** is false.
 (2) **A** is false but **R** is true.
 (3) Both **A** and **R** are true and **R** is the correct explanation of **A**.
 (4) Both **A** and **R** are true and **R** is NOT the correct explanation of **A**.

Sol. (2)

NCERT (XII) Page No. 158

185. Broad palm with single palm crease is visible in a person suffering from-

- (1) Klinefelter's syndrome
- (2) Thalassemia
- (3) Down's syndrome
- (4) Turner's syndrome

Sol. (3)

NCERT (XII) Page No. 91

Section - B (Biology : Zoology)

186. Select the correct statements with reference to chordates.

- A. Presence of a mid-dorsal, solid and double nerve cord.
- B. Presence of closed circulatory system.
- C. Presence of paired pharyngeal gill slits.
- D. Presence of dorsal heart
- E. Triploblastic pseudocoelomate animals.

Choose the correct answer from the options given below:

- (1) B, D and E only
- (2) C, D and E only
- (3) A, C and D only
- (4) B and C only

Sol. (4)

NCERT (XI) Page No. 55

187. Which one of the following is the sequence on corresponding coding strand, if the sequence on mRNA formed is as follows

5' AUCGAUCGUCGAUCGAUCGAUCG AUCG 3'?

- (1) 5' ATCGATCGATCGATCGATCGATCGATCG 3'
- (2) 3' ATCGATCGATCGATCGATCGATCGATCG 5'
- (3) 5' UAGCUAGCUAGCUAGCUAGCUAGC UAGC 3'
- (4) 3' UAGCUAGCUAGCUAGCUAGCUAGC 5'

Sol. (1)

NCERT (XII) Page No. 108

188. The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are :

- (1) Brain stem & epithalamus
- (2) Corpus callosum and thalamus
- (3) Limbic system & hypothalamus
- (4) Corpora quadrigemina & hippocampus

Sol. (3)

NCERT (XI) Page No. 321

189. Which of the following statements are correct?

- A. An excessive loss of body fluid from the body switches off osmoreceptors.
- B. ADH facilitates water reabsorption to prevent diuresis.
- C. ANF causes vasodilation.
- D. ADH causes increase in blood pressure.
- E. ADH is responsible for decrease in GFR.

Choose the correct answer from the options given below:

- (1) A, B and E only (2) C, D and E only (3) A and B only (4) B C and D only

Sol. (4)

NCERT (XI) Page No.297

190. Which of the following statements are correct?

- A. Basophils are most abundant cells of the total WBC_s
- B. Basophils secrete histamine, serotonin and heparin
- C. Basophils are involved in inflammatory response
- D. Basophils have kidney shaped nucleus
- E. Basophils are agranulocytes

Choose the correct answer from the options given below:

- (1) B and C only (2) A and B only (3) D and E only (4) C and E only

Sol. (1)

NCERT (XI) Page No. 279

191. Which of the following are NOT under the control of thyroid hormone?

- A. Maintenance of water and electrolyte balance
- B. Regulation of basal metabolic rate
- C. Normal rhythm of sleep-wake cycle
- D. Development of immune system
- E. Support the process of R.B.Cs formation

Choose the correct answer from the options given below:

- (1) C and D only (2) D and E only (3) A and D only (4) B and C only

Sol. (1)

NCERT (XI) Page No. 334

192. Which of the following is characteristic feature of cockroach regarding sexual dimorphism?

- (1) Presence of sclerites (2) Presence of anal cerci
- (3) Dark brown body colour and anal cerci (4) Presence of anal styles

Sol. (4)

NCERT (XI) Page No. 112

193. Which one of the following is **NOT** an advantage of inbreeding?

- (1) Elimination of less desirable genes and accumulation of superior genes takes place due to it.
- (2) It decrease the productivity of inbred population, after continuous inbreeding.
- (3) It decreases homozygosity.
- (4) It exposes harmful recessive genes that are eliminated by selection.

Sol. (2)

NCERT (XII) Page No. 167

194. The unique mammalian characteristics are :

- (1) hairs, pinna and indirect development
- (2) pinna, monocondylic skull and mammary glands
- (3) hairs, tympanic membrane and mammary glands
- (4) hairs, pinna and mammary glands

Sol. (4)

NCERT (XI) Page No. 59- 60

195. Select the correct statements.

- A. Tetrad formation is seen during Leptotene.
- B. During Anaphase, the centromeres split and chromatids separate.
- C. Terminalization takes place during pachytene.
- D. Nucleolus, Golgi complex and ER are reformed during Telophase.
- E. Crossing over takes place between sister chromatids of homologous chromosome.

Choose the correct answer from the options given below:

- (1) A, C and E only (2) B and E only (3) A and C only (4) B and D only

Sol. (4)

NCERT (XI) Page No. 166, 168

196. Given below are two statements:

Statement I: During G_0 phase of cell cycle, the cell is metabolically inactive.

Statement II: The centrosome undergoes deplication during S phase of interphase

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) **Statement I** is correct but **Statement II** is incorrect,
- (2) **Statement I** is incorrect but **Statement II** is correct.
- (3) Both **Statement I** and **Statement II** are correct
- (4) Both **Statement I** and **Statement II** are incorrect

Sol. (2)

NCERT (XI) Page No. 163- 164

197. Which of the following statements are correct regarding skeletal muscle?

- A. Muscle Bundles are held together by collagenous connective tissue layer called fascicle.
- B. Sarcoplasmic reticulum of muscle fibre is a store house of calcium ions.
- C. Striated appearance of skeletal muscle fiber is due to distribution pattern of actin and myosin proteins.
- D. M line is considered as functional unit of contraction called sarcomere.

Choose the **most appropriate** answer from the options given below:

- (1) A, C and D only (2) C and D only (3) A, B and C only (4) B and C only

Sol. (4)

NCERT (XI) Page No. 304

198. Match List I with List II.

List I

List II

- | | |
|--------------------------|--|
| A. Logistic growth | I. Unlimited resource availability condition. |
| B. Exponential growth | II. Limited resource availability condition |
| C. Expanding age pyramid | III. The percent individuals of pre-reproductive age is largest followed by reproductive and post reproductive age group |
| D. Stable age pyramid | IV. The percent individuals of pre-reproductives and reproductive age group are same |

Choose the correct answer from the options given below :

- (1) A–II, B–IV, C–I, D–III (2) A–II, B–IV, C–III, D–I
(3) A–II, B–I, C–III, D–IV (3) A–II, B–III, C–I, D–IV

Sol. (3)

NCERT (XII) Page No. 227, 230, 231

199. Match List I with List II

List I

List II

- | | |
|--------------------------------|-----------------------------------|
| A. Mast cells | I. Ciliated epithelium |
| B. Inner surface of bronchiole | II. Areolar connective tissue |
| C. Blood | III. Cuboidal epithelium |
| D. Tubular parts of nephron | IV. specialised connective tissue |

Choose the correct answer from the options given below :

- (1) A–II, B–I, C–IV, D–III (2) A–III, B–IV, C–II, D–I
(3) A–I, B–II, C–IV, D–III (3) A–II, B–III, C–I, D–IV

Sol. (1)

NCERT (XI) Page No. 101, 103

200. In cockroach, excretion is brought about by

- A. Phallic gland B. Urecose gland C. Nephrocytes D. Fat body

Choose the correct answer from the options given below :

- (1) B, C and D only (2) B and D only (3) A and E only (4) A, B and E only

Sol. (1)

NCERT (XI) Page No. 114

