# Physics

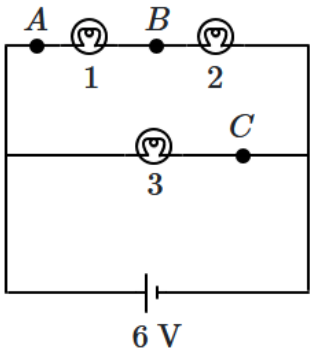
**1.** Two waves can be expressed as $x = 4\sin\left(\omega t + kx + \frac{\pi}{3}\right)$ and $x' = 3\cos(\omega t + kx)$. The phase difference between the two waves is:

1. $\frac{\pi}{3}$ rad
2. $\frac{\pi}{6}$ rad
3. $\frac{\pi}{2}$ rad
4. $\pi$ rad

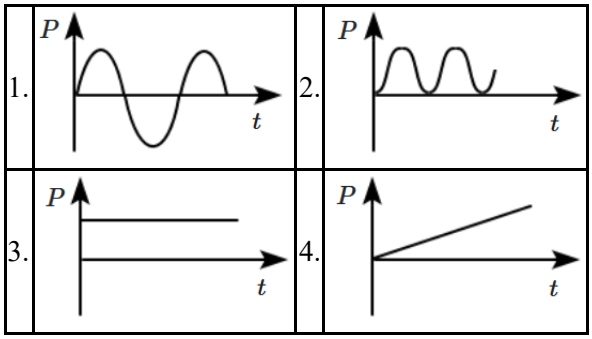
**2.** Alternating equal and opposite charges, each of magnitude, $q$ are placed at the six vertices of a regular hexagon of side $a$. If one of the negative charges is now removed, the electrostatic potential at the centre of the hexagon is: $\left(k = \frac{1}{4\pi\varepsilon_0}\right)$

| | | | |
|---|---|---|---|
| 1. | $k\frac{q}{a}$ | 2. | $k\frac{2q}{a}$ |
| 3. | $k\frac{\sqrt{3}q}{2a}$ | 4. | $k\frac{q}{2a}$ |

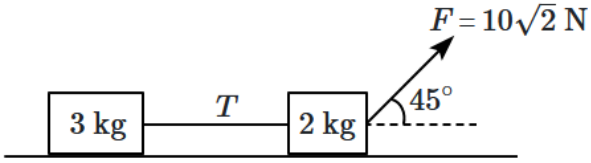
**3.** In the circuit shown, each light bulb has a resistance 2 Ω, and the potential source has an EMF of 6 V.




Which graph best shows the power dissipated by the light bulb $(3)$ as a function of time?



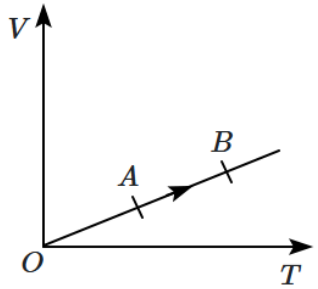

**4.** The system of blocks, connected by an ideal horizontal string, lies at rest on a smooth horizontal surface. A constant force $F(= 10\sqrt{2}\ \text{N})$ acts on the 2 kg block, at an angle of $45^\circ$ above the horizontal. The system undergoes a displacement of 2 m. Match the quantities mentioned in **Column I** with their values (SI) in **Column II**. Take $g = 10\ \text{m/s}^2$.




| Column I | | Column II | |
|---|---|---|---|
| (A) | Work done by force $F$ on 2 kg block | (I) | $20\sqrt{2}$ |
| (B) | Work done by tension $(T)$ on 2 kg block | (II) | 12 |
| (C) | Power due to force $F$, finally | (III) | 20 |
| (D) | Final kinetic energy of 3 kg block | (IV) | $-12$ |

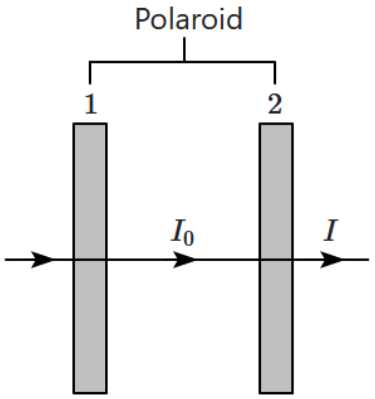
| | |
|---|---|
| 1. | A-II, B-II, C-III, D-I |
| 2. | A-III, B-IV, C-I, D-II |
| 3. | A-I, B-IV, C-III, D-II |
| 4. | A-II, B-IV, C-I, D-III |

**5.** The volume $(V)$ of a monatomic gas varies with its temperature $(T)$, as shown in the graph. The ratio of work done by the gas to the heat absorbed by it when it undergoes a change from state $A$ to state $B$ will be:



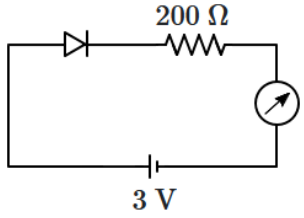

| | | | |
|---|---|---|---|
| 1. | $\frac{2}{5}$ | 2. | $\frac{2}{3}$ |
| 3. | $\frac{1}{3}$ | 4. | $\frac{2}{7}$ |

**6.** Two identical polaroid sheets are held perpendicular to an unpolarised light beam. If $I_0$ is the intensity of the light between the two polaroids and $I$ is the intensity of the emergent beam (see figure), then the intensity ratio, $\frac{I}{I_0} = \frac{1}{2}$. The angle between the pass axes of the two polaroids is:



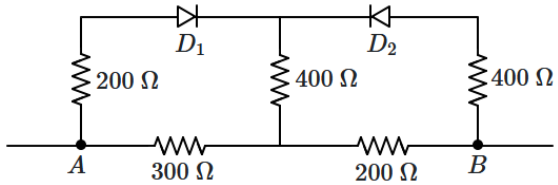

| | | | |
|---|---|---|---|
| 1. | $90^\circ$ | 2. | $60^\circ$ |
| 3. | $45^\circ$ | 4. | $30^\circ$ |

**7.** The ammeter reading for the silicon diode in the given circuit is:




| | | | |
|---|---|---|---|
| 1. | 0 | 2. | 15 mA |
| 3. | 11.5 mA | 4. | 13.5 mA |

**8.** In the circuit shown in the figure, the diodes $D_1, D_2$ are ideal.




The resistance between $A$ & $B$, when $V_A < V_B$, is:

1. 460 Ω
2. 400 Ω
3. 600 Ω
4. 1500 Ω

**9.** The radius of the orbit corresponding to the $4^{\text{th}}$ excited state in $Li^{++}$-ion is:
(where $a_0$ is the radius of the first orbit in the hydrogen atom)

1. $\frac{25}{3}a_0$
2. $\frac{16}{3}a_0$
3. $25a_0$
4. $12a_0$

**10.** A 100-turn coil of wire of size $2\text{ cm} \times 1.5\text{ cm}$ is suspended between the poles of a magnet producing a field of $1\text{ T}$, inside a galvanometer. Calculate the torque on the coil due to a current of $0.1\text{ A}$ passing through the coil.

1. $3 \times 10^{-5}$ N-m
2. 30 N-m
3. $3 \times 10^{-3}$ N-m
4. $3 \times 10^{-2}$ N-m

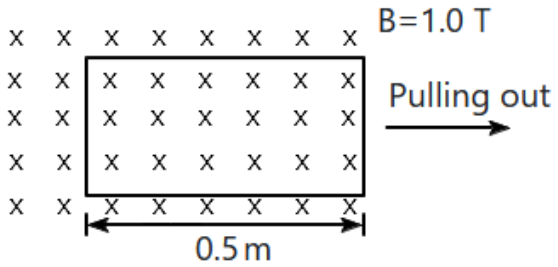
**11.** Select the correct statements regarding potential energy $(U)$ in the simple harmonic motion of a particle along $x$-axis:

| | |
|---|---|
| 1. | $\frac{dU}{dx} < 0$ for all positions of a particle performing SHM. |
| 2. | $\frac{dU}{dx} > 0$ for all time. |
| 3. | Potential energy is minimum at the equilibrium position of a particle performing SHM. |
| 4. | Potential energy increases linearly with the position as the particle moves away from the equilibrium position. |

**12.** An electron falls from rest through a vertical distance $h$ in a uniform and vertically upward-directed electric field $E$. The direction of the electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest through the same vertical distance $h$. The fall time of the electron in comparison to the fall time of the proton is:

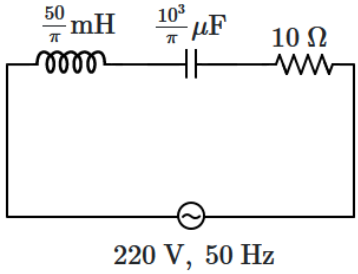
| | | | |
|---|---|---|---|
| 1. | smaller | 2. | 5 times greater |
| 3. | 10 times greater | 4. | equal |

**13.** Figure shows a square loop of side 0.5 m and resistance 10 Ω. The magnetic field has a magnitude $B = 1.0$ T. The work done in pulling the loop out of the field uniformly in 2.0 s is:



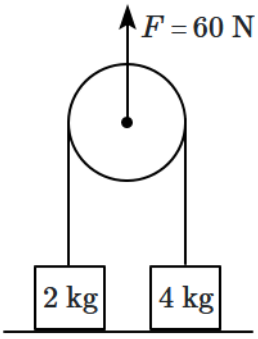

| | | | |
|---|---|---|---|
| 1. | $3.125 \times 10^{-3}$ J | 2. | $6.25 \times 10^{-4}$ J |
| 3. | $1.25 \times 10^{-2}$ J | 4. | $5.0 \times 10^{-4}$ J |

**14.** The net impedance of the circuit (as shown in the figure) will be:




| | | | |
|---|---|---|---|
| 1. | 25 Ω | 2. | $10\sqrt{2}$ Ω |
| 3. | 15 Ω | 4. | $5\sqrt{5}$ Ω |

**15.** A force of 60 N is applied vertically to the system, where the pulley and string are ideal. The blocks are on the ground. The upward acceleration of the pulley is: (take $g = 10$ m/s$^2$)




1. 5 m/s$^2$
2. 10 m/s$^2$
3. 2.5 m/s$^2$
4. 1.5 m/s$^2$

**16.** Eddy currents can be minimised by:

| | |
|---|---|
| 1. | reducing relative motion between the core and magnet in an electric motor |
| 2. | by making the core of thin laminations |
| 3. | by increasing the conductor cross-sectional area |
| 4. | both (1) and (2) are correct |

**17.** A tuning fork, placed in a room, vibrates according to the equation: $Y = (10^{-4}\text{ m}) \sin\left(\frac{2\pi t}{0.01\text{ s}}\right)$ where $Y$ is the displacement of the tip of a prong. The speed of sound in air is 330 m/s. The frequency of the tuning fork is:

1. 100 Hz
2. 50 Hz
3. 200 Hz
4. 200π Hz

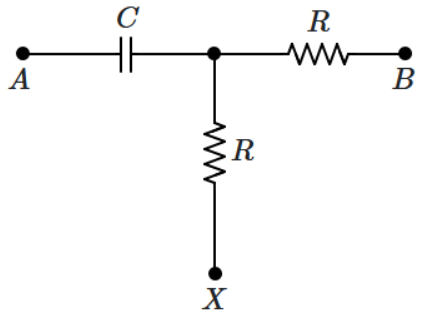
**18.** A mixture of two or more ideal gases:

| | |
|---|---|
| 1. | does not follow the ideal gas equation |
| 2. | does not follow the first law of thermodynamics |
| 3. | has the same RMS speed (per molecule) for each gas |
| 4. | has the same average translational kinetic energy for each type of gas molecule |

**19.** A soup bubble of radius $r$ is blown up to form a bubble of radius $2r$. If $\sigma$ is the surface tension of soap solution, the energy spent in doing so is: (Assuming surface tension is constant.)

| | | | |
|---|---|---|---|
| 1. | $3\pi\sigma r^2$ | 2. | $6\pi\sigma r^2$ |
| 3. | $12\pi\sigma r^2$ | 4. | $24\pi\sigma r^2$ |

**20.** The end $'B'$ of the circuit is earthed $(V_B = 0)$ while a sinusoidal voltage is applied at $'A'$; $V_A = V_0 \sin \omega t$. The rms voltage across the capacitor $C$ equals that across the upper resistor $R$ (as shown in the figure). What is the phase difference between the current through the capacitor and the voltage across the capacitor when no current flows out at $X$?




1. $0^\circ$
2. $45^\circ$
3. $90^\circ$
4. $180^\circ$

**21.** The de-Broglie wavelength of an electron in the ground state of a H-atom is $\lambda_1$ and that on the $He^+$-ion is $\lambda_2$. The kinetic energies of the electrons in the H-atom and the $He^+$-ion-having the same de-Broglie wavelength are $E_1$ and $E_2$. The ratio $\frac{\lambda_1}{\lambda_2}$ is:

| | | | |
|---|---|---|---|
| 1. | 4 | 2. | 2 |
| 3. | $\frac{1}{2}$ | 4. | $\frac{1}{4}$ |

**22.** Match **List I** with **List II.**

| **List I** (Spectral Lines of Hydrogen for transitions from) | | **List II** (Wavelength (nm)) | |
|---|---|---|---|
| A. | $n_2 = 3$ to $n_1 = 2$ | I. | 410.2 |
| B. | $n_2 = 4$ to $n_1 = 2$ | II. | 434.1 |
| C. | $n_2 = 5$ to $n_1 = 2$ | III. | 656.3 |
| D. | $n_2 = 6$ to $n_1 = 2$ | IV. | 486.1 |

Choose the correct answer from the options given below:

| | |
|---|---|
| 1. | A – III, B – IV, C – II, D – I |
| 2. | A – IV, B – III, C – I, D – II |
| 3. | A – I, B – II, C – III, D – IV |
| 4. | A – II, B – I, C – IV, D – III |

**23.** In a gravitational field, the gravitational potential is given by; $V = -\frac{K}{x}$ J/kg. The gravitational field intensity at the point $(2, 0, 3)$ m is:

| | | | |
|---|---|---|---|
| 1. | $+\frac{K}{2}$ | 2. | $-\frac{K}{2}$ |
| 3. | $-\frac{K}{4}$ | 4. | $+\frac{K}{4}$ |

**24.** Four identical point charges $q$, each are fixed at the corners of a square of side $a$. The work done in bringing a point charge $q$, from infinity and placing it at the centre of the square is: $\left(k = \frac{1}{4\pi\varepsilon_0}\right)$

1. $k.\ \frac{4q^2}{a}$
2. $k.\ \frac{4\sqrt{2}q^2}{a}$
3. $k.\ \frac{4q^2}{a\sqrt{2}}$
4. zero

**25.** In Young's double-slit experiment, if there is no initial phase difference between the light from the two slits, a point on the screen corresponding to the fifth minimum has a path difference:

| | | | |
|---|---|---|---|
| 1. | $\frac{5\lambda}{2}$ | 2. | $\frac{10\lambda}{2}$ |
| 3. | $\frac{9\lambda}{2}$ | 4. | $\frac{11\lambda}{2}$ |

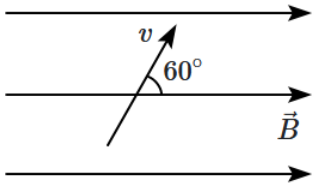
**26.** A light ray falls on a glass surface of refractive index $\sqrt{3}$, at an angle of $60^\circ$. The angle between the refracted and reflected rays would be:

| | | | |
|---|---|---|---|
| 1. | $120^\circ$ | 2. | $30^\circ$ |
| 3. | $60^\circ$ | 4. | $90^\circ$ |

**27.** When a soft-iron core is inserted into a solenoid, the magnetic field is observed to increase by 1500 times near its opening. The turns density is 1000 $m^{-1}$ and the solenoid carries a current 100 mA. The field at its centre is (nearly):

1. 0.2 T
2. 0.02 T
3. 0.4 T
4. 0.04 T

**28.** A proton is projected with a speed $v$ into a magnetic field $B$ of magnitude 1 T with the angle between the proton's velocity and the magnetic field being $60^\circ$, as shown. The kinetic energy of the proton is 2 eV (with the proton's mass $= 1.67 \times 10^{-27}$ kg, and charge $e = 1.6 \times 10^{-19}$ C). The pitch of the path of the proton is:




1. $6.28 \times 10^{-2}$ m
2. $6.42 \times 10^{-4}$ m
3. $3.14 \times 10^{-2}$ m
2. $3.14 \times 10^{-4}$ m

**29.** The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is: ($c$ = speed of electromagnetic waves)

| | | | |
|---|---|---|---|
| 1. | 1 : 1 | 2. | 1 : $c$ |
| 3. | 1 : $c^2$ | 4. | $c$ : 1 |

**30.** The magnifying power of a telescope is 9. When it is adjusted for parallel rays the distance between the objective and eyepiece is 20 cm. The focal length of the lenses is:

1. 10 cm, 10 cm
2. 15 cm, 5 cm
3. 18 cm, 2 cm
4. 11 cm, 9 cm

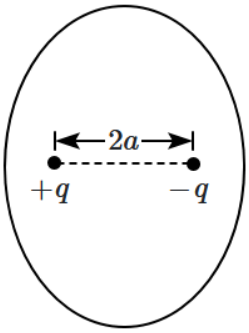
**31.** The radius of curvature of a convex lens can be measured by a:

| | | | |
|---|---|---|---|
| 1. | screw gauge | 2. | vernier callipers |
| 3. | spherometer | 4. | barometer |

**32.** Which, of the following, emits electromagnetic waves?

| | |
|---|---|
| 1. | a charge moving with constant velocity |
| 2. | a charged particle falling freely under gravity |
| 3. | a magnet moving with constant velocity |
| 4. | a dipole at rest, in a uniform electric field |

**33.** An electric dipole is enclosed by a Gaussian surface (see figure). The total electric flux through the surface is:




| | | | |
|---|---|---|---|
| 1. | $q/\varepsilon_0$ | 2. | zero |
| 3. | $-q/\varepsilon_0$ | 4. | $2q/\varepsilon_0$ |

**34.** A metal wire with length $L$, cross-sectional area $A$, and Young's modulus $Y$ is stretched by a variable force $F$ such that $F$ is always slightly greater than the elastic resistance forces in the wire. When the elongation of the wire is $l$, the following statements hold:

| | |
|---|---|
| **(A)** | The work done by $F$ is $\frac{YAl^2}{2L}$. |
| **(B)** | The work done by $F$ is $\frac{YAl^2}{L}$. |
| **(C)** | The elastic potential energy stored in the wire is $\frac{YAl^2}{2L}$. |
| **(D)** | No heat is produced during the elongation. |

Choose the correct option from the options given below:

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

**35.** A body oscillates with simple harmonic motion according to the equation, $x = 5\cos(2\pi t + \frac{\pi}{4})$ m. The frequency of the oscillation is:

1. 1 $s^{-1}$
2. 2 $s^{-1}$
3. $\pi$ $s^{-1}$
4. $2\pi$ $s^{-1}$

**36.** A string is wrapped along the rim of a wheel of the moment of inertia 0.10 kg-m$^2$ and radius 10 cm. If the string is now pulled by a force of 10 N, then the wheel starts to rotate about its axis from rest. The angular velocity of the wheel after 2 s will be:

| | | | |
|---|---|---|---|
| 1. | 40 rad/s | 2. | 80 rad/s |
| 3. | 10 rad/s | 4. | 20 rad/s |

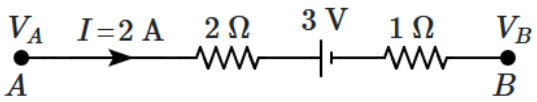
**37.** The energy equivalent of 0.5 g of a substance is:

1. $4.5 \times 10^{13}$ J
2. $1.5 \times 10^{13}$ J
3. $0.5 \times 10^{13}$ J
4. $4.5 \times 10^{16}$ J

**38.** If the magnitude of the sum of two vectors is equal to the magnitude of the difference of the two vectors, then the angle between these vectors is:

1. $0^\circ$
2. $45^\circ$
3. $90^\circ$
4. $180^\circ$

**39.** The potential difference $V_A - V_B$ between the points $A$ and $B$ in the given figure is:




| | | | |
|---|---|---|---|
| 1. | $-3$ V | 2. | $+3$ V |
| 3. | $+6$ V | 4. | $+9$ V |

**40.** Which, of the following solid substances, will most likely show the photoelectric effect easily?

1. Potassium
2. Rubber
3. Plastic
4. Solid hydrogen

**41.** An inductor coil of self-inductance 10 H carries a current of 1 A. The magnetic field energy stored in the coil is:

| | | | |
|---|---|---|---|
| 1. | 10 J | 2. | 2.5 J |
| 3. | 20 J | 4. | 5 J |

**42.** A radioactive nucleus ${}^{A}_{Z}X$ undergoes spontaneous decay in the sequence ${}^{A}_{Z}X \rightarrow B_{Z-1} \rightarrow C_{Z-3} \rightarrow D_{Z-2}$ where Z is the atomic number of element X. The possible decay particles in the sequence are:

| | | | |
|---|---|---|---|
| 1. | $\beta^+,\ \alpha,\ \beta^-$ | 2. | $\beta^-,\ \alpha,\ \beta^+$ |
| 3. | $\alpha,\ \beta^-,\ \beta^+$ | 4. | $\alpha,\ \beta^+,\ \beta^-$ |

**43.** A particle moves in a circle of radius $R$ with a constant speed $v$. The average acceleration of the particle in during $\left(\frac{1}{6}\right)^{\text{th}}$ revolution is:

1. $\frac{v^2}{R}$
2. $\frac{2\pi v^2}{6R}$
3. $\frac{\pi v^2}{6R}$
4. $\frac{3v^2}{\pi R}$

**44.** A cavity is made within a solid, shaped in the form of a cube. The cavity is also cubical and centred within the solid. The temperature of the solid is raised. The volume of the cavity:

| | |
|---|---|
| 1. | increases by the same fraction as the cube |
| 2. | increases by a lower fraction than the cube |
| 3. | decreases |
| 4. | remains the same |

**45.** The friction of the air causes vertical retardation equal to 10% of the acceleration due to gravity. The maximum height will be decreased by:

(Take $g = 10$ ms$^{-2}$)

| | | | |
|---|---|---|---|
| 1. | 8% | 2. | 9% |
| 3. | 10% | 4. | 11% |

# Chemistry

**46.**

| | |
|---|---|
| **Assertion (A):** | $SeCl_4$ does not have a tetrahedral structure. |
| **Reason (R):** | Se has two lone pairs in $SeCl_4$ . |

| | |
|---|---|
| 1. | Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**. |
| 2. | Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**. |
| 3. | **(A)** is True but **(R)** is False. |
| 4. | Both **(A)** and **(R)** are False. |

**47.** Which of the following reactions has/have a positive $\Delta S$ (entropy change)?

(i) $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$

(ii) $NH_4Cl(g) \rightarrow NH_3(g) + HCl(g)$

(iii) $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$

1. (i) & (ii)
2. (iii)
3. (ii) & (iii)
4. (ii)

**48.** What is the value of ΔH for the reaction $2Al + Cr_2O_3 \rightarrow 2Cr + Al_2O_3$, knowing that the enthalpies of formation of $Al_2O_3$ and $Cr_2O_3$ are –1596 kJ and –1134 kJ, respectively?

| | | | |
|---|---|---|---|
| 1. | –1365 kJ | 2. | 2730 kJ |
| 3. | –2730 kJ | 4. | –462 kJ |

**49.** Match List-I with List-II:

| | **List-I (Atom/Molecule)** | | **List-II (Property)** |
|---|---|---|---|
| A. | Nitrogen | I. | Paramagnetic |
| B. | Fluorine molecule | II. | Most reactive element in group 18 |
| C. | Oxygen molecule | III. | Element with highest ionisation enthalpy in group 15 |
| D. | Xenon atom | IV. | Strongest oxidising agent |

Identify the correct answer from the option given below:

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

**50.** Which of the following solutions will cause Mohr's salt to precipitate out as iron (II) hydroxide?

| | | | |
|---|---|---|---|
| 1. | Hydrochloric acid | 2. | Sodium hydroxide |
| 3. | Sulphuric acid | 4. | Potassium nitrate |

**51.** Which of the following statements is correct for an element that forms oxides in different oxidation states?

| | |
|---|---|
| 1. | The oxide is neutral when the element is in its highest oxidation state. |
| 2. | The oxide is most acidic when the element is in its highest oxidation state. |
| 3. | The oxide is amphoteric when the element is in its highest oxidation state. |
| 4. | The oxide is most basic when the element is in its highest oxidation state. |

**52.** What is the oxidation state of a phosphorus atom in hypophosphoric acid?

| | | | |
|---|---|---|---|
| 1. | +3 | 2. | +4 |
| 3. | +5 | 4. | +3 |

**53.** The lowest enthalpy of atomization among the following is:

| | | | |
|---|---|---|---|
| 1. | Sc | 2. | Cu |
| 3. | Zn | 4. | Ni |

**54.** Given that

$E^\circ_{O_2/H_2O} = +1.23\ V$

$E^\circ_{S_2O_8^{2-}/SO_4^{2-}} = 2.05\ V$

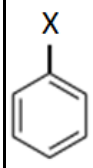
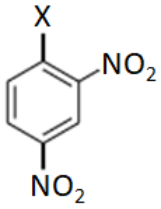
$E^\circ_{Br_2/Br^-} = +1.09\ V$

$E^\circ_{Au^{3+}/Au} = +1.4\ V$

The strongest oxidising agent is:

1. $Au^{3+}$
2. $O_2$
3. $S_2O_8^{2-}$
4. $Br_2$

**55.** The correct order of increasing C-X bond reactivity toward nucleophiles among the following is:

| | | | |
|---|---|---|---|
| **I** |  | **II** |  |
| **III** | $(CH_3)_3C-X$ | **IV** | $(CH_3)_2CH-X$ |

| | | | |
|---|---|---|---|
| 1. | I < II < IV < III | 2. | II < III < I < IV |
| 3. | IV < III < I < II | 4. | III < II < I < IV |

**56.** The enolic form of an acetone contains:
1. 9 sigma bonds, 1 pi bond, and 2 lone pairs of electrons
2. 8 sigma bonds, 2 pi bonds, and 2 lone pairs of electrons
3. 10 sigma bonds, 1 pi bond, and 1 lone pair of electrons
4. 9 sigma bonds, 2 pi bonds, and 1 lone pair of electrons

**57.** Match the species in **Column-I** with their corresponding hybridisation in **Column-II**:

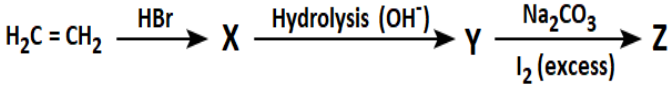
| | **Column-I (Species)** | | **Column-II (Hybridisation)** |
|---|---|---|---|
| A. | Boron in $[B(OH)_4]^-$ | i. | $sp^2$ |
| B. | Aluminium in $[Al(H_2O)_6]^{3+}$ | ii. | $sp^3$ |
| C. | Carbon in Buckminsterfullerene | iii. | $sp^3d^2$ |
| D. | Germanium in $[GeCl_6]^{2-}$ | | |

**Codes:**

| | **A** | **B** | **C** | **D** |
|---|---|---|---|---|
| 1. | ii | iii | i | iii |
| 2. | i | i | iii | ii |
| 3. | iii | ii | ii | i |
| 4. | i | iii | ii | iii |

**58.** What factor influences the molar mass of acetic acid in benzene when measured using freezing point depression?
1. Vapour Pressure
2. Dissociation
3. Complex formation
4. Association (Dimerisation)

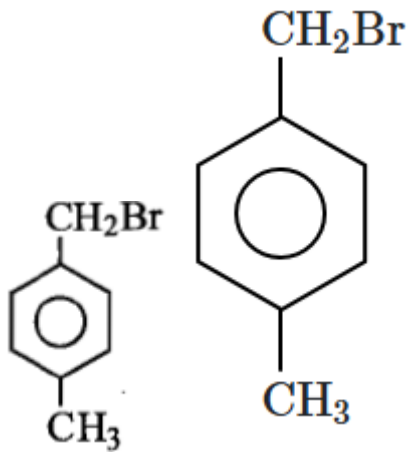
**59.** In the following reaction sequence, what is the final product, compound Z?

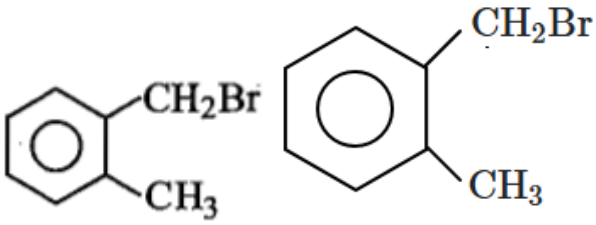


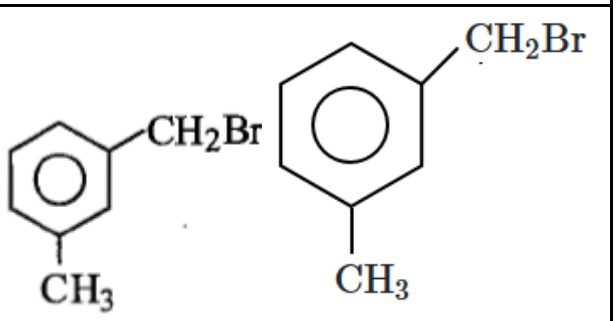

1. $C_2H_5I$
2. $CHI_3$
3. $CH_3CHO$
4. $C_2H_5OH$

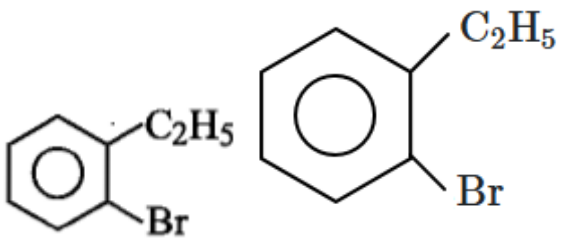
**60.** The compound among the following that used in cosmetic surgery is:
1. Silica
2. Silicates
3. Silicones
4. Zeolites

**61.** Compound (A), $C_8H_9Br$ , gives a white precipitate when warmed with alcholic $AgNO_3$. Oxidation of (A) gives an acid (B), $C_8H_6O_4$. (B) easily forms anhydride on heating. Identify the compound (A).

1. 


2. 


3. 


4. 


**62.** The correct value of cell potential in volts for the reaction that occurs when the following two half cells are connected, is:

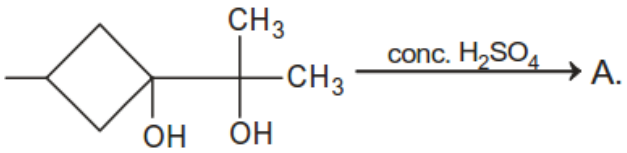
$Fe^{2+}_{(aq)} + 2e^- \rightarrow Fe(s), E^\circ = -0.44$ V

$Cr_2O^{2-}_{7\ (aq)} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$,

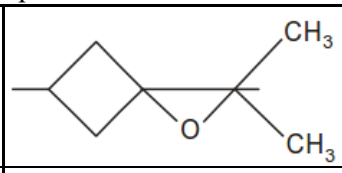
$E^\circ = +1.33$ V

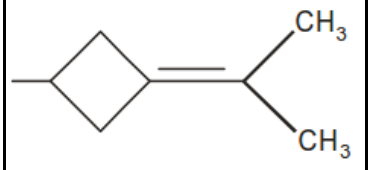
1. +1.77 V
2. +2.65 V
3. +0.01 V
4. +0.89 V

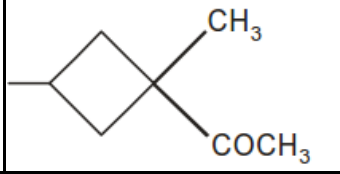
**63.** In the reaction

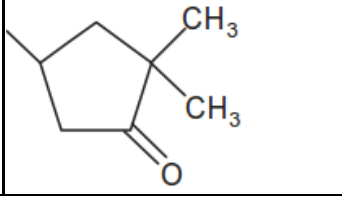



The product is –

1. 


2. 


3. 

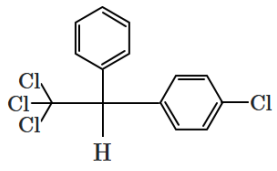
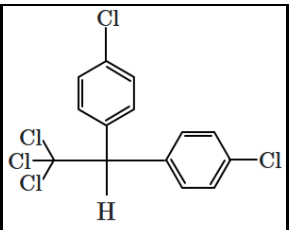
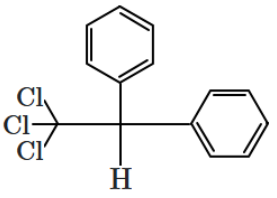
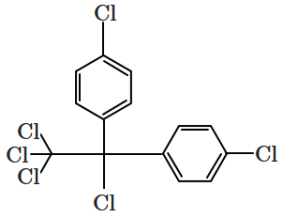

4. 


**64.** The number of moles of $KMnO_4$ required to oxidize one mole of KI in the presence of sulphuric acid are:

| | | | |
|---|---|---|---|
| 1. | 5 | 2. | 2 |
| 3. | 1/2 | 4. | 1/5 |

**65.** Carbon and oxygen combine to form two oxides, carbon monoxide and carbon dioxide in which the ratio of the weights of carbon and oxygen is respectively 12 : 16 and 12 : 32. These figures illustrate the:
1. Law of multiple proportions
2. Law of reciprocal proportions
3. Law of conservation of mass
4. Law of constant proportions

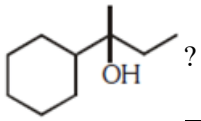
**66.** The correct structure of DDT is:

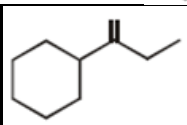
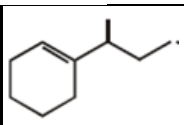
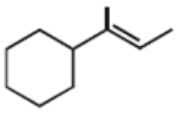
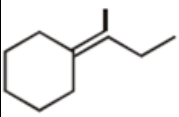
| | | | |
|---|---|---|---|
| 1. |  | 2. |  |
| 3. |  | 4. |  |

**67.** When two liquids A and B mix together, the boiling point of solution is found higher than that of the individual liquids. The nature of the solution is:

| | |
|---|---|
| 1. | Ideal solution. |
| 2. | Positive deviation with a non-ideal solution. |
| 3. | Negative deviation with a non-ideal solution. |
| 4. | Normal solution. |

**68.** Which structure(s) of proteins remains(s) intact during denaturation process?
1. Both secondary and tertiary structures
2. Primary structure only
3. Secondary structure only
4. Tertiary structure only

**69.** Which of the following is not the product of dehydration of  ?

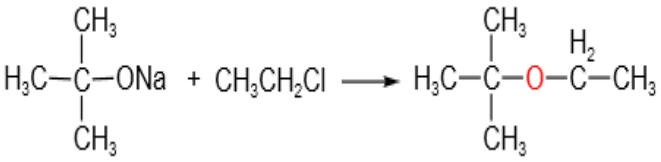
| | | | |
|---|---|---|---|
| 1. |  | 2. |  |
| 3. |  | 4. |  |

**70.** Which species in the given-below reversible reaction is/are acting as Brönsted acids?
$CO_3^{2-}(aq) + H_2O(l) \leftrightharpoons HCO_3^-(aq) + OH^-(aq)$

| | |
|---|---|
| 1. | $CO_3^{2-}(aq)$ |
| 2. | $H_2O(l)$ and $OH^-(aq)$ |
| 3. | $H_2O(l)$ and $HCO_3^-(aq)$ |
| 4. | $CO_3^{2-}(aq)$ and $OH^-(aq)$ |

**71.** The elementary step of the reaction, $2Na + Cl_2 \rightarrow 2NaCl$ is found to follow 3rd order kinetics. Its molecularity is:
1. One
2. Two
3. Three
4. Four

**72.** The reaction,



is called:
1. Williamson synthesis
2. Williamson's continuous etherification process
3. Etard reaction
4. Gatterman-Koch reaction

**73.** A basic radical among the following that cannot be precipitated by
$H_2S$ gas in the presence of $NH_3$ is:
1. $Mn^{2+}$
2. $Ni^{2+}$
3. $Cd^{2+}$
4. $Ca^{2+}$

**74.** Which one of the following is an inner orbital complex as well as is diamagnetic in behaviour?
(Atomic number of Zn = 30, Cr = 24, Co= 27, Ni = 28)
1. $[Zn(NH_3)_6]^{2+}$
2. $[Cr(NH_3)_6]^{3+}$
3. $[Co(NH_3)_6]^{3+}$
4. $[Ni(NH_3)_6]^{2+}$

**75.** Match List I with List II.

| | **List I Quantum Number** | | **List II Information provided** |
|---|---|---|---|
| A. | $m_l$ | I. | Shape of the orbital |
| B. | $m_s$ | II. | Size of the orbital |
| C. | $l$ | III. | Orientation of the orbital |
| D. | $n$ | IV. | Orientation of spin of the electron |

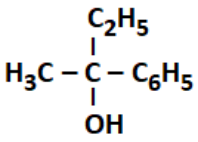
Choose the correct answer from the options given below:
1. A-III, B-IV, C-I, D-II
2. A-III, B-IV, C-II, D-I
3. A-II, B-I, C-IV, D-III
4. A-I, B-III, C-II, D-IV

**76.** E° for the cell,
$Zn\left|Zn^{2+}(aq)\right|\left|Cu^{2+}(aq)\right|Cu(s)$ is 1.01 V at 25°C .
The equilibrium constant for the cell reaction
$Zn + Cu^{2+}(aq) \rightleftharpoons Cu + Zn^{2+}(aq)$ is of the order of:
1. $10^{-37}$
2. $10^{37}$
3. $10^{-17}$
4. $10^{17}$

**77.** In a set of the given reactions, acetic acid yielded a product C.

$$CH_3COOH + PCl_5 \rightarrow A \xrightarrow[Anh.AlCl_3]{C_6H_6} B \xrightarrow[ether]{C_2H_5MgBr} C$$

Product C would be:

| | |
|---|---|
| 1. | $CH_3CH(OH)C_2H_5$ |
| 2. | $CH_3COC_6H_5$ |
| 3. | $CH_3CH(OH)C_6H_5$ |
| 4. |  |

**78.** A steam volatile organic compound which is immiscible with water has a boiling point of 250°C. During steam distillation, a mixture of this organic compound and water will boil:
1. Above 100°C but below 250°C.
2. Above 250°C.
3. At 250°C.
4. Close to but below 100°C.

**79.** Which of the following is a redox reaction?
1. $H_2SO_4$ with NaOH
2. Formation of $O_3$ in the atmosphere
3. Evaporation of $H_2O$
4. Oxides of nitrogen forming nitrogen & oxygen from lightening

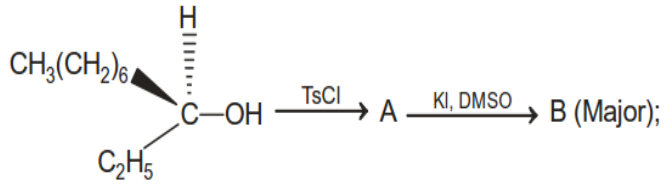
**80.** The molecule(s) that will have dipole moment is/are:
**(a)** 2,2-Dimethylpropane
**(b)** Trans-2-pentene
**(c)** Cis-3-hexene
**(d)** 2,2,3,3-Tetramethylbutane
1. **a**, **b** and **c**
2. **a** and **c**
3. **b** and **c**
4. None of the above

**81.** Which of the following acts as a lewis acid?
1. $NH_3$
2. $SnCl_4$
3. $CCl_4$
4. None of above

**82.** Semicarbazide, among the following, is:
1. $NH_2CONH_2$
2. $NH_2$-$NH_2$
3. $NH_2CONHNH_2$
4. None of the above

**83.** For a first-order reaction $t_{67\%} = \left(\frac{x}{10}\right) t_{50\%}$ & $k = 3.84 \times 10^9$ $sec^{-1}$, the value of x will (based on information given):
(Report your answer to the nearest integer)
1. 14
2. 16
3. 18
4. 20

**84.**




(1) R
(2) S
(3) R, S both
(4) None of these

**85.** Why are acetylenic hydrogens acidic?

| | |
|---|---|
| 1. | The sigma electron density of the C-H bond in acetylene is closer to carbon, which has 50% s-character. |
| 2. | Acetylene has only one hydrogen on each carbon. |
| 3. | Acetylene contains the least number of hydrogens among the possible hydrocarbons having two carbons. |
| 4. | Acetylene belongs to the class of alkynes with the molecular formula $C_nH_{2n-2}$. |

**86.** When an alcoholic solution of ethylene dibromide is heated with granulated zinc, the compound formed is:
(1) ethane
(2) ethylene
(3) butane
(4) isobutane

**87.** What are the values of crystal field stabilization energy (CFSE) for a high-spin $d^6$ metal ion in octahedral and tetrahedral fields, respectively?
1. $-0.4\ \Delta_o$ and $-0.6\ \Delta_t$
2. $-2.4\ \Delta_o$ and $-0.6\ \Delta_t$
3. $-1.6\ \Delta_o$ and $-0.4\ \Delta_t$
4. $-0.4\ \Delta_o$ and $-0.27\ \Delta_t$

**88.** Which reagent is used to convert benzoic acid into benzoyl chloride?
1. $Cl_2$, hv
2. $SO_2$
3. $SOCl_2$
4. $Cl_2$, $H_2O$

**89.** Match the biological molecules from **Column-I** with their respective characteristics/examples from **Column-II** and choose the correct option:

| | **Column-I (Biological Molecules)** | | **Column-II (Characteristics/Examples)** |
|---|---|---|---|
| (A) | Pentose sugar in DNA | (i) | Ascorbic acid |
| (B) | RNA | (ii) | Globular protein |
| (C) | Albumin | (iii) | Uracil |
| (D) | Vitamin | (iv) | Furanose structure |

1. (A) → (iv), (B) → (iii), (C) → (ii), (D) → (i)
2. (A) → (iii), (B) → (ii), (C) → (iv), (D) → (i)
3. (A) → (ii), (B) → (iii), (C) → (iv), (D) → (i)
4. (A) → (i), (B) → (ii), (C) → (iii), (D) → (iv)

**90.** Mark the correct reaction among the following to convert acetamide to methenamine:
1. Hoffmann bromamide reaction
2. Stephens reaction
3. Gabriels phthalimide synthesis
4. Carbylamine reaction

# Biology

**91.** You do not expect to see in a plant cell:
1. A tonoplast
2. An elaioplast
3. 80 S ribosomes
4. A centrosome

**92.** An elaborate network of filamentous proteinaceous structures consisting of microtubules, microfilaments and intermediate filaments present in the cytoplasm of eukaryotic cells is collectively referred to as the:

| | | | |
|---|---|---|---|
| 1. | cytoskeleton | 2. | MTOC |
| 3. | Contractile elements | 4. | vimentin |

**93.** The PGR ethylene does not:
1. promote senescence and abscission of plant organs
2. affect fruit ripening
3. stimulate closure of stomata in times of water stress
4. help in initiating flowering in pineapple

**94.** Which of the following is not correct regarding the decomposition of wastes?

| | |
|---|---|
| **(a)** | Low temperature inhibits decomposition |
| **(b)** | Warm and moist environment favors the process |
| **(c)** | The process is anaerobic |
| **(d)** | It is slower if detritus is rich in proteins and carbohydrates |
| **(e)** | Detritus is degraded into simpler inorganic substance by fungal and bacterial enzymes |

Choose the correct answer from the options given below:

| | | | |
|---|---|---|---|
| 1. | **(b)** and **(c)** only | 2. | **(c)**, **(a)** and **(d)** only |
| 3. | **(c)** and **(d)** only | 4. | **(c)**, **(d)** and **(e)** only |

**95.** Which cells in a dorsiventral (dicotyledonous) leaf are responsible for carrying out photosynthesis and are arranged vertically and parallel to each other?
1. Spongy parenchyma
2. Palisade parenchyma
3. Bulliform cells
4. Guard cells

**96.** What is the working principle of hemodialysis?

| | |
|---|---|
| 1. | It uses active transport to remove waste products from the blood. |
| 2. | It uses a selectively permeable membrane to remove waste products from the blood by diffusion. |
| 3. | It directly removes waste from the kidneys. |
| 4. | It recycles red blood cells and plasma. |

**97.** Consider the two statements:

| | |
|---|---|
| **Assertion (A):** | It is necessary to define the boundaries that would demarcate the region and the strand of DNA that would be transcribed. |
| **Reason (R):** | In transcription, only a segment of DNA and only one of the strands is copied into RNA. |

| | |
|---|---|
| 1. | Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**. |
| 2. | Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**. |
| 3. | **(A)** is True but **(R)** is False. |
| 4. | Both **(A)** and **(R)** are False. |

**98.** Which of the following statements is correct about the origin and evolution of men?

| | |
|---|---|
| 1. | Agriculture came around 50,000 years back. |
| 2. | The *Dryopithecus* and *Ramapithecus* primates existing 15 million years ago, walked like men. |
| 3. | *Homo habilis* probably ate meat. |
| 4. | Neanderthal men lived in Asia between 100000 and 40000 years back. |

**99.** When is the first heart sound produced during cardiac cycle?
1. Beginning of atrial systole
2. Beginning of ventricular systole
3. End of atrial diastole
4. End of ventricular diastole

**100.** Consider the given two statements:

| | |
|---|---|
| **Statement I:** | Terrestrial adaptation necessitated the production of more and more toxic nitrogenous wastes like urea and uric acid for conservation of water. |
| **Statement II:** | Ureotelic and uricotelic animals eliminate nitrogenous waste efficiently with minimal water loss, unlike ammonotelic animals that require a large amount of water for excretion. |

Choose the correct option:

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

**101.** Identify the incorrectly matched pair:

| | | |
|---|---|---|
| 1. | Renal hilum | the entry and exit site for structures servicing the kidneys: vessels, nerves, lymphatics, and ureters. |
| 2. | Columns of Bertini | Extension of renal medulla into renal cortex |
| 3. | Renal pelvis | The funnel-like dilated part of the ureter in the kidney |
| 4. | Renal capsule | A tough fibrous layer surrounding the kidney |

**102.** The side-effects of the use of anabolic steroids in males include all of the following except:
1. increased aggressiveness
2. testicular enlargement
3. decreased sperm production
4. breast enlargement

**103.** Consider the given two statements:

| | |
|---|---|
| **Assertion(A):** | Flowering plants have developed many devices to discourage self-pollination and to encourage cross-pollination. |
| **Reason (R):** | Continued self-pollination results in inbreeding depression and a decrease in genetic variation. |

| | |
|---|---|
| 1. | Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**. |
| 2. | Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**. |
| 3. | **(A)** is True; **(R)** is False |
| 4. | Both **(A)** and **(R)** are False |

**104.** A blood cholesterol lowering agent can be isolated from:

| | | | |
|---|---|---|---|
| 1. | *Trichoderma polysporum* | 2. | *Trichoderma harzianum* |
| 3. | *Monascus purpureus* | 4. | *Penicillium notatum* |

**105.** Why do ecosystems require a constant supply of energy?

| | |
|---|---|
| 1. | To support the cycling of matter through biotic and abiotic components. |
| 2. | To counteract the tendency toward increasing disorder, in line with the Second Law of Thermodynamics. |
| 3. | To ensure continuous reproduction of species within the ecosystem. |
| 4. | To stabilize the populations of consumers at each trophic level. |

**106.** At the alveolar site, the reaction catalyzed by carbonic anhydrase moves in the direction of:
1. Formation of $HCO_3^-$ and $H^+$
2. Formation of $CO_2$ and $H_2O$
3. Binding of $O_2$ to $CO_2$
4. Dissociation of $CO_2$ into carbon and oxygen

**107.** The age pyramid with broad base indicates:
1. high percentage of old individuals
2. low percentage of young individuals
3. a stable population
4. high percentage of young individuals

**108.** The follicular phase of the menstrual cycle is marked by which of the following processes?

| | |
|---|---|
| 1. | Corpus luteum formation |
| 2. | Regression of endometrium |
| 3. | LH surge leading to ovulation |
| 4. | Growth of primary follicles and regeneration of the endometrium |

**109.** The sodium-potassium pump maintains a polarized state in the resting neuron by transporting:

1. 2 $Na^+$ outwards for every 3 $K^+$ inwards
2. 2 $Na^+$ outwards for every 2 $K^+$ inwards
3. 2 $K^+$ outwards for every 3 $Na^+$ inwards
4. 3 $Na^+$ outwards for every 2 $K^+$ inwards

**110.** What is the correct description of a prothallus?

| | |
|---|---|
| 1. | A structure in gymnosperms formed just after fertilisation |
| 2. | A sporophytic free living structure formed in pteridophytes |
| 3. | A gametophytic free living structure formed in pteridophytes |
| 4. | Sex organs bearing stage in Bryophytes |

**111.** All the following regarding collenchyma tissue in plants are correct except:

| | |
|---|---|
| 1. | It occurs below the epidermis of stem and leaves in most monocots |
| 2. | It is found either as a homogenous layer or in patches |
| 3. | Cells are much thickened at the corners |
| 4. | Intercellular spaces are absent |

**112.** Any part of a plant taken out and grown in a test tube under sterile conditions in special nutrient media for generating new plants is called:

| | | | |
|---|---|---|---|
| 1. | Implant | 2. | Explant |
| 3. | Supplant | 4. | Plantlet |

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

| | |
|---|---|
| **Assertion (A):** | The alimentary canal in frogs is short. |
| **Reason (R):** | Frogs are carnivores. |

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

| | |
|---|---|
| 1. | Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**. |
| 2. | Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**. |
| 3. | **(A)** is True but **(R)** is False. |
| 4. | Both **(A)** and **(R)** are False. |

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

| | |
|---|---|
| **Assertion (A):** | Dominance is not an autonomous feature of a gene or the product that it has information for. |
| **Reason (R):** | The frequency of a gene or an allele in a population is ultimately decided by factors such as natural selection. |

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

| | |
|---|---|
| 1. | Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**. |
| 2. | Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**. |
| 3. | **(A)** is True but **(R)** is False. |
| 4. | **(A)** is False but **(R)** is True. |

**115.** In basidiomycetes:

| | |
|---|---|
| **I:** | The asexual spores are generally not found. |
| **II:** | Vegetative reproduction by fragmentation is common. |
| **III:** | The sex organs are absent. |

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

**116.** Sexually transmitted infections (STIs) can be characterized by:

| | |
|---|---|
| 1. | Being always symptomatic with clear physical manifestations |
| 2. | Only affecting individuals with multiple sexual partners |
| 3. | The possibility of being asymptomatic, making them harder to diagnose without testing |
| 4. | Always causing infertility in both males and females |

**117.** Darwin Finches are an excellent example of:
1. Adaptive radiation
2. Sewall Wright effect
3. Saltation
4. Stabilising natural selection

**118.** When population density is plotted against time, the exponential growth curve is:

| | | | |
|---|---|---|---|
| 1. | S shaped | 2. | Straight line |
| 3. | J shaped | 4. | Hyperbola |

**119.** All the following biomolecules can be called both polymers and macromolecules except:
1. Lipids
2. Proteins
3. Carbohydrates
4. Nucleic acids

**120.** Which of the following is an incorrect pairing of biomolecules and their primary function?

| | |
|---|---|
| 1. | Collagen – Structural support in connective tissue. |
| 2. | RuBisCO – Enzymatic activity in the Calvin cycle. |
| 3. | Starch – Energy storage in animal tissues. |
| 4. | Cellulose – Structural component in plant cell walls. |

**121.** Which of the following statements best explains why plant cells cannot undergo cytokinesis through cleavage furrow formation?

| | |
|---|---|
| 1. | Plant cells lack centrioles, which are essential for cleavage furrow formation. |
| 2. | Plant cells have a rigid cell wall that prevents the plasma membrane from pinching inward. |
| 3. | Plant cells do not have actin and myosin filaments required for cleavage furrow formation. |
| 4. | Plant cells have a large central vacuole that interferes with cleavage furrow formation. |

**122.** Bacteria that fix gaseous nitrogen in the atmosphere into a more usable form, such as ammonia,
while free-living in soil, include:

| | |
|---|---|
| **I:** | *Azospirillum* |
| **II:** | *Azotobacter* |
| **III:** | *Rhizobia* |
| **IV:** | *Frankia* |

1. Only **I** and **II**
2. Only **III** and **IV**
3. Only **I** and **III**
4. Only **III**

**123.** The step in the glycolytic pathway where NADH + $H^+$ is formed from NAD+ is when:

| | |
|---|---|
| 1. | fructose 1, 6-bisphosphate is split into dihydroxyacetone phosphate and 3-phosphoglyceraldehyde (PGAL) |
| 2. | 3-phosphoglyceraldehyde (PGAL) is converted to 1, 3-bisphosphoglycerate (BPGA) |
| 3. | BPGA is converted to 3-phosphoglyceric acid (PGA) |
| 4. | PEP is converted to pyruvic acid |

**124.** The partial pressure of oxygen in oxygenated blood is about:
1. 159 mm Hg
2. 104 mm Hg
3. 100 mm Hg
4. 95 mm Hg

**125.** Muscle:

| | |
|---|---|
| **I:** | is a specialised tissue of endodermal origin. |
| **II:** | contributes about 20-30 per cent of the body weight of a human adult. |

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

**126.** Match each item in Column I with one in Column II regarding taxonomic categories of wheat and select the correct match from the codes given:

| | **Column I** | | **Column II** |
|---|---|---|---|
| A | Family | P | Monocotyledonae |
| B | Order | Q | Poaceae |
| C | Class | R | Angiospermae |
| D | Division | S | Poales |

**Codes:**

| | **A** | **B** | **C** | **D** |
|---|---|---|---|---|
| 1. | S | Q | R | P |
| 2. | S | Q | P | R |
| 3. | Q | S | P | R |
| 4. | Q | S | R | P |

**127.** Which of the following is not true about the vascular system of frogs?

| | |
|---|---|
| 1. | The heart has three chambers: two atria and one ventricle. |
| 2. | The conus arteriosus helps pump blood to all parts of the body. |
| 3. | The sinus venosus receives oxygenated blood from the lungs. |
| 4. | Blood circulation is achieved through the pumping action of the heart. |

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

| | **List I (Types of stamens )** | | **List II (Example)** |
|---|---|---|---|
| A. | Monoadelphous | I. | Citrus |
| B. | Diadelphous | II. | Pea |
| C. | Polyadelphous | III. | Lily |
| D. | Epiphyllous | IV. | China-rose |

Choose the correct answer from the options given below:
1. A-IV, B-I, C-II, D-III
2. A-I, B-II, C-IV, D-III
3. A-III, B-I, C-IV, D-II
4. A-IV, B-II, C-I, D-III

**129.** What is the correct definition of saltation in evolutionary biology?

| | |
|---|---|
| 1. | The gradual accumulation of small variations in a population over time, leading to the formation of new species. |
| 2. | The sudden appearance of a new species or major variation due to large-scale mutations or abrupt changes in the genome. |
| 3. | The migration of individuals between populations, leading to the mixing of genetic material. |
| 4. | The survival of individuals with advantageous traits that allow them to adapt to their environment. |

**130.** Which of the following equipment is essentially required for growing microbes on a large scale for the industrial production of enzymes?

| | | | |
|---|---|---|---|
| 1. | Bioreactor | 2. | BOD incubator |
| 3. | Sludge digester | 4. | Industrial oven |

**131.** What feature on ECG represents the return of ventricles from excited to normal state?

| | | | |
|---|---|---|---|
| 1. | P wave | 2. | R wave |
| 3. | S wave | 4. | T wave |

**132.** The mass of living material at a tropic level at a particular time is called:
1. gross primary productivity
2. standing state
3. net primary productivity
4. standing crop

**133.** Different types of leaves in different phases of life in cotton, coriander and larkspur are an example of:
1. Pleiotropy
2. Phenotypic plasticity
3. Developmental noise
4. Polygenic trait

**134.** There can be a net gain of ____ ATP molecules during aerobic respiration of one molecule of glucose [as per NCERT textbook]:
1. 30
2. 36
3. 38
4. 40

**135.** 'Pericarp' is a derivative of which of the following structures?
1. integuments
2. endosperm
3. ovule wall
4. ovary wall

**136.** What is the significance of the memory characteristic of acquired immunity?

| | |
|---|---|
| 1. | It ensures immediate neutralization of pathogens upon first exposure. |
| 2. | It produces a stronger and faster response upon subsequent exposure to the same pathogen. |
| 3. | It activates non-specific immune responses. |
| 4. | It reduces the need for antibody production in subsequent infections. |

**137.** How can tissue culture be used to produce virus-free plants from infected plants?

| | |
|---|---|
| 1. | By removing the infected leaves and growing them in sterile conditions. |
| 2. | By isolating and growing the virus-free meristem from infected plants. |
| 3. | By using pesticides in the growth medium to kill the virus. |
| 4. | By exposing the infected plants to ultraviolet light to eliminate the virus. |

**138.** What does the T-wave in an electrocardiogram (ECG) represent?

| | |
|---|---|
| 1. | Depolarization of atria leading to atrial contraction. |
| 2. | Depolarization of ventricles leading to ventricular contraction. |
| 3. | Repolarization of ventricles indicating ventricular relaxation. |
| 4. | Electrical activation of the sinoatrial (SA) node. |

**139.** Eukaryotic genes:

| | |
|---|---|
| **I:** | include coding regions (exons) and non-coding regions (introns). |
| **II:** | are part of a larger DNA sequence within a chromosome. |

| | | | |
|---|---|---|---|
| 1. | Only **I** is correct | 2. | Only **II** is correct |
| 3. | Both **I** and **II** are correct | 4. | Both **I** and **II** are incorrect |

**140.** Consider the given two statements:

| | |
|---|---|
| Statement I: | It is scientifically correct to say that the sex of the baby is determined by the father and not by the mother. |
| Statement II: | The sex chromosome pattern in the human female is XX and that in the male is XY. |

| | |
|---|---|
| 1. | Statement I is correct; Statement II is incorrect |
| 2. | Statement I is correct; Statement II is correct |
| 3. | Statement I is incorrect; Statement II is incorrect |
| 4. | Statement I is incorrect; Statement II is correct |

**141.** By studying purple sulphur bacteria and green sulphur bacteria, who was the first scientist to demonstrate, in 1931, that photosynthesis is a light-dependent redox reaction in which hydrogen from an oxidizable compound reduces carbon dioxide to cellular materials?

1. Robert Hill
2. C. B. van Neil
3. Arnon
4. Jan Ingenhousz

**142.** Consider the given two statements:

| | |
|---|---|
| **Assertion (A):** | The introduction of sex education in schools should be encouraged to provide right information to young individuals. |
| **Reason (R):** | Proper sex education helps in discouraging children from believing in myths and having misconceptions about sex-related aspects. |

| | |
|---|---|
| 1. | Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)** |
| 2. | Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**. |
| 3. | **(A)** is True but **(R)** is False. |
| 4. | **(A)** is False but **(R)** is True. |

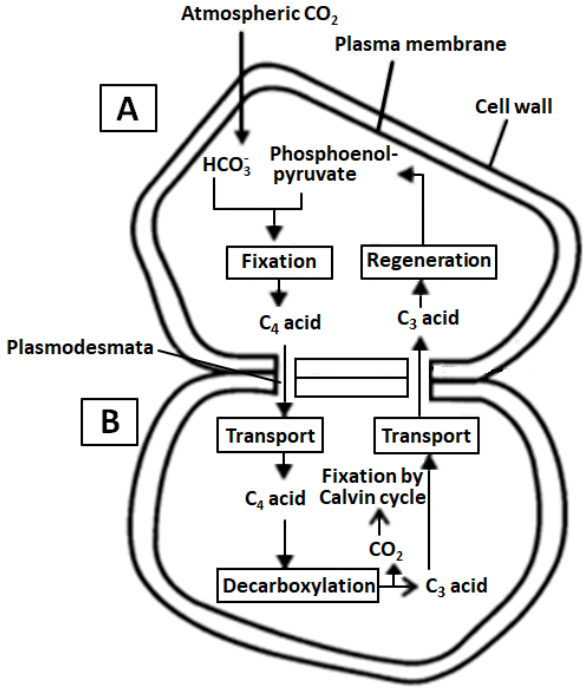
**143.** According to the IUCN Red List (2004), which of the following groups faces the highest percentage of species threatened with extinction?

1. Amphibians
2. Birds
3. Mammals
4. Insects

**144.** Due to increasing air-borne allergens and pollutants, many people in urban areas are suffering from respiratory disorder causing wheezing due to:

| | |
|---|---|
| 1. | reduction in the secretion of surfactants by pneumocytes |
| 2. | benign growth on mucous lining of nasal cavity |
| 3. | inflammation of bronchi and bronchioles |
| 4. | proliferation of fibrous tissues and damage of the alveolar walls |

**145.** In the diagrammatic representation of the Hatch and Slack pathway, A and B respectively represent:




| | |
|---|---|
| 1. | Mesophyll cells and Bundle sheath cells |
| 2. | Bundle sheath cells and Mesophyll cells |
| 3. | Bundle sheath cells and Palisade cells |
| 4. | Mesophyll cells and Guard cells |

**146.** Why is a nucleic acid probe required in many genetic engineering experiments?

| | |
|---|---|
| 1. | To clone genes |
| 2. | To produce a large amount of DNA from a tiny amount of DNA |
| 3. | To make DNA on the template of RNA |
| 4. | To identify genes that have been separated by electrophoresis, or mRNA molecules through in-situ hybridization |

**147.** Match **List-I** with **List-II**:

| | **List-I** | | **List-II** |
|---|---|---|---|
| A. | Predator | I. | *Ophrys* |
| B. | Mutualism | II. | *Pisaster* |
| C. | Parasitism | III. | Female wasp and fig |
| D. | Sexual deceit | IV. | *Plasmodium* |

Choose the correct answer from the options given below:

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

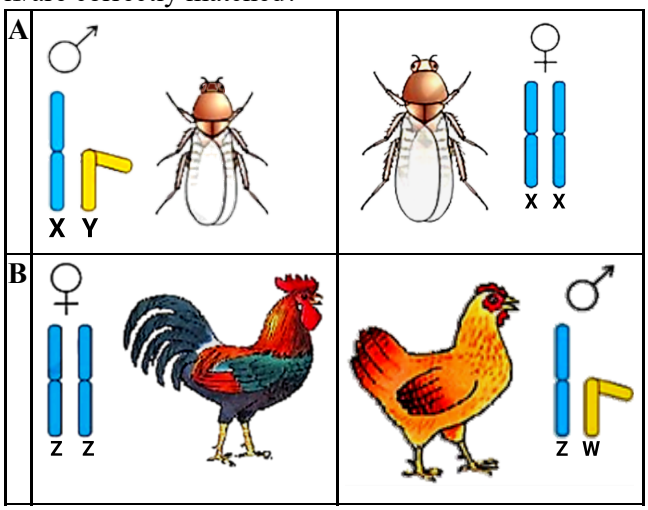
**148.** Match List - I with List - II

| | **List-I** | | **List-II** |
|---|---|---|---|
| (A) | Non-medicated IUDs | (I) | Multiload 375 |
| (B) | Copper releasing IUDs | (II) | Rubber barrier |
| (C) | Hormone releasing IUDs | (III) | Lippes loop |
| (D) | Vaults | (IV) | LNG-20 |

Choose the correct answer from the options given below:

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

**149.** The following figure shows the determination of sex by chromosomal differences. Which of the following is/are correctly matched?




| | | | |
|---|---|---|---|
| 1. | Only A | 2. | Only B |
| 3. | Both A and B | 4. | Neither A nor B |

**150.** Which of the following regions of the brain is incorrectly paired with its function?

| | |
|---|---|
| 1. | Medulla oblongata-Homeostatic control |
| 2. | Cerebellum-Language comprehension |
| 3. | Corpus callosum-Communication between the left and right cerebral cortices |
| 4. | Cerebrum-Calculation and contemplation |

**151.** What type of cartilage forms the pubic symphysis in humans?

| | | | |
|---|---|---|---|
| 1. | Elastic | 2. | Fibrous |
| 3. | Hyaline | 4. | Calcified |

**152.** Consider the given statements:

| | |
|---|---|
| **I:** | Annelids have a segmented body plan with each segment containing a set of organs. |
| **II:** | Annelids possess a pseudocoelom. |
| **III:** | Earthworms and leeches are examples of annelids. |

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

**153.** Consider the two statements:
**Statement I:** Thyroid hormones are lipid soluble
**Statement II:** Epinephrine is a derivative of tyrosine.
1. **Statement I** is incorrect; **Statement II** is correct
2. **Statement I** is correct; **Statement II** is incorrect
3. **Statement I** is correct; **Statement II** is correct
4. **Statement I** is incorrect; **Statement II** is incorrect

**154.** Consider the two statements:

| | |
|---|---|
| **I:** | Most of the developing and underdeveloped world is rich financially, but poor in biodiversity and traditional knowledge. |
| **II:** | Most of the industrialised nations are rich in biodiversity and traditional knowledge related to bio-resources but poor in biotechnology. |

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

**155.** Match the following hormones with the respective disease:

| | | | |
|---|---|---|---|
| (a) | Insulin | (i) | Addison's disease |
| (b) | Thyroxin | (ii) | Diabetes insipidus |
| (c) | Corticoids | (iii) | Acromegaly |
| (d) | Growth Hormone | (iv) | Goitre |
| | | (v) | Diabetes mellitus |

Select the correct option.

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

**156.** Which of the following statements is not correct?

| | |
|---|---|
| 1. | The proinsulin has an extra peptide called C-peptide |
| 2. | Functional insulin has A and B chains linked together by hydrogen bonds. |
| 3. | Genetically engineered insulin is produced in *E. Coli.* |
| 4. | In man, insulin is synthesized as proinsulin. |

**157.** Parthenocarpy in tomatoes can be induced by the application of:

| | | | |
|---|---|---|---|
| 1. | Auxins | 2. | Gibberellins |
| 3. | Ethylene | 4. | Kinetins |

**158.** The sixth mass extinction is characterized by:

| | |
|---|---|
| 1. | A natural cooling period leading to widespread glaciation. |
| 2. | The impact of human activities on biodiversity loss. |
| 3. | A catastrophic volcanic event that altered the Earth's climate. |
| 4. | An asteroid impact leading to the extinction of many species. |

**159.** For its activity, carboxypeptidase requires:
1. Iron
2. Niacin
3. Copper
4. Zinc

**160.** Consider the given two statements:

| | |
|---|---|
| **Statement I:** | Classification of living organisms is important to make study of living organisms possible. |
| **Statement II:** | Classification is the process by which anything is grouped into convenient categories based on some easily observable characters. |

1. **Statement I** is correct; **Statement II** is incorrect
2. **Statement I** is correct; **Statement II** is correct
3. **Statement I** is incorrect; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is correct

**161.** The cerebral aqueduct is a narrow 15 mm conduit for cerebrospinal fluid (CSF) that passes through the:
1. Corpus callosum
2. Diencephalon
3. Mid brain
4. Medulla oblongata

**162.** Which statement is true regarding biogas?

| | |
|---|---|
| 1. | Biogas is primarily composed of methane and is produced by the aerobic decomposition of organic matter. |
| 2. | Biogas is produced through the anaerobic decomposition of organic matter by methanogens. |
| 3. | Biogas production requires high temperatures to convert organic matter into methane. |
| 4. | Biogas is composed mainly of carbon dioxide and nitrogen with traces of methane. |

**163.** Identify the algal group:

| | |
|---|---|
| **I:** | They possess chlorophyll a, c, carotenoids and xanthophylls. |
| **II:** | Food is stored as complex carbohydrates, which may be in the form of laminarin or mannitol. |

1. Green algae
2. Brown algae
3. Red algae
4. Blue-green algae

**164.** Starch synthesis in pea seeds is controlled by one gene. What will be true?

| | |
|---|---|
| **Statement I:** | BB homozygotes produce large starch grains, Bb heterozygotes produce large starch grains and bb homozygotes produce smaller starch grains. |
| **Statement II:** | BB homozygotes produce round seeds, Bb heterozygotes produce oval seeds and bb homozygotes produce wrinkled seeds. |

| | |
|---|---|
| 1. | **Statement I** is correct; **Statement II** is correct |
| 2. | **Statement I** is correct; **Statement II** is incorrect |
| 3. | **Statement I** is incorrect; **Statement II** is incorrect |
| 4. | **Statement I** is incorrect; **Statement II** is correct |

**165.** Members of Phylum Platyhelminthes typically have bodies that are ____ compressed.
1. dorso-laterally
2. bilaterally
3. ventro-laterally
4. dorso-ventrally

**166.** *Wuchereria (W. bancrofti* and *W. malayi),* the filarial worm affect:

| | | | |
|---|---|---|---|
| 1. | lungs | 2. | large intestines |
| 3. | lymphatic system | 4. | brain |

**167.** All chromosomes of a eukaryotic cell are replicated during which of the following phases of the interphase of the cell cycle?
1. $G_1$
2. $G_0$
3. S
4. $G_2$

**168.** What was the primary challenge in producing human insulin using recombinant DNA technology?

| | |
|---|---|
| 1. | Isolating the insulin gene from human DNA. |
| 2. | Ensuring that bacterial cells could survive the production of human insulin. |
| 3. | Assembling the A and B chains of insulin into a mature, functional hormone with disulfide bonds. |
| 4. | Ensuring the bacterial plasmids could produce the C-peptide of insulin along with the A and B chains. |

**169.** Consider the given two statements:

| | |
|---|---|
| **Assertion (A):** | Plasmid DNA is used to monitor bacterial transformation with foreign DNA. |
| **Reason (R):** | Plasmid is extrachromosomal DNA in some bacteria. |

| | |
|---|---|
| 1. | Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)** |
| 2. | Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)** |
| 3. | **(A)** is True but **(R)** is False |
| 4. | **(A)** is False but **(R)** is True |

**170.** Why are the plants produced through micropropagation called somaclones?

| | |
|---|---|
| 1. | They are genetically identical to the original plant as they arise from single somatic cells. |
| 2. | They contain genetic variations due to recombination during tissue culture. |
| 3. | They result from hybridization between different plant species. |
| 4. | They develop only from seeds, ensuring genetic stability. |

**171.** Given below are two statements:

| | |
|---|---|
| **I:** | Amphibians and reptiles have a 3-chambered heart with two atria and a single ventricle, and are oviparous in nature |
| **II:** | Crocodiles possess a 4 chambered heart with two ventricles and two atria and are viviparous in nature |

Select the most appropriate option:
1. **I** is correct but **II** is incorrect.
2. **I** is incorrect but **II** is correct.
3. Both **I** and **II** are correct.
4. Both **I** and **II** are incorrect.

**172.** Consider the given two statements:

| | |
|---|---|
| **Assertion(A):** | Majority of flowering plants produce unisexual flowers. |
| **Reason (R):** | In unisexual flowers, pollen grains are likely to come in contact with the stigma of the same flower. |

| | |
|---|---|
| 1. | Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**. |
| 2. | Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**. |
| 3. | **(A)** is True; **(R)** is False |
| 4. | Both **(A)** and **(R)** are False |

**173.** The "Sixth Extinction," currently underway, is unique from past extinction events primarily due to:

| | |
|---|---|
| 1. | The types of species being lost |
| 2. | The unprecedented rate of species extinctions caused by human activities |
| 3. | The natural causes leading to extinction |
| 4. | Its exclusive impact on marine species |

**174.** The number of correct statements from the statements given below will be:

| | |
|---|---|
| **I:** | The striated appearance of skeletal muscle myofibril is due to the distribution pattern of two important proteins – Actin and Myosin. |
| **II:** | The light band contains actin and is called as I-band or Isotropic band. |
| **III:** | Actin and myosin in a myofibril are arranged as rod-like structures, parallel to each other and also to the longitudinal axis of the myofibrils. |
| **IV:** | Actin filaments are thinner as compared to the myosin filaments. |

| | | | |
|---|---|---|---|
| 1. | 1 | 2. | 2 |
| 3. | 3 | 4. | 4 |

**175.** Polyembryony, as observed in species like Citrus and Mango, refers to which of the following phenomenon?

| | |
|---|---|
| 1. | The formation of multiple embryos from a single zygote due to excessive mitotic divisions. |
| 2. | The development of multiple embryos in an ovule due to the proliferation of nucellar cells surrounding the embryo sac. |
| 3. | The occurrence of multiple ovules within a single seed leading to the formation of numerous embryos. |
| 4. | The differentiation of synergids and antipodal cells into functional embryos within the embryo sac. |

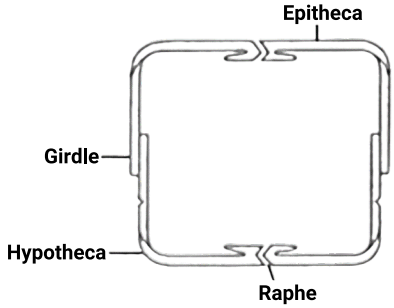
**176.** In cockroach:

| | |
|---|---|
| **I:** | The entire foregut is lined by cuticle. |
| **II:** | The hind gut is broader than midgut and is differentiated into ileum, colon and rectum. |

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

**177.** Which of the following is not true about hormone as described by the current scientific definition?
1. Non nutrient chemical
2. Intercellular messenger
3. Produced in trace amounts
4. Secreted only by organised endocrine glands.

**178.** The given diagram shows a schematic representation of:




| | |
|---|---|
| 1. | Cell wall of diatoms |
| 2. | Plates on body of dinoflagellates |
| 3. | Pseudoplasmodium |
| 4. | Pellicle of Euglenoids |

**179.** In human beings, menstrual cycles cease around 50 years of age. This is termed as

| | | | |
|---|---|---|---|
| 1. | Implantation | 2. | Ovulation |
| 3. | Menarche | 4. | Menopause |

**180.** In the naming convention of restriction enzymes, what does the Roman numeral indicate in the enzyme name?

| | |
|---|---|
| 1. | The type of enzyme |
| 2. | The strain of the bacteria |
| 3. | The order in which the enzyme was isolated from the strain |
| 4. | The type of DNA sequence it recognises |