# Physics

**1.** A ship $A$ is moving westward with a speed of 10 kmph and a ship $B$, 100 km south of $A$, is moving northward with a speed of 10 kmph. The time after which the distance between them becomes the shortest is:

1. 0 h
2. 5 h
3. $5\sqrt{2}$ h
4. $10\sqrt{2}$ h

**2.** Consider a system of two identical particles. One of the particles is at rest and the other has an acceleration $\vec{f}$. The acceleration of the centre-of-mass is:

1. zero
2. $\vec{f}$
3. $\frac{\vec{f}}{2}$
4. $2\vec{f}$

**3.** When AC voltage is applied across an inductor with inductance $L$, the average power dissipated across the inductor is:

| | |
|---|---|
| 1. | non-zero and greater than one |
| 2. | zero |
| 3. | unity |
| 4. | infinite |

**4.** Three vectors $\vec{A}, \vec{B}$ and $\vec{C}$ each having magnitude of 200 units, are inclined to the $x$-axis at angles $45^\circ$, $135^\circ$ and $315^\circ$ respectively. They are added to get a resultant vector $\vec{R}$. The magnitude of $\vec{R}$ is:

| | | | |
|---|---|---|---|
| 1. | $200\sqrt{2}$ units | 2. | 200 units |
| 3. | 300 units | 4. | zero |

**5.** A cycle wheel of radius 0.5 m is rotated with a constant angular velocity of 10 rad/s in a region of a magnetic field of 0.1 T which is perpendicular to the plane of the wheel. The EMF generated between its centre and the rim is:

| | | | |
|---|---|---|---|
| 1. | 0.25 V | 2. | 0.125 V |
| 3. | 0.5 V | 4. | zero |

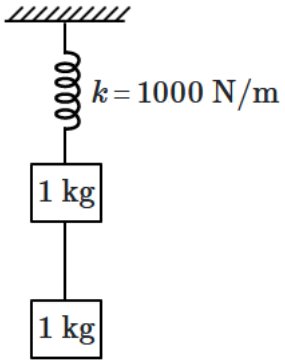
**6.** An electromagnetic wave of frequency $\nu = 3.0$ MHz passes from a vacuum into a dielectric medium with relative permittivity $\varepsilon = 4.0$. Then:

| | |
|---|---|
| 1. | wavelength is doubled and frequency becomes half |
| 2. | wavelength is halved and frequency remains unchanged |
| 3. | wavelength and frequency both remain unchanged |
| 4. | wavelength is doubled and frequency unchanged |

**7.** A force $F = (20 + 10y)$ acts on a particle in the $y$-direction where $F$ is in Newton and $y$ is in metre. The work done by this force to move the particle from $y = 0$ to $y = 1$ m is:

1. 20 J
2. 30 J
3. 5 J
4. 25 J

**8.** Two 1 kg blocks are connected by a light inextensible string and the system is suspended by a spring of stiffness 1000 N/m. Take $g = 10\ \text{m/s}^2$




If the string connecting the blocks is cut, the acceleration of the upper block will be (immediately after the cut):

1. zero
2. $10\ \text{m/s}^2$ upward
3. $5\ \text{m/s}^2$ upward
4. $10\ \text{m/s}^2$ downward

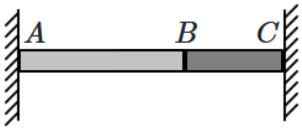
**9.** Let $T_1$ and $T_2$ be the energy of an electron in the first and second excited states of the hydrogen atom, respectively. According to Bohr's model of an atom, the ratio $T_1 : T_2$ is:

1. 9 : 4
2. 1 : 4
3. 4 : 1
4. 4 : 9

**10.** Two charges, $q_1 = 1.1 \times 10^{-8}$ C and $q_2 = 1.1 \times 10^{-9}$ C are initially placed 0.1 m apart. How much energy is required to bring them to a distance of 0.01 m apart?

| | | | |
|---|---|---|---|
| 1. | $10^{-9}$ J | 2. | $10^{-8}$ J |
| 3. | $10^{-6}$ J | 4. | $10^{-5}$ J |

**11.** Two uniform rods, $AB$ and $BC$, have Young's moduli of $1.2 \times 10^{11}$ N/m$^2$ and $1.5 \times 10^{11}$ N/m$^2$, respectively. The coefficient of linear expansion for rod $AB$ is $1.5 \times 10^{-5}/^\circ$C. If both rods have equal cross-sectional area, then the coefficient of linear expansion of $BC$, for which there is no shift of the junction at all temperatures, is:




1. $1.5 \times 10^{-5}/^\circ$C
2. $1.2 \times 10^{-5}/^\circ$C
3. $0.6 \times 10^{-5}/^\circ$C
4. $0.75 \times 10^{-5}/^\circ$C

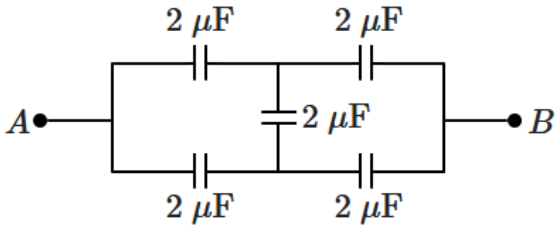
**12.** The elastic energy density in a stretched wire is:

| | | | |
|---|---|---|---|
| 1. | $(\text{stress})^2 \times \text{strain}$ | 2. | stress $\times$ strain |
| 3. | $\frac{1}{2} \times$ stress $\times$ strain | 4. | stress $\times (\text{strain})^2$ |

**13.** In a sinusoidal wave, the time required for a particular point to move from maximum displacement to zero displacement is 0.170 s. The frequency of the wave is:

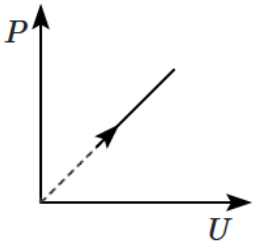
| | | | |
|---|---|---|---|
| 1. | 1.47 Hz | 2. | 0.36 Hz |
| 3. | 0.73 Hz | 4. | 2.94 Hz |

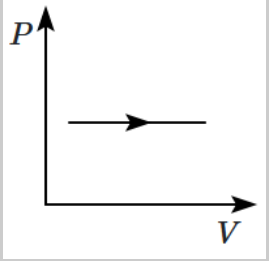
**14.** In the following circuit, the equivalent capacitance between terminal $A$ and terminal $B$ is:

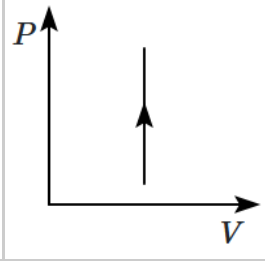


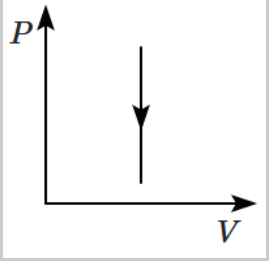

1. 1 $\mu$F
2. 0.5 $\mu$F
3. 4 $\mu$F
4. 2 $\mu$F

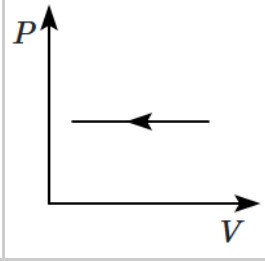
**15.** The given $(P\text{-}U)$ graph shows how the internal energy of an ideal gas changes with increasing pressure. Which of the following pressure-volume $(P\text{-}V)$ graphs corresponds to this relationship?




1. 


2. 


3. 


4. 

**16.** A charged particle of charge $q$ and mass $m$ is projected vertically upward with a speed $u$. Acceleration due to gravity $(g)$ acts downwards, while a uniform electric field $E$ acts along the horizontal. The speed of the projectile's impact on the horizontal is $v$, while the horizontal range is $R$. Then:

1. $v^2 = u^2 + 2gR$
2. $v^2 = u^2 + 2gR\left(\frac{qE}{mg}\right)$
3. $v^2 = u^2 + gR$
4. $v^2 = u^2 + gR\left(\frac{qE}{mg}\right)$

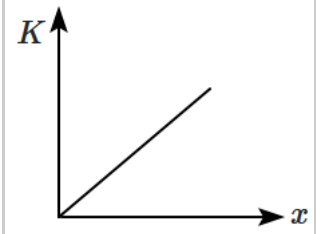
**17.** The ratio of wavelengths of the last line of the Balmer series and the last line of the Lyman series is:

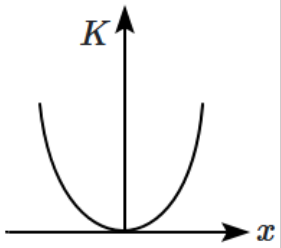
1. 1
2. 4
3. 0.5
4. 2

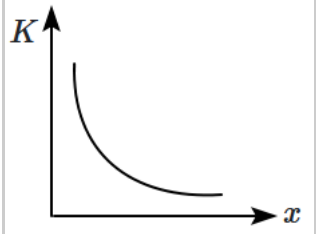
**18.** A ball, thrown vertically upward, is observed to move upward with a speed $v_1$ at time $t_1$ and a speed $v_2$, downward, at time $t_2$.
The average velocity of the ball during the motion is (downward):

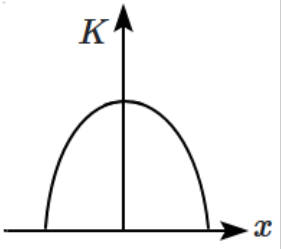
| | | | |
|---|---|---|---|
| 1. | $\frac{v_2 - v_1}{2}$ | 2. | $\frac{v_2 + v_1}{2}$ |
| 3. | $v_2 - v_1$ | 4. | $v_2 + v_1$ |

**19.** For a particle undergoing linear simple harmonic motion (SHM), the graph showing the variation of kinetic energy, $K$ with position, $x$ of the particle is:

1. 


2. 


3. 


4. 

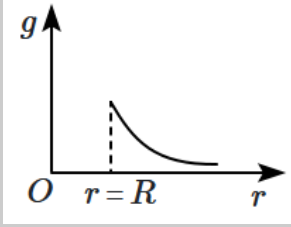

**20.** In the given nuclear fission reaction:
${}^{235}_{92}\mathrm{U} + {}^{1}_{0}\mathrm{n} \rightarrow {}^{x}_{56}\mathrm{Ba} + {}^{89}_{y}\mathrm{Kr} + 3\,{}^{1}_{0}\mathrm{n}$,
the respective values of $x$ and $y$ are:

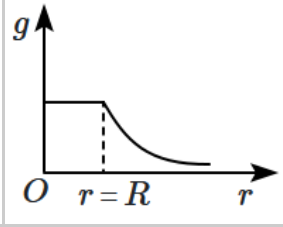
| | | | |
|---|---|---|---|
| 1. | $143, 36$ | 2. | $145, 37$ |
| 3. | $144, 36$ | 4. | $141, 37$ |

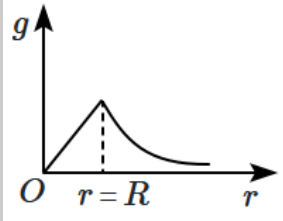
**21.** The current passing through a certain device doubles when the temperature rises by $10^{\circ}\mathrm{C}$, in the temperature range from $0^{\circ}\mathrm{C}$ to $500^{\circ}\mathrm{C}$. This effect is used to measure the temperature of a sample. The current is measured to be $5\ \mathrm{mA}$ at $15^{\circ}\mathrm{C}$ and then the next measurement shows a current of $50\ \mathrm{mA}$. The temperature of the new measurement is nearly: (take $\log_{10} 2 \simeq 0.3$, if required)

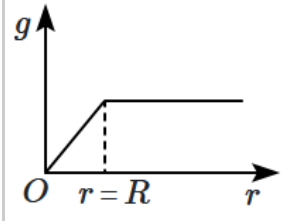
1. $150^{\circ}\mathrm{C}$
2. $50^{\circ}\mathrm{C}$
3. $450^{\circ}\mathrm{C}$
4. $25^{\circ}\mathrm{C}$

**22.** The variation of gravitational intensity $g$ for a uniform solid sphere of mass $M$ and radius $R$ is given by:
(where $r$ is the distance from the centre of the solid sphere)

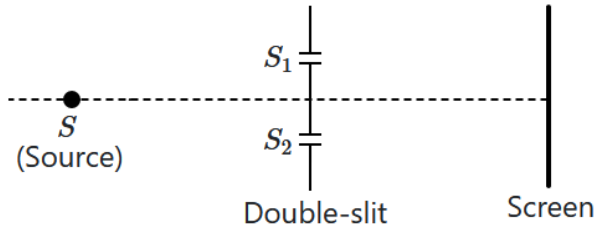
1. 


2. 


3. 


4. 

**23.** A standard Young's double-slit experiment is carried out with identical slits, and the source $(S)$ kept symmetrically, far away from the slits along the normal. The screen is kept parallel to the double-slit far away. The intensity of the central maximum is $I_0$. Some questions are asked about physical quantities in **Column-I** & their answers are provided in **Column-II**, in a different order.




| | Column-I | Column-II | |
|---|---|---|---|
| (A) | Phase difference between the interfering waves at the central fringe | (I) | 0.5 |
| (B) | Phase difference between the waves midway between the $1^{st}$ minimum & $1^{st}$ maximum (as a multiple of $\pi$) | (II) | 1.0 |
| (C) | Intensity at the point midway between the $1^{st}$ maximum & the $1^{st}$ minimum (in terms of $I_0$) | (III) | 1.5 |
| (D) | The average intensity on the screen (as a multiple of $I_0$) | (IV) | 0 |

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

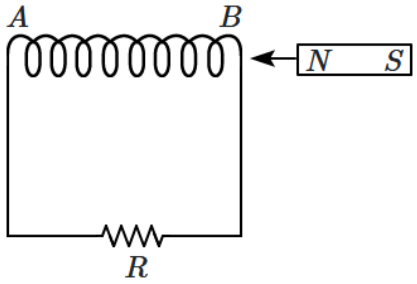
**24.** An electron has been accelerated by a potential difference of $V$ volts. The de-Broglie wavelength for the electron is given by:

1. $\lambda = \dfrac{h}{\sqrt{2mVe}}$
2. $\lambda = \dfrac{hm}{\sqrt{2Ve}}$
3. $\lambda = \dfrac{hV}{\sqrt{2me}}$
4. $\lambda = \dfrac{hm}{2\mathrm{Ve}}$

**25.** The percentage error in the measurement of $g$ is: (Given, $g = \frac{4\pi^2 L}{T^2}$, $L = (10 \pm 0.1)$ cm, $T = (100 \pm 1)$ s)

1. $2\%$
2. $5\%$
3. $3\%$
4. $7\%$

**26.** A permanent magnet is driven towards a solenoid $(AB)$, as shown, along its axis. As it approaches the solenoid:

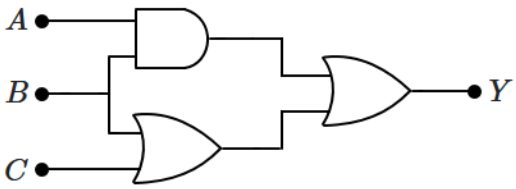



| | |
|---|---|
| 1. | ends $A, B$ become $N, S$ poles due to induction |
| 2. | ends $A, B$ become $S, N$ poles due to induction |
| 3. | ends $A, B$ both become $N$-poles due to induction |
| 4. | ends $A, B$ both become $S$-poles due to induction |

**27.** In Young's double-slit experiment conducted with the light of an unknown wavelength, it is found that the fringe width is twice the separation between the slits, $d$, which is 0.5 mm. The slit to screen distance is 1 m. The wavelength of light used is:

| | | | |
|---|---|---|---|
| 1. | 125 nm | 2. | 250 nm |
| 3. | 500 nm | 4. | 1000 nm |

**28.** Consider the circuit shown in the above diagram. The output $(Y)$ of the circuit does not depend on $A$. Then, $Y =$




1. $B$ AND $C$
2. $B$ OR $C$
3. $B$
4. $C$

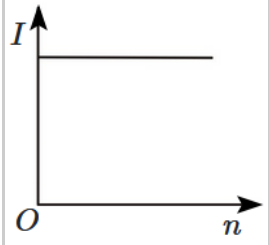
**29.** Images of the same size are formed by a convex lens when the object is placed at 20 cm or at 10 cm from the lens. The focal length of the convex lens is:

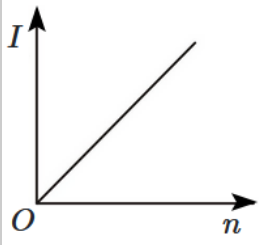
| | | | |
|---|---|---|---|
| 1. | 5 cm | 2. | 10 cm |
| 3. | 15 cm | 4. | 20 cm |

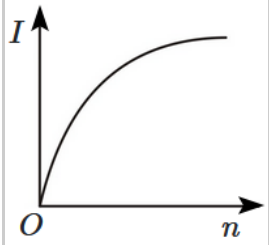
**30.** An electromagnetic wave, given by its electric field $\vec{E}$, is travelling in space:
$\vec{E} = E_0\hat{j}\sin 2\pi\left(10^3\ \mathrm{s}^{-1}t - \frac{x}{\lambda}\right)$
The wave is travelling along:

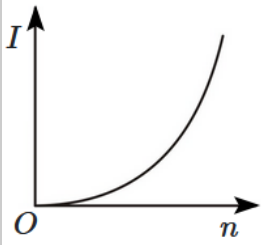
| | |
|---|---|
| 1. | the positive $x$-axis |
| 2. | the negative $x$-axis |
| 3. | the positive $y$-axis |
| 4. | the negative $y$-axis |

**31.** A battery consists of a variable number $n$ of identical cells (having internal resistance $r$ each) which are connected in series. The terminals of the battery are short-circuited and the current $I$ is measured. Which of the graphs shows the correct relationship between $I$ and $n$?

1. 


2. 

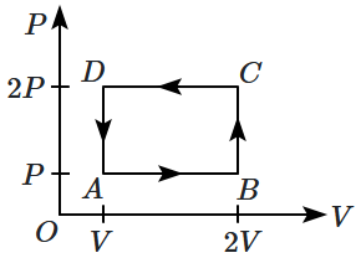

3. 


4. 


**32.** If a bar magnet of magnetic moment $m$ is cut (divided) into four parts such that the length and width of each part is half that of the initial one, then the magnetic moment of each part will be:

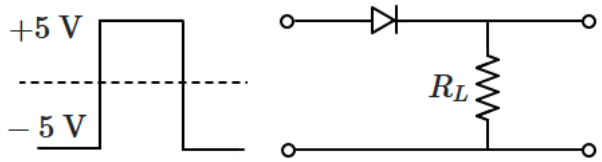
1. $\frac{m}{4}$
2. $\frac{m}{2}$
3. $\frac{m}{8}$
4. $4m$

**33.** A thermodynamic system is taken through the cycle $ABCD$ as shown in the figure. Heat rejected by the gas during the cycle is:

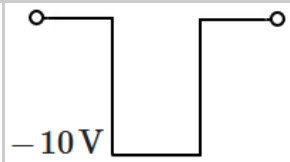


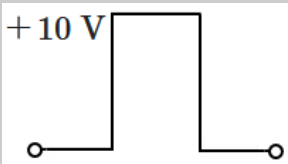

1. $2PV$
2. $4PV$
3. $\frac{1}{2}PV$
4. $PV$

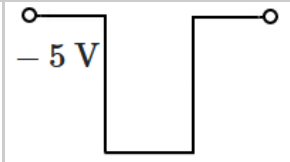
**34.** If in a p-n junction, a square input signal of 10 V is applied as shown,

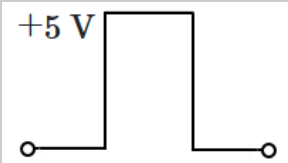



then the output across $R_L$ will be:

1. 


2. 


3. 


4. 

**35.** The heart of a man pumps 5 L of blood through the arteries per minute at a pressure of 150 mm of mercury. If the density of mercury is $13.6 \times 10^3\ \mathrm{kg/m^3}$ and $g = 10\ \mathrm{m/s^2}$, then the power of the heart in watts is:

| | | | |
|---|---|---|---|
| 1. | 1.70 | 2. | 2.35 |
| 3. | 3.0 | 4. | 1.50 |

**36.** A steady current $I$ flows in a small square loop of wire of side $L$ in a horizontal plane. The loop is now folded about its middle such that half of its lies in a vertical plane. Let $\mu_1$ and $\mu_2$ (vectors) denote the magnetic moment due to the current loop before and after folding, respectively. Then:

1. $\frac{|\mu_1|}{|\mu_2|} = 1$
2. $\mu_1$ and $\mu_2$ are in the same direction
3. $\frac{|\mu_1|}{|\mu_2|} = \sqrt{2}$
4. $\frac{|\mu_1|}{|\mu_2|} = \frac{1}{\sqrt{2}}$

**37.** What is the flux through a cube of side $a$, if a point charge of $q$ is placed at one of its corners?

1. $\frac{2q}{\varepsilon_0}$
2. $\frac{q}{8\varepsilon_0}$
3. $\frac{q}{\varepsilon_0}$
4. $\frac{q}{2\varepsilon_0}$

**38.** A string, under tension, and lying along the $x$-axis is set into transverse vibrations. The displacement at a point $x$ is given by the function $y(x,t)$ where $t$ represents the time: $y(x,t) = (3\ \mathrm{mm}) \sin\left(\frac{\pi x}{20\ \mathrm{cm}}\right) \cos\left\{2\pi\left(100\ \mathrm{s^{-1}}\right) t\right\}$

A node is formed on the string at:

| | |
|---|---|
| 1. | $x = 0$ only |
| 2. | $x = 20$ cm only |
| 3. | $x = 0, x = 20\ \mathrm{cm}, x = 40\ \mathrm{cm}, \ldots$ |
| 4. | $x = 10\ \mathrm{cm}, x = 30\ \mathrm{cm}, x = 50\ \mathrm{cm}, \ldots$ |

**39.** Which of the following quantities is always zero in a simple harmonic motion?

| | | | |
|---|---|---|---|
| **(a)** | $\vec{F} \times \vec{a}$ | **(b)** | $\vec{v} \times \vec{r}$ |
| **(c)** | $\vec{a} \times \vec{r}$ | **(d)** | $\vec{F} \times \vec{r}$ |

Choose the correct option from the given ones:

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

**40.** The de-Broglie wavelength of a body of mass 1 kg moving with velocity 2000 m/s is:

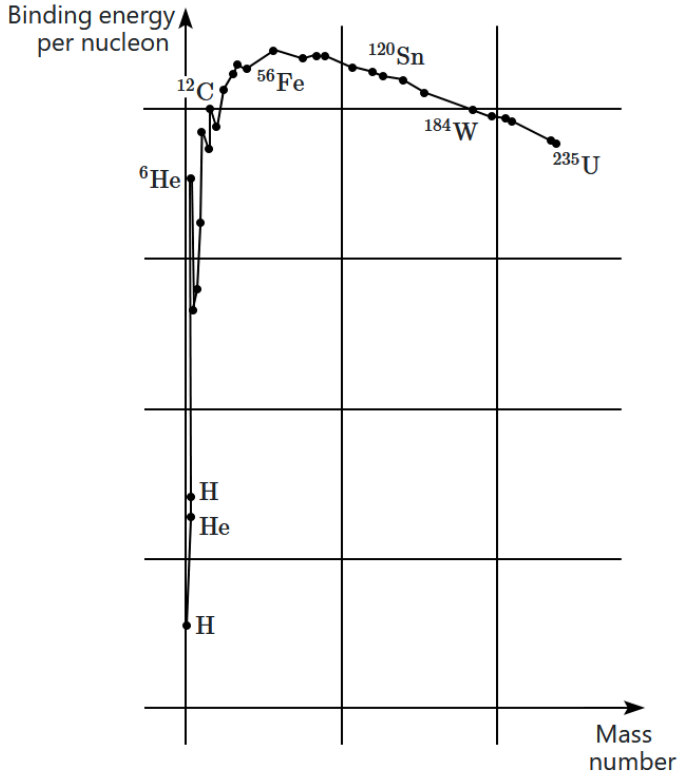
1. $3.32 \times 10^{-27}\ \mathring{A}$
2. $1.6 \times 10^{7}\ \mathring{A}$
3. $0.55 \times 10^{-22}\ \mathring{A}$
4. none of the above

**41.** The binding energy per nucleon (MeV/nucleon) is given below for the following:

| | | |
|---|---|---|
| $^{*}\mathrm{H} - 1.11$ | $^{4}\mathrm{He} - 7.07$ | $^{120}\mathrm{Sn} - 8.50$ |
| $^{3}\mathrm{He} - 2.57$ | $^{12}_{6}\mathrm{C} - 7.68$ | $^{184}\mathrm{W} - 8.01$ |
| $^{*}\mathrm{H} - 2.83$ | $^{56}_{26}\mathrm{Fe} - 8.79$ | $^{235}\mathrm{U} - 7.59$ |

$^{*}-$ missing data

This data is also represented as a graph plotted against mass number:




After studying the data carefully, answer the following.
Which of the following is the most stable?

1. $^{56}\mathrm{Fe}$
2. $^{235}\mathrm{U}$
3. $^{120}\mathrm{Sn}$
4. $^{206}\mathrm{Pb}$

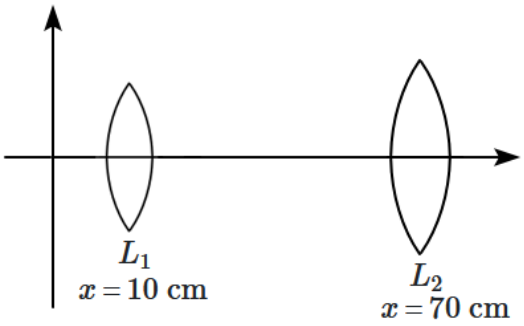
**42.** A tightly wound 100 turns coil of radius 10 cm carries a current of 7 A. The magnitude of the magnetic field at the centre of the coil is: (Take permeability of free space as $4\pi \times 10^{-7}$SI units):

1. 4.4 T
2. 4.4 mT
3. 44 T
4. 44 mT

**43.** The magnetic field within an iron-cored solenoid (carrying a current) is $5 \times 10^{-3}$ T. If a small cavity is made within the solenoid, near the centre, and the region is filled with a diamagnetic substance, the magnetic field within the solenoid will:

| | |
|---|---|
| 1. | increase by a small amount |
| 2. | decrease by a small amount |
| 3. | increase by a large amount |
| 4. | decrease by a large amount |

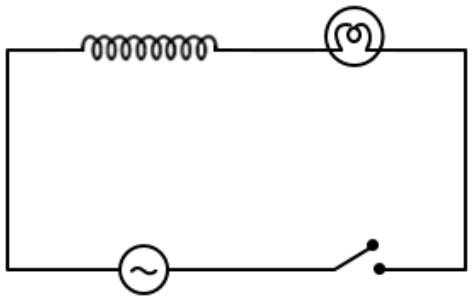
**44.** Lenses $L_1$ and $L_2$ of focal length 10 cm and 20 cm are placed with their principal axis coinciding with the $x$ -axis: lens $L_1$ is placed at $x = 10$ cm, lens $L_2$ is placed at $x = 70$ cm.




A point object is placed at the origin, it functions as a source of light. The final image is formed at $x =$

| | | | |
|---|---|---|---|
| 1. | 90 cm | 2. | 110 cm |
| 3. | 50 cm | 4. | infinity |

**45.** A light bulb and an inductor coil are connected to an AC source through a key as shown in the figure below. The key is closed and after some time an iron rod is inserted into the interior of the inductor. The glow of the light bulb:

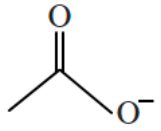
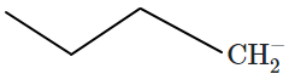
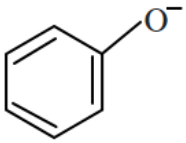


| | |
|---|---|
| 1. | decreases |
| 2. | remains unchanged |
| 3. | will fluctuate |
| 4. | increases |

# Chemistry

**46.** A substance that gives a brick red flame and breaks down on heating to give oxygen and a brown gas is:
1. Calcium carbonate
2. Magnesium carbonate
3. Calcium nitrate
4. None of the above

**47.** Increasing order of basic strength of the following compounds is:

| | | | |
|---|---|---|---|
| I. |  | II. |  |
| III. | $NH_2^-$ | IV. |  |

1. IV > II> I> III
2. III> II> IV> I
3. II > III > IV> I
4. II > III > I > IV

**48.** What would happen when a solution of potassium chromate is treated with an excess of dilute nitric acid ?
1. $Cr^{3+}$ and $Cr_2O_7^{2-}$
2. $Cr_2O_7^{2-}$ and $H_2O$ are formed
3. $Cr_2O_4^{2-}$ is reduced to +3 state of Cr
4. None of the above

**49.** 5g of $Na_2SO_4$ was dissolved in $x$ g of $H_2O$. The change in freezing point was found to be 3.82°C. If $Na_2SO_4$ is 81.5% ionised, the value of $x$ ($K_f$ for water = 1.86°C kg $mol^{-1}$) is approximately:
(molar mass of S = 32 g $mol^{-1}$ and that of Na = 23 g $mol^{-1}$)
1. 15 g
2. 25 g
3. 45 g
4. 65 g

**50.** Which lanthanide among the following readily forms stable divalent ions?
1. Tb
2. Dy
3. Er
4. Eu

**51.** A solution of 0.02 M $CH_3COOH$ has a specific conductance ($\kappa$) of $5 \times 10^{-5}$ S $cm^{-1}$. Given that the limiting molar conductance of $CH_3COOH$ is 400 S $cm^2$ $mol^{-1}$, what is the dissociation constant ($K_a$) of $CH_3COOH$?

| | | | |
|---|---|---|---|
| 1. | $8 \times 10^{-7}$ | 2. | $6 \times 10^{-7}$ |
| 3. | $10 \times 10^{-7}$ | 4. | $4 \times 10^{-7}$ |

**52.** The reagent used in dehydrohalogenation process is:
1. Alcoholic KOH
2. $NaNH_2$
3. $C_2H_5ONa$
4. All of these

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

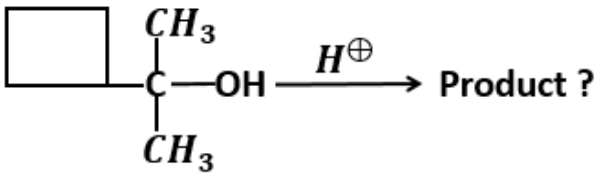
**54.** The correct order of first ionisation potential of Be, B , C, N and O is:
1. O >N > C > B > Be
2. N >O > C > B > Be
3. N > O > C > Be > B
4. O >N > C > Be > B

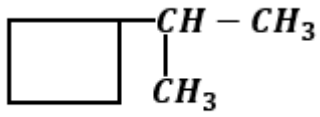
**55.** Match the underlined atom in a compound given in Column I with the oxidation states given in Column II and mark the appropriate choice.

| | **Column I** | | **Column II** |
|---|---|---|---|
| (A) | $Na\underline{B}H_4$ | (i) | –1 |
| (B) | $\underline{C}HCl_3$ | (ii) | +3 |
| (C) | $Ca\underline{O}_2$ | (iii) | +2 |
| (D) | $\underline{O}_2F_2$ | (iv) | +1 |

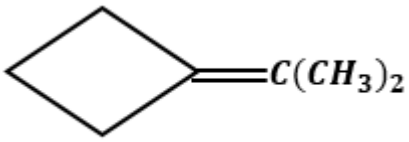
1. (A) → (iv), (B) → (iii), (C) → (ii), (D) → (i)
2. (A) → (i), (B) → (ii), (C) → (iii), (D) → (iv)
3. (A) → (ii), (B) → (iii), (C) → (i), (D) → (iv)
4. (A) → (iii), (B) → (ii), (C) → (i), (D) → (iv)

**56.**

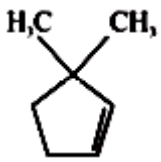


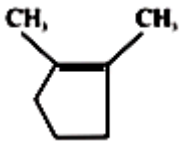

1.




2.




3.




4.

**57.** The enthalpy of fusion of water is 1.435 kcal/mol. The molar entropy change for the melting of ice at 0 °C is:
1. 10.52 cal/(mol K)
2. 21.04 cal/(mol K)
3. 5.260 cal/(mol K)
4. 0.526 cal/(mol K)

**58.** Incorrect statements among the following are:

| | |
|---|---|
| **(a)** | Group I radicals are precipitated as chloride |
| **(b)** | Group IV radicals are precipitated as sulphide |
| **(c)** | Group V radicals are precipitated as hydroxide |
| **(d)** | Group III radicals are precipitated as chloride |

1. **(a)**, **(b)** and **(d)**
2. **(c)** and **(d)**
3. **(a)**, **(b)** and **(c)**
4. **(a)**, **(b)**, **(c)** and **(d)**

**59.** Neopentyl iodide is treated with aq. $AgNO_3$ solution, a yellow precipitate is formed along with another compound which is
1. $(CH_3)_3CCH_2ONO_2$
2. $(CH_3)_2\overset{\overset{OH}{|}}{C} - CH_2CH_3$
3. $(CH_3)_3CCH_2OH$
4. $(CH_3)_2\overset{\overset{ONO_2}{|}}{C}–CH_2CH_3$

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

| | |
|---|---|
| 1. | Ovalbumin is a simple food reserve in egg white. |
| 2. | Blood proteins thrombin and fibrinogen are involved in blood clotting. |
| 3. | Denaturation makes the proteins more active. |
| 4. | Insulin maintains sugar level in the blood of the human body. |

**61.** Choose the correct statement:

| | |
|---|---|
| 1. | Both diamond and graphite are used as dry lubricants. |
| 2. | Diamond and graphite have a two-dimensional network. |
| 3. | Diamond is covalent and graphite is ionic. |
| 4. | Diamond is $sp^3$ hybridised and graphite is $sp^2$ hybridized. |

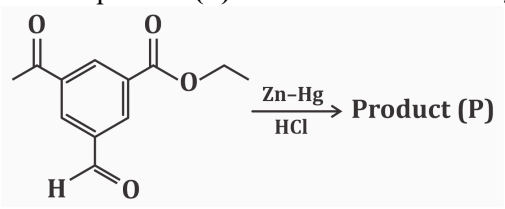
**62.** For a first-order reaction with a half-life of 170 seconds, what fraction of the reactant will remain unreacted after 510 seconds?

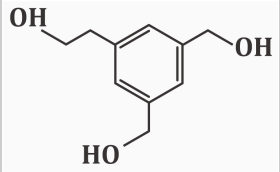
| | | | |
|---|---|---|---|
| 1. | $\frac{1}{2}$ | 2. | $\frac{1}{4}$ |
| 3. | $\frac{1}{8}$ | 4. | $\frac{1}{3}$ |

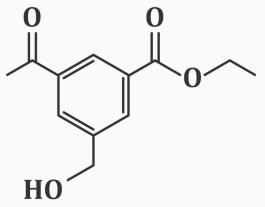
**63.** For the process $H_2O(l)(1bar, 373\ K) \rightarrow H_2O(g)$ (1 bar, 373 $K$), the correct set of thermodynamic parameters is:

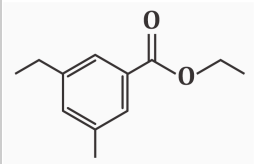
1. $\Delta G = +ve, \Delta S = 0$
2. $\Delta G = 0, \Delta S = -ve$
3. $\Delta G = 0, \Delta S = +ve$
4. $\Delta G = -ve, \Delta S = +ve$

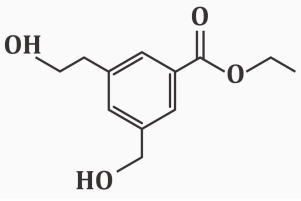
**64.** The product **(P)** formed in the following reaction is:




1. 


2. 


3. 


4. 

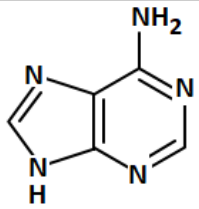
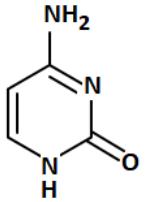
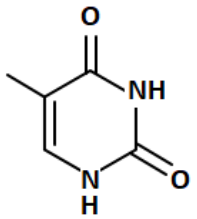
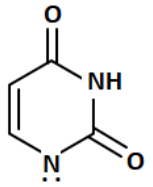

**65.** The correct IUPAC name of $AlCl_3(EtOH)_4$ is:

1. Aluminium (II)Chloride-4-ethanol
2. Aluminium (III)Chloride-4-ethanol
3. Aluminium (IV)Chloride-4-hydroxy ethane
4. Aluminium Chloride-4-ethanol

**66.** The hybridised state of Xe and shape of $XeOF_4$ , respectively, will be:

1. $sp^3d$ and Square pyramidal
2. $sp^3d^2$ and Octahedral
3. $sp^3d^2$ and Square pyramidal
4. $sp^3d$ and Trigonal bipyramidal

**67.** Match the structure of the bases in column I with their names given in column II:

| | **Column-I** | | **Column-II** |
|---|---|---|---|
| A. |  | I. | Uracil |
| B. |  | II. | Adenine |
| C. |  | III. | Cytosine |
| D. |  | IV. | Thymine |

Choose the correct answer from the options given below:

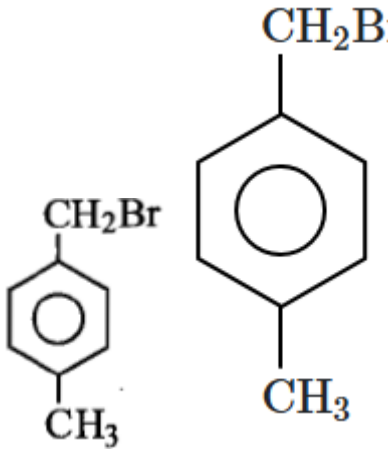
| | (A) | (B) | (C) | (D) |
|---|---|---|---|---|
| 1. | (IV) | (II) | (III) | (I) |
| 2. | (I) | (II) | (III) | (IV) |
| 3. | (II) | (III) | (IV) | (I) |
| 4. | (IV) | (I) | (II) | (III) |

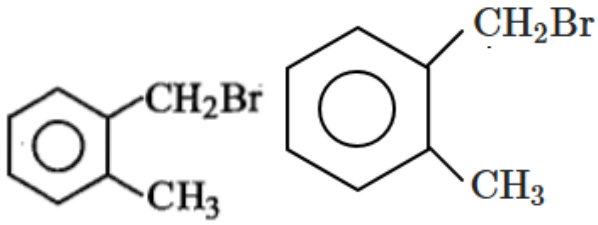
**68.** Match **Column-I** with **Column-II** and choose the appropriate option:

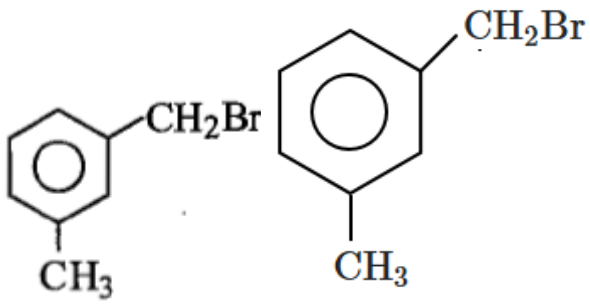
| | **Column-I (Species)** | | **Column-II (Electronic Configuration)** |
|---|---|---|---|
| A. | $Cr$ | (i). | $[Ar]3d^8 4s^0$ |
| B. | $Fe^{2+}$ | (ii). | $[Ar]3d^{10} 4s^1$ |
| C. | $Ni^{2+}$ | (iii). | $[Ar]3d^6 4s^0$ |
| D. | $Cu$ | (iv). | $[Ar]3d^5 4s^1$ |
| | | (v). | $[Ar]3d^6 4s^2$ |

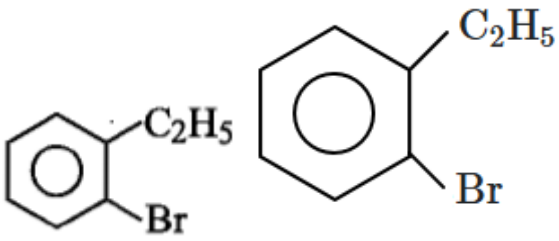
| Options: | A | B | C | D |
|---|---|---|---|---|
| 1. | iv | iii | i | ii |
| 2. | i | ii | iii | v |
| 3. | v | iv | iii | ii |
| 4. | iv | v | iii | ii |

**69.** 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).

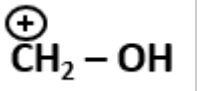
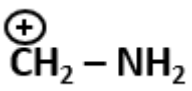
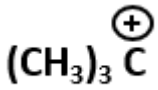
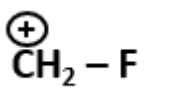
1. 


2. 


3. 


4. 

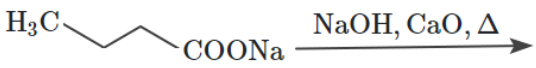
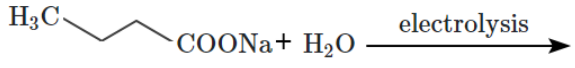
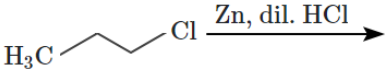
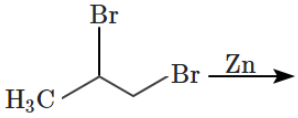
**70.** The most stable carbocation is:

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

**71.** For the $PO_4^{3-}$ ion, what are the formal charges on each oxygen atom and the bond order of the P-O bond, respectively?

| | | | |
|---|---|---|---|
| 1. | –0.75, 0.6 | 2. | –0.75, 1.0 |
| 3. | –0.75, 1.25 | 4. | –3.1, 1.25 |

**72.** Which of the following reactions yield(s) propane as a major product?

| | |
|---|---|
| a. |  |
| b. |  |
| c. |  |
| d. |  |

| | | | |
|---|---|---|---|
| 1. | a, c | 2. | b, c |
| 3. | b, d | 4. | None of the above. |

**73.** The standard reduction potentials at 298 K for the following half-cell reactions are given against each.

$Zn^{2+}(aq) + 2e^- \rightleftharpoons Zn(s)$ $\quad -0.762V$

$Cr^{3+}(aq) + 3e^- \rightleftharpoons Cr(s)$ $\quad -0.740V$

$2H^+(aq) + 2e^- \rightleftharpoons H_2(g)$ $\quad 0.000V$

$Fe^{3+}(aq) + e^- \rightleftharpoons Fe^{2+}(aq)$ $\quad 0.770V$

Which is the strongest reducing agent?

1. Zn(s)
2. Cr(s)
3. $H_2(g)$
4. $Fe^{2+}(aq)$

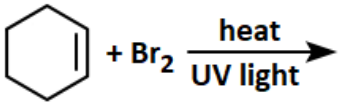
**74.** Given the reaction:

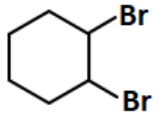
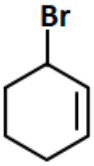
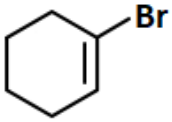
R-OH + $PCl_5$ $\longrightarrow$ R-Cl + $POCl_3$ + HCl

The most reactive alcohol in the above reaction will be:

| | | | |
|---|---|---|---|
| 1. | 1° Alcohol | 2. | 2° Alcohol |
| 3. | 3° Alcohol | 4. | Cannot be predicted |

**75.** The structure of major monohalogenated product in the following reaction is:



| | | | |
|---|---|---|---|
| 1. |  | 2. |  |
| 3. |  | 4. | None of the above. |

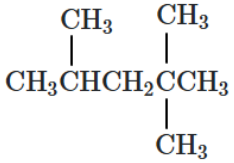
**76.** Accumulation of lactic acid ($HC_3H_5O_3$ a monobasic acid), in tissues leads to pain and fatigue. In a 0.10 M aqueous solution, lactic acid is 3.7% dissociated. The value of the dissociation constant, $K_a$, for this acid, will be:

1. $1.4 \times 10^{-5}$
2. $1.4 \times 10^{-4}$
3. $3.7 \times 10^{-4}$
4. $2.8 \times 10^{-4}$

**77.** Which of the following aqueous solutions of electrolytes will exhibit the least elevation in boiling point?

| | | | |
|---|---|---|---|
| 1. | 0.05 M NaCl | 2. | 0.1 M KCl |
| 3. | 0.1 M $MgSO_4$ | 4. | 1 M NaCl |

**78.** How many hydrogen atoms in the given compound can be classified as primary?



| | | | |
|---|---|---|---|
| 1. | 10 | 2. | 15 |
| 3. | 17 | 4. | 18 |

**79.** The oxidation numbers of sulphur in $S_8$, $S_2F_2$, $H_2S$ respectively, are:

1. 0, +1 and -2
2. +2, +1 and -2
3. 0, +1 and +2
4. -2, +1 and -2

**80.** The activation energy of a reaction is 75.0 kJ $mol^{-1}$. At what temperature will the rate constant be twice its value at 298 K?

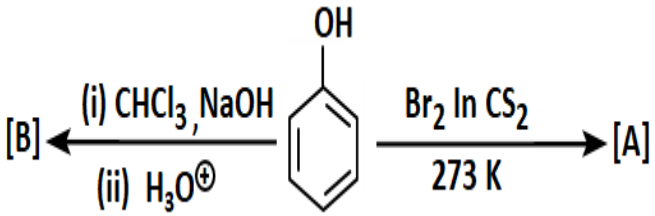
1. 455 K
2. 307 K
3. 371 K
4. 410 K

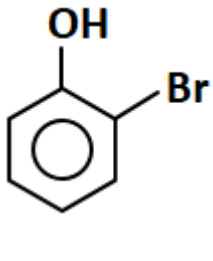
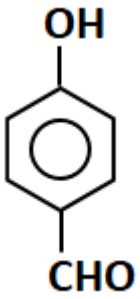
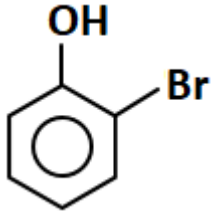
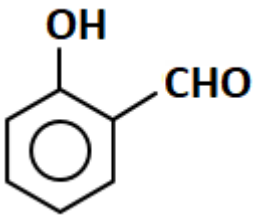
**81.** Which acid of each pair shown here would you expect to be stronger?

| | | | |
|---|---|---|---|
| (i) | (a) $CH_3CO_2H$ | or | (b) $CH_2FCO_2H$ |
| (ii) | (c) $CH_2FCO_2H$ | or | (d) $CH_2ClCO_2H$ |

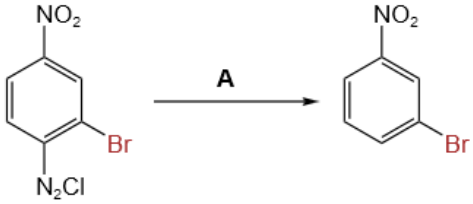
1. (a), (d)
2. (b), (c)
3. (a), (c)
4. (b), (d)

**82.** Identify the major products **(A)** and **(B)** respectively in the following reactions of phenol:



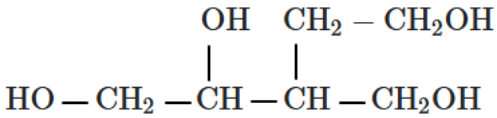

| | [A] | [B] | | [A] | [B] |
|---|---|---|---|---|---|
| 1. |  |  | 2. |  | |
| 3 |  |  | 4. |  | |

**83.** "A" in the below reaction is:




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

**84.** What is the IUPAC name of the following compound?



1. 3-Hydroxymethyl pentane-1,4,5-triol
2. 3-Hydroxyethyl butane-1,2,4-triol
3. 4-Hydroxyethyl-1,2,4-trihydroxy butane
4, 3-Hydroxymethyl pentane-1,2,5-triol

**85.** In $[Cr(NH_3)_6]$ $[Co(CN)_6]$ , the oxidation state of Cr and Co, respectively, are :

| | | | |
|---|---|---|---|
| 1. | 0 and +6 | 2. | +2 and +4 |
| 3. | +3 and +3 | 4. | +4 and +2 |

**86.** Nessler's reagent is used to detect:

1. $CrO_4^{2-}$
2. $PO_4^{3-}$
3. $MnO_4^-$
4. $NH_4^+$

**87.** The empirical formula of Kevlar, used in making bulletproof vests, given it contains 70.6% carbon (C), 4.2% hydrogen (H), 11.8% nitrogen (N), and 13.4% oxygen (O) is:
1. $C_7H_5NO_2$
2. $C_7H_5N_2O$
3. $C_7H_9NO$
4. $C_7H_5NO$

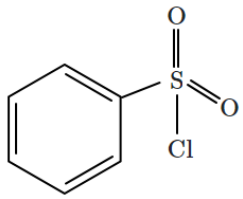
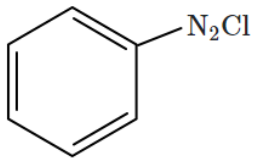
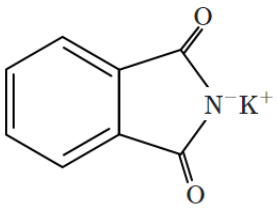
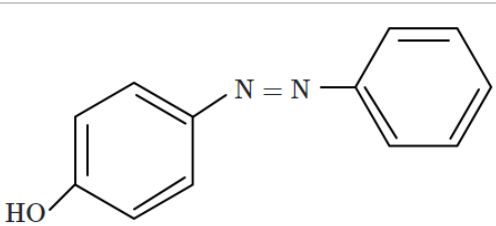
**88.** The pH of a 0.045 M solution of the monoprotic acid is 5.30. What is the $K_a$ of monoprotic acid?

(Given: $10^{-5.30} = 5.0 \times 10^{-6}$)

1. $1.1 \times 10^{-4}$
2. $5.0 \times 10^{-6}$
3. $2.0 \times 10^{-9}$
4. $5.6 \times 10^{-10}$

**89.** T-shaped molecule among the following is:
1. $SF_4$
2. $NH_3$
3. $BrCl_3$
4. $FO_3^-$

**90.** Hinsberg reagent, among the following:

1. 
2. 
3. 
4. 

# Biology

**91.** Which of the following is not true regarding the structure of the cell wall in members of various Kingdoms in Whittaker's classification system?

| | |
|---|---|
| 1. | It is composed of polysaccharides and amino acids in Monera. |
| 2. | All members of Kingdom Protista have a cell wall, usually cellulosic. |
| 3. | Cell wall with chitin is present in Fungi. |
| 4. | Animals lack a cell wall in their cells. |

**92.** Curd produced with the use of lactic acid bacteria is considered nutritionally superior as it provides:

| | | | |
|---|---|---|---|
| 1. | Iron | 2. | Vitamin B12 |
| 3. | Iodine | 4. | Vitamin A |

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

| | |
|---|---|
| **Assertion (A):** | The problem of classification becomes tougher as one ascends in the taxonomic hierarchy. |
| **Reason (R):** | Higher taxonomic categories are more complex, incorporating diverse members with fewer common characteristics. |

| | |
|---|---|
| 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. |

**94.** How many of the following will be the functions of adrenaline and noradrenaline?

| | |
|---|---|
| I: | increase in heart rate |
| II: | decrease in the strength of heart contraction |
| III: | increase in the rate of respiration |
| IV: | glycogenolysis |
| V: | breakdown of lipids and proteins |

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

**95.** In the exponential growth equation $N_t = N_0 e^{rt}$, e represents :
1. The base of natural logarithms
2. The base of geometric logarithms
3. The base of number logarithms
4. The base of exponential logarithms

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

| | |
|---|---|
| **I:** | The right kidney is located slightly lower than the left kidney. |
| **II:** | The average weight of human kidney varies between 120 g and 170 g. |

1. Only **I** is correct
2. Only **II** is correct
3. Neither **I** nor **II** are correct
4. Both **I** and **II** are correct

**97.** The number of autosomes in a human egg would be:

| | | | |
|---|---|---|---|
| 1. | 22 | 2. | 23 |
| 3. | 1 | 4. | 2 |

**98.** Which region of the brain contains centers responsible for controlling involuntary reflexes like respiration and cardiovascular functions?
1. Hypothalamus
2. Cerebellum
3. Pons
4. Medulla oblongata

**99.** Find the **incorrect** statement/s

| | |
|---|---|
| **a:** | Flocs are masses of anaerobic bacteria associated with fungal filaments |
| **b:** | BOD gets reduced significantly when the secondary treatment is done using aerobic microbes |
| **c:** | Activated sludge can be sedimented only after anaerobic digestion of sewage |
| **d:** | Mixture of gases is released during aerobic digestion of sewage |

1. **a**, **b**, **c** & **d**
2. Only **c**
3. All, except **b**
4. **a**, **b** & **d**

**100.** Down's syndrome in humans is due to:
1. Three 'X' chromosomes
2. Three copies of chromosome 21
3. Monosomy
4. Two 'Y' chromosomes

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

| | |
|---|---|
| **Assertion (A):** | Post-menopausal women are at higher risk to develop osteoporosis. |
| **Reason (R):** | Level of oestrogen in post-menopausal women is decreased. |

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. |

**102.** Identify the incorrect statement regarding mitosis:

| | |
|---|---|
| 1. | Mitosis usually results in the production of haploid daughter cells with variable genetic complement. |
| 2. | The growth of multicellular organisms is due to mitosis. |
| 3. | Mitosis restores the nucleo-cytoplasmic ratio. |
| 4. | Mitosis replaces lost cells in multicellular organisms. |

**103.** *Agrobacterium tumifaciens*:

| | |
|---|---|
| **I:** | is a pathogen of several monocot plants |
| **II:** | is able to deliver a piece of DNA known as 'T-DNA' to transform normal plant cells into a tumor and direct these tumor cells to produce the chemicals required by the pathogen. |

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

**104.** Arrange the components of the mammary gland. (from proximal to distal)
(a) Mammary duct
(b) Lactiferous duct
(c) Alveoli
(d) Mammary ampulla
(e) Mammary tubules
Choose the most appropriate answer from the options given below :
1. (c) → (a) → (d) → (e) → (b)
2. (b) → (c) → (e) → (d) → (a)
3. (c) → (e) → (a) → (d) → (b)
4. (e) → (c) → (d) → (b) → (a)

**105.** Which of the following is an anatomical feature of a dicot root?
1. Presence of a single layer of cortex.
2. Radial arrangement of vascular bundles.
3. Lack of secondary growth.
4. Scattered vascular bundles.

**106.** A transcription unit in DNA is defined primarily by the three regions in DNA and these are with respect to upstream and downstream end:
1. Structural gene, Transposons, Operator gene
2. Inducer, Repressor, Structural gene
3. Promotor, Structural gene, Terminator
4. Repressor, Operator gene, Structural gene

**107.** Which of the following is not a typical feature of Down's syndrome?
1. Short stature and a small round head
2. Development of gynecomastia in males
3. Mental retardation
4. Broad palm with characteristic palm crease

**108.** Renin, secreted by the juxtaglomerular apparatus, plays a key role in:

| | |
|---|---|
| 1. | Converting angiotensinogen to angiotensin I, initiating the RAAS pathway. |
| 2. | Directly increasing sodium reabsorption in the proximal convoluted tubule. |
| 3. | Stimulating the release of aldosterone from the adrenal medulla. |
| 4. | Breaking down proteins into amino acids for energy production. |

**109.** Cryopreservation is a technique used to preserve cells, tissues, or any other biological constructs by cooling them to very low temperatures. At what temperature, typically involving liquid nitrogen, is cryopreservation carried out to ensure the long-term preservation of biological samples?
1. −20°C
2. −80°C
3. −150°C
4. −196°C

**110.** Consider the given two statements.

| | |
|---|---|
| **Assertion (A):** | A plant with $C_4$ pathway has a tremendous advantage over a plant with $C_3$ pathway when the weather is hot and dry. |
| **Reason (R):** | The stomata remain open and there is always sufficient carbon dioxide to combine directly with RUBP in $C_4$ plants when the weather is hot and dry. |

| | |
|---|---|
| 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. | **(A)** is False, **(R)** is True |

**111.** How many of the given statements are correct?

| | |
|---|---|
| **I:** | Enzymes are composed of one or several polypeptide chains. |
| **II:** | Cofactors are non-protein constituents that make the enzyme catalytically active. |
| **III:** | Prosthetic groups are transiently associated with the apoenzyme. |
| **IV:** | Coenzymes are tightly bound to the apoenzyme and are part of the active site. |
| **V:** | Zinc is a cofactor for the proteolytic enzyme carboxypeptidase. |

1. 2
2. 3
3. 4
4. 5

**112.** All the following are examples of synovial joints except:
1. joint between carpal bones
2. joint between adjacent thoracic vertebrae
3. joint between atlas and axis vertebra
4. joint between the humerus and pectoral girdle

**113.** Bt cotton is not
1. a GM plant
2. insect resistant
3. a bacterial gene expressing system
4. resistant to all pesticides

**114.** The shared terminal duct of the reproductive and urinary system in the human male is:
1. Urethra
2. Ureter
3. Vas deferens
4. Vasa efferentia

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

| | |
|---|---|
| **Assertion (A):** | Inhalation of carbon monoxide (CO) is dangerous and can be fatal. |
| **Reason (R):** | Carbon monoxide has a much higher affinity for haemoglobin than oxygen, forming carboxyhaemoglobin and reducing oxygen transport. |

Choose the correct option:

| | |
|---|---|
| 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. |

**116.** The number of points in the TCA cycle where $FAD^+$ is reduced to $FADH_2$ is/are:
1. 1
2. 2
3. 3
4. 4

**117.** The respiratory pathway is best considered as:
1. a pure catabolic pathway
2. a pure anabolic pathway
3. an amphibolic pathway
4. a redundant pathway

**118.** What type of organic compounds are found in the acid insoluble fraction?

| | |
|---|---|
| 1. | Lipids, polysaccharides, proteins, and nucleic acids |
| 2. | Monosaccharides, disaccharides, and trisaccharides |
| 3. | Vitamins, minerals, and water |
| 4. | Carotenoids, alkaloids, and essential oils |

**119.** Angina pectoris is primarily caused by:

| | |
|---|---|
| 1. | Complete blockage of a coronary artery, leading to myocardial infarction. |
| 2. | Reduced blood flow to the heart muscle due to partial coronary artery blockage. |
| 3. | Rupture of a blood vessel in the brain, causing a stroke. |
| 4. | Inflammation of the pericardium due to infection. |

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

| | |
|---|---|
| **Statement I:** | Birds are characterized by their pneumatic (hollow) bones and a four-chambered heart. |
| **Statement II:** | Birds are cold-blooded and possess air sacs that supplement their respiration. |

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

**121.** How does immunotherapy help in the treatment of cancer?

| | |
|---|---|
| 1. | Immunotherapy works by directly destroying cancer cells using radiotherapy. |
| 2. | Immunotherapy focuses on the use of chemical agents to inhibit tumour growth and metastasis. |
| 3. | Immunotherapy works by surgically removing tumours and enhancing the patient's recovery through medication. |
| 4. | Immunotherapy involves using biological response modifiers like α-interferon to activate the immune system to target and destroy cancer cells. |

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

| | |
|---|---|
| **Assertion (A):** | Plant development is considered 'open' because plants retain the ability to form new organs throughout their life. |
| **Reason (R):** | Plants exhibit phenotypic plasticity. |

| | |
|---|---|
| 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. |

**123.** 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. |

**124.** Which enzyme must not be used when isolating DNA in pure form from a bacterial cell?

1. Lysozyme
2. Ribonuclease
3. Deoxyribonuclease
4. Protease

**125.** How many of the given statements are correct?

| | |
|---|---|
| **I:** | Mosses and liverworts are examples of Bryophytes. |
| **II:** | Pteridophytes include horsetails and ferns. |
| **III:** | The plant body of angiosperms is differentiated into roots, stems, and leaves. |
| **IV:** | Algae can be found in both freshwater and marine habitats. |

1. 1
2. 2
3. 3
4. 4

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

| | | |
|---|---|---|
| 1. | Golden rice | Vitamin $B_{12}$ enriched rice |
| 2. | Rosie | First transgenic cow |
| 3. | Bt Cotton | Genetically modified pest resistant plant cotton variety |
| 4. | Basmati controversy | Biopiracy |

**127.** Consider the following statements:

| | |
|---|---|
| **I:** | Statins, used as blood cholesterol-lowering agents, are derived from *Monascus purpureus* |
| **II:** | Cyclosporin A, derived from *Trichoderma*, is used as an immunosuppressant |
| **III:** | Baculoviruses, in the genus Nucleopolyhederovirus, are species-specific, broad-spectrum insecticides |

Which of the above statements are true?
1. **I** and **II** only
2. **I** and **III** only
3. **II** and **III** only
4. **I**, **II** and **III**

**128.** Allergic responses are mediated in humans by the antibodies belonging to the class:
1. IgG
2. IgD
3. IgE
4. IgM

**129.** Auxins:
**I:** promote flowering in tomatoes.
**II:** induce parthenocarpy in pineapples.

| | | | |
|---|---|---|---|
| 1. | Only **I** | 2. | Only **II** |
| 3. | Both **I** and **II** | 4. | Neither **I** nor **II** |

**130.** Which one of the following statements about Histones is wrong?

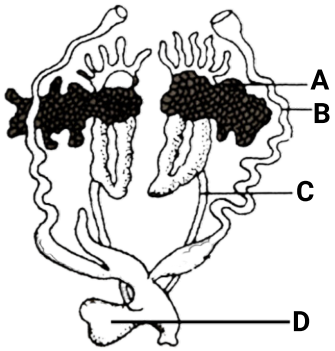
| | |
|---|---|
| 1. | Histones are rich in amino acids - Lysine and Arginine. |
| 2. | Histones carry a positive charge in the side chain. |
| 3. | Histones are organized to form a unit of 8 molecules |
| 4. | Histones are organized to form a unit of 10 molecules |

**131.** Of the following living cells, identify the smallest one, which is known to be able to survive even without oxygen and lacking a rigid cell wall?
1. Mycoplasma
2. Typical bacterial cells
3. A yeast
4. Single-celled amoeba

**132.** Filiform apparatus is a characteristic feature of?
1. Generative cell
2. nucellar embryo
3. aleurone cell
4. synergids

**133.** Myelin sheath around axons in peripheral nervous system and in central nervous system is produced respectively by:
1. Schwann cells; microglia
2. oligodendrocytes; Schwann cells
3. Schwann cells; oligodendrocytes
4. satellite cells; astrocytes

**134.** The figure shows the female reproductive system of a frog. Identify A, B, C and D:




| | **A** | **B** | **C** | **D** |
|---|---|---|---|---|
| 1. | Ova | Ovary | Ureter | Urinary bladder |
| 2. | Ovary | Oviduct | Ureter | Urinary bladder |
| 3. | Ova | Oviduct | Urethra | Urinary bladder |
| 4. | Ova | Oviduct | Ureter | Cloaca |

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

| | **List-I (Cockroach)** | | **List-II (Term Used)** |
|---|---|---|---|
| A. | Metamorphosis | I. | Ommatidia |
| B. | Brain | II. | Paurometabolous |
| C. | Vision | III. | Spiracles |
| D. | Respiration | IV. | Supra oesophageal ganglion |

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

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

| | |
|---|---|
| **Statement I:** | Apical dominance is caused by the presence of gibberellins. |
| **Statement II:** | Apical dominance is the inhibition of lateral bud growth by the apical bud. |

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

**137.** In a monocot stem:

| | |
|---|---|
| **I:** | hypodermis is collenchymatous |
| **II:** | vascular bundles are conjoint and closed |
| **III:** | phloem parenchyma is 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

**138.** Cnidarians exist in two basic body forms: polyp and medusa. Some cnidarians, like Obelia, alternate between these two forms in a process called metagenesis. In this process:

| | |
|---|---|
| 1. | Polyps reproduce sexually, forming medusae. |
| 2. | Medusae reproduce asexually, forming polyps. |
| 3. | Medusae reproduce sexually, forming polyps, while polyps reproduce asexually, forming medusae. |
| 4. | Both polyps and medusae reproduce asexually. |

**139.** What is the function of thrombokinase in blood clotting?

| | |
|---|---|
| 1. | Thrombokinase directly converts fibrinogen into fibrin, which forms a clot. |
| 2. | Thrombokinase is an enzyme complex that converts prothrombin into thrombin, which subsequently converts fibrinogen into fibrin. |
| 3. | Thrombokinase prevents clot formation by inhibiting thrombin activity. |
| 4. | Thrombokinase dissolves clots by breaking down fibrin into smaller fragments. |

**140.** Identify the incorrect statement:

| | |
|---|---|
| 1. | Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis. |
| 2. | Gross primary productivity minus respiration losses (R), is the net primary productivity (NPP). |
| 3. | Gross primary productivity is the available biomass for the consumption of heterotrophs (herbivores and decomposers). |
| 4. | Secondary productivity is defined as the rate of formation of new organic matter by consumers. |

**141.** In the reproductive system of female frogs, which of the following statements is true?

| | |
|---|---|
| 1. | The oviducts open directly into the coelom. |
| 2. | Females have a single ovary. |
| 3. | Eggs are fertilized internally. |
| 4. | Eggs are laid and fertilized externally in water. |

**142.** According to the MTP [Amendment] Act 2017, the gestational age till which MTP can be performed is a maximum of:
1. 12 weeks
2. 16 weeks
3. 20 weeks
4. 24 weeks

**143.** Each trophic level has a certain mass of living material at a particular time called as the:
1. Standing state
2. Primary Productivity
3. Secondary Productivity
4. Standing crop

**144.** Working independently, who reached conclusions similar to those reached by Darwin on evolution of life forms?

| | | | |
|---|---|---|---|
| 1. | T R Malthus | 2. | Hugo de Vries |
| 3. | Alfred Russell Wallace | 4. | Jean Baptist Lamarck |

**145.** Which of the following events occurs during anaphase of mitosis?

| | |
|---|---|
| 1. | Condensation of chromatin into chromosomes. |
| 2. | Alignment of chromosomes at the metaphase plate. |
| 3. | Separation of sister chromatids and their movement to opposite poles. |
| 4. | Formation of the nuclear envelope around daughter chromosomes. |

**146.** During concentration of urine by human kidneys small amounts of urea enter the thin segment of the ascending limb of Henle's loop which is transported back to the interstitium by the:
1. collecting tubule.
2. proximal convoluted tubule.
3. descending limb of loop of Henle.
4. descending limb of vasa recta.

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

| | |
|---|---|
| **Assertion (A):** | When a particular restriction enzyme cuts strands of DNA, overhanging stretches or sticky ends are formed. |
| **Reason (R):** | Some restriction enzymes cut the strand of DNA a little away from the centre of palindromic site. |

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

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

**148.** Alexander von Humboldt:

| | |
|---|---|
| 1. | was German and worked in South America and gave species-area relationship |
| 2. | was French and worked in South East Asia and gave species-area relationship |
| 3. | was English and worked in South East Asia and gave resource partitioning concept |
| 4. | was Spanish and worked in South America and gave character displacement concept |

**149.** The posterior pituitary is:

| | |
|---|---|
| 1. | under the direct neural regulation of the hypothalamus |
| 2. | under the regulation of the chemicals produced by the hypothalamus |
| 3. | is not under any regulation of the hypothalamus |
| 4. | is regulated directly by the humoral concentrations of the hormones it secretes |

**150.** The leading cause of the loss of global biodiversity in current times is:
1. Habitat loss and fragmentation
2. Alien species invasion
3. Over-exploitation
4. Co-extinction

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

| | |
|---|---|
| **Statement I:** | A single filament of tropomyosin runs close to the 'F' actins throughout its length. |
| **Statement II:** | In the resting state, a subunit of troponin masks the active binding sites for myosin on the actin filaments. |

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 correct
4. **Statement I** is incorrect; **Statement II** is incorrect

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

| | |
|---|---|
| **Assertion (A):** | Analogous structures are a result of divergent evolution |
| **Reason (R):** | Analogous structures evolve for the same function and hence have structural similarity. |

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

**153.** What makes the vacuoles in plant cells distinct from those in protists like Amoeba?

| | |
|---|---|
| 1. | Plant cell vacuoles facilitate osmoregulation, while protist vacuoles store ions. |
| 2. | Plant vacuoles maintain turgor pressure, while protist vacuoles are involved in food storage or osmoregulation. |
| 3. | Vacuoles in plant cells are surrounded by a double membrane, while those in protists have a single membrane. |
| 4. | Vacuoles in protists are larger than those in plant cells. |

**154.** The number of organised endocrine bodies in the head and neck region of a human being will be:

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

**155.** In the 'test–tube baby' procedure:

| | |
|---|---|
| 1. | Fertilization is in-vitro but embryo development is in-vivo |
| 2. | Fertilization is in-vivo but embryo development is in-vitro |
| 3. | Both fertilization and embryo development are in-vitro |
| 4. | Both fertilization and embryo development are in-vivo |

**156.** Which of the following statements is/are correct regarding the human respiratory system?

| | |
|---|---|
| **1.** | The primary bronchi divide into secondary bronchi, which further divide into tertiary bronchi. |
| **2.** | The pleural fluid between the pleural membranes increases friction during breathing movements. |
| **3.** | The trachea is supported by complete cartilaginous rings. |
| **4.** | The epiglottis prevents food from entering the trachea during swallowing. |

Options:
1. Only **1** and **4** are correct.
2. Only **2** and **3** are correct.
3. Only **1**, **3**, and **4** are correct.
4. Only **1**, **2**, and **4** are correct.

**157.** What is the key concept behind plant tissue culture?

| | |
|---|---|
| 1. | Growing plants from seeds in a nutrient-rich solution. |
| 2. | Growing whole plants from explants in a sterile nutrient medium. |
| 3. | Reproducing plants by using their fruits and seeds in controlled conditions. |
| 4. | Crossbreeding two different plant species to create hybrids. |

**158.** Which of the following statements about Saheli, the oral contraceptive pill, is true?

| | |
|---|---|
| 1. | It is a once-a-week pill containing high doses of estrogen. |
| 2. | It is a daily pill that works by suppressing ovulation through the administration of progesterone only. |
| 3. | It is a non-steroidal pill, taken once a week, known for its fewer side and high contraceptive value. |
| 4. | It functions primarily by altering the cervical mucus, making it impermeable to sperm. |

**159.** 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 |

**160.** In *Obelia*:

| | |
|---|---|
| **a:** | both polyp and medusa forms exist during its life cycle |
| **b:** | metagenesis, a sort of alternation of generation, is seen |
| **c:** | polyps produce medusae sexually and medusae form the polyps sexually |

| | | | |
|---|---|---|---|
| 1. | only **a** is correct | 2. | only **a** and **b** are correct |
| 3. | only **c** is correct | 4. | **a**, **b** and **c** are correct |

**161.** 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. |

**162.** Which of the following is not included in hot spots of biodiversity including India?
1. Western Ghats
2. Eastern Himalayas
3. Indo Burma
4. Ganga Yamuna Doab

**163.** The process of leaching in decomposition primarily involves:

| | |
|---|---|
| 1. | Transformation of detritus into humus by microbial action. |
| 2. | Direct nutrient release from detritus to plant roots through bacterial activity. |
| 3. | Release of inorganic nutrients through water flow, causing them to precipitate as unavailable salts. |
| 4. | Breakdown of large detritus particles into smaller fragments by detritivores. |

**164.** Artificial hybridization involves which two key steps to ensure controlled pollination?
1. Self-incompatibility and bagging
2. Cross-pollination and emasculation
3. Pollen germination and bagging
4. Emasculation and bagging

**165.** Ovary does not secrete:
1. Estrogen
2. Progesterone
3. Relaxin
4. Human chorionic gonadotropin

**166.** The process by which cancer cells spread from their original location to another part of the body is called as:

| | | | |
|---|---|---|---|
| 1. | metagenesis | 2. | metastasis |
| 3. | teratogenesis | 4. | mitosis |

**167.** Among the two nucleic acids, the DNA is a better genetic material because:

| | |
|---|---|
| 1. | It is able to generate its replica (Replication). |
| 2. | It is more stable chemically and structurally. |
| 3. | It provides the scope for rapid changes (mutation). |
| 4. | It is able to express itself in the form of 'Mendelian Characters'. |

**168.** Oxygen is *not* produced during photosynthesis by:

| | | | |
|---|---|---|---|
| 1. | Green sulphur bacteria | 2. | *Nostoc* |
| 3. | *Cycas* | 4. | *Chara* |

**169.** What wave of the ECG represents ventricular repolarization?

| | | | |
|---|---|---|---|
| 1. | P | 2. | Q |
| 3. | R | 4. | T |

**170.** Which type of neuron, with one axon and one dendrite, is primarily found in the retina of the eye?
1. Unipolar
2. Multipolar
3. Bipolar
4. Quadripolar

**171.** What is a prothallus?

| | |
|---|---|
| 1. | A structure in pteridophytes formed before the thallus develops |
| 2. | A sporophytic free living structure formed in pteridophytes |
| 3. | A gametophyte free living structure formed in pteridophytes |
| 4. | A primitive structure formed after fertilization in pteridophytes |

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

| | |
|---|---|
| **Statement I:** | Properties of tissues are present in the constituent cells and similarly properties of cellular organelles are present in the molecular constituents of the organelle. |
| **Statement II:** | All living organisms – present, past and future, are linked to one another by the sharing of the common genetic material, but to varying degrees. |

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

**173.** If the % weight of elements in Earth's crust and human body are compared, all the following will have a higher % composition in human body except:
1. Carbon
2. Oxygen
3. Nitrogen
4. Calcium

**174.** In a monocotyledonous seed, what separates the endosperm from the embryo?
1. Scutellum
2. Coleoptile
3. Aleurone layer
4. Coleorhiza

**175.** The term that describes the maximum number of individuals a population can sustain in a given environment is:
1. Carrying capacity
2. Biotic potential
3. Limiting factor
4. Environmental resistance

**176.** Match **Column-I** with values given in **Column-II**:

| | **Column-I Partial Pressure of** | | **Column-II Value (in mm of Hg)** |
|---|---|---|---|
| A. | Carbon dioxide in tissues | 1. | 104 |
| B. | Carbon dioxide in alveoli | 2. | 40 |
| C. | Oxygen in alveoli | 3. | 45 |
| D. | Oxygen in oxygenated blood | 4. | 95 |

1. A-1, B-2, C-4, D-3
2. A-3, B-1, C-2, D-4
3. A-3, B-2, C-1, D-4
4. A-2, B-1, C-3, D-4

**177.** In an epigynous flower, the ovary is situated:

| | |
|---|---|
| 1. | below other floral parts |
| 2. | above other floral parts |
| 3. | at the same level as other floral parts |
| 4. | not on the thalamus |

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

| | |
|---|---|
| **Assertion (A):** | RNA interference (RNAi) can be used to silence specific genes in an organism |
| **Reason (R):** | RNAi involves the use of single-stranded RNA molecules that are complementary to the DNA sequences of the target gene. |

| | |
|---|---|
| 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 **(R)** |
| 3. | **(A)** is True but **(R)** is False |
| 4. | **(A)** is False but **(R)** is True |

**179.** An orchid growing as an epiphyte on a mango branch is a classical example of:
1. Parasitism
2. Mutualism
3. Commensalism
4. Predation

**180.** Match each item in Column I with one item in Column II and select the best match from the codes given:

| | **Column I** | | **Column II** |
|---|---|---|---|
| A. | Cyanobacteria | P. | Asexual reproduction |
| B. | Archaebacteria | Q. | Silica cell wall |
| C. | Diatoms | R. | Methanogens |
| D. | Deuteromycetes | S. | Nitrogen fixation |

Codes:

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