NEET 2022

OFFICIAL QUESTION PAPERS WITH DETAILED SOLUTION

All questions with detailed solutions of Physics, Chemistry and Biology

CAREERS360

Physics

Q. 1 The dimensions $\left[\mathrm{MLT}^{-2}\ \mathrm{A}^{-2}\right]$ belong to the:

Option 1:
self inductance

Option 2:
magnetic permeability

Option 3:
electric permittivity.

Option 4:
magnetic flux.

Correct Answer:
magnetic permeability

Solution:
We know that,

the force per unit length between two current-carrying conductors is

$$\frac{f}{l}=\frac{\mu_0 i_1 i_2}{2\pi a}$$

$$\therefore [\mu_0]=\left[\frac{F}{i_1 i_2}\right]\left[\frac{a}{l}\right]$$

$$[\mu_0]=\left[M^1L^1T^{-2}A^{-2}\right]$$

Hence, the answer is the option (2).

Q. 2 The area of a rectangular field $\left(\text{in } \mathrm{m}^2\right)$ of length $55.3\mathrm{m}$ and breadth $25\mathrm{m}$ after rounding off the value for correct significant digits is

Option 1:
1382

Option 2:

1382.5

Option 3:

14×10^2

Option 4:

138×10^1

Correct Answer:

14×10^2

Solution:

$\mathrm{l} = 55.3\ \mathrm{m}$

$\mathrm{b} = 25\ \mathrm{m}$

$\text{Area } = \mathrm{l} \times \mathrm{b}$

$= 55.3 \times 25\ \mathrm{m}$

$= 14 \times 10^2$

$\therefore$ In product or division by arithmetic rules, the answer must have the least no of significant figures.

Hence, the answer is the option (3).

Q. 3 Plane angle and solid angle have:

Option 1:

Dimensions but no units

Option 2:

No units and no dimensions

Option 3:

Both units and dimensions

Option 4:

Units but no dimensions

Correct Answer:

Units but no dimensions

Solution:

$$\text{plane angle} = \theta = \frac{\text{length of arc subtended}}{\text{radius of arc}}$$

$$\text{Solid angle}(\Omega) = \frac{\text{Area subtended}}{(\text{ radius })^2}$$

$\therefore$ Both plane angle and solid angle don't have dimensions, But the units of plane angle and solid angle are radian (rad) and steradian (sr) respectively.
Hence, the answer is the option (4).

Q. 4 A ball is projected with a velocity 10ms^{-1}, at an angle of 60° with the vertical direction . It's speed at the highest point of its trajectory will be:

Option 1:
$5\sqrt{3}\text{ms}^{-1}$

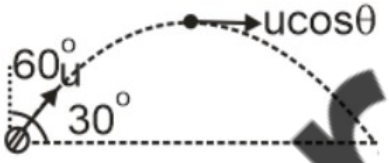
Option 2:
5ms^{-1}

Option 3:
10ms^{-1}

Option 4:
Zero

Correct Answer:
$5\sqrt{3}\text{ms}^{-1}$

Solution:

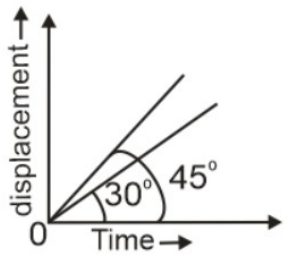


At the topmost position, the speed of the projectile is $\text{u}\cos\theta$

$$\text{u}\cos\theta = 10 \times \cos 30^\circ = 5\sqrt{3}\frac{\text{m}}{\text{s}}$$

Hence the correct option is 1

Q. 5 The displacement time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. the ratios of their respective velocity are



Option 1:
1:1

Option 2:
1:2

Option 3:
$1 : \sqrt{3}$

Option 4:
$\sqrt{3} : 1$

Correct Answer:
$1 : \sqrt{3}$

Solution:
For the displacement-time graph,
Slope = velocity

$$\therefore V_1 = (\text{ slope })_1 = \tan 30^\circ$$
$$V_2 = (\text{ slope })_2 = \tan 45^\circ$$
$$\frac{V_1}{V_2} = \frac{\tan 30^\circ}{\tan 45^\circ} = \frac{1}{\sqrt{3}}$$

Q. 6 The ratio of the distances traveled by a freely falling body in the $1^{st}, 2^{nd}, 3^{rd}$ and 4^{th} second :

Option 1:
1: 4: 9: 16

Option 2:
1: 3: 5: 7

Option 3:
1: 1: 1: 1

Option 4:
1: 2: 3: 4

Correct Answer:
1: 3: 5: 7

Solution:
The initial speed of the body is zero i.e. u=0

Distance travelled in the nth second is given by $S_{nth}=u+a/2(2n-1)$

$\Longrightarrow S_{nth}=(a/2)(2n-1)$ ($\because u=0$)

So, distance travelled in the first second, $S_1=(a/2)(2\times1-1)=a/2$

So, distance travelled in 2nd second, $S_2=(a/2)(2\times2-1)=3a/2$

So, distance travelled in 3rd second, $S_3=(a/2)(2\times3-1)=5a/2$

So, distance travelled in 4th second, $S_4=(a/2)(2\times4-1)=7a/2$

$\Longrightarrow S_1:S_2:S_3:S_4=1:3:5:7$

By Galileo's ratio, the distance travelled by a freely falling body is in the ratio 1: 3: 5: 7 (odd number)

$\therefore s_1 : s_2 : s_3 : s_4 = 1 : 3 : 5 : 7$

Hence, the answer is the option (2).

Q. 7 A shell of mass m is at rest initially. It explodes into three fragments having mass in the ratio 2:2:1. If the fragments having equal mass fly off along mutually perpendicular directions with speed v, the speed of the third (lighter) fragment is :

Option 1:
$\sqrt{2}\mathrm{v}$

Option 2:
$2\sqrt{2}\mathrm{v}$

Option 3:
$3\sqrt{2}\mathrm{v}$

Option 4:
v

Correct Answer:
$2\sqrt{2}\mathrm{v}$

Solution:
The ratio of the masses of the fragments is

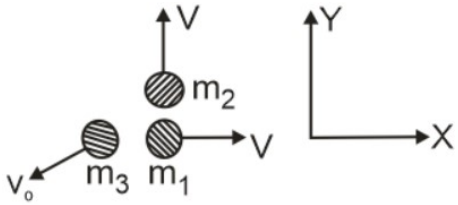
$\mathrm{m_1 : m_2 : m_3 = 2 : 2 : 1}$

$\mathrm{m_1 + m_2 + m_3 = m}$

$\therefore \mathrm{m_1 = m_2 = 0.4\ m\ \&\ m_3 = 0.2\ m}$

Since initially the shell is at rest and also external force is zero

$\therefore \bar{P}_i = \bar{P}_f = 0$



$\bar{P}_f = m_1 v(\hat{i}) + m_2 v(\hat{j}) + m_3 \overline{v_0}$

$\bar{V}_0 = -(2v\hat{i} + 2v\hat{j})$

$V_0 = \left(\sqrt{(2)^2 + (2)^2}\right) = 2\sqrt{2}V$

The speed of the lighter fragment is $2\sqrt{2}V$

Hence the correct option is 2

Q. 8 An electric lift with a maximum load of $2000\ \text{kg}(\text{lift} + \text{passengers})$ is moving up with a constant speed of $1.5\ \text{ms}^{-1}$. The frictional force opposing the motion is $3000\ \text{N}$. The minimum power delivered by the motor to the lift in watts is: $(g = 10\ \text{ms}^{-2})$

Option 1:
20000

Option 2:
34500

Option 3:
23500

Option 4:
23000

Correct Answer:
34500

Solution:
For the minimum power delivered by the motor to the lift, lift is moving up with a constant speed i.e net acceleration is zero

$$\begin{aligned}\text{External force (by motor)} &= \text{Frictional force} + \text{weight} \\ &= 3000\ \text{N} + (2000) \times 10 \\ &= 23000\end{aligned}$$

$$
\begin{aligned}
P_{\text{delivered}} &= F \cdot v \\
&= (23000)(1.5) \\
&= 34500 \text{ W}
\end{aligned}
$$

Hence, the answer is the option (2).

Q. 9 The energy that will be ideally radiated by a 100kW transmitter in an hour is:

Option 1:
$36 \times 10^4 \text{J}$

Option 2:
$36 \times 10^5 \text{J}$

Option 3:
$1 \times 10^5 \text{J}$

Option 4:
$36 \times 10^7 \text{J}$

Correct Answer:
$36 \times 10^7 \text{J}$

Solution:

$$
\begin{aligned}
\text{Energy} &= (\text{ power })(\text{ time }) \\
&= 100 \times 10^3 \left(\frac{\text{J}}{\text{s}}\right) \times (3600 \text{ s}) \\
&= 3600 \times 10^5 \text{ J} \\
&= 36 \times 10^7 \text{ J}
\end{aligned}
$$

Hence, the answer is the option (4).

Q. 10 Two objects of mass 10kg and 20kg respectively are connected to the two ends of a rigid rod of length 10m with negligible mass. The distance of the centre of mass system from the 10kg mass is :

Option 1:
$\frac{20}{3}\text{m}$

Option 2:
10m

Option 3:

$5\mathrm{m}$

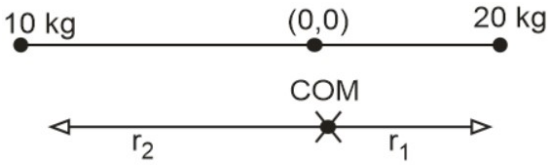
Option 4:

$\frac{10}{3}\mathrm{m}$

Correct Answer:

$\frac{20}{3}\mathrm{m}$

Solution:



Let the com be at the origin

$$\mathrm{r_{cm}} = \frac{\mathrm{m_1 r_1 + m_2 r_2}}{\mathrm{m_1 + m_2}}$$

$$0 = \frac{20\,(\mathrm{r_1}) + 10\,(-\mathrm{r_2})}{30}$$

$$\mathrm{r_1} = \frac{\mathrm{r_2}}{2} \qquad \rightarrow 1$$

$$\because \mathrm{r_1 + r_2 = 10\ m\ (given)}$$

$$\therefore \mathrm{r_1} = \frac{10}{3}\ \mathrm{m}$$

$$\mathrm{r_2} = \frac{20}{3}\ \mathrm{m}$$

the distance of the centre of mass of the system from the 10kg mass is $\mathrm{r_2} = \frac{20}{3}\mathrm{m}$

Hence the correct option is 1

Q. 11 The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is :

Option 1:

$\sqrt{2} : 1$

Option 2:

$4 : 1$

Option 3:

$1 : \sqrt{2}$

Option 4:

$2:1$

Correct Answer:

$\sqrt{2}:1$

Solution:

Let the moment of inertia of a thin uniform disc about an axis normal to its plane and its diameter be I_1 & I_2 respectively

$$I_1 = \frac{MR^2}{2} = MK_1^2$$

$$I_2 = \frac{MR^2}{4} = MK_2^2$$

$$\frac{K_1}{K_2} = \sqrt{2}$$

Hence, the answer is the option (1).

Q. 12 The angular speed of a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/$_s^2$ is:

Option 1:

4π

Option 2:

12π

Option 3:

104π

Option 4:

2π

Correct Answer:

4π

Solution:

$$\omega_{\text{initial}} = 1200\text{rpm} = 1200 \times \frac{2\pi}{60}$$
$$= 40\pi \frac{\text{rad}}{\text{s}}$$
$$\omega_{\text{final}} = 3120\text{rpm} = 3120 \times \frac{2\pi}{60}$$
$$= 104\pi$$
$$\text{Angular acceleration} = \frac{\omega_{\text{final}} - \omega_{\text{initial}}}{\Delta t}$$
$$(\alpha) = \frac{104\pi - 40\pi}{16}$$
$$= \frac{64\pi}{16} = 4\pi \frac{\text{rad}}{\text{s}^2}$$

Hence, the answer is the option (1).

Q. 13 Match list I with list II

	List I		List II
a	Gravitational constant(G)	i	$[\text{L}^2\text{T}^{-2}]$
b	Gravitational potential energy	ii	$[\text{M}^{-1}\text{L}^3\text{T}^{-2}]$
c	Gravitational potential	iii	$[\text{LT}^{-2}]$
d	Gravitational Intensity	iv	$[\text{ML}^2\text{T}^{-2}]$

Choose the correct answer from the options given below:

Option 1:
$(\text{a}) - (\text{ii}), (\text{b}) - (\text{iv}), (\text{c}) - (\text{i}), (\text{d}) - (\text{iii})$

Option 2:
$(\text{a}) - (\text{ii}), (\text{b}) - (\text{iv}), (\text{c}) - (\text{iii}), (\text{d}) - (\text{i})$

Option 3:
$(\text{a}) - (\text{iv}), (\text{b}) - (\text{ii}), (\text{c}) - (\text{i}), (\text{d}) - (\text{iii})$

Option 4:
$(\text{a}) - (\text{ii}), (\text{b}) - (\text{i}), (\text{c}) - (\text{iv}), (\text{d}) - (\text{iii})$

Correct Answer:
$(\text{a}) - (\text{ii}), (\text{b}) - (\text{iv}), (\text{c}) - (\text{i}), (\text{d}) - (\text{iii})$

Solution:
Gravitational Potential energy $= [\text{M}^1\text{L}^2\text{T}^{-2}]$

Gravitational Potential $= \left[\mathrm{L}^2\mathrm{T}^{-2}\right]$

Gravitational Intensity $= \left[\dfrac{\mathrm{F}}{\mathrm{m}}\right] = \left[\mathrm{M}^0\mathrm{L}^1\mathrm{T}^{-2}\right]$

Gravitational Constant $= \left[\dfrac{\mathrm{Fr}^2}{\mathrm{m}_1\mathrm{m}_2}\right] = \left[\mathrm{M}^{-1}\mathrm{L}^3\mathrm{T}^{-2}\right]$

Hence, the answer is the option (1).

Q. 14 A body of mass 60g experiences a gravitational force $3.0\ \mathrm{N}$ when placed at a particular point. The magnitude of the gravitational field intensity at that point is:

Option 1:
$50\ \mathrm{N/kg}$

Option 2:
$20\ \mathrm{N/kg}$

Option 3:
$180\ \mathrm{N/kg}$

Option 4:
$0.05\ \mathrm{N/kg}$

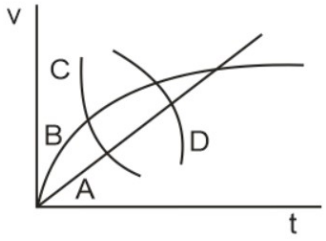
Correct Answer:
$50\ \mathrm{N/kg}$

Solution:

$$\begin{aligned}\text{Gravitational field intensity} &= \frac{F}{m}\\ &= \frac{3\ \mathrm{N}}{60\times10^{-3}\ \mathrm{kg}}\\ &= 50\ \mathrm{N/kg}\end{aligned}$$

Hence, the answer is the option (1).

Q. 15 A spherical ball is dropped in a long column of a highly viscous liquid . The curve in the graph shown, which represents the speed of the ball as a function of time (t) is:



Option 1:
B

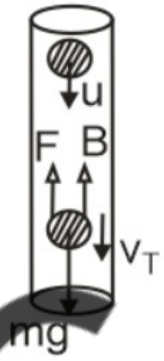
Option 2:
C

Option 3:
D

Option 4:
A

Correct Answer:
B

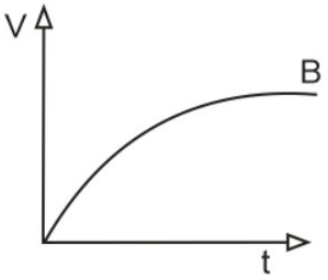
Solution:



Let the spherical ball is dropped with initial speed say, u
With the increase in speed, the friction drag force by stokes increase until it reaches the terminal speed

B $\rightarrow$ Buoyancy force

$$F + B = mg$$



Q. 16 Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**

Assertion (A): The stretching of a spring is determined by the shear modulus of the material of the spring.

Reason (R): A coil spring of copper has more tensile strength than a steel spring of the same dimensions.

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

Option 1:
Both **(A)** and **(R)** are true and **(R)** is not the correct explanation of **(A)**

Option 2:
(A) is true but **(R)** is false

Option 3:
(A) is false but **(R)** is ture

Option 4:
Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

Correct Answer:
(A) is true but **(R)** is false

Solution:
$\rightarrow$ During the stretching of spring, the shape of spring is changed. Therefore, we say that the shear modulus determines that.

$\rightarrow Y_{\text{steel}} > Y_{\text{copper}}$ (Tensile Strength αY)

$\therefore$ The assertion is true but the reason is not true

Hence, the answer is the option (2).

Q. 17 if a soap bubble expands, the pressure inside the bubble:

Option 1:
increases

Option 2:

remains the same

Option 3:
is equal to the atmospheric pressure

Option 4:
decreases

Correct Answer:
decreases

Solution:
Inside the soap bubble, excess pressure is

$$\Delta P = \frac{4T}{R}$$

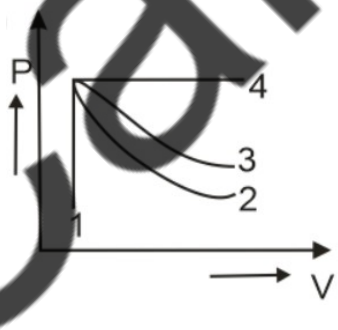
$$\Delta P = P_{\text{inside}} - P_{\text{outside}} = \frac{4T}{R}$$

$$\because P_{\text{outside}} = P_{\text{atmospheric}} = \text{constant}$$

With the increase in radius as the bubble expands, P_{inside} decreases.

Hence, the answer is the option (4).

Q. 18 An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1,2,3 and 4 is.



Option 1:
2

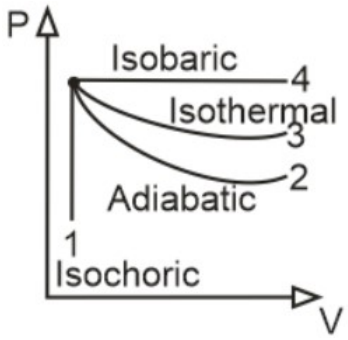
Option 2:
3

Option 3:
4

Option 4:
1

Correct Answer:
2

Solution:



curve 4 $\rightarrow$ pressure is const constant, therefore it is an Isobaric process
curve 2 is more steeper than Curve 3
$\therefore$ curve 2 $\rightarrow$ Adiabatic

curve 3 $\rightarrow$ Isothermal
For curve 1, volume is constant
$\therefore$ curve 1 $\rightarrow$ Isochoric process.
The correct option is (1)

Q. 19 The volume occupied by the molecules contained in $4.5kg$ water at STP, if the intermolecular forces vanish away is :

Option 1:
$5.6 \times 10^{3}\ \mathrm{m}^{3}$

Option 2:
$5.6 \times 10^{-3}\ \mathrm{m}^{3}$

Option 3:
$5.6\ \mathrm{m}^{3}$

Option 4:
$5.6 \times 10^{6}\ \mathrm{m}^{3}$

Correct Answer:
$5.6\ \mathrm{m}^{3}$

Solution:
The molar mass of water $= 18$

Given mass, $M = 4500\text{gm}$

no of moles $= \frac{\text{m}}{\text{M}} = \frac{4500}{18}$

$\text{n} = 250\ \text{mol}$

At STP, 1 mol occupies 22.4dm^3 of volume

$1\text{mol} \rightarrow 22.4\text{dm}^3$

$250\ \text{mol} \rightarrow \text{V}$

$\text{V} = 250 \times 22.4\text{dm}^3$

$\text{V} = 5.6\ \text{m}^3 \qquad (\because (\text{dm})^3 = 10^{-3}\ \text{m}^3)$

Hence, the answer is the option (3).

Q. 20 Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is :

Option 1:
9

Option 2:
10

Option 3:
8

Option 4:
11

Correct Answer:
11

Solution:

$$\text{T}_1 = 2\pi\sqrt{\frac{\text{l}_1}{\text{g}}} = \frac{2\pi}{\omega_1} = \frac{2\pi \times \sqrt{1 \cdot 21}}{\sqrt{\text{g}}}$$

$$\text{T}_2 = 2\pi\sqrt{\frac{\text{l}_2}{\text{g}}} = \frac{2\pi}{\omega_2} = \frac{2\pi}{\sqrt{\text{g}}}(\sqrt{1})$$

Let θ_1 and θ_2 be the phase covered by the 1st and 2nd pendulum respectively. For the two pendulums to be in the same phase,

$\theta_2 - \theta_1 = 2n\pi$

$(n = 1, 2, 3.....)$

For the minimum number of vibrations ie. $(n = 1)$

$\theta_2 - \theta_1 = \omega_2 t - \omega_1 t = 2\pi$

$t\left(\frac{2\pi}{T_2} - \frac{2\pi}{T_1}\right) = 2\pi$

$\frac{1}{t} = \frac{1}{T_2} - \frac{1}{T_1}$

$\because \frac{T_1}{T_2} = \frac{1.1}{1} = \frac{11}{10}$

$\therefore T_1 = \frac{11T_2}{10}$

$\frac{1}{t} = \frac{1}{T_2} - \frac{1}{\frac{11T_2}{10}}$

$\frac{1}{t} = \frac{1}{11T_2}$

$t = 11T_2$

Hence, the answer is the option (4).

Q. 21 If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse wave along the string is:

Option 1:
$\sqrt{2} : 1$

Option 2:
$1 : \sqrt{2}$

Option 3:
$1 : 2$

Option 4:
$1 : 1$

Correct Answer:
$1 : \sqrt{2}$

Solution:
The speed of a transverse wave along the string is

$$V = \sqrt{\frac{T}{\mu}}$$
$$\frac{V_1}{V_2} = \sqrt{\frac{T_1}{T_2}}$$
$$T_2 = 2T_1 \ (\text{Given})$$
$$\frac{V_1}{V_2} = \frac{1}{\sqrt{2}}$$

Hence, the answer is the option (2).

Q. 22 Two hollow conducting spheres of radius $\mathrm{R_1}$ and $\mathrm{R_2}$ $(\mathrm{R_1} >> \mathrm{R_2})$ have equal charges. The potential would be:

Option 1:
more on smaller sphere

Option 2:
equal on both the spheres

Option 3:
dependent on the material property of the sphere

Option 4:
more on bigger sphere

Correct Answer:
more on smaller sphere

Solution:

Let the potential of sphere of radius $\mathrm{R_1\ and\ R_2\ be\ V_1 \& V_2}$ respectively

$$V_1 = \frac{KQ}{R_1}$$

$$V_2 = \frac{KQ}{R_2}$$

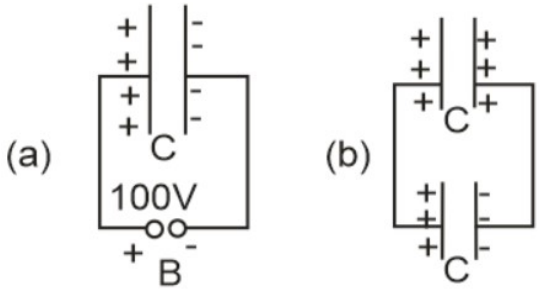
$$\because R_1 > R_2$$

$$\therefore V_1 < V_2$$

The potential would be more on smaller sphere.

The correct option is (1)

Q. 23 A capacitor of capacitance $\mathrm{C = 900pF}$ is charged fully by $100\mathrm{V}$ battery B as shown in fig (a). Then it is disconnected from the battery and connected to another uncharged capacitor of capacitance $\mathrm{C = 900pF}$ as shown in fig(b). The electrostatic energy stored by system (b) is :



Option 1:

$3.25 \times 10^{-6}\ \mathrm{J}$

Option 2:

$2.25 \times 10^{-6}\ \mathrm{J}$

Option 3:

$1.5 \times 10^{-6}\ \mathrm{J}$

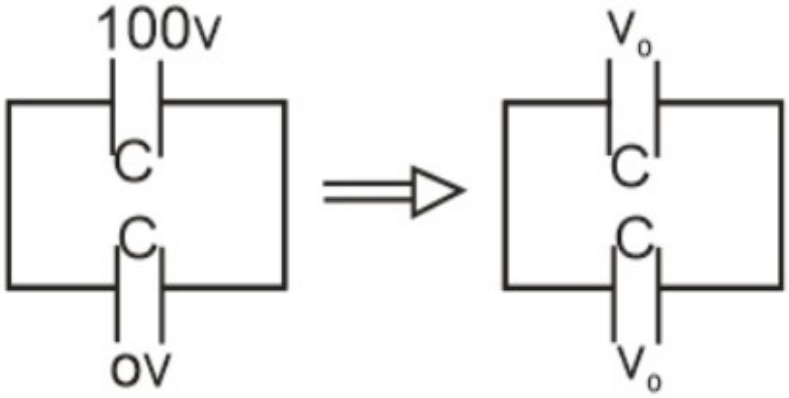
Option 4:

$4.5 \times 10^{-6}\ \mathrm{J}$

Correct Answer:

$2.25 \times 10^{-6}\ \mathrm{J}$

Solution:



(charged capacitor just connected to uncharged capacitor)

(Steady state)

As both the capacitor are in a parallel connection they attained the same potential at the steady state

Common potential $= \mathrm{V_0} = \dfrac{\mathrm{C_1V_1 + C_2V_2}}{\mathrm{C_1 + C_2}}$

$$= \frac{100\mathrm{C} + 0}{2\mathrm{C}}$$

$$\mathrm{V_0} = 50\mathrm{volt}$$

$$\mathrm{U_{initial}} = \frac{1}{2}\mathrm{C(V)^2} = \frac{1}{2} \times 900 \times 10^{-12} \times 10^4$$

$$= 450 \times 10^{-8}\ \mathrm{J}$$

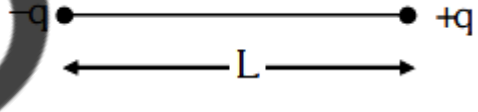
$$\mathrm{U_{final}} = \left(\frac{1}{2}\mathrm{CV_0^2} + \frac{1}{2}\mathrm{CV_0^2}\right)$$

$$= 2\left(\frac{1}{2} \times 900 \times 10^{-9} \times (50)^2\right)$$

$$= 225 \times 10^{-8}\ \mathrm{J}$$

Hence the correct option is 2

Q. 24 Two point charges -q and +q are placed at a distance of L, as shown in the figure.



The magnitude of electric field intensity at a distance $\mathrm{R}(\mathrm{R} >> \mathrm{L})$ varies as

Option 1:

$\dfrac{1}{R^3}$

Option 2:

$\frac{1}{R^4}$

Option 3:

$\frac{1}{R^6}$

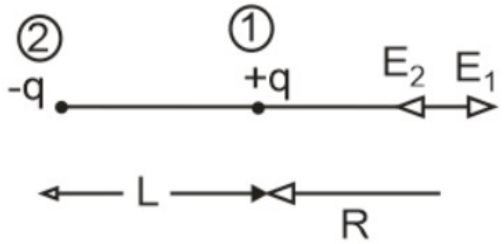
Option 4:

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

Correct Answer:

$\frac{1}{R^3}$

Solution:



$$E_1 = \frac{kq}{R^2}$$

$$E_2 = \frac{kq}{(R+L)^2}$$

$$E_{net} = E_1 - E_2$$

$$= \frac{kq}{R^2} - \frac{kq}{R^2\left(1+\frac{L}{R}\right)^2}$$

$$= \frac{kq}{R^2}\left[1-\left(1+\frac{L}{R}\right)^{-2}\right]$$

$$E_{net} = \frac{2kqL}{R^3}$$

$$= \frac{kq}{R^2}\left(1-\left(1-\frac{2L}{R}\right)\right) \quad (\text{ by binomial expantion })$$

Hence correct option is 1

Q. 25 The angle between the electric lines of force and the equipotential surface is :

Option 1:

45°

Option 2:
90°

Option 3:
180°

Option 4:
0°

Correct Answer:
90°

Solution:
The angle between the equipotential surface and lines of force is always 90 degrees.

EXPLANATION

The angle between the equipotential surface and lines of force is always 90 degrees because when the electric potential becomes constant, the negative potential gradient becomes zero, and thus it makes it necessary for the Electric field to be always normal with the surface.

Hence, the answer is the option (2).

Q. 26 The angle between the electric lines of force and the equipotential surface is:

Option 1:
45°

Option 2:
90°

Option 3:
180°

Option 4:
0°

Correct Answer:
90°

Solution:
Electric field lines are always perpendicular to the equipotential surface.

The angle between an Electric field and an equipotential surface is always 90^0. This is because, when the potential becomes constant, the negative potential gradient also becomes zero, hence necessitating the need for the Electric field to be always normal with the surface.

Hence, the answer is the option (2).

Q. 27 Two resistors of resistance, 100Ω and 200Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100Ω to that in 200Ω in a given time is:

Option 1:
2:1

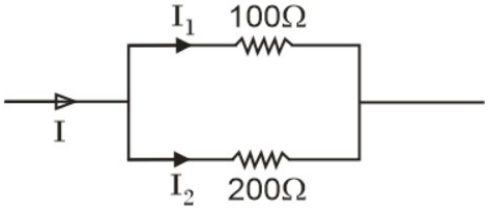
Option 2:
1:4

Option 3:
4:1

Option 4:
1:2

Correct Answer:
2:1

Solution:



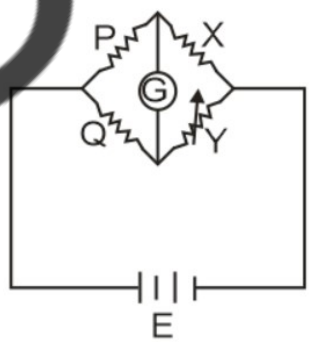
$$I_1 = \frac{I(200)}{(300)} = \frac{2I}{3}$$

$$I_2 = \frac{I(100)}{200+100} = \frac{I}{3}$$

$$\frac{H_1}{H_2} = \frac{I_1^2 R_1 t}{I_2^2 R_2 t} = \frac{2}{1}$$

The correct option is (1)

Q. 28 A Wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q:



Option 1:
should be approximately equal and are small

Option 2:
should be very large and unequal

Option 3:
do not play any significant role

Option 4:
should be approximately equal to 2X

Correct Answer:
should be approximately equal and are small

Solution:
In Wheatstone bridge for the balanced condition

$$\frac{P}{Q}=\frac{X}{Y}$$

$$P=\frac{XQ}{Y}$$

$$Q=\frac{YP}{X}$$

If $P \& Q$ are equal, then by balancing conditions for $X \& Y$ will be equal which is a possible case.

The correct option is 1

Q. 29 As the temperature increases, the electrical resistance

Option 1:
decreases for both conductors and semiconductors

Option 2:
increases for conductors but decreases for semiconductors

Option 3:
decreases for conductors but increases for semiconductors

Option 4:
increases for both conductors and semiconductors

Correct Answer:
increases for conductors but decreases for semiconductors

Solution:

The temperature coefficient of resistance (α) is positive for conductors and negative for semiconductors as

$$\propto= \frac{\Delta R}{R\Delta T}$$

Therefore, with the increase in temperature, the electrical resistance increases for conductors but decreases for semiconductors

Hence, the answer is the option (2).

Q. 30 A copper wire of length $10\mathrm{m}$ and radius $\left(10^{-2}/\sqrt{\pi}\right)\,\mathrm{m}$ has an electrical resistance of 10Ω. The current density in the wire for an electric field strength of $10\,(\mathrm{V/m})$ is :

Option 1:
$10^{6}\mathrm{A/m^2}$

Option 2:
$10^{-5}\mathrm{A/m^2}$

Option 3:
$10^{5}\mathrm{A/m^2}$

Option 4:
$10^{3}\mathrm{A/m^2}$

Correct Answer:
$10^{5}\mathrm{A/m^2}$

Solution:
We know that,

$$\mathrm{J}=\frac{\mathrm{E}}{\rho}$$

$$\text{Also, } \mathrm{R}=\frac{\rho \mathrm{l}}{\mathrm{A}}$$

$$\therefore \mathrm{J}=\frac{\mathrm{E}}{\left(\frac{\mathrm{RA}}{\mathrm{l}}\right)}$$

$$\mathrm{J}=\frac{10}{\frac{10\times\pi\left(10^{-4}/\pi\right)}{10}}$$

$$\mathrm{J}=10^{5}\ \mathrm{A/m^2}$$

Hence, the answer is the option (3).

Q. 31 From Ampere's circuital law for a long straight wire of circular cross section carrying a steady current, the variation of magneic field in the inside and outside region of the wire is :

Option 1:
A linearly increasing function distance upto the boundary of the wire and then linearly decreasing for the outside region

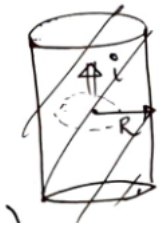
Option 2:
A linearly increasing function distance r upto the boundary of the wire and then decreasing with 1/r for the outside region

Option 3:
A linearly increasing function distance upto the boundary of the wire and then linearly increasing one for the outside region

Option 4:
uniform and remains constant for both the regions.

Correct Answer:
A linearly increasing function distance r upto the boundary of the wire and then decreasing with 1/r for the outside region

Solution:



$$B_{inside} = \frac{\mu_0 ir}{2\pi R^2} \quad (r \leq R)$$

$$B_{outside} = \frac{\mu_0 i}{2\pi r} (r > R)$$

Hence the correct option is 2

Q. 32 Given below are two statements :
Statement I: Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current-carrying conductor only.
Statement II: Biot-Savart's law is analogous to Coulomb's inverse square law of charge q, with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q.
In light of the above statements choose the most appropriate answer from the options given below:

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct and Statement II is incorrect

Option 3:
Statement I is incorrect and Statement II is correct

Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Statement I is correct and Statement II is incorrect

Solution:
Statement (I) is correct

Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current-carrying conductor only

$$B = \frac{\mu_0}{4\pi}\frac{Idl\sin\theta}{r^2}$$

Statement (II) is incorrect
Biot-Savart's law is analogous to Coulomb's inverse square law of charge q with the former being related to the field produced by the vector source, Idl while the latter is produced by a ' scalar source ' q '.

Hence, the answer is the option (2).

Q. 33 A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is?

Option 1:
$12.56 \times 10^{-2}\mathrm{T}$

Option 2:
$12.56 \times 10^{-4}\mathrm{T}$

Option 3:
$6.28 \times 10^{-4}\mathrm{T}$

Option 4:
$6.28 \times 10^{-2}\mathrm{T}$

Correct Answer:
$12.56 \times 10^{-2}\mathrm{T}$

Solution:

$$r = 1 \text{ mm}$$

$$n = \frac{N}{l} = 100 \text{ turns per mm}$$

$$i = 1 \text{ A}$$

$$B_{\text{centre}} = \mu_0 n i$$

$$= 4\pi \times 10^{-7} \times \frac{100}{10^{-3} \text{ m}} \times 1$$

$$= 4\pi \times 10^{-2} \text{ T}$$

$$B_{\text{centre}} = 12.56 \times 10^{-2} \text{ T}$$

Hence, the answer is the option (1).

Q. 34 A square loop of side 1m ad resistance 1Ω is placed in a magnetic field of 0.5T. If the plane of the loop is perpendicular to the direction of the magnetic field, the magnetic flux through the loop is :

Option 1:

0.5weber

Option 2:

1weber

Option 3:

zero weber

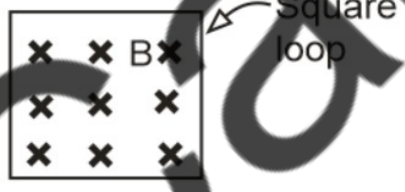
Option 4:

2weber

Correct Answer:

0.5weber

Solution:



$$\text{B} = 0.5\text{T}$$

$$\phi = \text{BA}\cos 0^\circ \qquad (\because \bar{\text{A}} \| \bar{\text{B}})$$

$$\phi = \text{BA} = (0.5)(1)^2$$

$$\phi = 0.5 \text{ weber}$$

Hence correct option is 1

Q. 35 A big circular coil of 1000 turns and average radius $10m$ is rotating about its horizontal diameter at $2\ rad\ s^{-1}$. If the vertical component of the earth's magnetic field at the place is $2 \times 10^{-5}T$ and the electrical resistance of the coil is 12.56Ω, then the maximum induced current in the coil will be :

Option 1:
$1.5A$

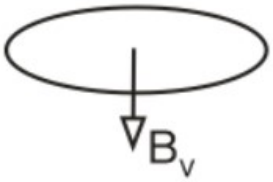
Option 2:
$1A$

Option 3:
$2A$

Option 4:
$0.25A$

Correct Answer:
$1A$

Solution:



$$e = e_0 \sin \omega t$$

$$\text{Peak emf induced} = e_0 = nAB\omega$$

$$i_{peak} = \text{Maximum induced current}$$

$$= \frac{e_0}{R} = \frac{nABW}{R}$$

$$i = \frac{1000 \times (\pi \times (10)^2 \times 2 \times 10^{-5} \times 2)}{12.56} = 1A$$

Hence correct option is 2.

Q. 36 A series LCR circuit with inductance 10H, capacitance $10\mu\text{F}$, and resistance 50Ω is connected to an AC source of voltage, $V = 200\sin(100t)$ volts, If the resonant frequency of the LCR circuit is ν_0 and the frequency of the AC source is ν, then :

Option 1:
$\nu_0 = \nu = \frac{50}{\pi}\text{Hz}$

Option 2:

$\nu_0 = \frac{50}{\pi}\text{Hz}, \nu = 50\ \text{Hz}$

Option 3:

$\nu = 100\ \text{Hz}; \nu_0 = \frac{100}{\pi}\text{Hz}$

Option 4:

$\nu_0 = \nu = 50\ \text{Hz}$

Correct Answer:

$\nu_0 = \nu = \frac{50}{\pi}\text{Hz}$

Solution:

$\text{V} = 200\sin(100\text{t})$

$\nu = \frac{50}{\pi}$

$\nu_0 = \frac{1}{2\pi} \times \frac{1}{\sqrt{\text{LC}}} = \frac{1}{2\pi}\frac{1}{\sqrt{10 \times 10^{-5}}} = \frac{100}{2\pi} = \frac{50}{\pi}$

Hence, the answer is the option (1).

Q. 37 The peak voltage of the AC source is equal to:

Option 1:

the rms value of the ac source

Option 2:

$\sqrt{2}$ times the rms value of the ac source

Option 3:

$\frac{1}{\sqrt{2}}$ times the rms value of the ac source

Option 4:

the value of voltage supplied to the circuit

Correct Answer:

$\sqrt{2}$ times the rms value of the ac source

Solution:

$$\frac{\text{Peak Voltage}}{\sqrt{2}} = \text{RMS Voltage}$$
$$\therefore \text{Peak voltage} = \sqrt{2}(\text{RMS voltage})$$

Hence, the answer is the option (2).

Q. 38 Match List-I with List-II

List-I	List-II
(Electromagnetic waves)	(Wavelength)
(a) AM radio waves	(i) 10^{-10}m
(b) Microwaves	(ii) 10^{2}m
(c) Infrared radiation	(iii) 10^{-2}m
(d) X-ray	(iv) 10^{-4}m

Choose the correct answer from the options given below;

Option 1:
(a)-(iii), (b)-(iii),(c)-(i),(d)-(iv)

Option 2:
(a)-(iii), (b)-(iv),(c)-(ii),(d)-(i)

Option 3:
(a)-(ii), (b)-(iii),(c)-(iv),(d)-(i)

Option 4:
(a)-(iv), (b)-(iii),(c)-(ii),(d)-(i)

Correct Answer:
(a)-(ii), (b)-(iii),(c)-(iv),(d)-(i)

Solution:

List-I	List-II
(Electromagnetic waves)	(Wavelength)
(a) AM radio waves	(i) 10^{2}m
(b) Microwaves	(ii) 10^{-2}m
(c) Infrared radiation	(iii) 10^{-4}m
(d) X-ray	(iv) 10^{-10}m

Hence, The answer is the option (3).

Q. 39 When light propagates through a material medium of relative permittivity ϵ_r and relative permeability μ_r, the velocity of light v is given by : (c- velocity of light in vacuum)

Option 1:
$\mathrm{v}=\sqrt{\frac{\mu_r}{\varepsilon_r}}$

Option 2:
$\mathrm{v}=\sqrt{\frac{\varepsilon_r}{\mu_r}}$

Option 3:
$\mathrm{v}=\frac{\mathrm{c}}{\sqrt{\varepsilon_r \mu_r}}$

Option 4:
$\mathrm{v}=\mathrm{c}$

Correct Answer:
$\mathrm{v}=\frac{\mathrm{c}}{\sqrt{\varepsilon_r \mu_r}}$

Solution:
For light traveling in the medium of relative permeability and permittivity, μ_r and ϵ_r respectively the speed of light is

$$\mathrm{v}=\frac{\mathrm{c}}{\sqrt{\mu_r \varepsilon_r}}$$

Hence, the answer is the option (3).

Q. 40 A biconvex lens has radii of curvature, $20\ \mathrm{cm}$ each. If the refractive index of the material of the lens is 1.5, the power of the lens is

Option 1:
$+20\mathrm{D}$

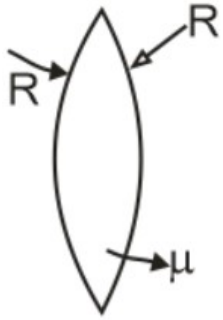
Option 2:
$+5\mathrm{D}$

Option 3:
infinity

Option 4:
$+2\mathrm{D}$

Correct Answer:
$+5\mathrm{D}$

Solution:



$R = 20\ \mathrm{cm}$
$\mu = 1.5$

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{(+R)} - \frac{1}{(-R)}\right)$$
$$\frac{1}{f} = \frac{2(\mu - 1)}{R} = \frac{1}{R} = \frac{1}{+R} = \frac{1}{20\ \mathrm{cm}} = +5D$$

The power of the lens is $5D$

The correct option is (2)

Q. 41 Two transparent media A and B are separated by a plane boundary. The speed of light in those media are $1.5 \times 10^8 m/s$ and $2.0 \times 10^8 m/s$ respectively. The critical angle for a ray of light for these two media is :

Option 1:
$\sin^{-1}(0.750)$

Option 2:
$\tan^{-1}(0.500)$

Option 3:
$\tan^{-1}(0.750)$

Option 4:
$\sin^{-1}(0.500)$

Correct Answer:
$\sin^{-1}(0.750)$

Solution:

V_1 Medium 1 (Denser)

V_2 Medium 2 (Rarer)

$V_1 = 1.5 \times 10^8 \text{ m/s}$

$V_2 = 2 \times 10^8 \text{ m/s}$

$\mu \propto \frac{1}{V}$

$\mu_1 > \mu_2$

$\sin i_c = \frac{1}{\mu_D^R} = \frac{\mu_R}{\mu_D} = \frac{\mu_2}{\mu_1}$

$\sin_c = 0.75$

$i_c = \sin^{-1}(0.75)$

Hence correct option is 1

Q. 42 A light ray falls on a glass surface of the refractive index $\sqrt{3}$ at an angle $60°$. The angle between the refracted and reflected rays would be.

Option 1:
$60°$

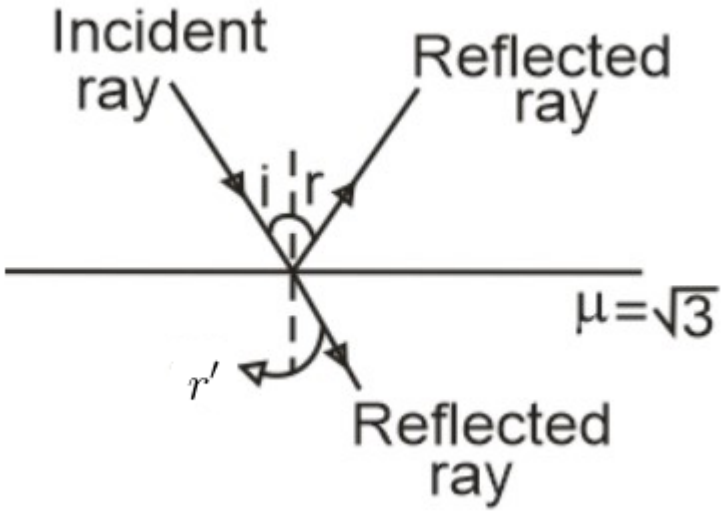
Option 2:
$90°$

Option 3:
$120°$

Option 4:
$30°$

Correct Answer:
$90°$

Solution:



$\angle r = \angle i = 60^\circ (\text{Laws of reflection})$

$\mu_1 \sin i = \mu_2 \sin r'$

$1 \times \sin 60^\circ = \sqrt{3} \sin r'$

$\Rightarrow r' = 30^\circ$

The angle between the refracted and reflected rays would be

$(180 - (r + r')) = 90^\circ$

Q. 43 In Young's double slit experiment, a student observes 8 fringes in a certain segment of the screen when a monochromatic light of 600nm wavelength is used. If the wavelength of light is changed 400nm, then the number of fringes he would observe in the same region of the screen is :

Option 1:

8

Option 2:

9

Option 3:

12

Option 4:

6

Correct Answer:

12

Solution:

Let the length of the segment be y

Since there are 8 fringes in that segment

$\therefore \quad 8\beta_1 = \mathrm{y}$ ....(1)

$\beta_1 = \dfrac{\lambda_1 \mathrm{D}}{\mathrm{d}} =$ fringe width for wavelength $(\lambda_1 = 600\mathrm{nm})$

Let's say there are n_2 fringes of wavelength $\lambda_2 = 400\mathrm{nm}$ in the segment y

$\therefore \mathrm{n}_2\beta_2 = \mathrm{y}$ .....(2)

From eqn (1)

$8\beta_1 = \mathrm{n}_2\beta_2$

$8 \times \lambda_1 = \mathrm{n}_2\lambda_2$

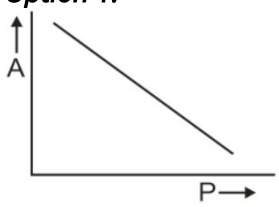
$8 \times 600 = \mathrm{n}_2(400)$

$\mathrm{n}_2 = 12$

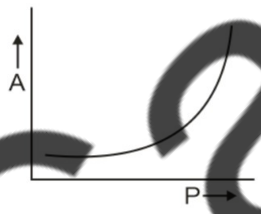
Hence, the answer is the option (3).

Q. 44 The graph which shows the variation of the De Broglie wavelength (A) of a particle and its associated momentum (p) is :

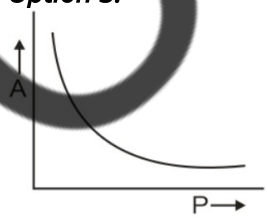
Option 1:



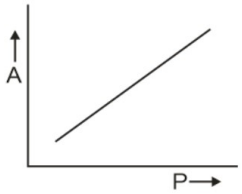
Option 2:



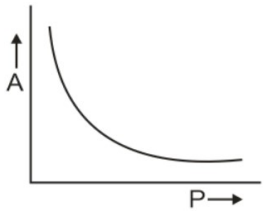
Option 3:



Option 4:



Correct Answer:



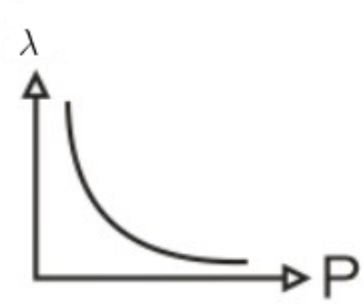
Solution:

The Broglie wavelength of a particle is $\lambda = \frac{\mathrm{h}}{\mathrm{p}}$

$\mathrm{p} \rightarrow$ momentum of particle

$\lambda \mathrm{p} = \mathrm{h} = \text{constant}$

$\therefore \lambda \text{ vs } \mathrm{p}$ the graph will be a rectangular hyperbola



Hence the correct option is 3

Q. 45 When two monochromatic lights of frequency, ν and $\frac{\nu}{2}$ are incident on a photoelectric metal, their stopping potential becomes $\frac{\mathrm{Vs}}{2}$ and Vs respectively. The threshold frequency for this metal is :

Option 1:

3ν

Option 2:

$\frac{2}{3}\nu$

Option 3:
$\frac{3}{2}\nu$

Option 4:
2ν

Correct Answer:
$\frac{3}{2}\nu$

Solution:
By Einstein's photoelectric equation,

For the first source

$$\mathrm{h}\nu = \phi_0 + \frac{\mathrm{eV_s}}{2} \quad \text{.....(1)}$$

For the second source,

$$\frac{\mathrm{h}\nu}{2} = \phi_0 + \mathrm{eV_s} \quad \text{.....(2)}$$

$2\times$ Eqn (1) - Eqn(2)

$$\frac{3\mathrm{h}\nu}{2} = \phi_0 = \mathrm{h}\nu_0$$

$$\nu_0 \rightarrow \text{threshold frequency}$$

$$\nu_0 \equiv \frac{3\nu}{2}$$

Hence, the answer is the option (3).

Q. 46 In the given nuclear reaction, the element X is : $^{22}_{11}Na \rightarrow X + e^{+} + v$

Option 1:
$^{23}_{10}\mathrm{Ne}$

Option 2:
$^{22}_{10}\mathrm{Ne}$

Option 3:
$^{22}_{12}\mathrm{Mg}$

Option 4:
$^{23}_{11}\mathrm{Na}$

Correct Answer:

$^{22}_{10}\mathrm{Ne}$

Solution:

$^{22}_{11}Na \rightarrow {}^{A}_{z}X + {}^{0}_{1}e + v$

$22 = \mathrm{A} + 0$

$\therefore \mathrm{A} = 22$

$11 = \mathrm{Z} + 1$

$\therefore \mathrm{Z} = 10$

The atomic number and atomic mass number of X are 10 and 22 respectively

$\therefore \mathrm{X} = {}^{22}_{10}\mathrm{Ne}$

Hence the correct option is 2

Q. 47 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 $\mathrm{T}_1 : \mathrm{T}_2$ is :

Option 1:

$4 : 1$

Option 2:

$4 : 9$

Option 3:

$9 : 4$

Option 4:

$1 : 4$

Correct Answer:

$9 : 4$

Solution:

The energy of the electron in the nth level of the hydrogen atom,

$$\mathrm{E_n} = \frac{-13.6\mathrm{eV}}{\mathrm{n}^2}$$

For the first excited state, $\mathrm{n}_1 = 2$

For the second excited state, $\mathrm{n}_2 = 3$

$$\mathrm{T}_1 = -\frac{13.6\mathrm{eV}}{\mathrm{n}_1^2} = \frac{-13.6\mathrm{eV}}{4}$$

$$T_2 = \frac{-13.6eV}{n_2^2} = \frac{-13.6eV}{9}$$

$$\frac{T_1}{T_2} = \frac{9}{4}$$

Hence, the answer is the option (3).

Q. 48 A nucleus of mass number 189 splits into two nuclei having mass numbers 125 and 64. The ratio of the radius of two daughter nuclei respectively is :

Option 1:
$4 : 5$

Option 2:
$5 : 4$

Option 3:
$25 : 16$

Option 4:
$1 : 1$

Correct Answer:
$5 : 4$

Solution:
$^{189}N \longrightarrow {}^{125}N_1 + {}^{64}N_2$

$A_1 = 125$

$A_2 = 64$

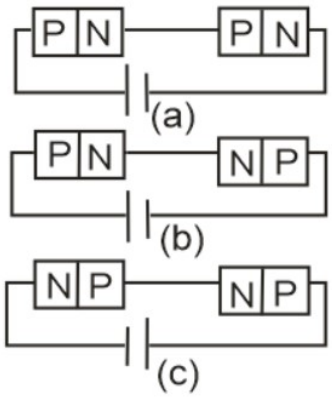
We know that the radius of nuclei and mass number relation is

$$R = R_0 A^{1/3}$$

$$\therefore \frac{R_1}{R_2} = \left(\frac{A_1}{A_2}\right)^{1/3} = \frac{5}{4}$$

Hence, the answer is the option (2).

Q. 49



In the given circuits (a), (b) and (c), the potential drop across the two p-n junctions are equal in :

Option 1:
Circuit (b) only

Option 2:
Circuit (c) only

Option 3:
Both circuits (a) and (c)

Option 4:
Circuit (a) only

Correct Answer:
Both circuits (a) and (c)

Solution:
(B) Both circuits (a) and (c) are forward-biased. The potential drop across both the diodes will be the same for circuits (a) & (c)
Circuit (b) is reverse-biased, so there is no current through the circuit.
The correct option is (3)

Q. 50

In half wave rectification, if the input frequency is $60\ \mathrm{Hz}$, then the output frequency would be:

Option 1:
$30\ \mathrm{Hz}$

Option 2:
$60Hz$

Option 3:

$120\ \text{Hz}$

Option 4:

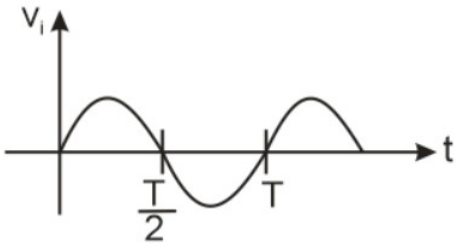
zero

Correct Answer:

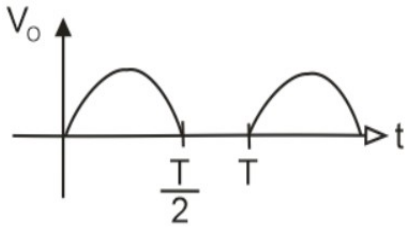
$60Hz$

Solution:

Inpute voltage



After rectification, The output voltage is

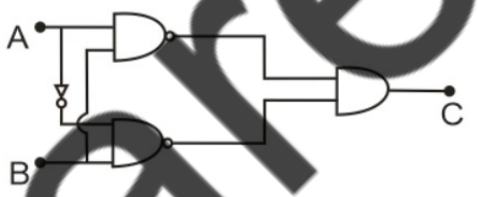


It can be seen from the graph that frequency of output and input are same

$\text{f}_{\text{input}} = \text{f}_{\text{output}} = 60\text{Hz}$

The correct option is (2)

Q. 51



The truth table for the given logic circuit is :

Option 1:

A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

Option 2:

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

Option 3:

A	B	C
0	0	0
0	1	1
1	0	0
1	1	1

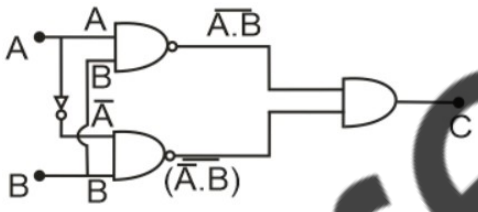
Option 4:

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

Correct Answer:

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

Solution:



$C = (\overline{A.B})\,(\overline{A.B})$

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

Hence correct option is 2

Chemistry

Q. 1 What mass of 95% pure $CaCO_3$ will be required to neutralise

$50\ mL$ of $0.5M HCl$ solution according to the following reaction?

$$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(\ aq\ )} + CO_{2(\ g)} + 2H_2O_{(1)}$$

[Calculate upto second place of decimal point]

Option 1:
$1.32\ g$

Option 2:
$3.65\ g$

Option 3:
$9.50\ g$

Option 4:
$1.25\ g$

Correct Answer:
$1.32\ g$

Solution:
Give reaction

$$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2\ (aq)} + CO_2(\ g) + 2H_2O(l)$$

From above,

For 2 mole of HCl = 1 mole of required

$$1 \text{ mole of } HCl = \frac{1}{2} \text{ mole of } CaCO_3$$

$$(50ml \times 0.5M)HCl = \frac{50 \times 0.5}{2} m \text{ mole of } CaCO_3$$

$$= 12.5m \text{ mole of } CaCO_3$$

$$= 12.5 \times 10^{-3} \times 100$$

$$= 1.25\ g \text{ of } CaCO_3 \text{ required}$$

For some of $0.5M\ HCl$ solution $1.25g$ of $CaCO_3$ required

But $CaCO_3$ is 85% so,

$FaCO_3$ is 95% so,

$$\% \text{ Purity } = \frac{\text{mass of pure } CaCO_3}{\text{Total Mass of impure } CaCO_3} \times 100$$

$$95 = \frac{1.25}{x} \text{ g}$$

$$x = \frac{1.25}{95} \text{ g} = 1.32 \text{ g}$$

Hence, the answer is the option (1).

Q. 2 Identify the incorrect statement from the following.

Option 1:
All the five $4d$ orbitals have shapes similar to the respective $3d$ orbitals.

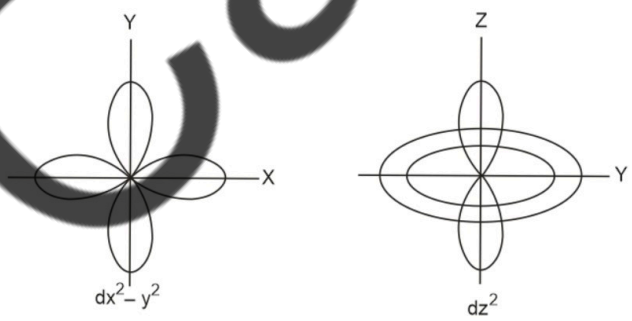
Option 2:
In an atom, all the five $3d$ orbitals are equal in energy in free state.

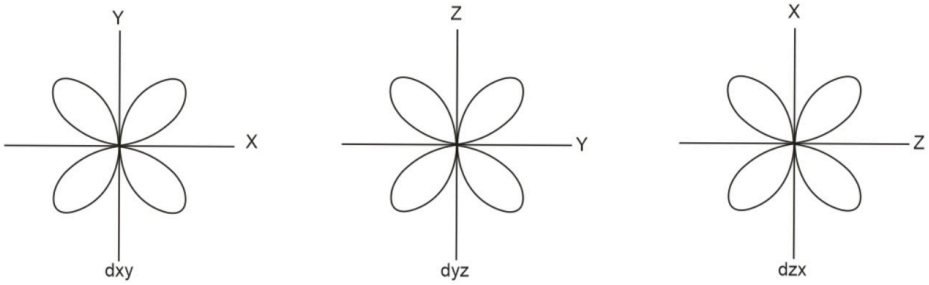
Option 3:
The shapes of d_{xy} d_{yz} and d_{zx} orbitals are similar to each other; and $d_{x^2} - y^2$ and $d_2 2$ are similar to each other.

Option 4:
All the five $5d$ orbitals are different in size when compared to the respective $4d$ orbitals.

Correct Answer:
The shapes of d_{xy} d_{yz} and d_{zx} orbitals are similar to each other; and $d_{x^2} - y^2$ and $d_2 2$ are similar to each other.

Solution:
The shapes of d-orbitals are given as





As evident from the orbital diagrams, the shapes of $\mathrm{dx^2-y^2}$ and $\mathrm{dz^2}$ are not similar.

Thus, Statement in option (3) is not correct

Hence answer is option (3).

Q. 3 If radius of second Bohr orbit of the $\mathrm{He^+}$ ion is $105.8\ \mathrm{pm}$, what is the radius of third Bohr orbit of $\mathrm{Li^{2+}}$ion?

Option 1:
$15.87\mathrm{pm}$

Option 2:
$1.587\mathrm{pm}$

Option 3:
$158.7\mathrm{\AA}$

Option 4:
$158.7\mathrm{pm}$

Correct Answer:
$158.7\mathrm{pm}$

Solution:
We know,

$$\mathrm{r} \propto \frac{\mathrm{n^2}}{\mathrm{z}}$$

$$\therefore \frac{\mathrm{r\left(He^+, n=2\right)}}{\mathrm{r\left(Li^{2+}, n=3\right)}} = \frac{2^2 \times 3}{2 \times 3^2} = \frac{2}{3}$$

$$\therefore \mathrm{r\left(Li^{2+}, n=3\right)} = \frac{3}{2}\mathrm{r\left(He^+, n=2\right)}$$

$$= \frac{3}{2} \times 105.8$$

$= 158.7\text{pm}$

Hence, the answer is the option (4).

Q. 4 The IUPAC name of an element with atomic number 119 is

Option 1:
unnilennium

Option 2:
unununnium

Option 3:
ununoctium

Option 4:
ununennium

Correct Answer:
ununennium

Solution:
IUPAC name of the element with atomic number 119 is ununennium

Hence, the answer is the option (4).

Q. 5 Amongst the following which one will have maximum ' lone pair - lone pair ' electron repulsions?

Option 1:
IF_5

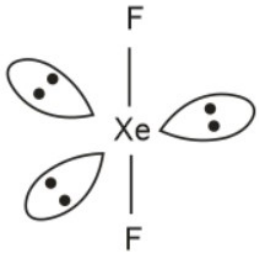
Option 2:
SF_4

Option 3:
XeF_2

Option 4:
$\mathrm{ClF_3}$

Correct Answer:
$\mathrm{XeF_2}$

Solution:
The maximum number of lone pairs on the control atom is present on Xe in $\mathrm{XeF_2}$



Hence maximum lone pair - lone pair repulsion will be present in $\mathrm{XeF_2}$

Hence correct option is 3.

Q. 6 Which amongst the following is incorrect statement?

Option 1:
$\mathrm{C_2}$ molecule has four electrons in its two degenerate π molecular orbitals.

Option 2:
$\mathrm{H_2^+}$ ion has one electron.

Option 3:
$\mathrm{O_2^+}$ ion is diamagnetic.

Option 4:
The bond orders of $\mathrm{O_2^+}$, $\mathrm{O_2}$, $\mathrm{O_2^-}$ and $\mathrm{O_2^{2-}}$ are $2.5, 2, 1.5$ and 1 respectively.

Correct Answer:
$\mathrm{O_2^+}$ ion is diamagnetic.

Solution:
$\mathrm{O_2^+}$ ion will be paramagnetic due to the presence of unpaired electrons in $\pi - 2\mathrm{p}$ orbital of molecular orbital

Hence, the answer is the option (3).

Q. 7 A $10.0\ \mathrm{L}$ flask contains $64\ \mathrm{g}$ of oxygen at $27^{\circ}\mathrm{C}$. (Assume $\mathrm{O_2}$ gas is behaving ideally). The pressure inside the flask in bar is
(Given $\mathrm{R} = 0.0831\ \mathrm{L\ bar\ K^{-1}\ mol^{-1}}$)

Option 1:
498.6

Option 2:
49.8

Option 3:
4.9

Option 4:
2.5

Correct Answer:
4.9

Solution:
From ideal gas equation, we have

$$\mathrm{PV} = \mathrm{nRT}$$

$$\Rightarrow \mathrm{P}(10) = \left(\frac{64}{32}\right)(0.0831)(300)$$

$$\Rightarrow \mathrm{P} = 4.986\ \mathrm{bar}.$$

Hence correct option is 3.

Q. 8 Which one is not correct mathematical equation for Dalton's Law of partial pressure? Here P = total pressure of the gaseous mixture.

Option 1:
$$\mathrm{P} = \mathrm{n_1}\frac{\mathrm{RT}}{\mathrm{V}} + \mathrm{n_2}\frac{\mathrm{RT}}{\mathrm{V}} + \mathrm{n_3}\frac{\mathrm{RT}}{\mathrm{V}}$$

Option 2:
$\mathrm{P_i} = \mathrm{x_i P}$, Where $\mathrm{P_i}$ =partial pressure of $\mathrm{i^{th}}$ gas
$\mathrm{X_i}$ =mole fraction of $\mathrm{i^{th}}$ gas in gaseous mixture

Option 3:

$P_i = x_i P_i^0$, where x_i = mole fraction of i^{th} gas in gaseous mixture

P_i^0 = Pressure of i^{th} gas in pure state

Option 4:

$p = p_1 + p_2 + p_3$

Correct Answer:

$P_i = x_i P$, Where P_i = partial pressure of i^{th} gas

X_i = mole fraction of i^{th} gas in gaseous mixture

Solution:

Daltons law of partial pressure equations are :

$$P_1 = n_1\frac{RT}{V}, P_2 = n_2\frac{RT}{V}, P_3 = n_3\frac{RT}{V}$$

$$P_{total} = P_1 + P_2 + P_3 = n_1\frac{RT}{V} + n_2\frac{RT}{V} + n_2\frac{RT}{V}$$

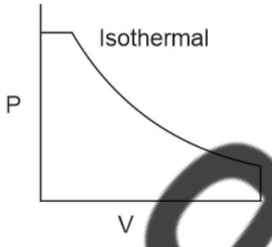
$$P_i = X_i P_{total}$$

but $P_i = X_i P_i^0$ is not the equation of Dalton's law of partial pressure

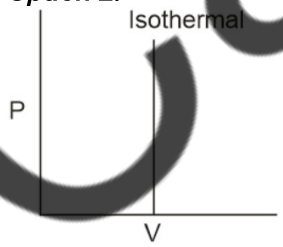
Hence correct option is 2

Q. 9 Which of the following p.V curve represents the maximum work done?

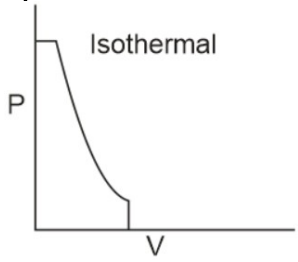
Option 1:



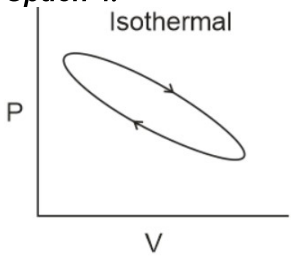
Option 2:



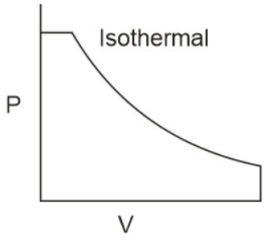
Option 3:



Option 4:

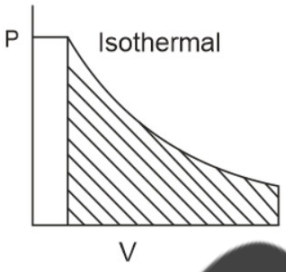


Correct Answer:



Solution:
In the P_V curve, the work is equal to the area under the P_V curve.

In graph (I) has the maximum area under the curve, so it will have maximum area under the curve



Hence the correct option is 1

Q. 10 $3O_2(g) \rightleftharpoons 2O_3(g)$

for the above reaction $298\mathrm{K}, \mathrm{K_c}$ is found to be 3.0×10^{-59}. If the concentration of $\mathrm{O_2}$ at equilibrium is $0.040\mathrm{M}$ then concentration of $\mathrm{O_3}$ in M is

Option 1:

1.9×10^{-63}

Option 2:

2.4×10^{31}

Option 3:

1.2×10^{21}

Option 4:

4.38×10^{-32}

Correct Answer:

4.38×10^{-32}

Solution:

$3O_2(\ g) \rightleftharpoons 2O_3(g)$

$$K_c = \frac{[O_3]^2}{[O_2]^3}$$

$$\Rightarrow 3 \times 10^{-59} = \frac{[O_3]^2}{(0.04)^3}$$

$$\Rightarrow [O_3]^2 = 3 \times 10^{-59} \times (0.04)^3$$

$$\Rightarrow [O_3]^2 = 1.92 \times 10^{-63}$$

$$\Rightarrow [O_3] = 4.38 \times 10^{-32}$$

Hence, the answer is the option (4).

Q. 11 The pH of the solution containing $50\ \mathrm{mL}$ each of $0.10\mathrm{M}$ sodium acetate and $0.01\mathrm{M}$ acetic acid is [Given $\mathrm{pK}_a \text{of } \mathrm{CH_3COOH} = 4.57$]

Option 1:

3.57

Option 2:

4.57

Option 3:

2.57

Option 4:

5.57

Correct Answer:

5.57

Solution:

Given salt (sodium acetate), $\mathrm{M} = 0.10, \mathrm{V} = 50\mathrm{mL}$ Weak acid

$(\mathrm{CH_3COOH})\ , \mathrm{pKa} = 4.57$ and $\mathrm{M} = 0.01$ So, weak acid and salt form an

acidic buffer

Then, $\mathrm{pH}=\mathrm{pK_a}+\log \frac{[\text{ salt}]}{[\text{ Acid}]}$

$$\mathrm{pH}=4.57+\log \frac{(0.1)}{(0.01)}$$

$$\mathrm{pH}=5.57$$

Trick: acetate ion is a base and if we add base in acid the pH solution will increase. So, pH of solution will be greater than 4.57

Hence, the answer is the option (4).

Q. 12 **Match List-I with List-II**

List-I(Hydrides)	**List-II(Nature)**
$(a)\mathrm{MgH_2}$	(i) Electron precise
$(b)\mathrm{GeH_4}$	(ii) Electron deficient
$(c)\mathrm{B_2H_6}$	(iii) Electron rich
$(d)\mathrm{HF}$	(iv) Ionic

Choose the correct answer from the options given below:

Option 1:
(a)-(iii),(b)-(i),(c)-(ii), (d)-(iv)

Option 2:
(a)-(i),(b)-(ii),(c)-(iv),(d)-(iii)

Option 3:
(a)-(ii),(b)-(iii),(c)-(iv),(d)-(i)

Option 4:
(a)-(iv),(b)-(i),(c)-(ii),(d)-(iii)

Correct Answer:
(a)-(iv),(b)-(i),(c)-(ii),(d)-(iii)

Solution:
By the definition of Hydrides

$\mathrm{MgH_2} \rightarrow$ Ionic

$\mathrm{GeH_4} \rightarrow$ Electron precise

$\mathrm{B_2H_6} \rightarrow$ Electron deficient

$\mathrm{HF} \rightarrow$ Electron rich

(a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

hence correct option is 4

Q. 13 Identify the incorrect statement from the following

Option 1:
The oxidation number of K in $\mathrm{KO_2}$ is $+4.$

Option 2:
Ionisation enthalpy of alkali metals decreases from top to bottom in the group.

Option 3:
Lithium is the strongest reducing agent among the alkali metals.

Option 4:
Alkali metals react with water to form their hydroxides.

Correct Answer:
The oxidation number of K in $\mathrm{KO_2}$ is $+4.$

Solution:
The oxidation number of K in $\mathrm{KO_2}$ is $+4$, is wrong because K oxidation number is $+1$,

$\mathrm{K^+ + O_2^- \rightarrow KO_2}$

superoxide

Hence correct option is 1.

Q. 14 Match List-I with List-II

List-I	List-II
(a)Li	(i) Absorbent for carbon dioxide
(b)Na	(ii) electrochemical cells
(c)KOH	(iii) coolant in fast breeder reactors
(d)Cs	(iv) photoelectric cell

Choose the correct answer from the options given below:

Option 1:
(a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

Option 2:
(a) -(i),(b)-(iii),(c)-(iv),(d)-(ii)

Option 3:
(a)-(i),(b)-(iii),(c)-(i),(d)-(iv)

Option 4:
(a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

Correct Answer:
(a)-(i),(b)-(iii),(c)-(i),(d)-(iv)

Solution:
1. Lithium is used to make electrochemical cells.

2. Liquid sodium metal is used as a coolant in fast breeder nuclear reactions.

3. KOH (Potassium hydroxide) is used in the manufacture of soft soap. It is also used as an excellent absorbent of carbon dioxide.

4. Caseium is used in deciding photoelectric cells.

So, (a) - (i), (b) - (iii), (c) - (i), (d) - (iv)

Hence the correct option is 3.

Q. 15 Which of the following statement is not correct about diborane?

Option 1:
The four terminal B-H bonds are two centre two electron bonds.

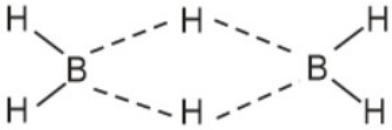
Option 2:
The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.

Option 3:
Both the Boron atoms are sp^2 hybridised.

Option 4:
There are two 3 -centre-2-electron bonds.

Correct Answer:
Both the Boron atoms are sp^2 hybridised.

Solution:
The structure of Diaborone is given below :



The bridge B-H-B bonde are 3c-2e bonds while the terminal B-H bonds are 2c-2e bonds

Boron atoms are sp^2 hybridized.

Hence correct option is 3

Q. 16 Choose the correct statement:

Option 1:
Diamond is covalent and graphite is ionic.

Option 2:
Diamond is sp^3 hybridised and graphite is sp^2 hybridized.

Option 3:
Both diamond aat graphite are used as dry lubricants.

Option 4:
Diamond and graphite have two dimensional network.

Correct Answer:
Diamond is sp^3 hybridised and graphite is sp^2 hybridized.

Solution:
In diamond, each carbon atom undergoes sp^3 hybridization and linked to form other carbon atoms by using hybridised orbitals in tetrahedral fashion. In graphite, each carbon atom in hexagonal ring undergoes sp^2 hybridization and makes three sigma bonds with the neighbouring carbon atoms.

Fourth electron forms π bond.

Diamond and graphite both of them are covalent.

Only graphite is used as dry lubricant.

Diamond form 3D network and graphite forms 2D network

hence correct option is 2.

Q. 17 Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**
Assertion (A) : ICl is more reactive than I_2.
Reason (R): $\mathrm{I-Cl}$ bond is weaker than $\mathrm{I-I}$ bond.
In the light of the above statements, choose the most appropriate answer from the options given below:

Option 1:
Both (A) and (R) are correct but (R) is not the correct explanation of (A).

Option 2:
(A) is correct but (R) is not correct.

Option 3:
(A) is not correct but (R) is correct.

Option 4:
Both (A) and (R) are correct and (R) is the cornect explanation of (A).

Correct Answer:
Both (A) and (R) are correct and (R) is the cornect explanation of (A).

Solution:
Interhalogen compounds are more reactive than halogens (except fluorine). This is because $X-X'$ bond in interhalogens is weaker than $X-X$ bond in halogens except $F-F$ bond .

So, ICl is more reactive than I_2 and because of $I-Cl$ bond is weaker than $I-I$ bond.

Hence the correct option is 4.

Q. 18 Given below are two statements.

Statement I:
The boiling points of the following hydrides of group 16 elements increase in the orders-
$H_2O < H_2\ S < H_2Se_e < H_2Te$
Statement II:
The boiling points of these hydrides increases with increase in molar mass.

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

Option 1:
Both Statement I and Statement II are incorrect.

Option 2:
Statement I is correct but Statement II is incorrect.

Option 3:
Statement I is incorrect but Statement II is correct.

Option 4:
Both Statement I and Statement II are correct.

Correct Answer:
Statement I is incorrect but Statement II is correct.

Solution:
The boiling points of the following hydrides :

$$H_2S < H_2Se < H_2Te < H_2O$$

The boiling points of their hydrides increase with the increase in molar mass from H_2S to

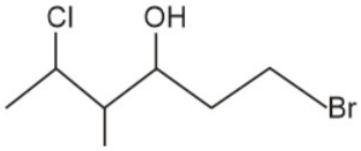
H_2Te, but due to the presence of H-bonding in H_2O and that forms intermolecular

H-bonding which increases the boiling point of H_2O

So, statement I is incorrect and statement II is correct

Hence, the answer is the option (3).

Q. 19 The correct IUPAC name of the following compound is :



Option 1:
$6-\text{bromo}-2-\text{chloro}-4-\text{methylhexan}-4-\text{ol}$

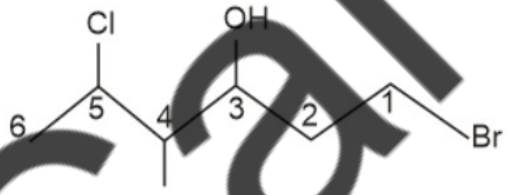
Option 2:
$1-\text{bromo}-4-\text{methyl}-5-\text{chlorohexan}-3-\text{ol}$

Option 3:
$6-\text{bromo}-4-\text{methyl}-2-\text{chlorohexan}-4-\text{ol}$

Option 4:
$1-\text{bromo}-5-\text{chloro}-4-\text{methylhexan}-3-\text{ol}$

Correct Answer:
$1-\text{bromo}-5-\text{chloro}-4-\text{methylhexan}-3-\text{ol}$

Solution:



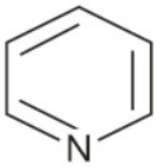
Convert IUPAC name is

1 - Bromo - 5 - Chloro - 4 - methylhexan - 3 - ol

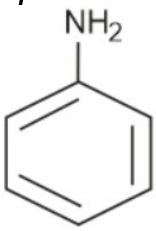
hence correct option is 4.

Q. 20 The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds?

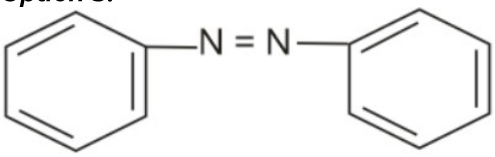
Option 1:



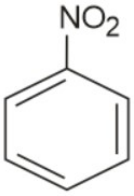
Option 2:



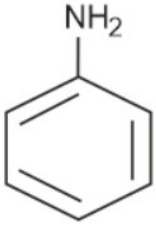
Option 3:



Option 4:



Correct Answer:



Solution:

As we have learnt,

Nitro compounds, Azo compounds and compounds containing nitrogen in aromatic rings do not respond to Kjeldahl's test.

Thus, among the given compounds, the one which response to Kjeldehl's test is aniline

Hence the correct option is 2

Q. 21 Which of the following is suitable to synthesize chlorobenzene ?

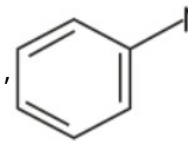
Option 1:

$\text{Phenol}, NaNO_2, HCl, CuCl$

Option 2:


, HCl

Option 3:



Option 4:

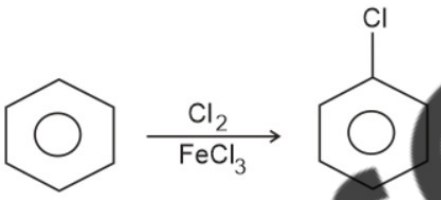
$\text{Benzene}, Cl_2, \text{anhydrous } FeCl_3$

Correct Answer:

$\text{Benzene}, Cl_2, \text{anhydrous } FeCl_3$

Solution:

Chlorobenzene can be obtained from benzene upon reaction with $Cl_2/FeCl_3$



hence correct option is 4

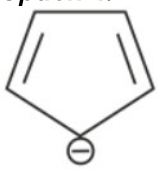
Q. 22 Which compound amongst the following is not an aromatic compound ?

Option 1:

Option 2:

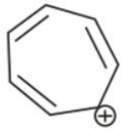
Option 3:

Option 4:



Correct Answer:

Solution:

(1)  $6\pi e^{(-)}$, planer, cyclic $\Rightarrow$ Aromatic

(2)  $2\pi e^{(-)}$, planer, cyclic $\Rightarrow$ Aromatic

(3)  $6\pi e^{(-)}$, not Planar, not cyclic $\Rightarrow$ Non-Aromatic

(4)  $6\pi e^{(-)}$, planar, cyclic $\Rightarrow$ Aromatic

hence correct option is 3.

Q. 23 The pollution due to oxides of sulphur gets enhanced due to the presence of :
(a) particulate matter
(b) ozone
(c) hydrocarbons
(d) hydrogen peroxide
Choose the most appropriate answer from the options given below:

Option 1:
(a), (b), (d) only

Option 2:
(b), (c), (d) only

Option 3:
(a), (c), (d) only

Option 4:
(a), (d) only

Correct Answer:
(a), (b), (d) only

Solution:
NCERT based

The oxidation of SO_2 to SO_3 is catalysed in the presence of particulate matter

$$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$$

The reaction can be promoted by Ozone and hydrogen peroxide.

$$SO_2(g) + O_3(g) \rightarrow SO_3(g) + O_2(g)$$

$$SO_2(g) + H_2O_2(l) \rightarrow H_2SO_4(aq).$$

Hence correct option is 1

Q. 24 Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) :
In a particular point defect, an ionic solid is electrically neutral, even if few of its cations are missing from its unit cells.

Reason (R) :
In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to interstitial site, maintaining overall electrical neutrality.

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

Option 1:
Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Option 2:
(A) is correct but (R) is not correct

Option 3:
(A) is not correct but (R) is correct

Option 4:
Both (A) and (R) are correct and (R) is the correct explanation of (A)

Correct Answer:
Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Solution:
Assertion (A) is correct as ionic solids are always electrically neutral. The given example is of metal deficiecy defect.

Reason (R) is also correct as frenkel defect is a dislocation defect

however **(R)** does not explain **(A)**

Hence correct option is 1

Q. 25 Copper crystallises in fcc unit cell with cell edge length of $3.608 \times 10^{-8} \mathrm{cm}$. The density of copper is $8.92\ \mathrm{g\ cm^{-3}}$. Calculate the atomic mass of copper.

Option 1:
$31.55\ \mathrm{u}$

Option 2:
$60\ \mathrm{u}$

Option 3:
$65\ \mathrm{u}$

Option 4:
$63.1\ \mathrm{u}$

Correct Answer:
$63.1\ \mathrm{u}$

Solution:
As we have learnt ,

$$d = \frac{Z \times M_0}{N_A \times a^3}$$

Putting values in the above expression we have

$$8.92 = \frac{4 \times M_0}{6.022 \times 10^{23} \times (3.608 \times 10^{-8})^3}$$

$$\Rightarrow \quad M_0 = \frac{8.92 \times 6.022 \times 10^{23} \times (3.608 \times 10^{-8})^3}{4}$$

$$\Rightarrow \quad M_0 = 63.1$$

Hence correct option is 4

Q. 26 In one molal solution that contains 0.5 mole of a solute, there is

Option 1:
500g of solvent

Option 2:
100mL of solvent

Option 3:
$1000\ \text{g}$ of solvent

Option 4:
500mL of solvent

Correct Answer:
500g of solvent

Solution:
1 molal solution means

1 mole of solvent is present in 1kg of solute

Thus 500g of solvent will contain 0.5 mole of solute

Hence, the answer is the option (1).

Q. 27 Find the emf of the cell in which the following reaction takes place at $298\ \mathrm{K}$

$\mathrm{Ni(s)} + 2\mathrm{Ag^+(0.001M)} \rightarrow \mathrm{Ni^2} + (0.001\mathrm{M}) + 2\mathrm{Ag(s)}$

(Given that $\mathrm{E^0_{cell}} = 1.05\mathrm{V}, \dfrac{2.303\ \mathrm{RT}}{\mathrm{F}} = 0.0285 \text{ at } 298\mathrm{K}$)

Option 1:

$1.385\ \mathrm{V}$

Option 2:

$0.9615\ \mathrm{V}$

Option 3:

$1.05\ \mathrm{V}$

Option 4:

$1.0385\ \mathrm{V}$

Correct Answer:

$0.9615\ \mathrm{V}$

Solution:

The cell reaction is

$$\mathrm{N_i(s) + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag}$$

$$\mathrm{n = 2 \text{ and } Q = \frac{[Ni^{2+}]}{[Ag^+]^2}}$$

$\therefore$ From the nearest equation, we have

$$\mathrm{E = E^0_{cell} - \frac{0.059}{2} \log \frac{[Ni^{2+}]}{[Ag^+]^2}}$$

$$= 1.05 - 0.0295 \log \frac{10^{-3}}{(10^{-3})^2}$$

$$= 1.05 - 0.0295 \log 10^3$$

$$= 1.05 - 0.0295 \times 3$$

$$= 0.9615\ \mathrm{V}$$

Hence, the answer is the option (2).

Q. 28 At $298\ \mathrm{K}$, the standard electrode potentials of $\mathrm{Cu^{2+}/Cu, Zn^{2+}/Zn, Fe^{2+}/Fe}$ and $\mathrm{Ag^{+}/Ag}$ are $0.34\ \mathrm{V}, -0.76\ \mathrm{V}, -0.44\ \mathrm{V}$ and $0.80\ \mathrm{V}$, respectively.
On the basis of standard electrode potential, predict which of the following reaction can not occur?

Option 1:
$\mathrm{CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)}$

Option 2:
$\mathrm{FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)}$

Option 3:
$\mathrm{2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)}$

Option 4:
$\mathrm{CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)}$

Correct Answer:
$\mathrm{2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)}$

Solution:
Given Standard electrical potentials so order will be

$$\mathrm{E^0_{Zn^{2+}/Zn} < E^0_{Fe^{2+}/Fe} < E^0_{Cu^{2+}/Cu} < E^0_{Ag^{2+}/Ag}}$$

$$-0.76 \qquad -0.44 \qquad 0.34 \qquad 0.80$$

From the above data,

$\mathrm{Ag^{2+}}$ can oxidize others and then get reduced to

$\mathrm{Zn^{2+}}$ cannot oxidize others

$\mathrm{Fe^{2+}}$ can oxidize only Zn and Fe metals but not Cu and Ag

$\mathrm{Cu^{2+}}$ can oxidize only Zn and Fe metals but it cannot oxidize Ag metal due to high value

In reaction $\mathrm{2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu_4(s) + Ag_2SO_4(aq)}$

$\mathrm{Cu^{2+}}$ is oxidizing Ag which is not possible, so this reaction can not occur.

Hence, the answer is the option (3).

Q. 29 Given below are half cell reactions:

$$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$$

$$E_{Mn^{2+}}/MnO_4 = -1.510\ V$$

$$\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O,$$

$$E_{O2}/H_2O = 1.223\ V$$

Will the permanganate ion, MnO_4^- liberate O_2 from Water in the presence of an acid?

Option 1:
No, because $E^0{}_{cell} = -0.287\ V$

Option 2:
Yes, because $E^o{}_{cell} = +2.733\ V$

Option 3:
No, because $E^o{}_{cell} = -2.733\ V$

Option 4:
Yes, because $E^0{}_{cell} = +0.287\ V$

Correct Answer:
Yes, because $E^0{}_{cell} = +0.287\ V$

Solution:
The E^0 values corresponding to the reactions are given below:

$$MnO^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O, E^0 = 1.510$$

$$H_2O \longrightarrow \frac{1}{2}O_2 + 2H^+ + 2e^-, E^0 = -1.223$$

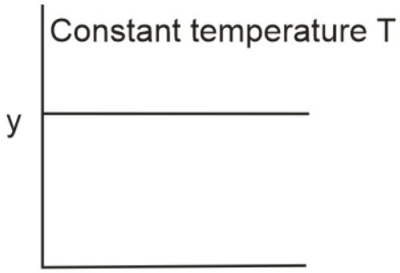
$$\therefore E^\circ Cell = (1.570 - 1.223)V$$

$$= 0.287\ V$$

Thus, MnO_4^- will be able to liberate O_2 from water in the presence of H^+

Hence, the answer is the option (4).

Q. 30 The given graph is a representation of kinetics of a reaction



The y and x axes for zero and first order reactions, respectively are

Option 1:
zero order (y= concentration and x= time), first order (y= rate constant and x= concentration)

Option 2:
zero order (y=rate and x=concentration), first order ($y = t_{1/2}$ and x= concenration)

Option 3:
zero order (y= rate and x=concentration), first order (y= rate and $x = t_{1/2}$)

Option 4:
zero order (y= concentration and x=time),first order ($y = t_{1/2,}$ and x= concentration)

Correct Answer:
zero order (y=rate and x=concentration), first order ($y = t_{1/2}$ and x= concenration)

Solution:
As we have learnt,

For a zero order reaction,

$\text{rate } \alpha [A]^0$

$\Rightarrow$ rate = K = constant.

$\Rightarrow$ rate is independent of concentration

For a first order reaction

$$t_{1/2} = \frac{\ln 2}{K}.$$

$\Rightarrow$ Half life is independent of concentration

Hence correct option is 2

Q. 31 For a first order reaction $\mathrm{A} \rightarrow$ Products, initial concentration of A is $0.1\ \mathrm{M}$, which become $0.001\ \mathrm{M}$ after 5 minutes. Rate constant for the reaction in min^{-1} is

Option 1:
0.9212

Option 2:
0.4606

Option 3:
0.2303

Option 4:
1.3818

Correct Answer:
0.9212

Solution:
For a first-order reaction, the integrated rate law expression is

$$\ln\left(\frac{\mathrm{A}_0}{\mathrm{A}_t}\right) = \mathrm{Kt}.$$

$$\Rightarrow \quad \ln\left(\frac{0.1}{0.001}\right) = \mathrm{K}(5)$$

$$\Rightarrow \mathrm{K} = \frac{\ln 100}{5} = \frac{4.606}{5} = 0.9212\ \mathrm{min}^{-1}$$

Hence, the answer is the option (1).

Q. 32 The incorrect statement regarding enzymes is:

Option 1:
Like chemical catalysts, enzymes reduce the activation energy of bio processes.

Option 2:
Enzymes are polysaccharides.

Option 3:
Enzymes are very specific for a particular reaction and substrate.

Option 4:
Enzymes are biocatalysts.

Correct Answer:
Enzymes are polysaccharides.

Solution:
Enzymes are not polysaccharides

Statement 2 is incorrect and others are correct

Hence the correct option is 2

Q. 33 Given below are two statements:

Statement I:
In the coagulation of a negative solution, the flocculating power of the three given ions is in the order-

$Al^{3}+ > Ba^{2}+ > Na^{+}$

Statement II:
In the coagulation of a positive sol, the flocculating power of the three given salts is in the order-

$NaCl > Na_2SO_4 > Na_3PO_4$

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

Option 1:
Both Statement I and Statement II are incorrect.

Option 2:
Statement I is correct but Statement II is incorrect.

Option 3:
Statement I is incorrect but Statement II is correct.

Option 4:
Both Statement I and Statement II are correct.

Correct Answer:
Statement I is correct but Statement II is incorrect.

Solution:
Hardly Schulze rule's say the greater the valence of the flocculating ion added, the greater is it's power to cause precipitation.

In the coagulation of a negative solution, the flocculating power is in the order :

$Al^{3+} > Ba^{2+} > Na^{+}$

In the coagulation of a positive solution, the fluctuating power is in the order :

$[Fe(CN)_6]^{4-} > PO_4^{3-} > SO_4^{2-} > Cl^{-}$

So, a statement I is correct but statement II is incorrect.

Hence the correct option is 2.

Q. 34 Match List -I with List -II

List-I (Ores)	List-II (Composition)
(a) Haematite	(i) Fe_3O_4
(b) Magnetite	(ii) $ZnCO_3$
(c) Calamine	(iii) Fe_2O_3
(d) Kaolinite	(iv) $[Al_2(OH)_4Si_2O_5]$

Choose the correct answer from the options given below:

Option 1:
(a)-(iii),(b)-(i),(c)-(ii),(d)-(iv)

Option 2:
(a)-(iii),(b)-(i),(c)-(iv),(d)-(ii)

Option 3:
(a)-(i),(b)-(iii),(c)-(ii),(d)-(iv)

Option 4:
(a)-(i),(b)-(ii),(c)-(iii),(d)-(iv)

Correct Answer:
(a)-(iii),(b)-(i),(c)-(ii),(d)-(iv)

Solution:
The correct match of Ores and their composition is given below:

(a) Hanematite : (iii) Fe_2O_3

(b) Magnetite : (i) Fe_3O_4

(c) Calamine : (ii) $\mathrm{ZnCO_3}$

(d) Kaolinite : (iv) $\left[\mathrm{Al_2\,(OH)_4\,Si_2O_5}\right]$

Hence the correct option is 1.

Q. 35 In the neutral or faintly alkaline medium, $\mathrm{KMnO_4}$ oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from

Option 1:
$+6$ to $+4$

Option 2:
$+7$ to $+3$

Option 3:
$+6$ to $+5$

Option 4:
$+7$ to $+4$

Correct Answer:
$+7$ to $+4$

Solution:
In a neutral or faintly alkaline medium $\mathrm{KMnO_4}$ is converted to $\mathrm{MnO_2}$

$\mathrm{MnO_4^-} \rightarrow \mathrm{MnO_2}$

$(+7) \qquad (+4)$

Hence, the answer is the option (4).

Q. 36 Gadolinium has a low value of third ionisation enthalpy because of

Option 1:
high exchange enthalpy

Option 2:
high electronegativity

Option 3:
high basic character

Option 4:
small size

Correct Answer:
high exchange enthalpy

Solution:
Gd^{2+} has a configuration of $4f^75d^1$. Thus, Gd^{3+} has a half-filled $4f^7$ configuration which has a high value of exchange enthalpy

Hence the third ionization energy of Gd is low

Hence, the answer is the option (1).

Q. 37 The $IUPAC$ name of the complex - $[AgH_2O)_2]\,[Ag(CN)_2]^2$ is :

Option 1:
diaquasilver(II) dicyanidoargentate(II)

Option 2:
dicyanidosilver(I) diaquaargentate(I)

Option 3:
diaquasilver(I) dicyanidoargentate(I)

Option 4:
dicyanidosilver(II) diaquaargentate(II)

Correct Answer:
diaquasilver(I) dicyanidoargentate(I)

Solution:
$$[Ag\,(H_2O)_2]\,[Ag(CN)_2] \rightarrow [Ag\,(H_2O)_2]^+ + [Ag\,(CN)_2]^-$$

$$\downarrow \qquad\qquad \downarrow$$

Cation complex Anion complex

Cation Complex $\Rightarrow$ Metal name: Silver

Anion Complex $\Rightarrow$ Metal name (Suffix-ate or Latin names)

$\Rightarrow$ Argentate (Latin name of Ag)

$H_2O \rightarrow$ aqua, $2\,(H_2O) \rightarrow$ diaqua

$CN^- \rightarrow$ cyanide, $2\,(CN^-) \rightarrow$ dicyanido

Oxidation state of $Ag = +1$

So IUPAC Name : Diaquasilver (I) dicyanidoargentate (I)

Hence, the answer is the option (3).

Q. 38 The order of energy absorbed which is responsible for the color of complexes

$(A)\ [Ni\,(H_2O)_2\,(en)_2]^{2+}$

$(B)[Ni(H_2O)_4(en)]^{2+}$ and

$(C)[Ni(en)_3]^{2+}$ is

Option 1:
(C)>(B)>(A)

Option 2:
(C)>(A)>(B)

Option 3:
(B)>(A)>(C)

Option 4:
(A)>(B)>(C)

Correct Answer:
(C)>(A)>(B)

Solution:
As we have learnt,

Energy absorbed by complexes depends upon the sitting energy.

Metal ion remaining save, splitting is greater for strong field chelating ligands.

$\therefore$ The order of splitting in given complexes is

$[Ni(en)_3]^{2+} > [Ni(H_2O)_2en_2]^{2+} > [Ni(H_2)_4en]^{2+}$

(C) (A) (B)

Hence, the answer is the option (2).

Q. 39 The incorrect statement regarding chirality is :

Option 1:
The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration.

Option 2:
Enantiomers are superimposable mirror images on each other.

Option 3:
A racemic mixture shows zero optical rotation.

Option 4:
S_N1 reaction yields $1:1$ mixture of both enantiomers.

Correct Answer:
Enantiomers are superimposable mirror images on each other.

Solution:
Enantiomers are non-superimposable mirror images of each other

Statement (2) is incorrect

Hence, the answer is the option (2).

Q. 40 Given below are two statements:
Statement I:
The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.
Statement II:
o-nitrophenol, m-nitrophenol and p-nitrophenol will have same acidic strength as they have one nitro group attached to the phenolic ring

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

Option 1:
Both Statement I and Statement II are incorrect.

Option 2:
Statement I is correct but Statement II is incorrect.

Option 3:
Statement I is incorrect but Statement II is correct.

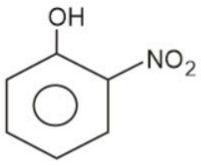
Option 4:
Both Statement I and Statement II are correct.

Correct Answer:
Statement I is correct but Statement II is incorrect.

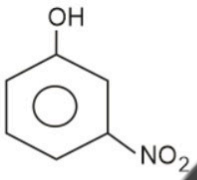
Solution:
Electron withdrawing group o Phenol increases it's acidic strength

Statement I is correct

now, the pka values of nitro substituted Phenols are given below:



: 7.23



: 8.35

: 7.14

thus acidic strength of nitrophenols is

Para > Ortho > Meta

Hence statement I is correct while statement II is incorrect

hence correct option is 2

Q. 41 Given below are two statements:

Statement I :

In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. $\mathrm{HCl} + \mathrm{ZnCl_2}$, known as Lucas Reagent.

Statement II :

Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

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

Option 1:
Both Statement I and Statement II are incorrect.

Option 2:
Statement I is correct but Statement II is incorrect.

Option 3:
Statement I is incorrect but Statement II is correct.

Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Statement I is correct but Statement II is incorrect.

Solution:
As we have learnt

In the Lucas test for alcohols, tertiary alcohols produce instant turbidity, secondary alcohols produce turbidity after $(5 - 10)$ min. While primary alcohol does not produce turbidity.

Thus, Statement I is correct while Statement II is incorrect

Hence, the answer is the option (2).

Q. 42 Given below are two statements :

Statement I:

The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole- dipole interactions,

Statement II:

The boiling points of aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding.

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

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect.

Option 3:
Statement I is incorrect but Statement II is correct.

Option 4:
Both Statement I and Statement II are correct.

Correct Answer:
Both Statement I and Statement II are correct.

Solution:
The boiling points of aldehydes and ketones are higher than hydrocarbons and ethers of comparable molecular masses. It is due to weak molecular association in Aldehydes and Ketones arising out of the dipole-dipole interactions. Also, their boiling points are lower than those of alcohols of similar molecular masses due to the absence of intermolecular hydrogen bonding.

Hence, the answer is the option (4).

Q. 43 Compound X on reaction with $\mathrm{O_3}$ followed by $\mathrm{Zn/\ H_2O}$ gives formaldehyde and 2-methyl propanal as products. The compound X is :

Option 1:
$2-\mathrm{Methylbut}-1-\mathrm{ene}$

Option 2:

$2-\text{Methylbut}-2-\text{ene}$

Option 3:

$\text{Pent}-2-\text{ene}$

Option 4:

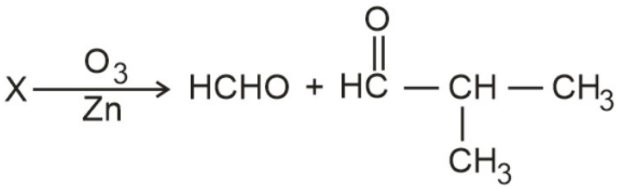
$3-\text{Methylbut}-1-\text{ene}$

Correct Answer:

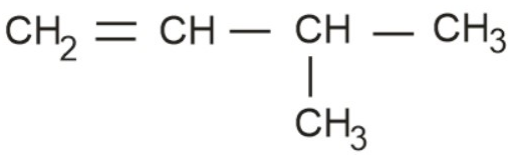
$3-\text{Methylbut}-1-\text{ene}$

Solution:

Given,



$\therefore$ The alkene X is

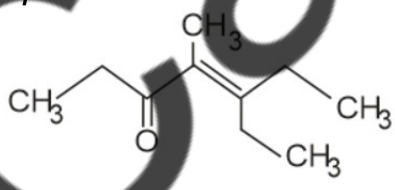


It's IUPAC name is 3-Methylbut-1-ene

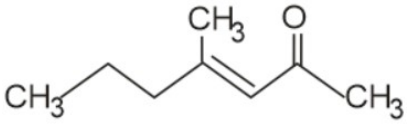
hence correct option is 4

Q. 44 Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating?

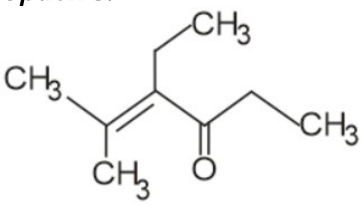
Option 1:



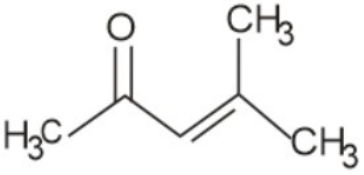
Option 2:



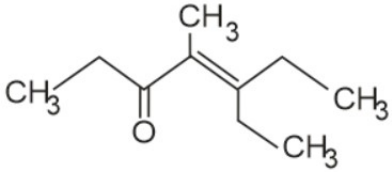
Option 3:



Option 4:

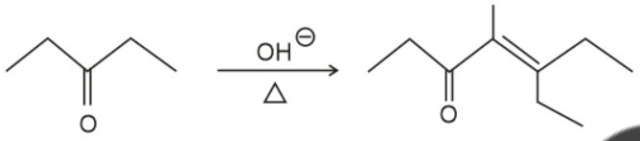


Correct Answer:



Solution:

The compound in option 1 is a self-aldol product of 3-Pentanone



Hence correct option is 1.

Q. 45 Match List-I with List-II

List-I (products formed)	List-II(Reaction of carbonyl compound with)
(a) Cyanohydrin	(i) NH_2OH
(b) Acetal	(ii) RNH_2
(c) Schiffs base	(iii) alcohol
(d) Oxime	(iv) HCN

Choose the correct answer from the options given below:

Option 1:

(a) -(ii),(b)-(iii),(c)-(iv),(d)-(i)

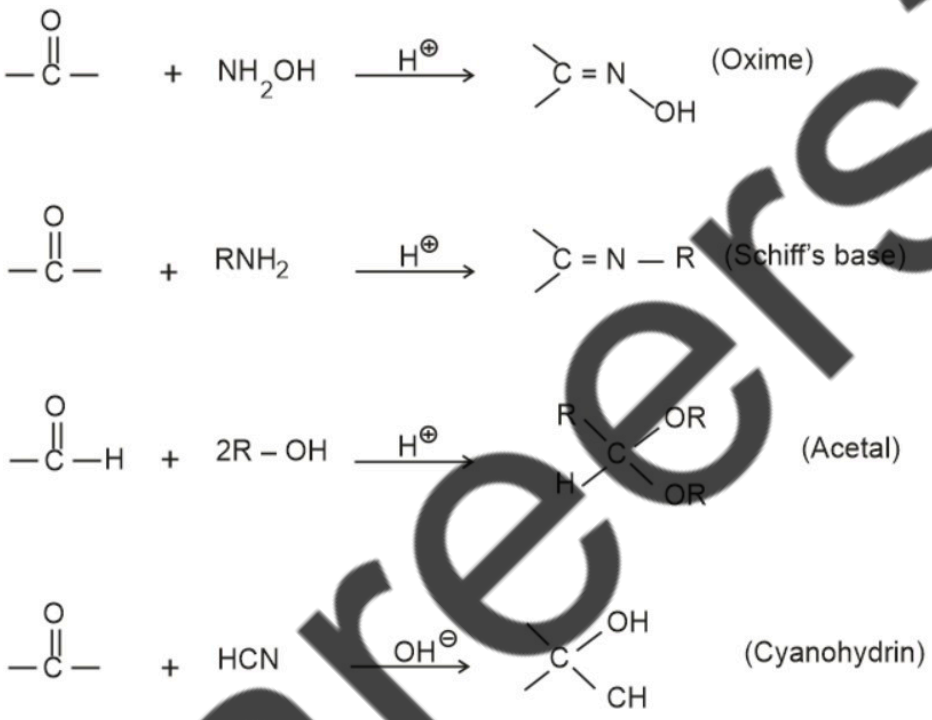
Option 2:
(a)-(i),(b)-(iii),(c)-(ii),(d)-(iv)

Option 3:
(a)-(iv),(b)-(iii),(c)-(ii),(d)-(i)

Option 4:
(a)-(iii),(b)-(iv),(c)-(ii),(d)-(i)

Correct Answer:
(a)-(iv),(b)-(iii),(c)-(ii),(d)-(i)

Solution:
Reaction of carbonyl and formed products.



So, (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

Hence the correct option is 3.

Q. 46 $\mathrm{RMgX} + \mathrm{CO_2} \xrightarrow[ether]{dry} \mathrm{Y} \xrightarrow{H_2O} \mathrm{RCOOH}$

What is Y in the above reaction?

Option 1:
$R_3CO^-Mg^+X$

Option 2:
$RCOO^-X^+$

Option 3:
$(RCOO)_2Mg$

Option 4:
$RCOO^-Mg^+X$

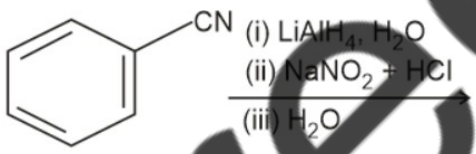
Correct Answer:
$RCOO^-Mg^+X$

Solution:
The given reaction occurs as

$$RMgX + CO_2 \xrightarrow{\text{ether}} RCOO^{(-)}Mg^{(+)} \xrightarrow[H_2O]{H^+} RCOOH$$

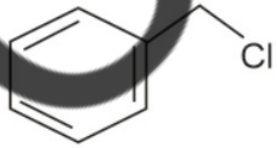
Hence, the answer is the option (4).

Q. 47 The product formed from the following reaction sequence is

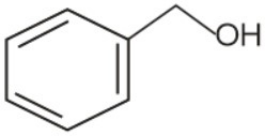


Option 1:

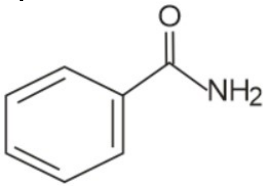
Option 2:



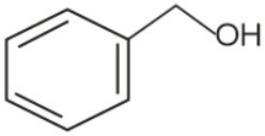
Option 3:



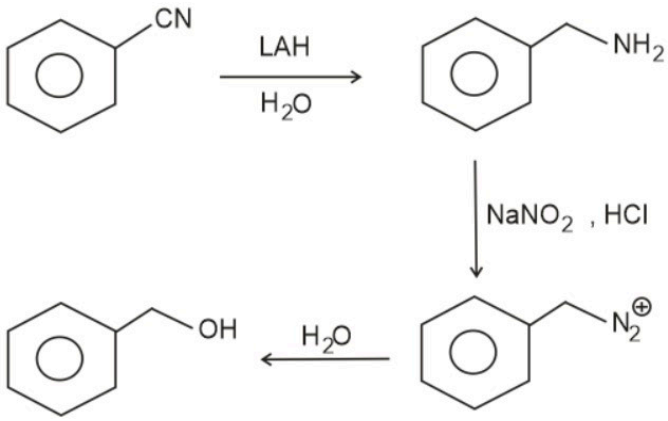
Option 4:



Correct Answer:



Solution:
The reaction sequence occurs as



hence correct option is 3.

Q. 48 Given below are two statements :

Statement I:
Primary aliphatic amines reacts with HNO_2 to give unstable diazonium salts.

Statement II:
Primary aromatic amines reacts with HNO_2 to form diazonium salts which are stable even above $300\ K$.
In the light of the above statement, choose the most appropriate answer from the options given below:

Option 1:
Both statement I and Statement II are incorrect.

Option 2:
Statement I is correct but Statement II is incorrect.

Option 3:
Statement I is incorrect but Statement II is correct.

Option 4:
Both Statement I and Statement II are correct.

Correct Answer:
Statement I is correct but Statement II is incorrect.

Solution:
Primary aliohatic amines react with nitrous acid to form aliphatic diazonium saltswhich being unstable.

$$R-NH_2 + HNO_2 \xrightarrow{NaNO_2 + HCl} [R-\overset{\oplus}{N}_2\overset{\ominus}{Cl}]$$

Primary aminesreact with nitrous acid at low temperature $273-278K$ to form diazonium salts

$$C_6H_5-NH_2 \xrightarrow[273-278k]{NaNO_2 + 2HCl} C_6H_5-\overset{\oplus}{N}_2\overset{\ominus}{Cl}$$

But above $300K$ diazonium salt is very unstable

So, statement I is correct but Statement II is incorrect

hence correct option is 2

Q. 49 Which statement regarding polymers is not correct?

Option 1:
Fibres possess high tensile strength.

Option 2:
Thermoplastic polymers are capable of repeatedly softening and hardening on heating and cooling respectively.

Option 3:
Thermosetting polymers are reusable.

Option 4:
Elastomers have polymer chains held together by weak intermolecular forces.

Correct Answer:
Thermosetting polymers are reusable.

Solution:
1. Fibers possess a high tensile strength

2. Thermoplastic polymers are capable of repeatedly softening and hardening on heating

and cooling respectively.

3. Thermosetting polymers cannot be reused

4. Elastomers have polymer chains held together by weak intermolecular forces.

Hence the correct option is 3.

Q. 50 Match List-I with List-II.

List-I(Drug Class)	List-II(Drug molecule)
(a) Antacids	(i) Salvarsan
(b) Antihistamines	(ii) Morphine
(c) Analgesics	(iii) Cimetidine
(d) Antimicrobials	(iv) Seldane

Choose the correct answer from the options given below:

Option 1:
(a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

Option 2:
(a) - (i), (b) - (iv), (c) - (ii), (d) - (iii)

Option 3:
(a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

Option 4:
(a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

Correct Answer:
(a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

Solution:
The correct matching of drug class with drug molecule is given below:

(a) Antacids : Cimetidine (iii)

(b) Antihistamines : Seldane (iv)

(c) Analgesics : Morphine (iii)

(d) Antimicrobials : Salvoarson (i)

Hence correct option is 1

Biology

Q. 1 Exoskeleton of arthropods is composed of :

Option 1:
Cellulose

Option 2:
Chitin

Option 3:
Glucosamine

Option 4:
Cutin

Correct Answer:
Chitin

Solution:
The exoskeleton of arthropods is made up of Chilin.

Hence, the correct answer is (2)

Q. 2 Which of the following is incorrectly matched?

Option 1:
Ulothrix - Mannitol

Option 2:
Porphyra - Floridian Starch

Option 3:
Volvox-Starch

Option 4:
Ectocarpus - Fucoxanthin

Correct Answer:
Ulothrix - Mannitol

Solution:

Ulothrix is a member of chlorophycean (green algae) with reserved food material, starch.

Mannitol is the stored food material of Phaeophyceae (brown algae).

Hence, the correct option is (1).

Q. 3 Match the plant with the kind of life cycle it exhibits :

	List I		**List II**
a	Spirogyra	i	Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte
b	Fern	ii	Dominant haploid free-living gametophyte
c	Funaria	iii	Dominant diploid sporophyte alternating with reduced gametophyte called prothallus
d	Cycas	iv	Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte

Choose the correct answer from the options given below:

Option 1:
(a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

Option 2:
(a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)

Option 3:
(a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

Option 4:
(a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

Correct Answer:
(a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

Solution:
→ Spirogyra is an alga. It shows the haplontic life cycle.

→ Fern is a pteridophyte. The dominant phase of the life cycle is diploid sporophyte. Its gametophyte is called prothallus

→ funaria is a bryophyte. Its gametophyte is a leafy stage

→ Cycas is a gymnosperm. The main plant body is sporophyte (2n). They have highly reduced gametophyte stage.

Hence, the correct option is (1).

Q. 4 In the taxonomic categories which hierarchial arrangement in ascending order is correct in case of animals ?

Option 1:
Kingdom, Class, Phylum, Family, Order, Genus, Species

Option 2:
Kingdom, Order, Class, Phylum, Family, Genus, Species

Option 3:
Kingdom, Order, Phylum, Class, Family, Genus, Species

Option 4:
Kingdom, Phylum,Class, Order, Family, Genus, Species

Correct Answer:
Kingdom, Phylum,Class, Order, Family, Genus, Species

Solution:
Correction order is

Kingdom
↓
Phylum
↓
Class
↓
Order
↓
Family
↓
Genus
↓
Species

Q. 5 In which of the following animals, digestive tract has additional chambers like crop and gizzard ?

Option 1:
Bufo, Balaenoptera, Bangarus

Option 2:
Carla, Columbia, Crocodilus

Option 3:
Paco,Psittacula, Corous

Option 4:
Corpus, Columba, Chameleon

Correct Answer:
Paco,Psittacula, Corous

Solution:
Crop and Gizzard are part of class Aves and Phylum Arthropoda. Pavo, Pssittacula and Corvus all are birds (Aver) and hence the covert answer

Option 1- Bufo is Amphibian

2 - Crocodilus is Reptile

4 - chameleon is Reptile

Q. 6 -Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) :

All vertebrates are chordates but all chordates but all chordates are not vertibrates.

Reason (R) :

Notochord is replaced by vertebral column in the adult vertebrates

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

Option 1:
Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Option 2:
(A) is correct but (R) is not correct

Option 3:
(A) is not correct but (R) is correct

Option 4:
Both (A) and (R) are correct but (R) is the correct explanation of (A)

Correct Answer:
Both (A) and (R) are correct but (R) is the correct explanation of (A)

Solution:
Assertion is True. Chordates can be vertebrates & Invertebrates. Thus, all vertebrates are definitely chordates.

Reason: Chordates are vertebrates when Notochord is replaced by a vertebral Column. Hence Reason is the correct explanation of Assertion.

Hence, Option (4) is correct.

Q. 7 Which of the following is a correct statement ?

Option 1:
Bacteria are exclusively heterotrophic organisms

Option 2:
Slime moulds are saprophytic organisms classified under Kingdown Monera

Option 3:
Mycoplasma have DNA, Ribosome and cell wall

Option 4:
Cyanobacteria are a group of autotorphic organisms classified under Kingdown Monera

Correct Answer:
Cyanobacteria are a group of autotorphic organisms classified under Kingdown Monera

Solution:
1) Bacteria can be photosynthetic as well

2) Slime moulids belong to the kingdom Protista

3) Mycoplasma Lack cell wall

Hence, Option (4) is correct.

Q. 8 Hydrocolloid carrageen is obtained from :

Option 1:
Phaeophyceae and Rhodophyceae

Option 2:
Rhodophyceae only

Option 3:
Phaeophyceae only

Option 4:
Chlorophyceae and Phaeophyceae

Correct Answer:
Rhodophyceae only

Solution:
Carrageenan is a polysaccharide obtained from red seaweed (Rhodophyta) It is a gelatin agent, makes the food via cous & use to make the capsule of medicines.

Hence, the correct option is (2).

Q. 9 Give below are two statement :

Statement I :

Mycoplasma ca pass through less than 1 micron filter size

Statement II :

Mycoplasma are bacteria with cell wall

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

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statemet II is incorrect

Option 3:
Statement I is incorrect but Statemet II is correct

Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Statement I is correct but Statemet II is incorrect

Solution:
Myoplasm are the smallest cells and hence can pass through filters less than 1 μ m. These are 'Jokers of Microbiology' as these can change their shape because they lack cell walls. Hence statement 1 is correct and 2 is incorrect.

Q. 10 Identify the correct set of statements :
(a) The leaflets are modified into pointed harc thorns in Citrus and Bougainvillea
(b) Axillary buds form slender and spirally coilec tendrils in cucumber and pumpkin
(c) Stem is flattened and fleshy in Opuntia anc modified to perform the function of leaves
(d) Rhizophora shows vertically upward growing roots that help to get oxygen for respiration
(e) Subaerially growing stems in grasses and strawberry help in vegetative propagation
Choose the correct answer from the options given below:

Option 1:
(a) and (d) Only

Option 2:
(b), (c), (d) and (e) Only

Option 3:
(a), (b), (d) and (e) Only

Option 4:
(b) and (c) Only

Correct Answer:
(b), (c), (d) and (e) Only

Solution:
Adventitious buds and no leaflets are modified into pointed hard thorns in Citrus and bougainvillea. The thorns not only check the rate of transpiration but also protect the plants from herbivorous animals.

Hence, the correct option is (2)

Q. 11 Match **List I** with **List II**

	List I		**List II**
(a)	Bronochioles	(i)	Dense Regular Connective Tissue
(b)	Goblet cell	(ii)	Loose Connective Tissue
(c)	Tendons	(iii)	Glandular Tissue
(d)	Adiopose Tissue	(iv)	Ciliated Epithelium

Choose the correct answer from the options given below:

Option 1:
(a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

Option 2:
(a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

Option 3:
(a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

Option 4:
(a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

Correct Answer:
(a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

Solution:
a) Bronchioles – Ciliated epithelium

b) Goblet cell – Glandular

c) Tendons – Dense regular CT

d) Adipose – Loose connective Tissues

Hence, Option (4) is correct

Q. 12 Which of the following is not a connective tissue ?

Option 1:
Adipose tissue

Option 2:
Cartilage

Option 3:
Neuroglia

Option 4:
Blood

Correct Answer:
Blood

Solution:
Adipose Tissue $\longrightarrow$ Loose Connective Tissue

Cartilage $\longrightarrow$ specialised Connective Tissue (skeletal)

Blood ⟶ specialised Connective Tissue

Neuroglia ⟶ supporting cells of Nervous Tissue.

Q. 13 Which of the following is present between the adjacent bones of the vertebral column ?

Option 1:
Cartilage

Option 2:
Areolar tissue

Option 3:
Smooth muscle

Option 4:
Intercalated discs

Correct Answer:
Cartilage

Solution:
White Fibrous cartilage is present between two vertebrae.

This provides limited movement.

Q. 14 Which one of the following plants shows vexillary aestivation and diadelphous stamens?

Option 1:
Pisum sativum

Option 2:
Allium cepa

Option 3:
Solanum nigrum

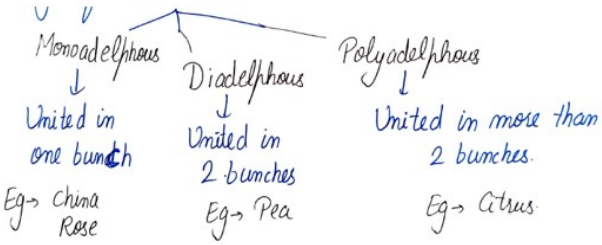
Option 4:
Colchicum autumnale

Correct Answer:
Pisum sativum

Solution:

Vexillary aestivation: - It is a unique arrangement where the other smaller petals are covered by one large petal. The larger petal is called the vexillum or standard while the other two curved petals laterally positioned are called wings. The two inmost, boat-shaped petals are called reels. E.g.: - In pea.

Stamens are the male reproductive structure of flowers. They are either free or united, when they are free, they are known as polyandrous. When they are united, they are referred to according to the number of bunches they form: -



So, the pea (Pisum sativum) is the plant that shows both vexillary aestivation 8 amadelphous stamens.

Hence the correct option is (a).

Q. 15 The flowers are Zygomorphic in:
(a) Mustard
(b) Gulmohar
(c) Cassia
(d) Datura
(e) Chilly
Choose the correct answer from the options given below.

Option 1:
(b), (c) Only

Option 2:
(d), (e) Only

Option 3:
(c), (d), (e) Only

Option 4:
(a), (b), (c) Only

Correct Answer:
(b), (c) Only

Solution:
Examples of zygomorphic flowers: Gulmohar and Cassia

Examples of actinomorphic flowers: Mustard, Datura and Chilly

Zygomorphic -Flowers with only a single line of symmetry like humans. humans.

Actinomorphic - flowers have multiple lines of symmetry (like a starfish) are radial Symmetrical, also called actinomorphic.

Hence, the correct option is (1)

Q. 16 The anatomy of springwood shows some peculiar features. Identify the correct set of statements about springwood.
(a) It is also called as the earlywood
(b) In spring season cambium produces xylem elements with narrow vessels
(c) It is lighter in colour
(d) The springwood along with autumnwood shows alternate concentric rings forming annual rings
(e) It has lower density
Choose the correct answer from the options given below:

Option 1:
(a), (c), (d) and (e) Only

Option 2:
(a), (b) and (d) Only

Option 3:
(c), (d) and (e) Only

Option 4:
(a), (b), (d) and (e) Only

Correct Answer:
(a), (c), (d) and (e) Only

Solution:
In the spring season, Cambium produces xylem elements with wider lumen instead of narrow ones, as the rate of transpiration in plants is very high at - that time. So to fulfill the requirement of water, the xylem with a wider lumen transports more water.

Hence, the correct option is (1).

Q. 17 Tegmina in cockroach, arises from :

Option 1:
Mesothorax

Option 2:
Metathorax

Option 3:
Prothorax and Mesothorax

Option 4:
Prothorax

Correct Answer:
Metathorax

Solution:
Cockroaches show 2 pairs of wings 1st pair is the forewings. These are also known as Tegmina. These arise from Mesothorax. These are for the protection of the hind wings.2nd pair is Hind wing. These are for flying.

Q. 18 "Girdling Experiment" was performed by Plant Physiologists to identify the plant tissue through which :

Option 1:
food is transported

Option 2:
for both water and food transportation

Option 3:
osmosis is observed

Option 4:
Water is transported

Correct Answer:
food is transported

Solution:
Girdling/Ringing experiment was performed by 'Malpighi' in 1672, to identify the tissues through which food is transported. It involves the removal of all the tissue outside to vascular cambium (bark, cortex and phloem) in the woody stem except for the xylem. In the absence of downward movement of food, the portion of the bark above the ring on the stem becomes swollen after a few weeks. This simple experiment shows that Phloem is the tissue responsible for the translocation of food and that transport takes place in one direction, i.e., towards the roots.

Hence, the correct option is (a).

Q. 19 Read the following statements about the vascular bundles:
(a) In roots, xylem and phloem in a vascular bundle are arranged in an alternate manner along the different radii.
(b) Conjoint closed vascular bundles do not possess cambium
(c) In open vascular bundles, cambium is present in between xylem and phloem
(d) The vascular bundles of dicotyledonous stem possess endarch protoxylem
(e) In monocotyledonous root, usually there are more than six xylem bundles present
Choose the most appropriate answer from the options given below:

Option 1:
(a),(c),(d) and (e) Only

Option 2:
(a),(b),(c) and (d) Only

Option 3:
(b), (c), (d) and (e) Only

Option 4:
(a), (b) and (d) Only

Correct Answer:
(a),(c),(d) and (e) Only

Solution:

- Statement (a) In roots, the xylem and phloem in a vascular bundle are alternately organized along various radii. This statement is correct and reflects how the xylem and phloem are arranged in root vascular bundles.
- Statement (b) Conjoint closed vascular bundles lack cambium. This statement is not included in the correct option.
- Statement (c) Cambium is found between the xylem and phloem in open vascular bundles. This statement is correct because cambium is present in open vascular bundles.
- Statement (d) Dicotyledonous stem vascular bundles contain endarch protoxylem. This statement is true and refers to the arrangement of the protoxylem towards the center of the stem.
- Statement (e) In the monocotyledonous root, usually there are more than six xylem bundles present. This statement is true and describes the typical number of xylem bundles in monocotyledonous roots.
- Therefore, the correct option is Option 1, which includes statements (a), (c), (d), and (e) only.

Q. 20 In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to :
(a) Secretion of secondary metabolities and their deposition in the lumen of vessels.
(b) Deposition of organic compounds like tannins and resins in the central layers of stem.
(c) Deposition of suberin and aromatic substances in the outer layer of stem.
(d) Deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem.
(e) Presence of parenchyma cells, functionally active xylem elements and essential oils.
Choose the correct answer from the options given below:

Option 1:
(c) and (d) Only

Option 2:
(d) and (e) Only

Option 3:
(b) and (d) Only

Option 4:
(a) and (b) Only

Correct Answer:
(a) and (b) Only

Solution:
In old trees, the greater part of the secondary xylem is dark brown due to the deposition of organic compounds like tannins, Resins, Oils, Gums and aromatic substances in the central or innermost layers of the stem. These substances make it hard, durable and resistant to the attacks of micro-organisms and insects.Hence, the correct option is (4).

Q. 21 Which one of the following never occurs during mitotic cell division?

Option 1:
Movement of centrioles towards opposite poles

Option 2:
Pairing of homologous chromosomes

Option 3:
Coiling and condensation of the chromatids

Option 4:
Spindle fibres attach to kinetochores of chromosomes

Correct Answer:
Pairing of homologous chromosomes

Solution:
Pairing of homologous chromosomes accurate prophase, I of meiosis.

Movement of centrioles towards opposite holes, coiling and condensation of the chromatics and attachment of spindle fibers to the kinetochores of chromosomes Occur in both meiosis and mitosis.

Hence, the correct option is (2).

Q. 22 Regarding Meiosis, which of the statement is incorrect ?

Option 1:
DNA replication occurs in S phase of Meiosis-II

Option 2:
Pairing of homologous chromosomes and recombination occurs in Meiosis - I

Option 3:
Four haploid cells are formed at the end of Meiosis - II

Option 4:
There are two stages in Meiosis, Meiosis - I and II

Correct Answer:
DNA replication occurs in S phase of Meiosis-II

Solution:
DNA replication occurs during S-phase. This is the part of Interphase which is before Meiosis I

Hence, Option (1) is correct.

Q. 23 The appearance of recombination nodules on homologous chromosomes during meiosis characterizes :

Option 1:
Bivalent

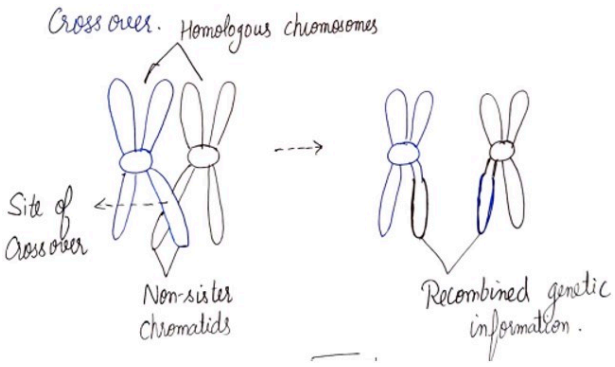
Option 2:
Sites at which crossing over occurs

Option 3:
Terminalization

Option 4:
Synaptonemal complex

Correct Answer:
Sites at which crossing over occurs

Solution:
Prophase I of meiosis I is a unique phase that involves the recombination of genetic material between homologous chromosomes. This occurs in the pachytene stage where the non-sister chromatics of the homologous chromosomes cross over and the exchange of genetic material takes place. Recombination modules are the sites at which the non-sister chromatids Cross over.



Hence, the correct option is (2)

Q. 24 Match List - I with List - II.

	List I		**List II**
a	Metacentric chromosome	i	Centromere situated close to the end forming one extremely short and one very long arms
b	Acrocentric chromosome	ii	Centromere at the terminal end
c	Sub-metacentric	iii	Centromere in the middle forming two equal arms of chromosomes
d	Telocentric chromosome	iv	Centromere slightly away from the middle forming one shorter arm and one longer arm

Choose the correct answer from the options given below:

Option 1:
(a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

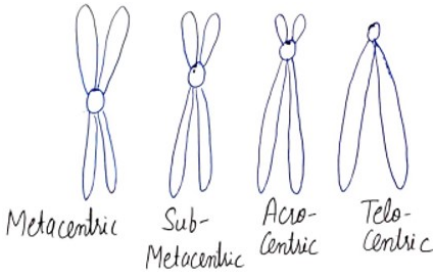
Option 2:
(a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

Option 3:
(a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

Option 4:
(a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)

Correct Answer:
(a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)

Solution:



Metacentric ⟶ Centromere lies in the middle forming two equal arms of chromosomes.

Sub-Metacentric ⟶ Centromere slightly away from the middle forming one shorter arm and one longer arm.

Acrocentric ⟶ Centromere situated close to the end forming one extremely short and one very long arm.

Telocentric ⟶ Centromere at the terminal end.

Hence, the correct option is (4)

Q. 25 Read the following statements on lipids and find out correct set of statements :
(a) Lecithin found in the plasma membrane is a glycolipid
(b) Saturated fatty acids possess one or more c=c bonds
(c) Gingely oil has lower melting point, hence remains as oil in winter
(d) Lipids are generally insoluble in water but soluble in some organic solvents
(e) When fatty acid is esterified with glycerol, monoglycerides are formed
Choose the correct answer from the options given below:

Option 1:
(a), (d) and (e) only

Option 2:
(c), (d) and (e) only

Option 3:
(a), (b) and (d) only

Option 4:
(a), (b) and (c) only

Correct Answer:
(c), (d) and (e) only

Solution:
Lecithin is a type of phospholipid found in the plasma membrane.

Saturated fatty acids have a single bond (c-c), whereas unsaturated fatty acids have double (c=c) and triple bonds (C = C)

Hence statements a and b are incorrect.

Hence, the correct option is (2)

Q. 26 Select the incorrect statement with reference to mitosis :

Option 1:
Spindle fibers attach to centromere of chromosomes

Option 2:
Chromosomes decondense at telophase

Option 3:
Splitting of centromere occurs at anaphase

Option 4:
All the chromosomes lie at the equator at metaphase

Correct Answer:
Spindle fibers attach to centromere of chromosomes

Solution:
In Mitosis, spindle fibers attach to the kinetochore of the chromatids.

Hence option 1 is incorrect

Q. 27 A dehydration reaction links two glucose molecules to produce maltose. If the formula for glucose is $C_6H_{12}O_6$ then what is the formula for maltose ?

Option 1:
$C_{12}H_{24}O_{12}$

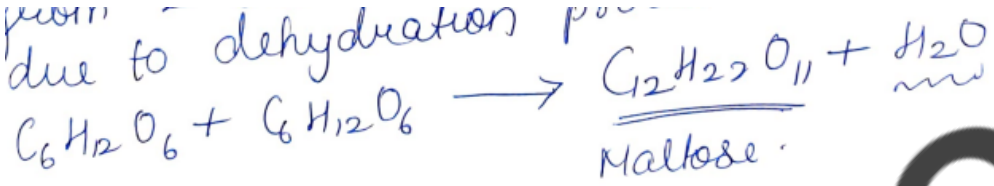
Option 2:
$C_{12}H_{22}O_{11}$

Option 3:
$C_{12}H_{24}O_{11}$

Option 4:
$C_{12}H_{20}O_{10}$

Correct Answer:
$C_{12}H_{22}O_{11}$

Solution:
As mentioned, Maltose is formed from 2 Glucose Molecules. This is due to the dehydration process. Thus



Hence, Option (2) is correct.

Q. 28 Which of the following statements with respect to Endoplasmic Reticulum is incorrect ?

Option 1:
SER is devoid of ribosomes

Option 2:
In prokaryotes only RER are present

Option 3:
SER are the sites for lipid synthesis

Option 4:
RER has ribosomes attached to ER

Correct Answer:
In prokaryotes only RER are present

Solution:
ER is absent in prokaryotes. Hence RER (Rough ER) and SER (smooth ER) are both absent. Option 2 is correct

Q. 29 Match List - I with List - II.

List I		List II	
a	Manganese	i	Activates the enzyme catalase
b	Magnesium	ii	Required for pollen germination
c	Boron	iii	Activates enzymes of respiration
d	Iron	iv	Functions in splitting of water during photosynthesis

Choose the correct answer from the options given below:

Option 1:
(a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

Option 2:
(a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

Option 3:
(a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)

Option 4:
(a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)

Correct Answer:
(a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

Solution:
Manganese - Functions in splitting of water during photosynthesis.

Magnesium - Activates enzymes of respiration

Boron - Required for pollen germination

Iron - Activates the enzyme catalase.

Hence the correct option is (1).

Q. 30 Production of Cucumber has increased manifold in recent years. Application of which of the following phytohormones has resulted in this increased yield as the hormone is known to produce female flowers in the plants :

Option 1:
Gibberellin

Option 2:
Ethylene

Option 3:
Cytokinin

Option 4:
ABA

Correct Answer:
Ethylene

Solution:
In cucumber, ethylene is responsible for promoting female flower production and thereby increasing the yield. Ethylene is a gaseous phytohormone.

Hence, the correct option is (2)

Q. 31 What is the role of large bundle shealth cells found around the vascular bundles in C4 plants ?

Option 1:
To increase the number of chloroplast for the operation of Calvin cycle

Option 2:
To enable the plant to tolerate high temperature

Option 3:
To protect the vascular tissue from high light intensity

Option 4:
To provide the site for photorespiratory pathway

Correct Answer:
To increase the number of chloroplast for the operation of Calvin cycle

Solution:
C4 plants are evolved C3 plants. They have large bundle sheath cells around the mesophyll cell to avoid a wasteful process i.e. photorespiration. Rubisco enzyme is present in the bundle sheath cells to perform Calvin Cycle and release sugar.

Hence, the correct option is (1).

Q. 32 Which one of the following is not true regarding the release of energy during ATP synthesis through chemiosmosis? It involves :

Option 1:
Breakdown of proton gradient

Option 2:
Movement of protons across the membrane to the stroma

Option 3:
Reduction of NADP to $NADPH_2$ on the stroma side of the membrane

Option 4:
Breakdown of proton gradient

Correct Answer:
Breakdown of proton gradient

Solution:
- Chemiosmosis is a process involved in ATP synthesis.

- During this process, protons in the Strom decrease in number, while in the lumen there is an accumulation of protons. This creates a proton gradient across the thylakoid membrane, and no formation of an electron gradient occurs.

The breakdown of this proton gradient leads to the synthesis of ATP.

Hence the correct option is (a)

Q. 33 Which one of the following produces nitrogen fixing nodules on the roots of Alnus?

Option 1:
Frankia

Option 2:
Rhodospirillum

Option 3:
Beijernickia

Option 4:
Rhizobium

Correct Answer:
Frankia

Solution:
Frankia - produces nitrogen-fixing nodules on the roots of the non-leguminous plants (e.g., Alnus)

Beijerinckia & Rhodospirillum - Free-living nitrogen fixing aerobic microbes

Rhizobium - Free-living in soil, but as symbionts can fix atmospheric nitrogen in the roots of the leguminous plants.

Hence the correct option is (a)

Q. 34 What amount of energy is released from glucose during lactic acid fermentation ?

Option 1:
More than 18%

Option 2:
About 10%

Option 3:
Less than 7%

Option 4:
Approximately 15%

Correct Answer:
Less than 7%

Solution:
During Aerobic respiration, 38 ATP are releases per glucose molecule.

During lactic acid fermentation, less than 7 % of the total energy in glucose

During alcoholic fermentation, 2 ATP is releases per glucose molecule.

Hence, the correct answer is Option (3)

Q. 35 The gaseous plant growth regulator is used in plants to :

Option 1:
promote root growth and roothair formation to increase the absorption surface

Option 2:
help overcome apical dominance

Option 3:
kill dicotyledonous weeds in the fields

Option 4:
speed up the malting process

Correct Answer:
promote root growth and roothair formation to increase the absorption surface

Solution:
→The gaseous plant growth regulator i.e. ethylene promotes root growth and root hair formation to increase the absorption surface.

→The presence of cytokinin in an area causes preferential movement of nutrients towards it. When applied to lateral buds, they helps in their growth despite the presence of apical bud .they thus act antagonistically to auxin which promotes apical dominance. Therefore cytokines can overcome apical dominance, caused by auxins.

→The compound 2,4-dichloro phenoxy acetic acid or 2, 4-D is a herbicide used-lo kill any dicot plant weed. The substance is a synthetic auxin, which is a phytohormone.

→Gibberellins are used to speed up the malting process in brewing in dust. They increase the yield of malt from barley grains.

Hence, the correct option is (1).

Q. 36 What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid ?

Option 1:
Six

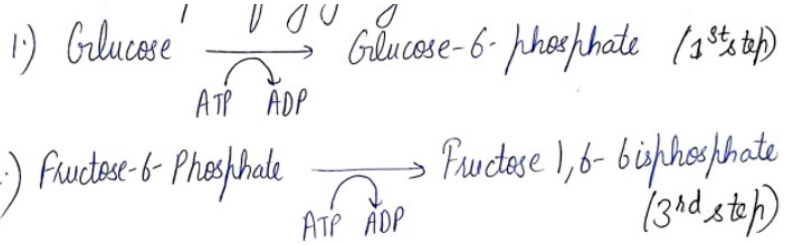
Option 2:
Two

Option 3:
Eight

Option 4:
Four

Correct Answer:
Two

Solution:
One molecule of glucose undergoes glycolysis to form 4 molecules of ATP, two are used in the activation phase or initial steps of glycolysis i.e. when



So, the Net gain is 2 ATP.

Hence, the correct option is (2)

Q. 37 Given below are two statements:
Statement I : The primary CO_2 acceptor in C_4 plants is phosphoenolpyruvate and is found in the mesophyll cells.
Statement II : Mesophyll cells of C_4 plants lack RuBisCo enzyme. In the light of the above statements, choose the correct answer from the options given below :

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

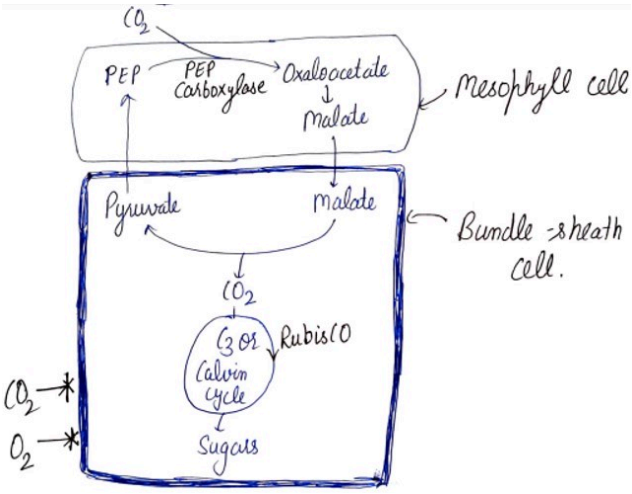
Option 3:
Statement I is incorrect but Statement II is correct

Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Both Statement I and Statement II are correct

Solution:

C4 plants are evolved C3 plants to avoid the process of photorespiration. C4 plants have mesophyll cells and bundle sheath cells. In mesophyll cells, primary CO_2 acceptor is PEP (Phosphoenolpyruvate), whereas the Rubisco enzyme is present in the bundle sheath cells. Due to the impervious walls of bundle sheath cells, CO_2 cannot reach Rubisco and photorespiration does not occur.



Hence, the correct option is (4)

Q. 38 Which one of the following plants does not show plasticity ?

Option 1:
Coriander

Option 2:
Buttercup

Option 3:
Maize

Option 4:
Cotton

Correct Answer:
Maize

Solution:
Plants follow different pathways in response to the environment or phases of beef to form different kinds of structures. This ability is called plasticity. e.g., heterophylly in cotton, coriander and larkspur in such plants, leaves of the juvenile plants are different in shape from those in mature plants. Maize does not show plasticity.

Hence, the correct option is (3).

Q. 39 Addition of more solutes in a given solution will :

Option 1:
lower its water potential

Option 2:
make its water potential zero

Option 3:
not affect the water potential at all

Option 4:
raise its water potential

Correct Answer:
lower its water potential

Solution:
If some solute is dissolved in pure water, the solution has lower free water and the concentration of water decrease, reducing its water potential. The magnitude of this lowering due to the dissolution of a solute is called solute potential.

Hence, the correct option is (1).

Q. 40 Which of the following is not observed during apoplastic pathway?

Option 1:
The movement does not involve crossing of cell membrane

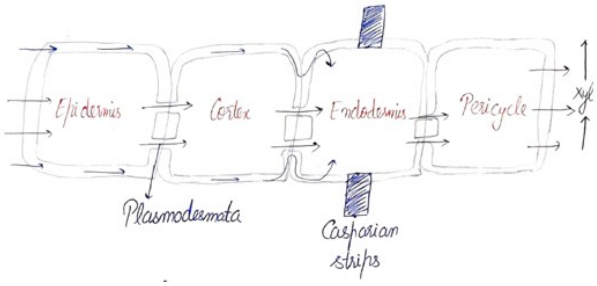
Option 2:
The movement is aided by cytoplasmic streaming

Option 3:
Apoplast is continuous and does not provide any barrier to water movement.

Option 4:
Movement of water occurs through intercellular spaces and wall of the cells.

Correct Answer:
The movement is aided by cytoplasmic streaming

Solution:
Pathway of water movement in the root



Apoplast = Away from cell

Symplast = Via cytoplasm

The apoplast is the system of adjacent cell walls that is continuous throughout the plant, except at the Casparian strips of the endodermis in the roots.

Therefore, it is not aided by cytoplasmic streaming.

Hence the correct option is (b).

Q. 41 Which of the following functions is not performed by secretions from salivary glands ?

Option 1:
Digestion of complex carbohydrates

Option 2:
Lubrication of oral cavity

Option 3:
Digestion of disaccharides

Option 4:
Control bacterial population in mouth

Correct Answer:
Digestion of disaccharides

Solution:
Salivary amylase brings about the digestion of starch (complex Carbohydrates into disaccharides (Maltose). It cannot digest Maltose further.
Hence option 3 is not a function.

Q. 42 Which of the following is correct match for disease and it's symptoms ?

Option 1:
Tetany - high Ca^{2+} level causing rapid spasms

Option 2:
Myasthenia gravis - Genetic disorder resulting in weakening and paralysis of skeletal muscle

Option 3:
Muscular dystrophy - An auto immune disorder causing progressive degeneration of sketel muscle.

Option 4:
Arthritis - Inflammed joints

Correct Answer:
Arthritis - Inflammed joints

Solution:
(1) $\longrightarrow$ Tetany is due to low Ca^{+2} levels.

(2) Myasthenia Gravis is an Autoimmune disorder where Ab destroys the body cells.

(3) Muscular dystrophy - It is a Genetic disorder.

(4) Arthritis $\longrightarrow$ Inflamed joints.

Q. 43 Which of the following is not the function of conducting part of respiratory system?

Option 1:
Inhaled air is humudified

Option 2:
Temperature of inhaled air is brought to body temperature

Option 3:
Provides surface for diffusion of O_2 and CO_2

Option 4:
It clears inhaled air from foreign particles

Correct Answer:
Provides surface for diffusion of O_2 and CO_2

Solution:
Respiratory system is divided into conducting part and Respiratory Part. Conducting Part is for transporting the gases. Respiratory is for exchange. Alveoli are for exchange that brings about diffusion.

Hence, Option (3) is correct.

Q. 44 Nitrogenous waste is excreted in the form of pellet or paste by :

Option 1:
Salamamdra

Option 2:
Hippocampus

Option 3:
Pavo

Option 4:
Ornithorhyuchus

Correct Answer:
Pavo

Solution:
Nitrogenous waste excreted in the form of pallets is uric acid (since it is insoluble in water). This is seen in class Aues. Hence option 3 pave is the answer

Hence, Option (3) is correct.

Q. 45 Which of the following statements is correct ?

Option 1:
The tricuspid and the bicuspid valves open due to the pressure exerted by the simultaneous contraction of the atria.

Option 2:
Blood moves freely from atrium to the ventricle during joint diastole.

Option 3:
Increased ventricular pressure causes closing of the semilunar valves.

Option 4:
The atrio-ventricular node (AVN) generates an action potential to stimulate aerial contraction

Correct Answer:
Blood moves freely from atrium to the ventricle during joint diastole.

Solution:
1) Tricuspid & Bicuspid open due to blood & arial systole

2) True

3) Increased ventricular pressure causes the opening of semilunar valves

4) Action potentials are generated by the SA node as it is the pacemaker

Hence, Option (2) is correct.

Q. 46 Which of the following are not the effects of Parathyroid hormone ?

(a) Stimulates the process of bone resorption

(b) Decrease Ca^{2+} level in blood

(c) Reabsorption of Ca^{2+} by renal tubules

(d) Decrease the absorption of Ca^{2+} from digested food

(e) Increase metabolism of carbohydrates

Choose the most appropriate answer from the options given below :

Option 1:
(b), (d) and (e) only

Option 2:
(a) and (e) only

Option 3:
(b) and (c) only

Option 4:
(a) and (c) only

Correct Answer:
(b), (d) and (e) only

Solution:
Parathyroid hormone (PTH) or Collop's hormone increases Ca+2 levels in the blood plasma.

This is achieved by

1. Increasing reabsorption by the bones
2. Increasing reabsorption by Kidney
3. Increasing absorption by intestines

Hence Option (1) is correct.

Q. 47 Select the incorrect statement regarding synapses:

Option 1:
Electrical current can flow directly from one neuron into the other across the electrical synapse.

Option 2:
Chemical synapses use neuotrasmitters

Option 3:
Impulse transmission across a chemical synapse is always faster than an electrical synapse.

Option 4:
The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.

Correct Answer:
Impulse transmission across a chemical synapse is always faster than an electrical synapse.

Solution:
The electrical synapse is faster than the chemical synapse.

Hence, Option (3) is correct.

Q. 48 Under normal physiological conditions in human being every 100ml of oxygenated blood can deliver _____ ml of O_2 to the tissues.

Option 1:
5ml

Option 2:
4ml

Option 3:
10ml

Option 4:
2ml

Correct Answer:
5ml

Solution:
Every 100ml of oxygenated blood can deliver 5ml of O_2 to the tissues. Option 1 is correct

Q. 49 Match List I with List II

	List I (Biological Molecules)		List II (Biological functions)
(a)	Glycogen	(i)	Hormone
(b)	Globulin	(ii)	Biocatalyst
(c)	Steroids	(iii)	Antibody
(d)	Thrombin	(iv)	Storage product

Choose the correct answer from the options given below:

Option 1:
$(a)-(iv),(b)-(ii),(c)-(i),(d)-(iii).$

Option 2:
$(a)-(ii),(b)-(iv),(c)-(iii),(d)-(i)$

Option 3:
$(a)-(iv),(b)-(iii),(c)-(i),(d)-(ii)$

Option 4:
$(a)-(iii),(b)-(ii),(c)-(iv),(d)-(i)$

Correct Answer:
$(a)-(iv),(b)-(iii),(c)-(i),(d)-(ii)$

Solution:
a) Glycogen – Storage product

b) Globulin – AB

c) Steroid – Hormone

d) Thrombin – Biocatalyst

Hence, Option (3) is correct.

Q. 50 Given below are two statements

Statement I: Fatty acids and glycerols cannot be observed in the blood.

Statement II: Specialized lymphatic capillaries called lacteals carry chylomicrons into lymphatic vessels and ultimately into the blood.

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

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

Option 3:
Statement I is incorrect but Statement II is correct

Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Both Statement I and Statement II are correct

Solution:
Statement 1 is correct because Fatty acids and Glycerol are insoluble in water. Hence these cannot be absorbed directly into the blood. Hence these cannot be absorbed directly into the blood.

Statement 2 is correct because Fatty acid and Glycerol are first converted into micelles. These move from the intestinal lumen into mucosa These are then transformed into very small protein-coated fat globules called chylomicrons. These enter lacteals (lymphatic capillaries) because chylomicrons are bigger and cannot enter blood capillaries. Inside the lacteals, they break down and finally enter blood:

Hence, option 4 is the correct answer.

Q. 51 Given below are two statement s:

Statement I: The coagulum is formed of a network of threads called thrombins.

Statement II: The spleen is the graveyard of erythrocytes.

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

Option 1:
Both the Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

Option 3:
Statement I is incorrect but Statement II is correct

Option 4:
Both the Statement I and Statement II are correct

Correct Answer:
Statement I is incorrect but Statement II is correct

Solution:
Statement 1 is incorrect because Coagulum is a blood clot. It is formed of a network of threads called fibrins.

Statement 2 is correct because RBCs have a life cycle of 120 days after which they die in the spleen Thus spleen is the graveyard is correct

Therefore, the correct answer is option 3.

Q. 52 Match List I with List II with respect to methods of contraception and their respective actions

	List I		**List II**
(a)	Diaphragms	(i)	Inhibit ovulation and Impkantation
(b)	Contraceptive pills	(ii)	Increase phagocytosis of sperm with Uterus
(c)	Intra uterine Devices	(iii)	Absence of Mentrual cycle and ovulation following parturition
(d)	Lactational Amenorrhea	(iv)	They cover the cervix blocking the entry of sperms

Choose the correct answer from the options given below :

Option 1:
(a) - (iv), (b) - (i), (c) - (ii), (d) - (iv)

Option 2:
(a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

Option 3:
(a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

Option 4:
(a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

Correct Answer:
(a) - (iv), (b) - (i), (c) - (ii), (d) - (iv)

Solution:
Diaphragms – Cover the cervix blocking the entry of sperms

Contraceptive Pills – Inhibit Ovulation and Implantation

Iu D – Increase phagocytosis of sperm with Uterus

Lactational Amenorrhea – Absence of Menstrual Cycle & ovulation following patriation

Hence, Option (1) is correct.

Q. 53 Identify the incorrect statement related to Pollination:

Option 1:
Pollination by wind is more common amongst abiotic pollination

Option 2:
Flowers produce foul odours to attract flies and beetles to get pollinated

Option 3:
Moths and butterflies are the most dominant pollinating agents among insects

Option 4:
Pollination by water is quite rare in flowering plants

Correct Answer:
Moths and butterflies are the most dominant pollinating agents among insects

Solution:
Among the animals, insects, particularly are the dominant biotic pollinating agents.

Hence, the correct answer is (c)

Q. 54 Given below are two statements:
Statement I: Cleistogamous flowers are invariably autogamous
Statement II: Cleistogamy is disadvantageous as there is no chance for cross-pollination In the light of the above statements, choose the correct answer from the options given below:

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

Option 3:
Statement I is incorrect but Statement II is correct

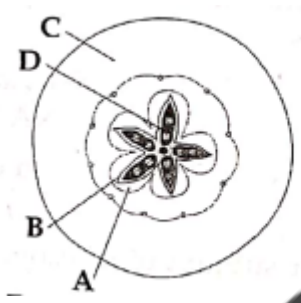
Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Both Statement I and Statement II are correct

Solution:
Qeistogamous flowers do not open at all. In such flowers, the anthers and stigma lie close to each other. When anthers dehisce in the flower buds, pollen grains come in contact with the stigma to affect pollination. Thus, Cleistogamous flowers are in variably autogenous as there is no chance of cross-pollen landing on the stigma.

Hence, the correct answer is (4)

Q. 55 Which part of the fruit, labelled in the given figure makes it a false fruit?



Option 1:
B → Endocarp

Option 2:
C → Thalamus

Option 3:
D → Seed

Option 4:
A → Mesocarp

Correct Answer:
C → Thalamus

Solution:
True fruits ⟶ Fruits develop from the ovary.

False fruits $\rightarrow$ Fruits develop from other floral parts and the thalamus along with the development of the ovary wall.

Eg $\rightarrow$ Apple, pears, strawberries, pineapple etc.

Hence, the correct option is (2)

Q. 56 Given below are two statements :

Statement I :

The release of sperms into the seminiferous tubules is called spermiation.

Statement II :

Spermiogenesis is the process of formation of sperms from spermatogonia .

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

Option 1:
Both Statements I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

Option 3:
Statement I is incorrect but Statement II is correct

Option 4:
Both Statements I and Statement II are correct

Correct Answer:
Both Statements I and Statement II are incorrect

Solution:
Spermiogenesis $\rightarrow$ Formation of sperms from spermatids. This is a morphologic change

Spermiation $\rightarrow$ The sperm once formed is embedded in the Sertoli cells where these gain maturation and are then released into the lumen.

Hence both statements are False.

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

Assertion (A) :

Osteoporosis is characterized by decreased bone mass and increased chances of fractures.

Reason (R) :

Common cause of osteoporosis is increased levels of estrogen.

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

Option 1:
Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Option 2:
(A) is correct but (R) is not correct

Option 3:
(A) is not correct but (R) is correct

Option 4:
Both (A) and (R) are correct but (R) is the correct explanation of (A)

Correct Answer:
(A) is correct but (R) is not correct

Solution:
Estragon is important for bone growth and maturation. It is also important for overall bone turnover. Hence, in the post-menopausal stage, bones become brittle or chances of osteoporosis increase. (As estrogen levels decrease after menopause).

Osteoporosis is decreased bone mass So the Assertion is correct but the Reason is wrong.

Q. 58 Which of the following Statemets are true for spermatogeesis it do it hold true for Oogeesis ?

(a) It results in the formation of haploid gametes

(b) Differentiation of gamete occurs after the completion of meiosis

(c) Meiosis occurs continuously in a mitotically dividing stem cell population

(d) It is controlled by the Luteinising hormone (LH) and Follic Stimulating Hormone (FSH) screted by the anterior pituitary

(e) It is initiated at puberty

Choose the most appropriate answer from the options given below :

Option 1:
(b) and (c) only

Option 2:
(b) , (d) and (e) only

Option 3:
(b), (c) and (e) only

Option 4:
(c) and (e) only

Correct Answer:
(b), (c) and (e) only

Solution:
(a) $\rightarrow$ True for both spermatogenesis and Oogenesis

(b) $\rightarrow$ This is true for spermatogenesis I Primary spermatocyte forms 4 sperms. In Oogenesis, when gametes are formed, they remain arrested at Meiosis - II (Metaphases II)

(c) $\rightarrow$ Meiosis is continuous in Spermatogenesis. In Oogenesis, it is arrested.

(d) This is true for both:

(e) Spermatogenesis initiates at Puberty Oogenesis is before birth

Hence b, c, and, e are true for spermatogenesis and not for Oogenesis

Q. 59 At which stage of life the oogenesis process is initiated ?

Option 1:
Embryonic development stage

Option 2:
Birth

Option 3:
Adult

Option 4:
Puberty

Correct Answer:
Embryonic development stage

Solution:
Oogenesis is the formation of ova. It begins in intra-utrine life when cells from the yolk sac enter the ovary and develop into primary oogonia. Thus, the answer is the Embryonic development Stage.

Hence, Option (1) is correct.

Q. 60 Lippe's loop is a type of contraceptive used as :

Option 1:
Vault barrier

Option 2:
Non-Medicated IUD

Option 3:
Copper realising IUD

Option 4:
Cervical barrier

Correct Answer:
Non-Medicated IUD

Solution:
Lippes Loop is a non-medicated IUD. It helps in the phagocytosis of sperms in the uterus.

Hence, Option (2) is correct.

Q. 61 Identify the asexual reproductive structure associated with Penicillium :

Option 1:
Conidia

Option 2:
Gemmules

Option 3:
Buds

Option 4:
Zoospores

Correct Answer:
Conidia

Solution:
In Penicillium, asexual spores are Conidia. These are seen exogenously and these produce mycelium.

Hence, Option (1) is correct.

Q. 62 XO type of sex determination can be found in:

Option 1:
Birds

Option 2:
Grasshoppers

Option 3:
Monkeys

Option 4:
Drosophila

Correct Answer:
Grasshoppers

Solution:
Grasshopper - XO, XX Males females

X X X

Birds - Males females

ZZ ZW

Drosophila - Male females

XY XX

Monkey - Male females

XY XX

Hence the correct option is (2).

Q. 63 The recombination frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%. What will be the sequence of these genes on a linear chromosome?

Option 1:
d,b,a,c

Option 2:
a,b,c,d

Option 3:
a,c,b,d

Option 4:
a,d,b,c

Correct Answer:
a,c,b,d

Solution:
Distance between genes is measured by frequency of recombination.

According to the question,

-Recombination frequency between a & d is highest. This means they are farthest.

-So, option 2 & 3 can be our answer

a_____b

-Recombination frequency between

a and b = 20%

a and c = 5%

so, a and c are close.

Hence the sequence is

a c b d

Hence, Option (3) is correct.

Q. 64 Read the following statements and choose the set of correct statements :
(a) Euchromatin is loosely packed chromatin
(b) Heterochromatin is transcriptionally active
(c) Histone octomer is wrapped by negatively charged DNA in nucleosome
(d) Histones are rich in lysine and arginine
(e) A typical nucleosome contains 400bp400bp of DNA helix
Choose the correct answer from the options given below:

Option 1:
(a), (c), (d) Only

Option 2:
(b), (e) Only

Option 3:
(a), (c), (e) Only

Option 4:
(b), (d), (e) Only

Correct Answer:
(a), (c), (d) Only

Solution:

Euchromatin	Heterochromatin
1. lightly stained	1. Darkly stained area
2. Participates in the translation process	2. Do not participate in the translation process.
3. Loosely packed form of DNA	3.A tightly packed form of DNA
4. Low DNA density	4. High DNA density
5. Found in both prokaryotes and eukaryotes	5. Found in eukaryotes only

àA typical nucleosome contains 200 bp of DNA helix.

Q. 65 The process of translation of mRNA to proteins begins as soon as :

Option 1:
The larger subunit of ribosome encounters mRNA

Option 2:
Both the subunits join together to bind with mRNA

Option 3:
The tRNA is activated and the larger subunit of ribosome encounters mRNA

Option 4:
The small subunit of ribosome encounters mRNA

Correct Answer:
The small subunit of ribosome encounters mRNA

Solution:
When the smaller submit of ribosome encounter m-RNA, the process of translation of m-RNA to protein begins. This process is followed by the binding of a larger subunit. The activated t-RNA molecule carrying the amine acid methionine binds to the start codon of the mRNA sequence.

Hence, the correct option is (4).

Q. 66 Given below are two statements:
Statement I : Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance
Statement II : Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height
In the light of the above statements, choose the correct answer from the options given below:

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

Option 3:
Statement I is incorrect but Statement II is correct

Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Both Statement I and Statement II are correct

Solution:
George J. Mendel conducted hybridization experiments on garden pea and selected 14 true-breeding pea plant verities (seven contrasting traits). Contrasting traits

Studied were: - 1.) Smooth or winkled seeds

2.) Yellow or green seeds

3.) Inflated or constricted pods

4.) green or yellow pods.

5.) tall or dwarf plants

6) Violet or white flowers

7.) Axial or terminal flower positions.

Hence, the correct option is (4).

Q. 67 Which of the following occurs due to the presence of autosome linked dominant trait?

Option 1:
Myotonic dystrophy

Option 2:
Haemophilia

Option 3:
Thalessemia

Option 4:
Sickle cell anaemia

Correct Answer:
Myotonic dystrophy

Solution:
Hemophilia is a disorder in which blood doesn't clot normally and it is a X-linked recessive disorder.

Thalassemia is a blood disorder involving a lower than normal amount of an-oxygen carrying protein .it is an autosomal recessive disorder.

Sickle cell anemia is a group of disorders that causes red blood cells to become misshapen and break down it is an autosomal recessive disorder.

Myotonic dystrophy is an autosomal dominant disorder i.e.it occurs due to the presence of autosomal linked dominant trail.

Hence, the correct option is (1)

Q. 68 If a geneticist uses the blind approach for sequencing the whole genome of an organism, followed by assignment of function to different segments, the methodology adopted by him is called as:

Option 1:
Gene mapping

Option 2:
Expressed sequence tags

Option 3:
Bioinformatics

Option 4:
Sequence annotation

Correct Answer:
Sequence annotation

Solution:
Sequencing the whole set of genomes that contained all the coding and non-coding sequences and later assigning different regions in the sequence with functions is called sequence annotation.

The second approach is EST (Expressed Sequence Tags) in which the focus is on identifying all the genes that are expressed as RNA.

Hence, the correct option is (4).

Q. 69 Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason(R).
Assertion (A) : Mendel's law of Independent assortment does not hold good for the genes that are located closely on the same chromosome.
Reason (R): Closely located genes assort independently.

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

Option 1:
Both (A) and (R) are correct but (R) is not the correct explanation of (A)

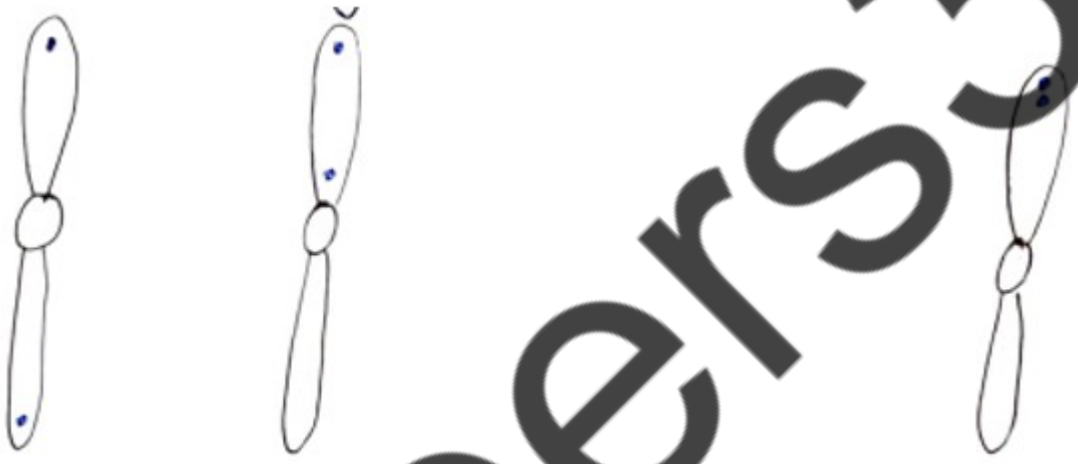
Option 2:
(A) is correct but (R) is not correct

Option 3:
(A) is not correct but (R) is correct

Option 4:
Both (A) and (R) are correct and (R) is the correct explanation of (A)

Correct Answer:
(A) is correct but (R) is not correct

Solution:
If genes are closely located on the chromosome, they won't assort independently and do not show recombination. Mendel's law of independent assortment holds good only for the genes that are located on the same chromosome, not for the closely related genes. Hence statement 1 is right, and 2nd is incorrect.



Case I	Case II	Case III
very far, therefore, show Independent assortment and recombination Occur with high percentage. Linkage Recombination	same arm, therefore shows independent assortment but the chance of Chances of recombination Will be less. Linkage Recombination	no independent assortment occur and no chance of recombination Linkage Recombination

Hence, the correct option is (b)

Q. 70 In an Ecoli Strain i gene gets mutated and it's product can not bind the inducer molecule. If growth medium is provided with lactose, what be the outcome ?

Option 1:
z,y,a a genes will be transcribed

Option 2:
z,y,a genes will not be translated

Option 3:
RNA polymerase will bind thepromoter region

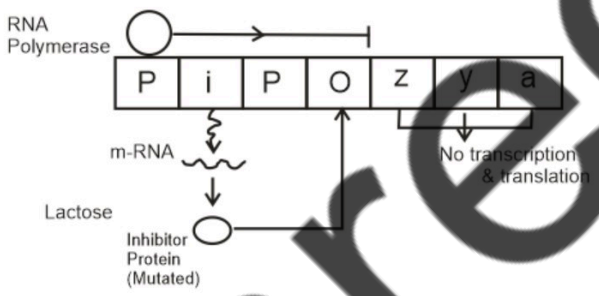
Option 4:
Only z gene will get transcribed

Correct Answer:
RNA polymerase will bind thepromoter region

Solution:
Normally, in On condition i.e. when lactose is present in the medium, the inhibitor protein binds to the lactose and not to the operator gene. This is because the inhibitor protein has more affinity with lactose as compared to the operator gene. This will allow the z, and y & genes to undergo transcription & then translation.

In this case, 'i' gene' has been mutated due to which, even in the presence of lactose, inhibitor protein binds to the operator gene which will block the movement of RNA polymerase and z, y and genes will not undergo transcription and translation.

Hence the correct option is C.



Q. 71 Natural selection where more individuals acquire specific character value other than the mean character value, leads to :

Option 1:
Directional Change

Option 2:
Disruptive change

Option 3:
Random change

Option 4:
Stabilising change

Correct Answer:
Directional Change

Solution:
- If in Natural selection, individuals do not acquire mean value, it can be Disruptive/Directional.

- Hence question is about a specific value other than the mean, hence it has to be Directional

- In Disruptive, peripheral values are selected (at both ends) and this is nonspecific.

Hence, Option (1) is correct.

Q. 72 If a colour blind female marries a man whose mother was also colour blind, what are the chances of her progeny having colour blindness ?

Option 1:
50%

Option 2:
75%

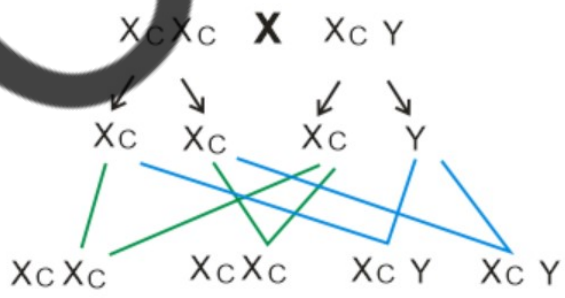
Option 3:
100%

Option 4:
25%

Correct Answer:
100%

Solution:
As given, the Female is colorblind i.e., XcXc & Male's mother was colorblind this means the male is XcY

So,



So, all the boys & girls will be colorblind. Hence 100% is the answer

Hence, Option (3) is correct.

Q. 73 Which of the following statement is not true ?

Option 1:
Sweet Potato and Potato is an example of analogy

Option 2:
Homology indicates common ancestry

Option 3:
Flippers of penguins and dolphins are a pair of homlogous organs

Option 4:
Analogous structures are a result of convergent evolution

Correct Answer:
Flippers of penguins and dolphins are a pair of homlogous organs

Solution:
-Flippers of Penguins and Dolphins are pairs of analogous organs

-Analogous organs have similar functions but dissimilar structures

Hence, Option (3) is correct.

Q. 74 If the length of a DNA molecule is 1.1 meters, what will be the approximate number of base pairs ?

Option 1:
$6.3 \times 10^{-9}\text{bp}$

Option 2:
$3.6 \times 10^{-9}\text{bp}$

Option 3:
$6.6 \times 10^{9}\text{bp}$

Option 4:
$3.3 \times 10^{-9}\text{bp}$

Correct Answer:
$3.3 \times 10^{-9}\text{bp}$

Solution:

$$\text{Length of DNA} = 1.1 \text{ m}$$

$$\text{Distance bet}^{\text{n}} \text{ 2 base pairs} = 0.34 \text{ nm}$$

$$= 0.34 \times 10^{-9}\text{m}$$

$$\therefore \text{N Q of Base pairs} = \frac{1.1}{0.34} \times 10^{-9}$$

$$= 3.23 \times 10^{-9}\text{bp}$$

Hence, the correct answer is option 4.

Q. 75 Given below are two statements:

Statement I :

Autoimmune disorder is a condition where body defense mechanism recognizes it's own cells as foreign bodies

Statement II :

Rheumatoid arthritis is a condition where body does not attack self cells.

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

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

Option 3:
Statement I is incorrect but Statement II is correct

Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Statement I is correct but Statement II is incorrect

Solution:
Statement 1: It is the definition of Autoimmune diseases

Statement 2: RA is an autoimmune and hence it is wrong

Hence, Option (2) is correct.

Q. 76 Breading crops with higher levels of vitamins and minerals or higher protiens and healthier fats is called :

Option 1:
Bio-remediation

Option 2:
Bio-fortification

Option 3:
Bio-accumulation

Option 4:
Bio-magnification

Correct Answer:
Bio-fortification

Solution:
Biofortification is process of breeding staple crops to have high levels of important nutrients like Zn in golden rice etc.

Hence, Option (2) is correct.

Q. 77 Select the incorrect statement with respect to acquired immunity

Option 1:
Anamnestic response is elicited on subsequent encounters with the same pathogen

Option 2:
Anamnestic response is due to memory of first encounter

Option 3:
Acquired immunity is non-specific type of defense present at the time of birth

Option 4:
Primary response is produced when our body encounters a pathagen for the first time.

Correct Answer:
Acquired immunity is non-specific type of defense present at the time of birth

Solution:
Acquired immunity is Adaptive immunity. This is specific immunity

Hence, Option (3) is correct.

Q. 78 identify the microorganism which is responsible for the production of an immunousuppressive molecule cyclosporin A :

Option 1:
Clostridium butylicum

Option 2:
Aspergillus niger

Option 3:
Streptococcus cerevisiae

Option 4:
Trichoderma polysporum

Correct Answer:
Trichoderma polysporum

Solution:
Cyclosporin A is used to treat RA. It reduces the activity of T-cells & thus suppresses the immune system. It is isolated from the Trichoderma polyparium.

Hence, Option (4) is correct.

Q. 79 Which one of the following statement is not true regarding gel electrophoresis technique?

Option 1:
The separated DNA fragments are stained by using ethidium bromide.

Option 2:
The presence of chromogenic substrate gives blue coloured DNA bands on the gel.

Option 3:
Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.

Option 4:
The process of extraction of separated DNA strands from gel is called elution.

Correct Answer:
The presence of chromogenic substrate gives blue coloured DNA bands on the gel.

Solution:

In agarose gel electrophoresis, bands are visualized as orange bands with EtBr (Ethiclium Bromide). Etbr on intercalation with nitrogenous bases gives orange colored bands on gel and it shows fluorescence upon UV exposure. Protein bands stain blue on SDS-PAGE.

Hence, the correct option is (2).

Q. 80 Which of the following is not a descriable feature of a cloning vector ?

Option 1:
Presence of a maker gene

Option 2:
Presence of single restriction enzyme site

Option 3:
Presence of two or move recognition sites

Option 4:
Presence of origin of replication

Correct Answer:
Presence of a maker gene

Solution:
Only 1 recognition site is important

Hence, Option (1) is correct.

Q. 81 DNA polymorphism forms the basis of :

Option 1:
DNA finger printing

Option 2:
Both genetic mapping and DNA finger printing

Option 3:
Translation

Option 4:
Genetic mapping

Correct Answer:
Both genetic mapping and DNA finger printing

Solution:
DNA polymorphism is a difference in DNA sequence among individuals, groups, or populations.

Genetic mapping refers to the process of determining the location of genes on chromosomes.

DNA fingerprinting is a laboratory technique used to determine the probable identity of a person based on the nucleotide sequences of certain regions of human DNA that are unique to individuals.

Therefore, DNA polymorphism forms the basis of genetic mapping and DNA fingerprinting.

Hence, the correct option is (2)

Q. 82 In the following palindromic base sequences of DNA, which one can be cut easily by particular restriction enzyme?

Option 1:
5' GAATTC3'; 3' CT T A A G 5'

Option 2:
5'CTCAGT3'; 3' GAGTCA 5'

Option 3:
5' G T A T T C3' ; 3' CATA A G5'

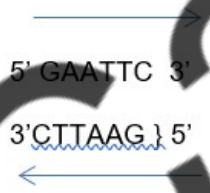
Option 4:
5' GATACT3'; 3' CTATGA 5'

Correct Answer:
5' GAATTC3'; 3' CT T A A G 5'

Solution:
Palindromic sequences are the sequences which are read back and forth in the same way.

Therefore, only option 1 has a palindromic sequence, the rest are not palindromic sequences.

Hence the correct option is 1.



Q. 83 Transposons can be used during which one of the following ?

Option 1:
Gene silencing

Option 2:
Autoradiography

Option 3:
Gene sequencing

Option 4:
Polymerase Chain Reaction

Correct Answer:
Gene silencing

Solution:
Option 1 is correct because the source of complementary RNA for RNAi (RNA interference) or gene silencing could be transposons (mobile genetic elements).

Option 2 is incorrect as autoradiography usually follows hybridization

Option 3 is incorrect as transposons are not required in gene sequencing.

Option 4 is also incorrect as PCR (polymerase Chain Reaction) is a process to make copies of DNA and does not need transposons.

Hence, the correct option is (1).

Q. 84 Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): Polymerase chain reaction is used in DNA amplification
Reason (R): The ampicillin resistant gene is used as a selectable marker to check transformation In the light of the above statements, choose the correct answer from the options given below :

Option 1:
Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Option 2:
(A) is correct but (R) is not correct

Option 3:
(A) is not correct but (R) is correct

Option 4:
Both (A) and (R) are correct and (R) is the correct explanation of (A)

Correct Answer:
Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Solution:
$\rightarrow$PCR stands for Polymerase Chain Reaction. In this reaction, multiple copies of the gene (or DNA) of interest is synthesized in irtro using two sets of primers and the enzyme DNA polymerase.

In this reaction, each cycle has 3 steps:-

i) Denaturation

ii) Primer annealing

iii) Extension of primers.

$\rightarrow$ Selectable markers help in identifying and eliminating non-transformants and selectively permitting the Growth of the transformants.

Transformation is a procedure through which a piece of DNA is in introduced in a host bacterium.

The genes encoding resistance to antibiotics are Ampallang, chloramphenicol, tetracycline, Kanamycin, etc.

Hence, the correct option is an option (a).

Q. 85 Statements related to human Insulin are given below :

Which statement(s) is /are correct about genetically engineered Insulin?

(a) Pro-hormone insulin contains extra stretch of C-peptide

(b) A-peptide and B-peptide chains of insulin were produced separately in E.coli, extracted and combines by creating disulphide bond between them

(c) Insulin used for treating Diabetes was extracted from Cattles and Pigs

(d) Pro-hormone Insulin needs to be processed for converting into a mature and functional hormone

(e) Some patients develop allergic reactions to the foreign insulin.

Choose the most appropriate answer from the options given below:

Option 1:
(b) only

Option 2:
(c) and (d) only

Option 3:
(c), (d) and (e) only

Option 4:
(a) ,(b) and (d) only

Correct Answer:
(b) only

Solution:
Only b is correct - A-peptide and B-peptide chains of insulin were produced separately in E.coli, extracted and combines by creating disulphide bond between them

Hence, Option (1) is correct.

Q. 86 Given below are two statements:

Statement I :

Restriction endonucleases recognize specific sequence to cut DNA known as palindromic nucleotide sequence.

Statement II :

Restriction endonucleases cut the DNA strand a little away from the center of the palindromic site.

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

Option 1:
Both Statement I and Statament II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

Option 3:
Statement I is incorrect but Statement II is correct

Option 4:
Both Statement I and Statament II are correct

Correct Answer:
Both Statement I and Statament II are correct

Solution:
Restriction Endonucleases are 'Molecular Sussors'. These recognize special sequences known as Palindromic sequences. (Eg. MAM is a Palindrome word). Thus statement 1 is correct. These enzymes cut the strand a little away from center. **Hence statement 2 is correct.**

Q. 87 In gene therapy of Adeosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because:

Option 1:
Gene isolated from marrow cells producing ADA is introduced into cells at embryonic stages.

Option 2:
Lymphocytes from patient's blood are grown in culture outside the body

Option 3:
Genetically engineered lymphocytes are not immortal cells.

Option 4:
Retroviral vector is introduced into these lymphocytes.

Correct Answer:
Lymphocytes from patient's blood are grown in culture outside the body

Solution:
In ADA deficiency, lymphocytes are given but these cells are immortal and hence periodic infusion is needed. Option 2 is correct.

Q. 88 The entire fleet of buses in Delhi were converted to CNG from diesel. In reference to this, which one of the following statements is false?

Option 1:
The same diesel engine is used in CNG buses making the cost of conversion low

Option 2:
It is cheaper than diesel

Option 3:
It can not be adulterated like diesel

Option 4:
CNG burns more efficiently than diesel

Correct Answer:
The same diesel engine is used in CNG buses making the cost of conversion low

Solution:
CNG is cheaper than petrol and it burns more efficiently unlike petrol or diesel.it also cannot be adulterated like diesel and petrol. The same diesel engine cannot be used in CNG buses for making the cost conversion low.

Hence, the correct option is (1).

Q. 89 If $'8'$ Drosophila in a laboratory population of $'80'$ died during a week, the death rate in the population is _____individuals per Drosophila per week

Option 1:
10

Option 2:
1.0

Option 3:
Zero

Option 4:
0.1

Correct Answer:
0.1

Solution:

$$\begin{aligned}\text{Death rate} &= \frac{\text{No of Death}}{\text{Total Population}} \\ &= \frac{8}{80} \\ &= \frac{1}{10} \\ &= 0.1\end{aligned}$$

Hence correct option is 4

Q. 90 Which one of the followings statements cannot be connected to predation ?

Option 1:
it might lead to extinetion of a species

Option 2:
Both the interacting species are negatively. impacted

Option 3:
It is necessitated by nature to maintaine the ecological balance

Option 4:
It helps in maintaining species diversity in a community

Correct Answer:
Both the interacting species are negatively. impacted

Solution:
Predation is a biological interaction where one organism, the predator, kills and eats other organisms, its prey. It is denoted as: -

	Species A (Predator)	Species B (Prey)
Predation	+	-

When both species are negatively impacted then it is known as competition.

	Species A	Species B
Competition	-	-

Hence the correct option is (b).

Q. 91 The device which can remove particulate matter present in the exhaust from a thermal power plant is :

Option 1:
Incinerator

Option 2:
Electrostatic Precipitator

Option 3:
Catalytic Convertor

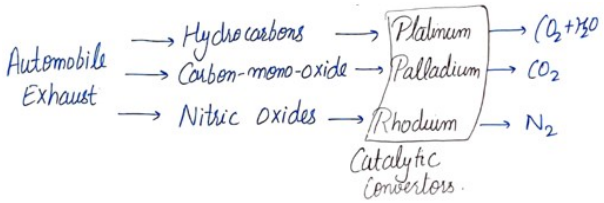
Option 4:
STP

Correct Answer:
Electrostatic Precipitator

Solution:
Incinerator: - An Incinerator is a furnace for burning waste.

Electrostatic precipitator: - It is the most effective device to remove fine particulate matter present in the exhaust from a thermal power plant. It works on the principle of electrical charging of the dust particles and collecting it on a differently changed platform.

Catalytic converter: - Device which converts automobile exhaust into less harmful gases.



STP (Sewage Treatment Plant): -

It is the process of removing contaminants from wastewater primarily from household sewage. It includes physical, chemical & biological processes to remove these Contaminants & produce environmentally safe treated wastewater.

Q. 92 Given below are two statements:
Statement I : Decomposition is a process in which the detritus is degraded into simpler substances by microbes.
Statement II : Decomposition is faster if the detritus is rich in lignin and chitin In the light of the above statements, choose the correct answer from the options given below :

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

Option 3:
Statement I is incorrect but Statement II is correct

Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Statement I is correct but Statement II is incorrect

Solution:
Decomposition is the process of conversion of complex organic matter into simple inorganic matter. Under different environmental conditions, the rate of decomposition may vary. If detritus is rich in lignin & chitin, the rate of decomposition is low and for nitrogen-rich detritus rate of decomposition is fast.

Hence, the correct option is (2)

Q. 93 Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for:

Option 1:
Competition

Option 2:
Biodiversity loss

Option 3:
Natality

Option 4:
Population explosion

Correct Answer:
Biodiversity loss

Solution:
The evil quartet for biodiversity loss is:-

1) Habitat loss and fragmentation

2.) Over exploitation

3) Alien species invasion

4) Co-extinction.

Hence, the correct option is (2)

Q. 94 Which of the following is not a method of ex situ conservation?

Option 1:
National Parks

Option 2:
Micropropagation

Option 3:
Cryopreservation

Option 4:
In vitro fertilization

Correct Answer:
National Parks

Solution:

In-situ conservation	Ex-situ conservation

It means 'Onsite' conservation	It means 'offsite' conservation.
It is the conservation of species in their natural habitats i.e. their maintenance ad recovery	This is the conservation of endangered species in man-made habitat that imitates their natural habitat
Egà National parks wildlife sanctuaries, biosphere reserves etc.	Eg.zoo, aquarium, seed bank botanical garden micropropagation, cryopreservation etc.

Micropropagation is the rapid vegetative propagation of plants under in vitro conditions.

Cryopreservation is a process that preserves Organelles, cells, tissues, or any other biological Construct by cooling the samples to a very low temperature.

Hence, the correct option is (1)

Q. 95 Which one of the following will accelerate phosphorus cycle?

Option 1:
Volcanic activity

Option 2:
Weathering of rocks

Option 3:
Rain fall and storms

Option 4:
Burning of fossil fuels

Correct Answer:
Weathering of rocks

Solution:
The phosphorus cycle is a sedimentary cycle. The Reservoir pool of phosphorus in the ecosystem is the earth's crust or lithosphere. Weathering of rocks accelerates the phosphorus cycle.

Hence, the correct option is (2).

Q. 96 While explaining interspecific interaction of population, (+)sign is assigned for beneficial interaction, (−) sign is assigned for detrimental interaction and (0) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (−) for another species involved in the interaction?

Option 1:
Amensalism

Option 2:
Commensalism

Option 3:
Competition

Option 4:
Predation

Correct Answer:
Predation

Solution:
(+) Sign indicates the population is benefitted

(-) Sign indicates the population is harmed

(0) sign indicates no effect on the population

⟶In predation, one species is benefitted and the other is harmed. It is (+-) type of population interaction.

⟶In anmensalism, one species is neutral where the other species is harmed. It is (0 -) type of population interaction.

⟶ In Commensalism, One species is benefited whereas the other species is neutral. It is (+0) type of population interaction.

⟶ In competition, both the species are harmed. It is (- -) type of population interaction.

Hence the correct option is (4).

Q. 97 Detritivores breakdown detritus into smaller particles. The process is called :

Option 1:
Fragmentation

Option 2:
Humification

Option 3:
Decomposition

Option 4:
Catabolism

Correct Answer:
Fragmentation

Solution:
Humification $\longrightarrow$ Accumulation of Humus

Decomposition $\longrightarrow$ Breakdown of bigger substances into simpler parts especially by the action of living things

Catabolism $\longrightarrow$ Degradation of detritus into simple inorganic substances by bacterial and fungal enzymes.

Fragmentation $\longrightarrow$ Breakdown of detritus by detritivores

Hence option 1 is correct.

Q. 98 In-situ conservation refers to :

Option 1:
Conserve only high risk species

Option 2:
Conserve only endangered species

Option 3:
Conserve only extinct species

Option 4:
Protect and conserve the whole ecosystem

Correct Answer:
Protect and conserve the whole ecosystem

Solution:
In Situ conservation is to conserve Organisms at their natural habitat. It helps to protect the organism as well as the ecosystem where they live.

Q. 99 Given below are two statements:

Statement I :

In a scrubber the exhaust from the thermal plant is passed through the electric wires to charge the dust particles

Statement II :

Particles matter $(\mathrm{PM}\ 2.5)$ can not be removed by scrubber but can be removed by an electrostatic precipitator.

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

Option 1:
Both Statement I and Statement II are incorrect

Option 2:
Statement I is correct but Statement II is incorrect

Option 3:
Statement I is incorrect but Statement II is correct

Option 4:
Both Statement I and Statement II are correct

Correct Answer:
Both Statement I and Statement II are incorrect

Solution:
Statement 1: Scrubber removes gases like Sulphur dioxide

Statement 2: Precipitators cannot remove particular matter (2.5)

Hence bother is incorrect

Hence, Option (1) is correct.