

CAREERS 360

TEST **Series**

NEET UG 2025

Free Mock Test

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About The eBook

The NEET UG 2025 Free Mock Test Ebook is a must-have resource for aspirants aiming to excel in the upcoming NEET UG exam. This ebook features a full-length mock test that mirrors the actual exam, providing an opportunity for students to practice in a real-time test environment, evaluate their performance, and fine-tune their preparation.

Additionally, the ebook offers a wealth of other resources, including expert tips, strategies for effective preparation, and links to chapter-wise study materials. Whether you are looking for targeted practice, guidance on key topics, or access to more mock tests, this ebook is your comprehensive companion to NEET UG 2025 success.

Introduction to NEET UG 2025

Exam Overview and Key Details

The **National Eligibility cum Entrance Test (NEET) UG 2025** is India's most prestigious medical entrance examination, conducted annually by the National Testing Agency (NTA). This exam is the gateway for admission into undergraduate medical (MBBS), dental (BDS), AYUSH, and other allied health science programs in both government and private institutions across India.

Key details about the NEET UG 2025 exam include:

- **Exam Mode:** Offline (Pen and Paper-based).
- **Duration:** 3 hours and 20 minutes (200 minutes).
- **Subjects Covered:**
 - Physics (50 questions, 35 to be answered).
 - Chemistry (50 questions, 35 to be answered).
 - Biology (Zoology and Botany: 100 questions, 70 to be answered).
- **Total Marks:** 720 marks (4 marks for each correct answer, 1 mark deducted for each wrong answer).
- **Eligibility Criteria:** Candidates must have completed or be appearing in Class 12 with Physics, Chemistry, Biology/Biotechnology, and English as core subjects.

This exam demands a strong grasp of concepts, excellent time management, and regular practice to excel in the highly competitive environment.

Role of Mock Tests in Success

Mock tests play a critical role in ensuring success in NEET UG 2025. Here's how:

- 1 Simulating the Exam Environment:**

Mock tests replicate the real NEET UG exam environment, helping aspirants acclimatize to the format, timing, and pressure of the actual test.
- 2 Performance Analysis:**

By taking mock tests, students can identify their strengths and weaknesses in Physics, Chemistry, and Biology. Detailed performance analysis allows them to focus on weak areas and improve.
- 3 Time Management and Accuracy:**

Practicing with timed mock tests trains students to allocate appropriate time to each section, enhancing their accuracy and speed.
- 4 Boosting Confidence:**

Regular practice through mock tests helps reduce exam anxiety, boosts confidence, and prepares students mentally to tackle the challenge.
- 5 Understanding Question Patterns:**

Mock tests expose students to various types of questions, including multiple-choice questions, concept-based problems, and tricky numerical, enabling them to familiarize themselves with the exam pattern.

By incorporating mock tests into their preparation plan, NEET UG 2025 aspirants can maximize their chances of achieving a high score and securing admission into their dream medical college.

Mock Test

Physics

- Q. 1** Light rays of wavelengths 6000\AA and of photon intensity 39.6 watt/m^2 is incident on a metal surface. If only one percent of photons incident on surface emit photoelectrons, then the number of electrons emitted per second per unit area from the surface will be : ($h = 6.64 \times 10^{-34}\text{ J-s}$, velocity of light = $3 \times 10^8\text{ m/s}$)

Option 1:

$$12 \times 10^{18}$$

Option 2:

$$10 \times 10^{18}$$

Option 3:

$$12 \times 10^{17}$$

Option 4:

$$12 \times 10^{16}$$

Correct Answer:

$$12 \times 10^{17}$$

Solution:

$$I = \frac{nhc}{At\lambda}$$

$$39.6 = \frac{n \times 6.6 \times 10^{-34} \times 3 \times 10^8}{1 \times 1 \times 6000 \times 10^{-10}}$$

$$n = 12 \times 10^{17}$$

- Q. 2** A wire oriented in the east-west direction carries a current eastward. Direction of the magnetic field at a point to the south of wire is

Option 1:

Vertically down

Option 2:

Vertically up

Option 3:

North-East

Option 4:

South-East

Correct Answer:
Vertically down

Solution:

As we learned

Right Hand Palm Rule -

If we stretch our right hand such that fingers point towards the point at which magnetic field is required while thumb is in the direction of current then normal to the palm will show the direction of magnetic field.

Using Right Hand Palm Rule.

Q. 3 From a certain apparatus, the diffusion rate of hydrogen has an avg. value $28.7 \text{ cm}^3/\text{s}$. while other gas is $7.2 \text{ cm}^3/\text{s}$. Identify the gas.

Option 1:
oxygen

Option 2:
fluorine

Option 3:
nitrogen

Option 4:
hydrogen

Correct Answer:
oxygen

Solution:

$$R \propto U_{\text{rms}}$$

$$\frac{R_1}{R_2} = \frac{U_{\text{rms}}}{U_{\text{rms}}}$$

$$= \sqrt{\frac{m_2}{m_1}}$$

$$\frac{28.7}{7.2} = \sqrt{\frac{m_2}{m_1}}$$

$$\frac{m_2}{m_1} = 16$$

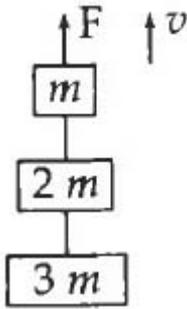
$$m_2 = 16m_1 = 16 \times 2$$

$$\therefore m_2 = 32$$

hence, the correct answer is option (a).

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

(g is the acceleration due to gravity)



Option 1:

$6mg$

Option 2:

zero

Option 3:

$2mg$

Option 4:

$3mg$

Correct Answer:

zero

Solution:

As we learnt in

Lift is moving down with $a = g$ -

$$a = g$$

$$mg - R = mg$$

$$R = 0$$

- wherein

Apparent weight = 0 (weightlessness)

∴ All the blocks are moving with constant velocity. so $F_{\text{net}} = 0$.

Correct option is 2.

Q. 5 In Parallel combination, the effective spring constant is given by

Option 1:
$$\frac{1}{k_{eq}} = \frac{1}{k_1} + \frac{1}{k_2}$$

Option 2:
$$k_{eq} = k_1 + k_2$$

Option 3:
$$k_{eq} = 2k_1 + k_2$$

Option 4:
$$k_{eq} = k_1 + 5k_2$$

Correct Answer:
$$k_{eq} = k_1 + k_2$$

Solution:

Parallel combination:-

$$k_{eq} = k_1 + k_2$$

Q. 6 A body of mass M hits normally a rigid wall with velocity V and bounces back with the same velocity. The impulse experienced by the body is

Option 1:
 MV

Option 2:
 $1.5MV$

Option 3:
 $2MV$

Option 4:
Zero

Correct Answer:

2MV

Solution:

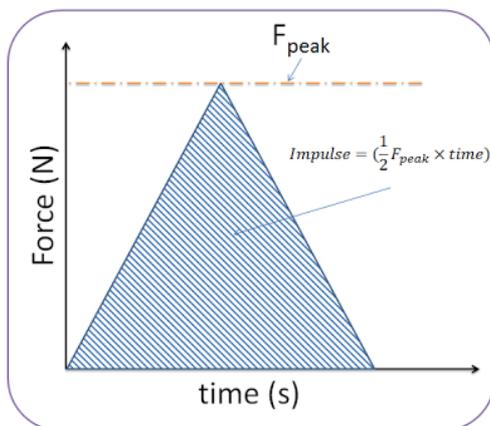
As we learnt in

Impulse -

$$\vec{I} = \int_{t_1}^{t_2} \vec{F} \cdot dt$$

$$* [MLT^{-1}]$$

- wherein



Impulse = Change in momentum

$$I = mv - (-mv) = 2mv$$

Q.7 A small steel ball of radius r experiences a viscous force F when it is falling in a jar of glycerine with terminal velocity v . The viscous force experienced by a steel ball of radius $r/2$ falling in glycerine with terminal velocity $v/2$ is

Option 1:

F

Option 2:

$\frac{F}{2}$

Option 3:

$\frac{F}{4}$

Option 4:

$$\frac{F}{8}$$

Correct Answer:

$$\frac{F}{4}$$

Solution:

$$F = 6\pi\eta rv$$

$$F' = 6\pi\eta \left(\frac{r}{2}\right) \times \left(\frac{v}{2}\right) = \frac{1}{4} \times 6\pi\eta rv = \frac{F}{4}$$

So the correct choice is (c).

- Q. 8** A ray of light is incident on a medium with angle of incidence i and refracted into a second medium with angle of refraction r . The graph of $\sin i$ vs $\sin r$ is shown in the figures. Then the velocity of light in the first medium is n times the velocity of light in the second medium. The value of n should be.

Option 1:

$$\sqrt{3}$$

Option 2:

$$\frac{1}{\sqrt{3}}$$

Option 3:

$$\frac{\sqrt{3}}{2}$$

Option 4:

$$\frac{2}{\sqrt{3}}$$

Correct Answer:

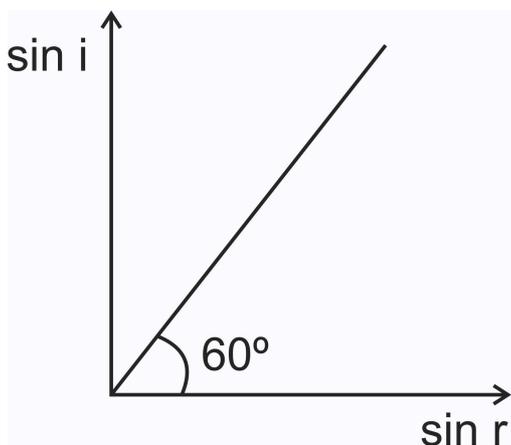
$$\sqrt{3}$$

Solution:

As we learn

Law of Refraction -

Incident ray, the normal to any refracting surface at the point of incidence & refracted ray all lie in one plane.



From Snell's law :

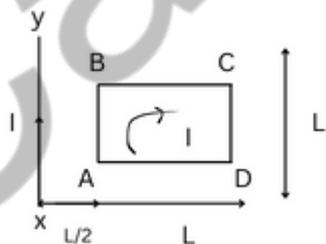
$$\mu_1 \sin i = \mu_2 \sin r \Rightarrow \frac{\mu_2}{\mu_1} = \frac{\sin i}{\sin r}$$

$$\Rightarrow \tan 60^\circ = \frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1} \Rightarrow \frac{\mu_1}{\mu_2} = \frac{1}{\sqrt{3}}$$

$$\mu = \frac{c}{v} \Rightarrow \frac{\mu_1}{\mu_2} = \frac{v_2}{v_1} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow v_1 = \sqrt{3}v_2$$

- Q.9** A square loop $ABCD$ carrying a current i , is placed near and coplaner with a long straight conductor XY carrying a current I , the net force on the loop will be -



Option 1:

$$\frac{2\mu_0 I i}{3\pi}$$

Option 2:

$$\frac{\mu_0 I i}{2\pi}$$

Option 3:

$$\frac{2\mu_0 I i L}{3\pi}$$

Option 4:

$$\frac{\mu_0 I i L}{2\pi}$$

Correct Answer:

$$\frac{2\mu_0 I i}{3\pi}$$

Solution:

The direction of current in conductor XY and AB is same.

$$\therefore F_{AB} = IlB \text{ (attractive)}$$

$$F_{AB} = i(L) \cdot \frac{\mu_0 I}{2\pi(L/2)} (\leftarrow) = \frac{\mu_0 I i}{\pi} (\leftarrow)$$

F_{BC} opposite to F_{AB}

$F_{BC}(\uparrow)$ and $F_{AD}(\downarrow) \rightarrow$ cancels each other

$F_{CD} = i\ell B$ (repulsive)

$F_{CD} = i\ell B$ (repulsive)

$$F_{CD} = i(L) \cdot \frac{\mu_0 I}{2\pi \left(\frac{3L}{2}\right)} (\rightarrow) = \frac{\mu_0 I L}{3\pi} (\rightarrow) \quad F_{CD} = i(L) \cdot \frac{\mu_0 I}{2\pi \left(\frac{3L}{2}\right)} (\rightarrow) = \frac{\mu_0 I L}{3\pi} (\rightarrow)$$

Therefore, the net force on the loop.

$$\begin{aligned} F_{\text{net}} &= F_{AB} + F_{BC} + F_{CD} + F_{AD} \\ &= \frac{\mu_0 i I}{\pi} - \frac{\mu_0 i I}{3\pi} = \frac{2\mu_0 i I}{3\pi} \end{aligned}$$

Q. 10 This question has Statement - 1 and Statement - 2. Of the four choices given after the Statements, choose the one that best describes the two Statements.

Statement 1: Short wave transmission is achieved due to the total internal reflection of the em wave from an appropriate height in the ionosphere.

Statement 2: Refractive index of plasma is independent of the frequency of em waves.

Option 1:

Statement 1 is true, Statement 2 is false

Option 2:

Statement 1 is false, Statement 2 is true

Option 3:

Statement 1 is true, Statement 2 is true but Statement 2 is **not** the correct statement of Statement 1.

Option 4:

Statement 1 is true, Statement 2 is true and Statement 2 is the correct explanation of Statement 1.

Correct Answer:

Statement 1 is true, Statement 2 is false

Solution:

Statement 1 is true because

Short wave transmission is achieved due to the total internal reflection of the em wave from an appropriate height in the ionosphere.

While statement 2 is false because

The effective refractive index of the ionosphere is given as

$$n_{eff} = n_0 \left[1 - \frac{80.5N}{f^2} \right]^{1/2}$$

where f is the frequency of em waves

Q. 11 One mole of an ideal gas ($\gamma = 1.4$) is adiabatically compressed so that its temperature rises from 27°C to 35°C . The change in the internal energy of the gas is (given $R = 8.3 \text{ J/mole/K}$)

Option 1:

- 166 J

Option 2:

166 J

Option 3:

- 168 J

Option 4:

168 J

Correct Answer:

166 J

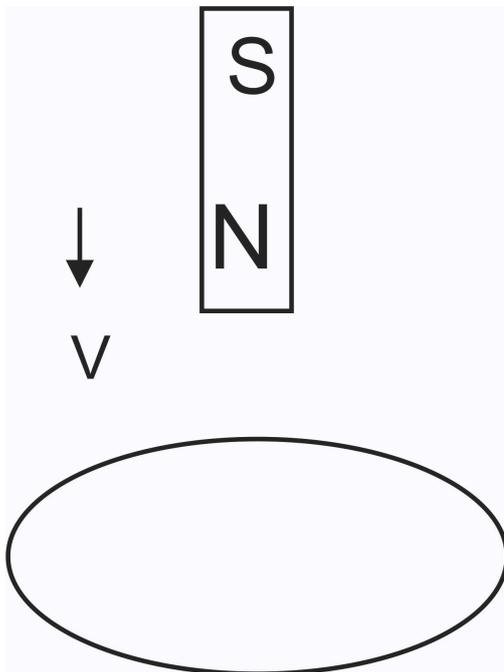
Solution:

$$\Delta U = C_v \Delta T. \text{ Now } C_p - C_v = R \text{ or } \frac{C_p}{C_v} - 1 = \frac{R}{C_v}$$

Or $C_v = \frac{R}{\gamma - 1}$, where $\gamma = \frac{C_p}{C_v}$. Hence

$$\Delta U = \frac{R\Delta T}{(\gamma - 1)} = \frac{8.3 \times 8}{(1.4 - 1)} = 166 \text{ J}$$

Q. 12



Q the direction of induced current in loop is

Option 1:

Anticlockwise

Option 2:

clockwise

Option 3:

No current will flow

Option 4:

data insufficient

Correct Answer:

Anticlockwise

Solution:

As we have learned

induced current in closed loop circuit -

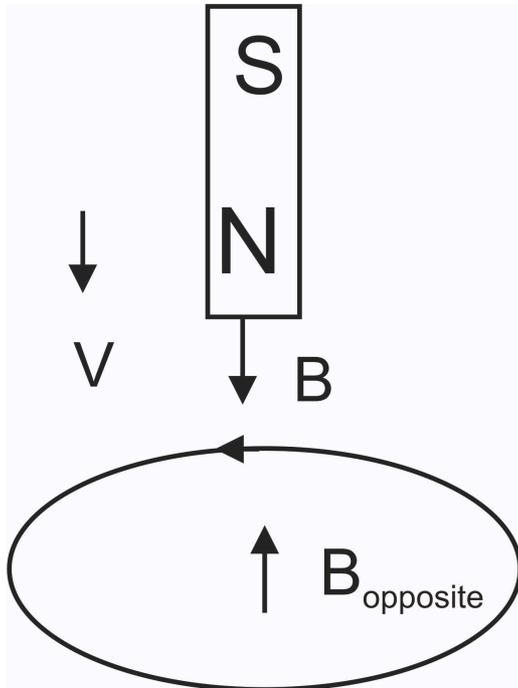
When N pole of a bar magnet move towards the coil the flux associated with loop increases and an emf is induced in it.

- wherein

To repel the approaching north pole, the induced current is set up in the loop.

Acc. to faradays law , Whenever there is change in magnetic flux passing through a circuit , an induced emf or current is produced in circuit .

And , direction of induced current is such that it will oppose the cause that produces it .



Q. 13 A bus moving on a road (200 km) with velocity $(t + e^t)$. Acceleration of the bus at t is equal to 20 seconds -

Option 1:

$$e^{20}$$

Option 2:

$$1 + \frac{e^{20}}{2}$$

Option 3:

$$1 + e^{20}$$

Option 4:

$$\frac{e^{20}}{2}$$

Correct Answer:

$$1 + e^{20}$$

Solution:

$$\text{Velocity of the bus} = t + e^t$$

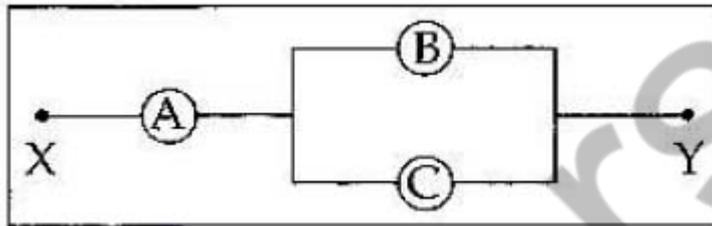
Now,

$$\text{Acceleration} = \frac{dv}{dt} = \frac{d}{dt} (t + e^t)$$

$$= 1 + e^t$$

$$\left. \frac{dv}{dt} \right|_{\text{at } t=20\text{sec}} = 1 + e^{20}$$

- Q. 14** A, B and C are voltmeters of resistance R , $1.5R$ and $3R$ respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A , V_B and V_C respectively. Then:



Option 1:

$$V_A = V_B \neq V_C$$

Option 2:

$$V_A \neq V_B \neq V_C$$

Option 3:

$$V_A = V_B = V_C$$

Option 4:

$$V_A \neq V_B = V_C$$

Correct Answer:

$$V_A = V_B = V_C$$

Solution:

As we learnt in

Potential difference -

The voltage across the terminals of a cell when it is supplying current to external resistance is known as Potential Difference .

- wherein

$$V = IR$$

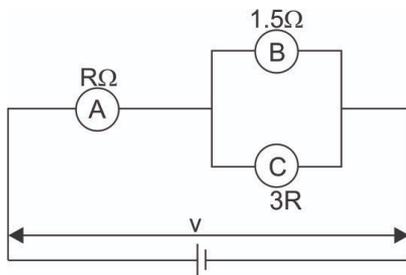
and

In series Grouping -

$$R_{eq} = R_1 + R_2 + R_3 + \dots + R_n$$

- wherein

R_{eq} – Equivalent Resistance



$$\frac{1}{R'} = \frac{1}{1.5R} + \frac{1}{3R} = \frac{2+1}{3R}$$

$$R' = R$$

$$V_{PQ} = V_A = IR$$

$$V_{QS} = V_B = V_C = IR$$

$$\text{Hence } V_A = V_B = V_C$$

Q. 15 A string is stretched between fixed points separated by 75 cm. It is observed to have resonant frequencies of 420 Hz and 315 Hz. There are no other resonant frequencies between these two. Then, the lowest resonant frequency for this string is

Option 1:

10.5 Hz

Option 2:

105 Hz

Option 3:

1.05 Hz

Option 4:

1050 Hz.

Correct Answer:

105 Hz

Solution:

Let the successive loops formed be p and $(p + 1)$ for frequencies 315 Hz and 420 Hz

$$\therefore v = \frac{p}{2l} \sqrt{\frac{T}{\mu}} = \frac{pv}{2l}$$

$$\therefore \frac{pv}{2l} = 315 \text{ Hz and } \frac{(p+1)v}{2l} = 420 \text{ Hz}$$

$$\text{or } \frac{(p+1)v}{2l} - \frac{pv}{2l} = 420 - 315$$

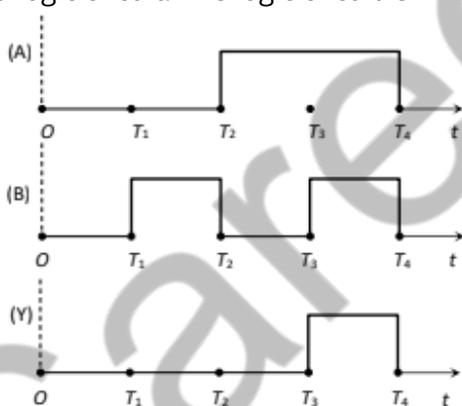
$$\frac{v}{2l} = 105 \Rightarrow \frac{1 \times v}{2l} = 105 \text{ Hz}$$

$p = 1$ for the fundamental mode of vibration of the string.

Lowest resonant frequency = **105 Hz**.

Hence the correct option is - "2"

Q. 16 The given figure shows the wave forms for two inputs A and B and that for the output Y of a logic circuit. The logic circuit is



Option 1:

An AND gate

Option 2:

An OR gate

Option 3:

A NAND gate

Option 4:

An NOT gate

Correct Answer:
An AND gate

Solution:

From the given waveforms, the following truth table can be made

Time interval	Inputs		Output Y
	A	B	
$0 \rightarrow T_1$	0	0	0
$T_1 \rightarrow T_2$	0	1	0
$T_2 \rightarrow T_3$	1	0	0
$T_3 \rightarrow T_4$	1	1	1

This truth table is equivalent to 'AND' gate

Q. 17 A photoelectric surface is illuminated successively by monochromatic light of wavelength λ and $\frac{\lambda}{2}$. If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work function of the surface of the material is :

(h = Planck's constant, c = speed of light)

Option 1:
 $\frac{hc}{\lambda}$

Option 2:
 $\frac{2hc}{\lambda}$

Option 3:
 $\frac{hc}{3\lambda}$

Option 4:
 $\frac{hc}{2\lambda}$

Correct Answer:
 $\frac{hc}{2\lambda}$

Solution:

As we learnt in

Conservation of energy -

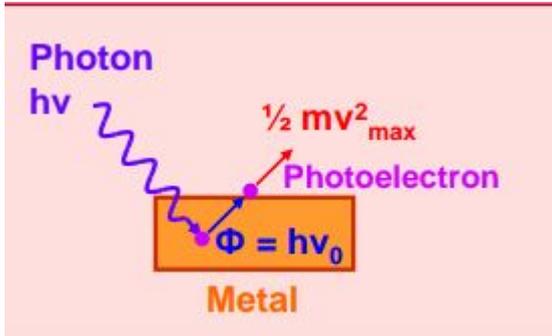
$$h\nu = \phi_0 + \frac{1}{2}mv_{max}^2$$

$$h\nu = h\nu_0 + \frac{1}{2}mv_{max}^2$$

$$h(\nu - \nu_0) = \frac{1}{2}mv_{max}^2$$

where, h – Planck's constant ν – Frequency ν_0 – threshold frequency ϕ_0 – work function

- wherein



Let work function be ϕ

$$K_1 = K.E_{max} = \frac{hc}{\lambda} - \phi \quad - (i)$$

$$K_2 = \frac{hc}{\frac{\lambda}{2}} - \phi = 2\frac{hc}{\lambda} - \phi \quad - (ii)$$

According to the question,

$$\frac{2hc}{\lambda} - \phi = 3 \left(\frac{hc}{\lambda} - \phi \right)$$

$$\text{Or, } \frac{2hc}{\lambda} - \phi = \frac{3hc}{\lambda} - 3\phi$$

$$\text{Or, } \phi = \frac{hc}{2\lambda}$$

Q. 18 Find the true match -

Measurement	No. of significant figures
1) 2165.4	P) 3
2) 238.4	Q) 5
3) 2.05	R) 4

Option 1:

1 - Q , 2 - R , 3- P

Option 2:

1 - R , 2 - P , 3 - Q

Option 3:

1 - P , 2 - R , 3 - Q

Option 4:

1 - P , 2 - Q , 3 - R

Correct Answer:

1 - Q , 2 - R , 3- P

Solution:

As we have studied that all non zero digits are significant and a zero becomes a significant figure if it exists between two non zero digits

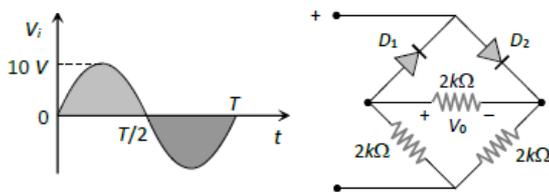
42.3 -Three significant figure

238.4 -four significant figure

2165.4 -five significant figures

So, correct option- (a)

Q. 19 In the circuit shown in figure the maximum output voltage V_0 is



Option 1:

0 V

Option 2:

5 V

Option 3:

10 V

Option 4:

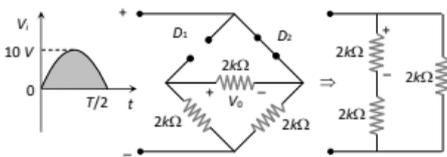
$\frac{5}{\sqrt{2}}$ V

Correct Answer:

5 V

Solution:

For the positive half cycle of input the resulting network is shown below



$$\Rightarrow (V_0)_{\max} = \frac{1}{2} (V_i)_{\max} = \frac{1}{2} \times 10 = 5 \text{ V}$$

Hence option 2 is correct.

Q. 20 Three particles, each having a charge of $10\mu\text{C}$ are placed at the corners of an equilateral triangle of side 10cm. The electrostatic potential energy of the system is (Given $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$)

Option 1:

Zero

Option 2:

Infinite

Option 3:

27 J

Option 4:

100 J

Correct Answer:

27 J

Solution:

Work done in placing the first charge at one of the corners = 0 (no other charge present)

$$\text{Work done in placing the second charge at the other corner} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r_{12}}$$

$$\text{Work done in placing the third charge} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_3}{r_{13}} + \frac{1}{4\pi\epsilon_0} \frac{q_2 q_3}{r_{23}}$$

$$\text{Thus the total work done} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r_{12}} + \frac{1}{4\pi\epsilon_0} \frac{q_1 q_3}{r_{13}} + \frac{1}{4\pi\epsilon_0} \frac{q_2 q_3}{r_{23}} = 27 \text{ J}$$

Q. 21 Two radiations of photons energies 1 eV and 2.5 eV, successively illuminate a photosensitive metallic surface of work function 0.5 eV. The ratio of the maximum speeds of the emitted electrons is:

Option 1:

1 : 2

Option 2:

1 : 1

Option 3:

1 : 5

Option 4:

1 : 4

Correct Answer:

1 : 2

Solution:

As we learnt in

Conservation of energy -

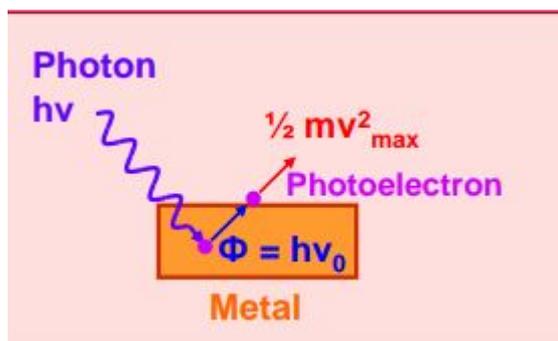
$$h\nu = \phi_0 + \frac{1}{2}mv_{max}^2$$

$$h\nu = h\nu_0 + \frac{1}{2}mv_{max}^2$$

$$h(\nu - \nu_0) = \frac{1}{2}mv_{max}^2$$

where, h - Planck's constant ν - Frequency ν_0 - threshold frequency ϕ_0 - work function

- wherein



$$\frac{1}{2}mv^2 = \frac{hc}{\lambda} - \phi$$

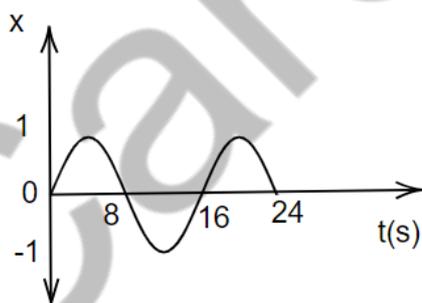
$$\text{Case I : } \frac{1}{2}mv_1^2 = 1 - 0.5 = 0.5eV \quad \dots\dots(1)$$

$$\text{Case II} = \frac{1}{2}mv_2^2 = (2.5 - 0.5)eV = 2eV \quad \dots\dots(2)$$

∴ Divide (1) and (2)

$$\frac{V_1^2}{V_2^2} = \frac{1}{4} \quad \text{or} \quad \frac{V_1}{V_2} = \frac{1}{2}$$

Q. 22 The x-t graph of a Particle undergoing simple harmonic motion is shown below. The acceleration of the Particle at $t=8/3$



Option 1:

$$-\frac{\sqrt{7}\pi^2}{128} \text{ cm/s}^2$$

Option 2:

$$-\frac{\sqrt{5}\pi^2}{128} \text{ cm/s}^2$$

Option 3:

$$-\frac{\sqrt{2}\pi^2}{128} \text{ cm/s}^2$$

Option 4:

$$-\frac{\sqrt{3}\pi^2}{128} \text{ cm/s}^2$$

Correct Answer:

$$-\frac{\sqrt{3}\pi^2}{128} \text{ cm/s}^2$$

Solution:

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

$$x = A \sin \frac{2\pi}{T} \cdot t$$

$$x = 1 \cdot \sin \frac{2\pi}{16} t$$

$$x = \sin \frac{\pi}{8} t$$

$$a = \frac{d^2x}{dt^2} = -\left(\frac{\pi}{8}\right)^2 \sin\left(\frac{\pi}{8} \cdot t\right)$$

$$= -\frac{\pi^2}{64} \times \sin \frac{\pi}{8} \times \frac{8}{3}$$

$$-\frac{\pi^2}{64} \sin \frac{\pi}{3}$$

$$-\frac{\pi^2}{64} \times \frac{\sqrt{3}}{2} = -\frac{\sqrt{3}\pi^2}{128} \text{ cm/s}^2$$

Q. 23 For conservative force the curl of the force is-

Option 1:

Zero

Option 2:

Negative

Option 3:

1

Option 4:

None

Correct Answer:

Zero

Solution:

for conservative force curl will be zero

$$\vec{\nabla} \times \vec{F} = 0$$

Where,

$$\vec{F} = -\frac{du}{dr}$$

$$u = -\int f \cdot dr$$

potential energy.

Q. 24 A particle is moving eastwards with a velocity of 5 m/s. In 10 s the velocity changes to 5 m/s northwards. The average acceleration in this time is

Option 1:

Zero

Option 2:

$\frac{1}{\sqrt{2}} \text{ms}^{-2}$ towards north-west

Option 3:

$\frac{1}{\sqrt{2}} \text{ms}^{-2}$ towards north-east

Option 4:

$\frac{1}{2} \text{ms}^{-2}$ towards north

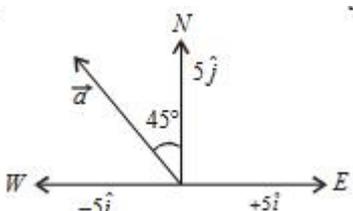
Correct Answer:

$\frac{1}{\sqrt{2}} \text{ms}^{-2}$ towards north-west

Solution:

Velocity in the east direction = $5\hat{i}$

Velocity in the north direction = $5\hat{j}$

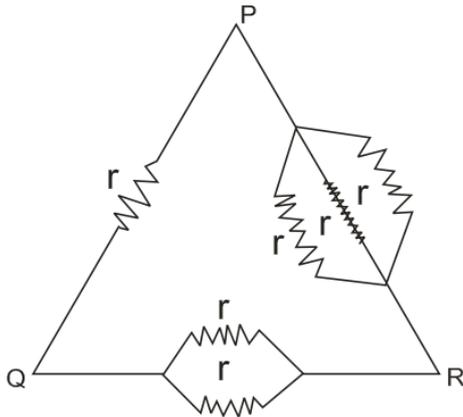


Acceleration $\vec{a} = \frac{5\hat{j} - 5\hat{i}}{10}$

or $\vec{a} = \frac{1}{2}\hat{j} - \frac{1}{2}\hat{i}$ or $|\vec{a}| = \sqrt{\left(\frac{1}{2}\right)^2 + \left(-\frac{1}{2}\right)^2}$

$|\vec{a}| = \frac{1}{\sqrt{2}} \text{ms}^{-2}$ towards north west

Q. 25 six equal resistances are connected between points P, Q and R as shown in figure. Then net resistance will be maximum between :



Option 1:

P and R

Option 2:

P and Q

Option 3:

Q and R

Option 4:

Any two points

Correct Answer:

P and Q

Solution:

Resistance in arm PQ , $\Rightarrow R_1 = r$

Resistance in arm QR

$$\Rightarrow R_2 = \frac{r \times r}{r+r} = \frac{r}{2}$$

Resistance in arm PR

$$\Rightarrow R_3 = \frac{1}{\frac{1}{r} + \frac{1}{r+\frac{r}{2}}} = \frac{r}{3}$$

Let net resistance between P and Q is R_{PQ} .

$$\frac{1}{R_{PQ}} = \frac{1}{r} + \frac{1}{\frac{r}{3} + \frac{r}{2}} = \frac{1}{r} + \frac{6}{5r} = \frac{11}{5r} \therefore R_{PQ} = \frac{5r}{11}$$

Let net resistance between Q and R, R_{QR}

$$\frac{1}{R_{QR}} = \frac{1}{\frac{r}{2}} + \frac{1}{\frac{r}{3}} = \frac{2}{r} + \frac{3}{r} = \frac{11}{r} \therefore R_{QR} = \frac{4r}{11}$$

Let net resistance between P and R, R_{PR}

$$\frac{1}{R_{PR}} = \frac{1}{\frac{r}{3}} + \frac{1}{\frac{r}{2}} = \frac{3}{r} + \frac{2}{r} = \frac{11}{3r} \therefore R_{PR} = \frac{3r}{11}$$

Hence $R_{PQ} > R_{QR} > R_{PR}$

Q. 26 A particle having a mass of 10^{-2} kg carries a charge of 5×10^{-8} C. The particle is given an initial horizontal velocity of 10^5 ms⁻¹ in the presence of electric field \vec{E} and magnetic field \vec{B} . To keep the particle moving in a horizontal direction, it is necessary that

- (a) \vec{B} should be perpendicular to the direction of velocity and \vec{E} should be along the direction of velocity.
- (b) Both \vec{B} and \vec{E} should be along the direction of velocity.
- (c) Both \vec{B} and \vec{E} are mutually perpendicular and perpendicular to the direction of velocity.
- (d) \vec{B} should be along the direction of velocity and \vec{E} should be perpendicular to the direction of velocity.

Which one of the following pairs of statements is possible?

Option 1:

(a) and (c)

Option 2:

(c) and (d)

Option 3:

(b) and (c)

Option 4:

(b) and (d)

Correct Answer:

(b) and (c)

Solution:

for statement (2) :

If both the fields are along the direction of velocity of charged particle, magnetic field will not deflect the charged particle and charged particle will move in the direction of electric field.

for statement (3) :-

let us assume the charged particle is moving along the direction of x-axis of cartesian coordinate system. If magnetic field is along y-axis, $v \times B$ force is acting along the direction z-axis. If electric field is in the direction of -z axis, then force due to electric field is exactly in opposite direction to the force due to magnetic field. By adjusting the field intensity, we can get two forces acting on charged particle that are equal in magnitude but opposite in direction so that net force is zero and charged particle will not be deflected

Q. 27 A satellite is seen after each 8 hours over equator at a place on the earth when its sense of rotation is opposite to the earth. The time interval after which it can be seen at the same place when the sense of rotation of earth & satellite is same will be :

Option 1:

8 hours

Option 2:

12 hours

Option 3:

24 hours

Option 4:

6 hours

Correct Answer:

24 hours

Solution:

Time period of Rotation of earth -

$$T = \frac{2\pi R}{\omega} = 2\pi \sqrt{\frac{R}{g}}$$

R → Radius of earth

T → Time period of rotation of earth

- wherein

$$R = 6400 \times 10^3 m$$

$$g = 10 m/s^2$$

$$T = 1.40 hr$$

$$\omega = \frac{1 \text{ rad}}{800 \text{ sec}}$$

$$\text{Given } 8 = \frac{2\pi}{\omega_1 + \omega_2} = \frac{2\pi}{\frac{2\pi}{T_1} + \frac{2\pi}{T_2}}$$

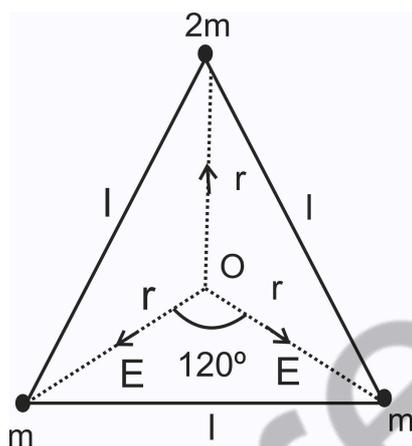
$T_1 = 24$ hours for earth.

($\omega_1 + \omega_2$ is the relative angular velocity for opposite direction)

$\Rightarrow T_2 = 12$ hours (T_2 being the time period of satellite, it will remain same as the distance from the centre of the earth remains constant).

$$\Rightarrow 8 = \frac{2\pi}{\omega_1 - \omega_2} = \frac{2\pi}{\frac{2\pi}{T_2} - \frac{2\pi}{T_1}} = 24 \text{ hours. } (\omega_1 - \omega_2 \text{ is the relative angular velocity for same direction})$$

Q. 28 Find the net gravitational field intensity at the centroid of an equilateral triangle as shown in figure



Option 1:

$$\frac{\sqrt{3}GM}{l^2}$$

Option 2:

$$\frac{3GM}{l^2}$$

Option 3:

$$\frac{GM}{l^2}$$

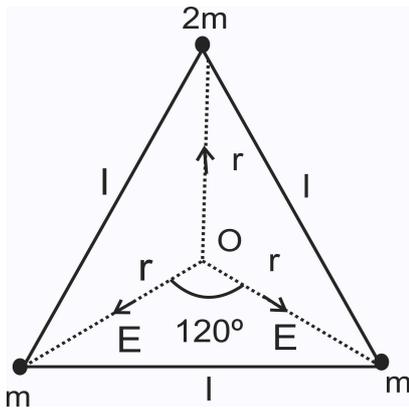
Option 4:

$$\frac{\sqrt{2}GM}{l^2}$$

Correct Answer:

$$\frac{3GM}{l^2}$$

Solution:



The resultant field at point O due to masses m and m

$$E^1 = \sqrt{E^2 + E^2 + 2E \cdot E \cdot \cos 120^\circ}$$

$$E^1 = E = \frac{Gm}{r^2}$$

Field due to mass 2m at point O

$$E^{11} = \frac{2Gm}{r^2} = 2E$$

Therefore net field



$$= E^{11} - E^1$$

$$= 2E - E$$

$$= E = \frac{GM}{r^2} = \frac{GM}{\left(\frac{l}{\sqrt{3}}\right)^2} = \frac{3GM}{l^2}$$

Q. 29 A parallel beam of white light falls on a thin film whose refractive index is 1.33. If angle of incidence is 52° then thickness of the film for the reflected light to be coloured yellow ($\lambda = 6000\text{\AA}$) most intensively must be

Option 1:

$$14(2n + 1)\mu\text{m}$$

Option 2:

$$1.4(2n + 1)\mu\text{m}$$

Option 3:

$$0.14(2n + 1)\mu\text{m}$$

Option 4:

$$142(2n + 1)\mu\text{m}$$

Correct Answer:

$$0.14(2n + 1)\mu\text{m}$$

Solution:

$$\mu = \frac{\sin i}{\sin r} \Rightarrow \sin r = \frac{\sin i}{\mu} = \frac{0.788}{1.33} = 0.6$$

$$\cos r = \sqrt{1 - \sin^2 r} = \sqrt{1 - (0.6)^2} = 0.8$$

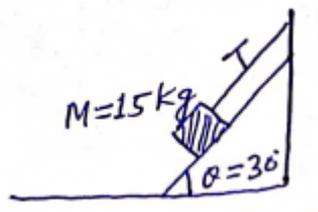
For constructive interference on reflection

$$2\mu t \cos r = (2n + 1) \frac{\lambda}{2}$$

$$\Rightarrow t = \frac{(2n + 1)\lambda}{4\mu \cos r} = \frac{(2n + 1) \times 0.6}{4 \times 1.33 \times 0.8}$$

$$= 0.14(2n + 1)\mu\text{m}$$

- Q. 30** A block of mass 15 kg is held by a string on an inclined plane (angle $\pi/6$). The tension T in the string is – ($g = 10 \text{ m/s}^2$).



Option 1:
55N

Option 2:
60N

Option 3:
75N

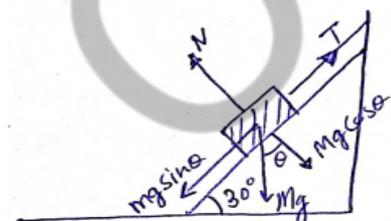
Option 4:
90N

Correct Answer:
75N

Solution:

Given,

$$M = 15 \text{ kg}, \theta = 30^\circ, g = 10 \text{ m/s}^2$$



As the block is held by the string,

$$T = mg \sin \theta$$

$$T = 15 \times 10 \times \sin 30^\circ$$

$$= 150 \times \frac{1}{2}$$

$$T = 75 \text{ N}$$

Q. 31 A current of 10A is flowing in a wire of length 1.5m. A force of 15N acts on it when it is placed in a uniform magnetic field of 2T. The angle between the magnetic field and the direction of the current is

Option 1:

30°

Option 2:

45°

Option 3:

60°

Option 4:

90°

Correct Answer:

30°

Solution:

As we learnt

Magnetic force for a straight conductor -

$$F = Bil \sin \theta$$

-

$$\begin{aligned} \sin \theta &= \frac{F}{ilB} \\ &= \frac{15}{10 * 1.5 * 2} = \frac{1}{2} \\ \theta &= 30^\circ \end{aligned}$$

Q. 32 A parallel combination of $0.1\text{M}\Omega$ resistor and a $10\mu\text{F}$ capacitor is connected across a 1.5 V source of negligible resistance. The time required for the capacitor to get charged up to 0.75V is approximately (in seconds)

Option 1:

∞

Option 2:

$\log_e 2$

Option 3:

$\log_{10} 2$

Option 4:

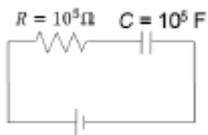
Zero

Correct Answer:

$\log_e 2$

Solution:

For the capacitor to get charged up to 0.75 V , the charge on the plates should be as follows



$$E = 1.5 \text{ V}$$

$$q = CE [1 - e^{-t/RC}]$$

$$0.75 \times 10^{-5} = 10^{-5} \times 1.5 \left[1 - e^{-\frac{t}{10^3 \times 10^{-5}}} \right]$$

$$\frac{1}{2} = [1 - e^{-t}] \Rightarrow e^{-t} = \frac{1}{2}$$

Taking log on both sides, we get

$$-t = -\ln 2 \Rightarrow t = 0.693 \text{ s}$$

-
- Q. 33** An external pressure P is applied on a cube at 0°C so that it is equally compressed from all sides. K is the bulk modulus of the material of the cube and α is its coefficient of linear expansion. Suppose we want to bring the cube to its original size by heating. The temperature should be raised by :

Option 1:

$$\frac{P}{3\alpha K}$$

Option 2:

$$\frac{P}{\alpha K}$$

Option 3:

$$\frac{3\alpha}{PK}$$

Option 4:

$$3PK\alpha$$

Correct Answer:

$$\frac{P}{3\alpha K}$$

Solution:

As we learned in

Liquid -

It is the type of matter that has got fixed volume but not a fixed shape. The force of attraction between any two molecules is not as large as in the case of a solid.

- wherein

e.g. Water, alcohol, milk, etc.

Bulk modulus is defined as

$$K = -\frac{\Delta P}{\left(\frac{\Delta V}{V}\right)} = -\frac{P}{\left(\frac{\Delta V}{V}\right)}$$

$$\Delta V_1 = -\frac{PV}{K}$$

Change in volume by heating

$$\Delta V_2 = V\gamma\Delta T = V \cdot (3\alpha\Delta T)$$

$$\Delta V_2 = 3\alpha V \Delta T$$

Since net change in volume is zero.

$$\Rightarrow \Delta V_1 + \Delta V_2 = 0$$

$$\Rightarrow -\frac{PV}{K} + 3\alpha V \Delta T = 0 \quad \text{or} \quad \Delta T = \frac{P}{3\alpha K}$$

Hence the Correct answer is option 1.

Q. 34 Two sound waves travel in the same direction in a medium. The amplitude of each wave is A and the phase difference between the two waves is 120° . The resultant amplitude will be

Option 1:

$2A$

Option 2:

$3A$

Option 3:

$4A$

Option 4:

A

Correct Answer:

A

Solution:

As we learnt in

Resultant Intensity -

$$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \cdot \cos \phi$$

- wherein

$\phi = \text{phase difference}$

Here $A_1 = A, A_2 = A, \Phi = 120^\circ$

The amplitude of the resultant wave is

$$A_R = \sqrt{A_1^2 + A_2^2 + 2A_1 A_2 \cos \Phi}$$

$$A_R = \sqrt{A^2 + A^2 + 2AA \cos 120^\circ}$$

$$A_R = \sqrt{A^2 + A^2 - A^2}$$

$$A_R = A$$

Q. 35 Which of the following charge is not possible

Option 1:

$$1.6 \times 10^{-18} C$$

Option 2:

$$1.6 \times 10^{-19} C$$

Option 3:

$$1.6 \times 10^{-20} C$$

Option 4:

None of these

Correct Answer:

$$1.6 \times 10^{-20} C$$

Solution:

As we learned

Electric charge -

It is the property associated with matter due to which it produces and experiences electrical and magnetic effects.

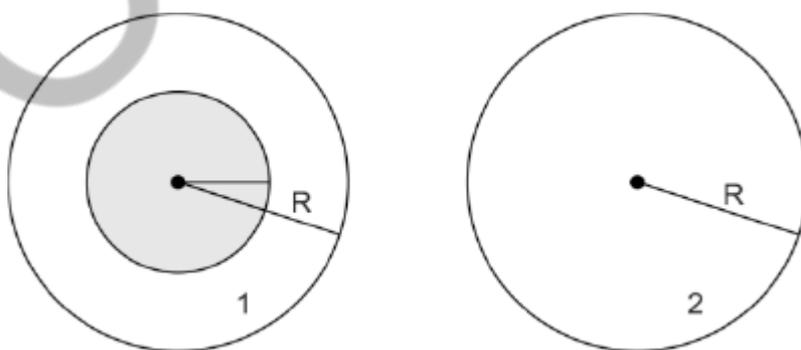
- wherein

it is known that every atom is electrically neutral.

$1.6 \times 10^{-20} C$, because this is $\frac{1}{10}$ of electronic charge and hence not an integral multiple.

Q. 36 A uniform magnetic field is restricted within a region of radius r . The magnetic field changes with time at a rate $\frac{d\vec{B}}{dt}$. Loop 1 of radius $R > r$

encloses the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure below. Then the e.m.f. generated is



Option 1:

zero in loop 1 and zero in loop 2

Option 2:

$$-\frac{d\vec{B}}{dt} \pi r^2 \text{ in loop 1 and } -\frac{d\vec{B}}{dt} \pi r^2 \text{ in loop 2}$$

Option 3:

$$-\frac{d\vec{B}}{dt} \pi R^2 \text{ in loop 1 and zero in loop 2}$$

Option 4:

$$-\frac{d\vec{B}}{dt} \pi r^2 \text{ in loop 1 and zero in loop 2}$$

Correct Answer:

$$-\frac{d\vec{B}}{dt} \pi r^2 \text{ in loop 1 and zero in loop 2}$$

Solution:

As we learnt in

Rate of change of magnetic Flux -

$$\varepsilon = \frac{-d\phi}{dt}$$

- wherein

$$d\phi \rightarrow \phi_2 - \phi_1$$

$\phi_2 - \phi_1$ - change in flux

In loop 1,

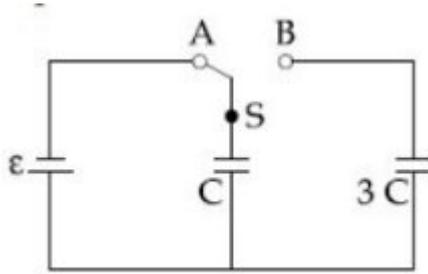
$$\varepsilon_1 = \frac{-d\phi}{dt} = \frac{-d}{dt}(\vec{B} \cdot \vec{A}) = \frac{-d}{dt}(BA) = A \frac{dB}{dt}$$

$$\varepsilon_1 = - \left(\frac{\pi r^2 dB}{dt} \right)$$

In loop 2,

$$\varepsilon_2 = \frac{-d}{dt}(BA) = \frac{-d}{dt}(0 \times A) = 0$$

- Q. 37** In the figure shown, after the switch 'S' is turned from position 'A' to position 'B', the energy dissipated in the circuit in terms of capacitance 'C' and total charge 'Q' is :



Option 1:

$$\frac{5 Q^2}{8 C}$$

Option 2:

$$\frac{1 Q^2}{8 C}$$

Option 3:

$$\frac{3 Q^2}{4 C}$$

Option 4:

$$\frac{3 Q^2}{8 C}$$

Correct Answer:

$$\frac{3 Q^2}{8 C}$$

Solution:

Energy Stored -

$$U = \frac{1}{2} CV^2 = \frac{1}{2} QV = \frac{Q^2}{2C}$$

-

$$V_i = \frac{1}{2} CE^2$$

$$V_f = \frac{(CE)^2}{2C_{eq}} = \frac{CE^2}{2 \times 4C} = \frac{1}{2} \frac{CE^2}{4}$$

$$\Delta E = \frac{1}{2} CE^2 \times \frac{3}{4}$$

$$= \frac{3}{8} CE^2$$

$$= \frac{3}{8} \frac{Q^2}{C}$$

Q. 38 If the distance of 100 watt lamp is increased from a photo cell, the saturation current 'i' in the photocell varies with the distance d as-

Option 1:

$$i \propto d^2$$

Option 2:

$$i \propto d$$

Option 3:

$$i \propto \frac{1}{d}$$

Option 4:

$$i \propto \frac{1}{d^2}$$

Correct Answer:

$$i \propto \frac{1}{d^2}$$

Solution:

Photoelectric current is directly proportional to intensity of incident light. Also, intensity of light is inversely proportional to square of distance.

Q. 39 Temperature of an ideal gas, initially at $27^{\circ}C$, is raised by $6^{\circ}C$, the rms velocity of the gas molecule will -

Option 1:

Increase by nearly 2%

Option 2:

Decrease by nearly 2%

Option 3:

Increase by nearly 1%

Option 4:

Decrease by nearly 1%

Correct Answer:

Increase by nearly 1%

Solution:

$$v_{rms} \propto \sqrt{T}$$

$$\text{or } \frac{\Delta v}{v} = \frac{1}{2} \frac{\Delta T}{T} = \frac{1}{2} \times \frac{6}{(273 + 27)} = \frac{1}{100} = 1\%$$

Q. 40 Two coherent monochromatic light beams of intensities I and $4I$ are superimposed. The maximum and minimum possible intensities in the resulting beam are:

Option 1:

$5I$ and I

Option 2:

$5I$ and $3I$

Option 3:

$9I$ and I

Option 4:

$9I$ and $3I$

Correct Answer:

$9I$ and I

Solution:

Intensity \propto (Amplitude)²

$$\Rightarrow I \propto A^2$$

When two waves (beams) of amplitude A_1 and A_2 superimpose, at maxima and minima, the amplitude of the resulting wave are $(A_1 + A_2)$ and $(A_1 - A_2)$ respectively. If the maximum and minimum possible intensities are I_{\max} and I_{\min} respectively, then

$$I_{\max} \propto (A_1 + A_2)^2$$

$$\text{And } I_{\min} \propto (A_1 - A_2)^2$$

$$\Rightarrow \frac{I_{\max}}{I_{\min}} = \left(\frac{A_1 + A_2}{A_1 - A_2} \right)^2 = \left\{ \frac{\frac{A_1}{A_2} + 1}{\frac{A_1}{A_2} - 1} \right\}^2 \quad \text{where } \frac{A_1}{A_2} = \frac{\sqrt{I}}{\sqrt{4I}} = \frac{1}{2}$$

$$\Rightarrow \frac{I_{\max}}{I_{\min}} = \frac{9}{1} \Rightarrow I_{\max} = 9I, I_{\min} = I$$

Q. 41 Which of the following statement is not true regarding gravitational force?

Option 1:

always attractive force

Option 2:

It is central force

Option 3:

It is strongest force of the universe

Option 4:

none of the above

Correct Answer:

It is strongest force of the universe

Solution:

As we learnt

Properties of Gravitational Force -

(i) Always attractive

(ii) It is the central force

(iii) Weakest force

Ratio of F_g to F_e between two electrons is 10^{-43}

So Gravitational Force is the weakest force of the Universe

Q. 42 Consider the P – V diagram shown in Figure . The diagram represents the process of n moles of an ideal gas undergoing a thermodynamic cycle between points A and B. Your task is to find the maximum temperature of the gas during this cycle.

Option 1:

125k

Option 2:

170 k

Option 3:

200 k

Option 4:

20 k

Correct Answer:

125k

Solution:

To find the maximum temperature of the gas between points A and B, we need to determine the path of the process that corresponds to the maximum temperature. The temperature of an ideal gas is related to its pressure and volume by the ideal gas law:

$$P V = nRT, \quad (1)$$

where P is the pressure, V is the volume, n is the number of moles of the gas, R is the ideal gas constant, and T is the temperature. Looking at the $P - V$ diagram, we observe that the maximum temperature occurs at the point where the gas is compressed the most while maintaining constant pressure. This corresponds to the steepest downward slope in the diagram.

Using this information, we can see that the segment from A to B with the steepest slope is the vertical segment on the right side. Along this segment, the volume decreases while the pressure remains constant. Therefore, we can write:

$$\Delta V = V_B - V_A, \quad (2)$$

where V_B is the volume at point B and V_A is the volume at point A. Since the process is isobaric (constant pressure), we can write:

$$\frac{\Delta V}{V} = \frac{\Delta T}{T} \quad (3)$$

where T is the temperature.

Solving for ΔT , we get:

$$\Delta T = T_B - T_A = \frac{\Delta V}{V} \cdot T, \quad (4)$$

where T_B is the temperature at point B and T_A is the temperature at point A. Now we can plug in the values from the diagram. Let's assume the initial volume at point A is V_A and the final volume at point B is V_B . Given that the volume decreases from A to B, $\Delta V = V_B - V_A$. Substituting into the equation:

$$\Delta T = \frac{V_B - V_A}{V_A} \cdot T. \quad (5)$$

The maximum temperature T_{\max} occurs when ΔT is maximum. To achieve this, V_B should be as small as possible while V_A should be as large as possible. Since the vertical segment represents the steepest slope, it implies that V_B is the smallest and V_A is the largest along this segment. Therefore, the maximum temperature T_{\max} is given by:

$$T_{\max} = \frac{V_{\min} - V_{\max}}{V_{\max}} \cdot T, \quad (6)$$

where V_{\min} is the smallest volume and V_{\max} is the largest volume along the vertical segment. Now, using the values from the diagram, we can calculate the maximum temperature:

$$T_{\max} = \frac{V_B - V_A}{V_A} \cdot T.$$

Substituting the numerical values and solving for T_{\max} , we get:

$$T_{\max} = \frac{1.0 \text{ L} - 0.4 \text{ L}}{0.4 \text{ L}} \cdot 300 \text{ K} = 125 \text{ K} \quad (8)$$

Therefore, the maximum temperature of the gas between points A and B is 125 K. Therefore, the correct option is 1.

Q. 43 What is the type of the wavefront on earth for sunlight?

Option 1:

Spherical

Option 2:

Plane

Option 3:

Cylindrical

Option 4:

none of the above

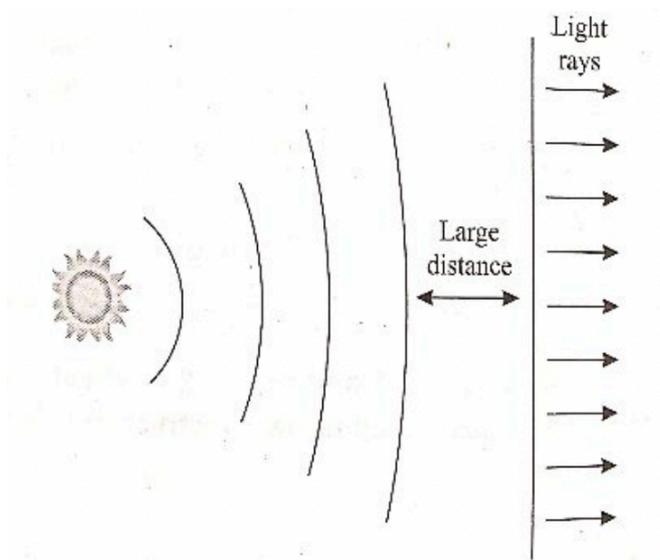
Correct Answer:

Plane

Solution:

The sun is at very large distance from the earth. Assuming sun as spherical, it can be considered as point source situated at infinity. We can treat it like a point object as seen from the surface of earth.

Because of large distance, the radius of wavefront can be considered as large (infinity) and hence, wavefront is almost plane.



Q. 44 An X-ray tube with Cu target is operated at 25kV . The glancing angle for a NaCl crystal for the CuK_α line is 15.8° . Find the wavelength of this line. (d for $\text{NaCl} = 2.82\text{\AA}$, $h = 6.62 \times 10^{-27} \text{ erg - sec}$)

Option 1:
 3.06\AA

Option 2:
 1.53\AA

Option 3:
 0.75\AA

Option 4:
 None of these

Correct Answer:
 1.53\AA

Solution:

According to Bragg's law ,

$$\Rightarrow 2 d \sin \theta = n\lambda$$

$n = 1$ for first order

$$\Rightarrow 2 \times 2.82 \sin 15.8 = \lambda$$

$$\Rightarrow \lambda = 5.64 \times 0.2723 = 1.53\text{\AA}$$

Hence option 2 is correct.

Q. 45 The intensity of radiation at a distance d from source is

Option 1:
proportional to d

Option 2:
Inversely proportional to d

Option 3:
Inversely proportional to d^2

Option 4:
proportional to d^2

Correct Answer:
Inversely proportional to d^2

Solution:
As we have learnt,

Intensity -

$$I \propto \frac{1}{d^2}$$

- wherein

d = distance from the source.

$$I \propto \frac{1}{d^2}$$

Q. 1 Which one of the following is not an acid salt?

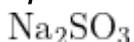
Option 1:



Option 2:



Option 3:



Option 4:

All of the above are acid salts

Correct Answer:

All of the above are acid salts

Solution:

Salt of S_B/W_A are called acid salts.



All are acid salts.

Therefore, **option(4) is correct**

Q. 2 Work function of platinum is 2 eV. What is the velocity of electron ejected from platinum surface when radiation of 400 nm falls on it.
($1\text{eV} = 1.6 \times 10^{-19} \text{ J}$)

Option 1:

$6.52 \times 10^5 \text{ m/s}$

Option 2:

$6.24 \times 10^5 \text{ m/s}$

Option 3:

$5.62 \times 10^4 \text{ m/s}$

Option 4:

$2 \times 10^3 \text{ m/s}$

Correct Answer:

$6.24 \times 10^5 \text{ m/s}$

Solution:

We know that ,

E_i (Energy of incident radiation) = K.E(Kinetic energy of ejected electron) + w_0 (Work function of Metal)

$$E_i = \frac{1240}{400} = 3.1\text{eV} \quad w_0 = 2\text{eV}$$

$$\text{K.E} = E_i - w_0 = (3.1 - 2) = 1.1\text{eV}$$

$$= 1.1 \times 1.6 \times 10^{-19}\text{J} = 1.76 \times 10^{-19}\text{J}$$

$$v(\text{Velocity}) = \sqrt{\frac{2\text{KE}}{m}} = \sqrt{\frac{2(1.76 \times 10^{-19})}{9.1 \times 10^{-31}}} = \sqrt{\frac{3.52 \times 10^{-19}}{9.1 \times 10^{-31}}} = \sqrt{\frac{3.52 \times 10^{-19+31}}{9.1}} = 6.24 \times 10^5 \text{ m/s}$$

Q. 3 Select the correct option in the context of dry cell

- a) it is also called Lechlance cell
- b) It can also be called Daniel cell
- c) Electrolyte used is a moist paste of NH_4Cl and ZnCl_2

Option 1:

a,c

Option 2:

c

Option 3:

a,b

Option 4:

b,c

Correct Answer:

c

Solution:

As we have learned,

Batteries -

Primary Cells

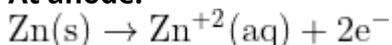
In such cells redox reaction occurs only once so cells can not be recharged again. The cell become dead after some time as electrode reactions cannot be reversed. For example, dry cell and mercury cell.

• Dry Cell

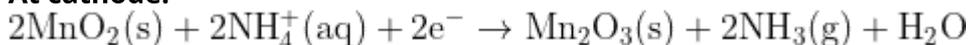
- ▷ It is compact form of Leclanche cell.
- ▷ It has anode of Zn-container and cathode of graphite rod surrounded by MnO_2 + carbon.
- ▷ Here a paste of NH_4Cl and ZnCl_2 is filled in between the electrodes.

Cell Reactions

At anode:



At cathode:



- ▷ Zn^{+2} combines with NH_3 to form diammine Zn(II) cation.
 - ▷ Dry cell has short life as NH_4Cl (acidic) corrodes the Zn-container even if the cell is not in use.
 - ▷ The cell potential is 1.25 to 1.5 volt
- Lechlance and daniel cell are different from dry cell

Therefore, **option(2) is correct**

Q. 4 Oxidation state of P in NaH_2PO_2 is

Option 1:

+1

Option 2:

+3

Option 3:

+5

Option 4:

+4

Correct Answer:

+1

Solution:

Answer (1)



$$\therefore x = 1$$

Q. 5 At 25°C , the solubility product of Mg(OH)_2 is 1.0×10^{-11} . At which pH, will Mg^{2+} ions start precipitating in the form of Mg(OH)_2 from a solution of 0.001 M Mg^{2+} ions?

Option 1:

8

Option 2:

9

Option 3:

10

Option 4:

11

Correct Answer:

10

Solution:

$$K_{sp} \text{ of } Mg(OH)_2 = [Mg^{2+}][OH^-]^2$$

$$[OH^-] = \sqrt{\frac{K_{sp}}{[Mg^{2+}]}} = \sqrt{\frac{1 \times 10^{-11}}{10^{-3}}} = 10^{-4}M$$

$$pOH = 4$$

$$pH = 14 - pOH = 14 - 4 = 10$$

Therefore, **Option (3) is correct.**

Q. 6 Value of gas constant R is

Option 1:

0.082 litre atm

Option 2:

0.987 cal mol⁻¹K⁻¹

Option 3:

8.3J mol⁻¹K⁻¹

Option 4:

83 erg mol⁻¹K⁻¹

Correct Answer:

8.3J mol⁻¹K⁻¹

Solution:

As we learnt in

Ideal Gas Law -

$$PV = nRT$$

- wherein

P - Pressure

V - Volume

n - No. of Moles

R - Gas Constant

T - Temperature

Units of R

(I) In atm lit $\Rightarrow 0.0821 \text{ atm litre mol}^{-1} \text{ k}^{-1}$

(II) In calories $\Rightarrow 1.987 \text{ cal mol}^{-1} \text{ k}^{-1}$

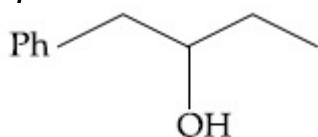
(III) In MKS $\Rightarrow 8.314 \text{ J mol}^{-1} \text{ k}^{-1}$

(IV) in CGS $\Rightarrow 8.314 \times 10^7 \text{ erg mol}^{-1} \text{ k}^{-1}$

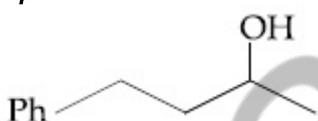
Correct option is 3.

Q. 7 Heating of 2-chloro-1-phenylbutane with $\text{EtO}^- \text{K}^+ / \text{EtOH}$ gives X as the major product. The reaction of X with $\text{Hg}(\text{OAc})_2 / \text{H}_2\text{O}$ followed by NaBH_4 gives Y as the major product. Y is:

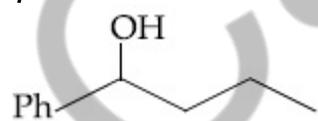
Option 1:



Option 2:



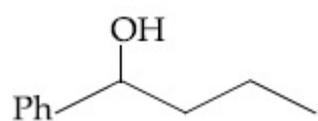
Option 3:



Option 4:

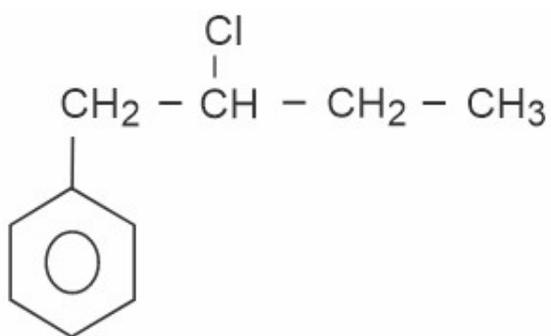


Correct Answer:

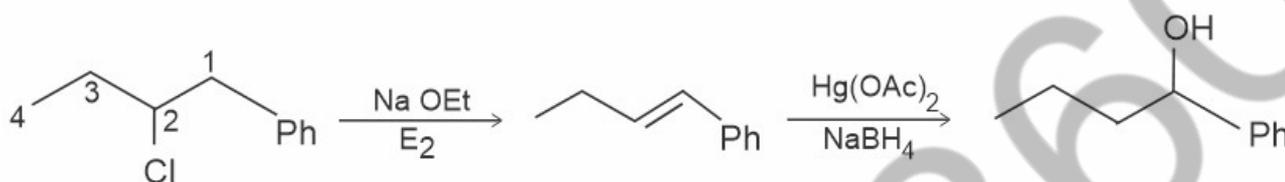


Solution:

The structure of 2-Chloro-1-Phenyl butane is given below:



It undergoes the given reaction sequence as



Hence, the correct answer is Option (3)

Q. 8 The mixture that forms maximum boiling azeotrope is:

Option 1:

Water + Nitric Acid

Option 2:

Ethanol + Water

Option 3:

Acetone + Carbon disulphide

Option 4:

Heptane + Octane

Correct Answer:

Water + Nitric Acid

Solution:

The Solutions that show a large negative deviation from Raoult's law form maximum boiling azeotrope at a specific combination.

Nitric acid and water, 68% Nitric acid + 32% Water by mass with a boiling point of 393.5 K, is an example of this class of azeotrope.

Ethanol and water show a positive deviation.

Acetone and Carbon disulphide show a positive deviation.

Heptane and Octane show no deviation because they behave as ideal solutions.

So, option 1 is correct.

Q. 9 $CH_3 - Mg - Br$ is an organometallic compound due to

Option 1:
 $Mg - Br$ Bond

Option 2:
 $C - Mg$ Bond

Option 3:
 $C - Br$ Bond

Option 4:
 $C - H$ Bond

Correct Answer:
 $C - Mg$ Bond

Solution:

Grignard reagent CH_3MgBr is an organometallic compound due to the presence of $C - Mg$ bond.

Therefore, **option (2) is correct.**

Q. 10 The pair that has similar atomic radii is:

Option 1:
Mn and Re

Option 2:
Ti and Hf

Option 3:
Sc and Ni

Option 4:
Mo and W

Correct Answer:
Mo and W

Solution:

Atomic Radius -

The distance from the centre of the nucleus to the outermost shell containing the electrons is called atomic radius. It can be measured by the spectroscopic method and by x-ray diffraction or electron diffraction techniques.

-

Size decrease $Ni < Sc$
 $Sc \quad Ti \quad Cr \quad Mn \quad Fe \quad Co \quad Ni \quad Cu \quad Zn$
 $\quad \quad Zr \quad \quad Mo$
 $\quad \quad Hf \quad \quad W$

$Hf > Ti$

Mo and W almost same because of lanthanide contraction $Mo \approx W$

Answer is $\rightarrow Mo$ & W

Therefore, **Option(4) is correct**

Q. 11 The correct order of the $O - O$ bond length in O_2 , H_2O_2 and O_3 is

Option 1:

$O_2 > O_3 > H_2O_2$

Option 2:

$O_3 > H_2O_2 > O_2$

Option 3:

$H_2O_2 > O_3 > O_2$

Option 4:

$O_2 > H_2O_2 > O_3$

Correct Answer:

$H_2O_2 > O_3 > O_2$

Solution:

As we have learnt,

With an increasing bond order, the bond length decreases.

Bond order of the given species are

$$H_2O_2 = 1; \quad O_3 = 1.5; \quad O_2 = 2$$

The correct order of Bond length is therefore

$$H_2O_2 > O_3 > O_2$$

Hence, **the correct answer is Option (3)**

Q. 12 $t_{1/4}$ can be taken as the time taken for the concentration of a reactant to drop to 3/4 of its initial value. If the rate constant for a first order reaction is k , the $t_{1/4}$ can be written as

Option 1:

$$0.10/k$$

Option 2:

$$0.29/k$$

Option 3:

$$0.69/k$$

Option 4:

$$0.75/k$$

Correct Answer:

$$0.29/k$$

Solution:

The formula for the first-order reaction is -

$$k = \frac{2.303}{t} \log \frac{a_0}{a_t}$$

Then,

$$k = \frac{2.303}{t_{\frac{1}{4}}} \log \frac{1}{\frac{3}{4}}$$

$$t_{\frac{1}{4}} = \frac{2.303}{k} \log \frac{4}{3}$$

$$t_{\frac{1}{4}} = \frac{2.303}{k} \times 0.125$$

$$t_{\frac{1}{4}} = \frac{0.29}{k}$$

The correct option is (2).

Q. 13 All of the following form ideal solutions except:

Option 1:
 C_2H_5Br and C_2H_5I

Option 2:
 C_6H_5Cl and C_6H_5Br

Option 3:
 C_6H_6 and $C_6H_5CH_3$

Option 4:
 C_2H_5I and C_2H_5OH

Correct Answer:
 C_2H_5I and C_2H_5OH

Solution:
 C_2H_5I and C_2H_5OH do not form an ideal solution.

Therefore, **option(4) is correct**

Q. 14 The hybridization involved in complex $[Ni(CN)_4]^{2-}$ is: (At. No. Ni = 28)

Option 1:
 dsp^2

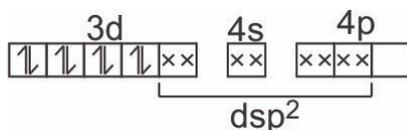
Option 2:
 sp^3

Option 3:
 d^2sp^2

Option 4:
 d^2sp^3

Correct Answer:
 dsp^2

Solution:
In $[Ni(CN)_4]^{2-}$ The oxidation state of Ni is +2 and CN^- is a strong field ligand which can pair the unpaired electrons of Ni^{2+}



Q. 15 During the nuclear explosion one of the product has its half life 8.21 years. If 1 Mg of product was absorbed in the bones of newly born baby in place of Ca, how much time in years, is required to reduce it by 90 %. if it not lost metabolically

Option 1:
36.8 years

Option 2:
45.2 years

Option 3:
28.7 years

Option 4:
30.6 years

Correct Answer:
28.7 years

Solution:

$$t_{1/2} = 8.21 \text{ years}$$

$$a = 10^{-6} \text{ g}$$

$$t_{1/2} = \frac{0.693}{k}$$

$$k = \frac{0.693}{t_{1/2}} = \frac{0.693}{8.21} = 0.08$$

For 1st order reaction,

$$k = \frac{2.303}{t} \log \frac{a}{a-x}$$

$$t = \frac{2.303}{k} \log \frac{a}{a-x}$$

$$k = \frac{2.303}{0.08} \log \frac{10^{-6}}{10^{-7}}$$

$$k = 28.7 \text{ years}$$

Q. 16 The ionisation constant of NH_4^+ in water is 6×10^{-10} at 25 degree Celcius. The rate constant for reaction of NH_4^+ and OH^- to form NH_3 and H_2O at 25 degree Celcius is 3.5×10^{10} l/mol.sec. Calculate the rate constant for proton transfer from water to NH_3

Option 1:
 6.66×10^3

Option 2:

$$5.83 \times 10^5$$

Option 3:

$$6.66 \times 10^6$$

Option 4:

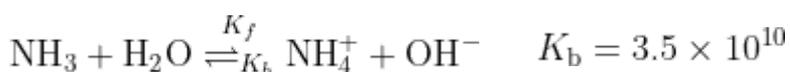
$$7.64 \times 10^5$$

Correct Answer:

$$5.83 \times 10^5$$

Solution:

The reactions according to the question will be:



$$K_{\text{base}} = \frac{K_f}{K_b}$$

$$\text{Also, } K_{\text{base}} = \frac{K_w}{K_{\text{acid}}}$$

$$\frac{K_f}{3.5 \times 10^{-10}} = \frac{10^{-14}}{6 \times 10^{-10}}$$

$$K_f = 5.83 \times 10^5$$

Q. 17 Which among the following is correct statement?

Option 1:

Ionic radii does not depend upon effective nuclear charge

Option 2:

Ionic radii increase with increase in effective nuclear charge

Option 3:

Ionic radii decreases with increase in effective nuclear charge

Option 4:

None of the above

Correct Answer:

Ionic radii decreases with increase in effective nuclear charge

Solution:

The electrons in the valence shell experience an attractive force from the nucleus and a repulsive force from the electrons in the inner shells. Due to this repulsive force caused by inner electrons, the net attractive force exerted by the nucleus on the valence shell electrons is somewhat reduced. The actual charge felt by the valence shell electrons is called effective nuclear charge.

Therefore, higher the effective nuclear charge felt by valence shell electrons, lesser the ionic radii.

Q. 18 For a first order reaction, calculate the ratio between the time taken to complete 3/4 th of the reaction and time taken to complete half of the reaction?

Option 1:

4/3

Option 2:

8/3

Option 3:

2

Option 4:

1

Correct Answer:

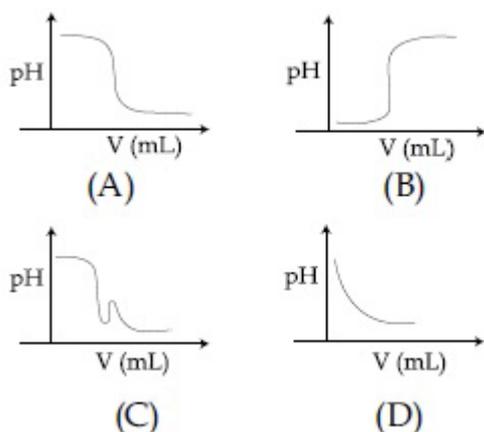
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Solution:

$$\begin{aligned}t_{1/2} &= \frac{0.69}{k}, & t_{3/4} &= t_{75\%} \\t_{3/4} &= \frac{2.303}{k} \log \frac{a}{\left(a - \frac{3a}{4}\right)} \\&= \frac{2.303}{k} \log 4 \\&= \frac{2.303}{k} \times 2 \times 0.3010 = \frac{0.69 \times 2}{k} \\ \frac{t_{3/4}}{t_{1/2}} &= \frac{\frac{0.69 \times 2}{k}}{\frac{0.69}{k}} \times \frac{k}{0.69} \\ \frac{t_{3/4}}{t_{1/2}} &= 2\end{aligned}$$

Therefore, **option(3) is correct**

Q. 19 In an acid -base titration , 0.1 M HCL solution was added to the NaOH solution of unknown strength . Which of the following correctly shows the change of pH of the titration mixture in this experiment ?



Option 1:
(B)

Option 2:
(A)

Option 3:
(C)

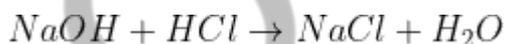
Option 4:
(D)

Correct Answer:
(A)

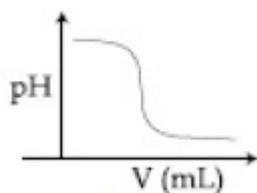
Solution:

$V = 0$ then pH will be high due to NaOH (Base)

$V = V_t$ then pH will decrease (As Acid concentration increases Basicity of solution decreases)



At a certain volume of solution suddenly change at equilibrium.



Hence, **option number (2) is correct.**

Q. 20 Which of the following represents the correct order of increasing electron gain enthalpy with negative sign for the elements O, S, F and Cl

Option 1:

$\text{Cl} < \text{F} < \text{O} < \text{S}$

Option 2:

$\text{O} < \text{S} < \text{F} < \text{Cl}$

Option 3:

$\text{F} < \text{S} < \text{O} < \text{Cl}$

Option 4:

$\text{S} < \text{O} < \text{Cl} < \text{F}$

Correct Answer:

$\text{O} < \text{S} < \text{F} < \text{Cl}$

Solution:

As we learnt

Variation of electron gain enthalpy in periodic table -

1. Electron gain enthalpy decreases down the group.
2. Generally, electron gain enthalpy increases (more negative) along the period.

Period second elements have lower electron gain enthalpy than period third elements due to smaller size of period second elements, on addition of extra electron, it experiences more electronic repulsions but due to larger size of period third elements, the repulsions are less and hence higher electron gain enthalpy.

Also, 17th group elements (Cl and F) have higher electron gain enthalpy than 16th group elements (O and S)

$\therefore \text{Cl and F} > \text{O and S}$ (Electron gain enthalpy)

and citing above reasons, we can say

$\text{Cl} > \text{F}$ and $\text{S} > \text{O}$

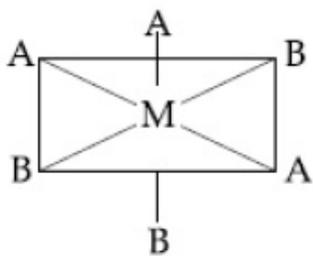
\therefore Overall, we have the following order of electron gain enthalpy:

$\text{Cl} > \text{F} > \text{S} > \text{O}$

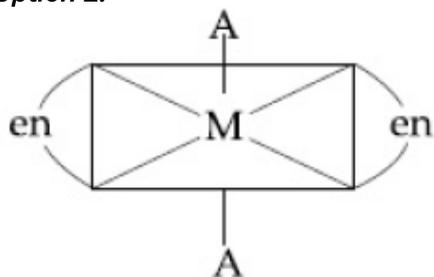
Q. 21 The one that will show optical activity is :

(*en*=ethane-1,2-diamine)

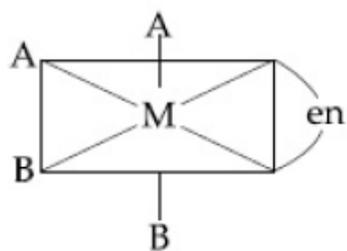
Option 1:



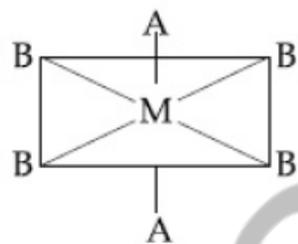
Option 2:



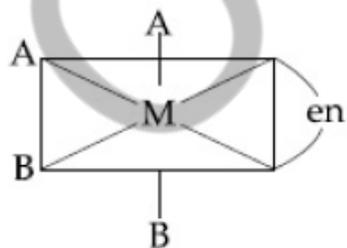
Option 3:



Option 4:



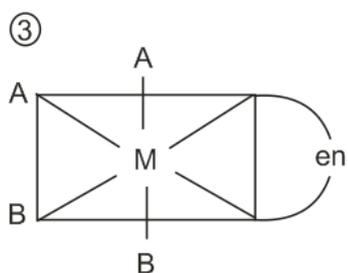
Correct Answer:



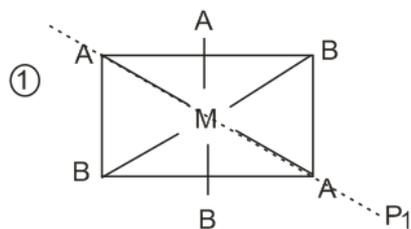
Solution:

As we have learnt,

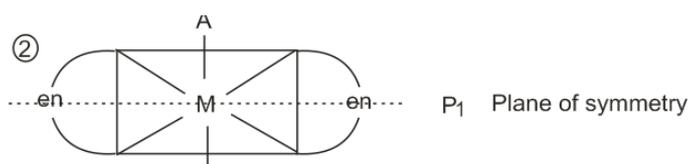
Optically active species do not contain any plane of symmetry or centre of symmetry.



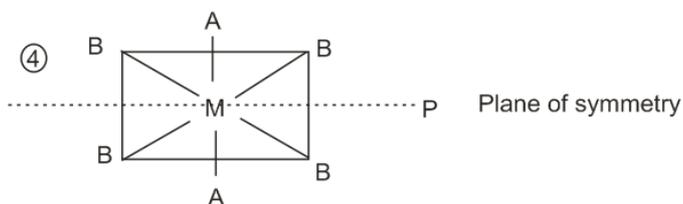
It is optically active ,
because there is no
plane of symmetry



Plane of symmetry



Plane of symmetry



Plane of symmetry

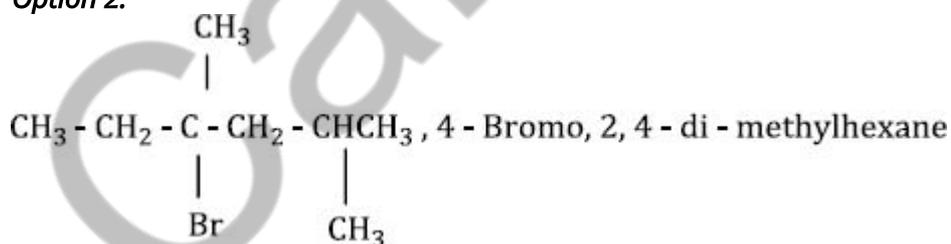
Therefore, **option (3) is correct.**

Q. 22 Which nomenclature is not according to IUPAC system?

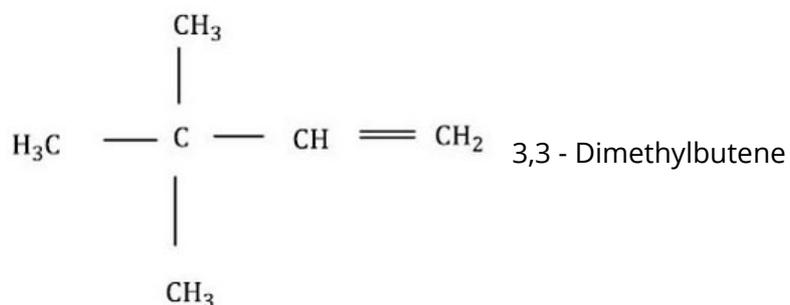
Option 1:



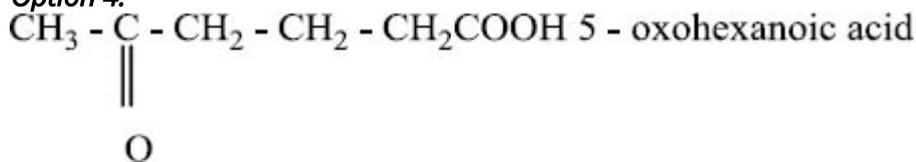
Option 2:



Option 3:



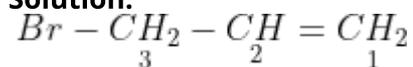
Option 4:



Correct Answer:



Solution:



IUPAC name : 3 - Bromopropene.

Therefore, **option (1) is correct.**

Q. 23 Assertion: The boiling point of a solution increases with increasing concentration of the solute.

Reasoning: The addition of a solute to a solvent increases the boiling point of the resulting solution due to the colligative property of boiling point elevation.

Option 1:

Both assertion and reasoning are true, and the reasoning is the correct explanation of the assertion.

Option 2:

Both assertion and reasoning are true, but the reasoning is not the correct explanation of the assertion.

Option 3:

Assertion is true, but reasoning is false.

Option 4:

Assertion is false, but reasoning is true.

Correct Answer:

Both assertion and reasoning are true, and the reasoning is the correct explanation of the assertion.

Solution:

The assertion is true because adding a solute to a solvent does indeed increase the boiling point of the resulting solution. This is due to the fact that the presence of solute particles in the solvent causes a decrease in the vapour pressure of the solvent, which in turn leads to an increase in the boiling point. The

reasoning is the correct explanation of the assertion because the colligative property of boiling point elevation is responsible for this phenomenon.

Q. 24 The hydrogenation of vegetable ghee at 25°C reduces the pressure of H₂ from 2atm to 1.2 atm in 50 min. Calculate the rate of reaction in terms of change of pressure per minute.

Option 1:

$$1.6 \times 10^{-2} \text{ atm min}^{-1}$$

Option 2:

$$0.8 \times 10^{-2} \text{ atm min}^{-1}$$

Option 3:

$$16 \times 10^{-2} \text{ atm min}^{-1}$$

Option 4:

$$3.2 \times 10^{-2} \text{ atm min}^{-1}$$

Correct Answer:

$$1.6 \times 10^{-2} \text{ atm min}^{-1}$$

Solution:

Pressure: For gaseous reactants rate varies with pressure just like concentration.

$$\frac{dx}{dt} \propto \text{Pressure (as } P \propto C)$$

$$\text{Rate of reaction} = \frac{\text{Change in pressure}}{\text{Time in min}}$$

$$\begin{aligned} \text{Rate of reaction} &= \frac{2 - 1.2}{50} \\ &= \frac{0.8}{50} = 1.6 \times 10^{-2} \text{ atm min}^{-1} \end{aligned}$$

Therefore, **option(1) is correct.**

Q. 25 The value of Planck's constant is $6.63 \times 10^{-34} \text{ Js}$. The speed of light is $3 \times 10^{17} \text{ nm s}^{-1}$. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of $6 \times 10^{15} \text{ s}^{-1}$?

Option 1:

75

Option 2:

10

Option 3:

25

Option 4:

50

Correct Answer:

50

Solution:

As we learned in

Speed of electromagnetic radiation -

$$c = \nu\lambda$$

where the frequency is (ν , pronounced as nu), the wavelength is (λ) and the velocity of light is (c)

$$\lambda = \frac{c}{\nu}$$

$$c = 3 \times 10^{17} \text{ nm s}^{-1}$$

$$\text{and, } \nu = 6 \times 10^{15} \text{ s}^{-1}$$

So,

$$\lambda = \frac{3 \times 10^{17} \text{ nm s}^{-1}}{6 \times 10^{15} \text{ s}^{-1}}$$

$$\lambda = 50 \text{ nm}$$

Therefore, **Option(4) is correct.**

Q. 26 Which of the following factors effect the value of the cell constant ?

- a) Nature of substance b) State of substance
c) distance between electrodes d) area of electrodes

Option 1:

a & c

Option 2:

a & b

Option 3:

b & c

Option 4:

c & d

Correct Answer:

c & d

Solution:

As we have learnt,

Cell Constant -

$$R = \rho \frac{l}{A}$$

$$G^* = \frac{l}{A} = \frac{R}{\rho} = \kappa R$$

- wherein

The quantity $\frac{l}{A}$ is called cell constant denoted by the symbol φ^* . It depends on the distance between the electrodes and their area of cross section.

Cell constant = $\frac{l}{A}$, l = distance between electrodes, A = area of electrodes

Q. 27 Which one of the following alkaline earth metal sulphates has its hydration enthalpy greater than its lattice enthalpy ?

Option 1:



Option 2:



Option 3:



Option 4:



Correct Answer:



Solution:

We know that

Solubility of sulphates of alkaline metals -

Solubility in water decreases from Be to Ba

Solubility order



Q. 28 The drug which may **not** interfere with the efficiency of oral contraceptives is?

Option 1:

Barbiturates

Option 2:

Rifampicin

Option 3:

Ampicillin

Option 4:

Amoxicillin

Correct Answer:

Amoxicillin

Solution:

Oral contraceptives also called **birth control** pills, are a safe and reliable option for preventing unwanted pregnancy.

Rifampicin, also known as rifampin, is an antibiotic used to treat several types of bacterial infections, it can lower the effectiveness of the pill.

Oral contraceptives (birth control pills) containing estrogen may not work properly if you take them while you are taking **barbiturates**.

amoxicillin won't change the effectiveness of your **birth control**

Ampicillin can make **birth control pills** less effective.

Therefore, **Option(4) is correct**.

Q. 29 The nitration of benzene with fuming HNO_3 will give

Option 1:

1,3,5-Trinitrobenzene

Option 2:

1,3-Dinitrobenzene

Option 3:

Picric acid

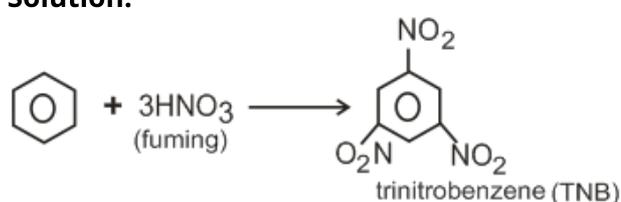
Option 4:

1,4-Dinitrobenzene

Correct Answer:

1,3,5-Trinitrobenzene

Solution:



Therefore, **option (1) is correct.**

Q. 30 The existence of two different coloured complexes with the composition of $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ is due to

Option 1:

Ionization isomerism

Option 2:

Linkage isomerism

Option 3:

Geometrical isomerism

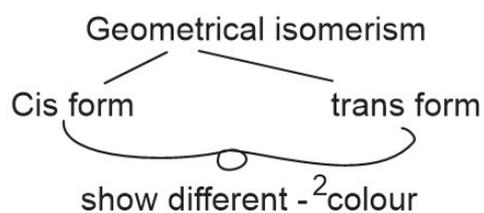
Option 4:

Coordination isomerism

Correct Answer:

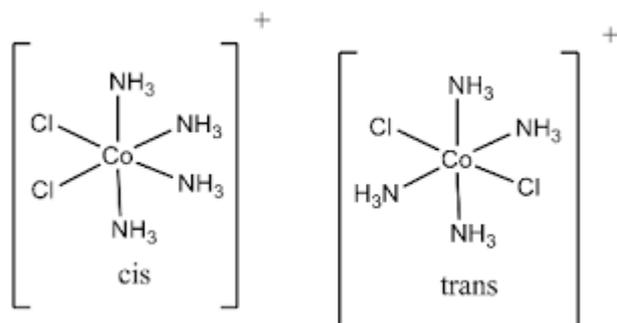
Geometrical isomerism

Solution:



$[Co(NH_3)Cl_2]^+$ shows geometrical isomerism where Cl can be kept at 90° and 180° respectively.

The two isomers thus formed have different colors.



Thus, the correct answer is option 3.

Q. 31 Which expression is not correctly represent the first order reaction?

Option 1:

$$kt = 2.303 \log \left(\frac{A_0}{A} \right)$$

Option 2:

$$A = A_0 e^{-kt}$$

Option 3:

$$kt = \ln \left(\frac{A_0}{A} \right)$$

Option 4:

$$(A)_0 - (A)_t = kt$$

Correct Answer:

$$(A)_0 - (A)_t = kt$$

Solution:

For first order Reaction

$$(A) = (A)_0 e^{-kt}$$

natural 109 Both side

$$\ln(A) = \ln(A)_0 - kt$$

$$kt = \ln \left(\frac{A_0}{A} \right) = 9 \quad 2.303 \log \left(\frac{A_0}{A} \right)$$

Q. 32 The percentage hydrogen calculation during the test for hydrogen in cyclopropane (C_3H_4) 2 moles of water is obtained Percentage hydrogen for this compound is?

Option 1:

20%

Option 2:

15%

Option 3:

25%

Option 4:

10%

Correct Answer:

10%

Solution:

As we learnt

Quantitative analysis of hydrogen -

$$\text{percentage of Hydrogen} = \frac{2 \times m_1 \times 100}{18 \times m}$$

- wherein

$m_1 = \text{Mass of Hydrogen}$

$m = \text{Mass of organic compounds}$

$$\text{percentage of Hydrogen} = \frac{2 \times 36 \times 100}{18 \times 40} = 10\%$$

Q. 33 Which of the following is true about the overlap of atomic orbitals in the formation of a covalent bond?

Option 1:

The overlap of atomic orbitals is always head-on.

Option 2:

The overlap of atomic orbitals is always sidewise.

Option 3:

The overlap of atomic orbitals can be either head-on or sidewise.

Option 4:

The overlap of atomic orbitals is not important in the formation of a covalent bond)

Correct Answer:

The overlap of atomic orbitals can be either head-on or sidewise.

Solution:

The overlap of atomic orbitals can be either head-on or sidewise, depending on the orientation of the orbitals. In a head-on overlap, the lobes of the orbitals that have the same sign (positive or negative) overlap, while in a sidewise overlap, the lobes of the orbitals that have opposite signs overlap. The type of overlap determines the strength and orientation of the covalent bond formed) The head-on overlap leads to a sigma bond, which is stronger and more directional, while the sidewise overlap leads to a pi bond, which is weaker and less directional.

Q. 34 The ion that has sp^3d^2 hybridization for the central atom is:

Option 1:

$[Cl_4]^-$

Option 2:

$[Cl_2]^-$

Option 3:

$[F_6]^-$

Option 4:

$[BrF_2]^-$

Correct Answer:

$[Cl_4]^-$

Solution:

Steric Number formula:-

$$X = \frac{1}{2} (S + V - C)$$

S = No. of the monovalent surrounding atom

V = No. of valent electron of the central atom

C = Charge on the molecule

$$\begin{aligned}
 X_{\text{ICl}_4^-} &= \frac{1}{2} (4 + 7 - (-1)) \\
 &= \frac{1}{2} (4 + 7 + 1) \\
 &= 6
 \end{aligned}$$

If steric No = 6 then hybridisation = sp^3d^2

so, ans is $[\text{ICl}_4]^-$

Q. 35 The correct relationship between free energy change in a reaction and the corresponding equilibrium constant K_c is

Option 1:

$$\Delta G = RT \ln K_c$$

Option 2:

$$-\Delta G = RT \ln K_c$$

Option 3:

$$\Delta G^\circ = RT \ln K_c$$

Option 4:

$$-\Delta G^\circ = RT \ln K_c$$

Correct Answer:

$$-\Delta G^\circ = RT \ln K_c$$

Solution:

$$\Delta G = \Delta G^\circ + 2.303 RT \log K_c$$

As we learnt in

At equilibrium, $\Delta G = 0$

$$\Delta G^\circ = -2.303 RT \log K_c$$

$$\Delta G^\circ = -RT \ln K_c$$

Q. 36 How many litres of water must be added to 1 litre of aqueous solution of HCl with a pH of 1 to create an aqueous solution with pH of 2 ?

Option 1:

9.0 L

Option 2:

0.1 L

Option 3:

0.9 L

Option 4:

2.0 L

Correct Answer:

9.0 L

Solution:

As we discussed in the concept

pH of Solutions: Strong Acids -

pH is also referred to as potential or power of hydrogen. Mathematically, it can be represented as follows:

$$\text{pH} = -\log_{10}[\text{H}_3\text{O}^+]$$

If solution is neutral, then:

$$K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$$

From the ionic product of water, we know:

$$K_w = 10^{-14}$$

$[\text{H}_3\text{O}^+] = [\text{OH}^-] = x$ (since solution is neutral)

$$\text{Thus, } 10^{-14} = K_w = x^2$$

$$x = 10^{-7}$$

Now, $[\text{H}_3\text{O}^+] = 10^{-7}$

$$\text{Thus, pH} = -\log_{10}(\text{H}_3\text{O}^+) = -\log_{10}(10^{-7}) = 7$$

For Acidic solutions:

For acidic solutions, we must have $[\text{H}_3\text{O}^+] > [\text{OH}^-]$

$$[\text{H}_3\text{O}^+] < [\text{OH}^-]$$

$$\text{Thus, } [\text{H}_3\text{O}^+] > 10^{-7}$$

Thus, $[\text{H}_3\text{O}^+]$ for acids can be 10^{-6} , 10^{-5} , 10^{-4} , etc.
 10^{-9} , 10^{-10} , etc.

Thus, pH of acids can be 6, 5, 4, etc.
etc.

Hence, pH of acidic solutions is less than 7
greater than 7

For Basic solutions:

For basic solutions, we must have

$$\text{Thus, } [\text{H}_3\text{O}^+] < 10^{-7}$$

Thus, $[\text{H}_3\text{O}^+]$ for basics can be 10^{-8} ,

Thus, pH of basics can be 8, 9, 10, 11,

Hence, pH of basic solutions is

pH depends upon temperature

We know from ionic product of water that at 63°C , the value of $K_w = 10^{-13}$.

For neutral solution we know:

$$[\text{H}_3\text{O}^+] = [\text{OH}^-]$$

$$\Rightarrow K_w = x^2$$

$$\Rightarrow x = \sqrt{10^{-13}} = 10^{-6.5}$$

$$\Rightarrow [\text{H}_3\text{O}^+] = 10^{-6.5}$$

$$\Rightarrow \text{pH} = -\log_{10}(10^{-6.5}) = 6.5$$

Hence, pH depends upon temperature

pH of Strong Acids

Strong acids are those acids which dissociate completely in solutions. For example:

- $2 \times 10^{-3} \text{ M HNO}_3$

Since HNO_3 is a strong acid, thus it will dissociate completely into H^+ and NO_3^- ions as follows:



$$\text{Thus, } [\text{H}^+] = 2 \times 10^{-3} \text{ M} \quad (\text{given})$$

$$\Rightarrow \text{pH} = -\log_{10}(2 \times 10^{-3})$$

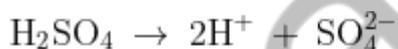
$$\Rightarrow \text{pH} = -\log_{10}(2) - \log_{10}(10^{-3})$$

$$\Rightarrow \text{pH} = -0.30 + 3 = 2.7$$

Thus, pH of HNO_3 is 2.7

- $10^{-4} \text{ M H}_2\text{SO}_4$

Since H_2SO_4 is a strong acid, thus it will dissociate completely into H^+ and SO_4^{2-} ions as follows:



$$\text{Thus, } [\text{H}^+] = 2 \times 10^{-4} \text{ M} \quad (\text{given})$$

$$\Rightarrow \text{pH} = -\log_{10}(2 \times 10^{-4})$$

$$\Rightarrow \text{pH} = -\log_{10}(2) - \log_{10}(10^{-4})$$

$$\Rightarrow \text{pH} = -0.30 + 4 = 3.7$$

Thus, pH of H_2SO_4 is 3.7

NOTE: If molarity(N) of solution is not given but normality(N) is given, then molarity can be calculated using the following formula:

$$N = M \times n$$

where, n is the number of moles

$$\text{Initial PH} = 2 = 1 \log [H^+]_2$$

$$[H^+]_1 \times 1 = [H^+]_2 \times V$$

$$10^{-1} \times 1 = 10^{-2} \times V$$

$$V = 10L$$

$$\text{Added water} = 10 - 1 = 9L$$

Q. 37 Transition metals easily dissolve in mineral acids because

Option 1:
Small size

Option 2:
Unfilled d-orbitals.

Option 3:
High positive charge

Option 4:
Low lattice energy

Correct Answer:
Unfilled d-orbitals.

Solution:

Due to unfilled d-orbitals they have electrons that can be donated and behave as bases. So, they are soluble in mineral acids to form salts.

Hence option 2 is correct.

Q. 38 The enthalpy of neutralisation of which of the following acids and base is nearly -13.7 Kcal

Option 1:
HCN and NaOH

Option 2:

HCN and NH_4OH

Option 3:

HCl and NaOH

Option 4:

HCl and NH_4OH

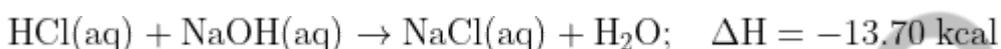
Correct Answer:

HCl and NaOH

Solution:

Enthalpy of Neutralisation -

Amount of Enthalpy change during Neutralisation of one gm equivalent acid & one gm equivalent base.

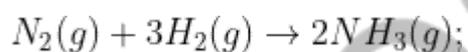


The heat of neutralisation of strong acid and strong base is equal to -13.7 kcal

HCl is a strong acid and NaOH is a strong base

Hence, **the correct answer is Option (3)**

Q. 39 For a reaction,



In which of the following reaction mixtures, H_2 is limiting reagent?

Option 1:

56 g of N_2 + 10 g of H_2

Option 2:

35 g of N_2 + 8 g of H_2

Option 3:

28 g of N_2 + 6 g of H_2

Option 4:

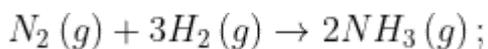
14 g of N_2 + 4 g of H_2

Correct Answer:

56 g of N_2 + 10 g of H_2

Solution:

For :-



Identifying H_2 as a limiting reagent

(1) 56 g of N_2 + 10 g of H_2

$$\frac{56}{28} = 2 \text{ mole} \quad \frac{10}{2} = 5 \text{ mole}$$

Thus, in this case, 2 moles of N_2 will react with 6 moles of H_2 , but only 5 moles of H_2 are available. Hence dihydrogen is the limiting reagent.

(2) 35 g of N_2 + 8 g of H_2

$$\frac{35}{28} = 1.25 \text{ mole} \quad \frac{8}{2} = 4 \text{ mole}$$

(LR)

(3) 28 g of N_2 + 6 g of H_2 :- Reaction gets completed here

$$\frac{28}{28} = 1 \text{ mole} \quad \frac{6}{2} = 3 \text{ mole}$$

(4) 14 g of N_2 + 4 g of H_2

$$\frac{14}{28} = 0.5 \text{ mole} \quad \frac{4}{2} = 2 \text{ mole}$$

(LR)

Therefore, **Option(1) is correct**

Q. 40 The name of two allotropes of polonium are

Option 1:
 α and β

Option 2:
 α and δ

Option 3:
 β and δ

Option 4:
 δ and γ

Correct Answer:
 α and β

Solution:

As we learnt

Allotropes of polonium -

α and β (both metallic)

-

Po has 2 allotropes

α → simple cubic crystal structure

β → Rhombohedral

Q. 41 A device that converts energy of combustion of fuels like hydrogen and methane, directly into electrical energy is known as:

Option 1:
Dynamo

Option 2:
Ni-Cd cell

Option 3:
Fuel Cell

Option 4:
Electrolytic Cell

Correct Answer:
Fuel Cell

Solution:

Fuel cells convert the chemical energy of fuel like H_2 , CH_4 into electrical energy.

Option 3 is correct.

Q. 42 The K_{sp} of Ag_2CrO_4 , $AgCl$, $AgBr$ and AgI , are respectively, 1.1×10^{-12} , 1.8×10^{-10} , 5.0×10^{-13} , 8.3×10^{-17} . Which one of the following salts will precipitate last if $AgNO_3$ solution is added to the solution containing equal moles of $NaCl$, $NaBr$, NaI and Na_2CrO_4 ?

Option 1:

$AgBr$

Option 2:

Ag_2CrO_4

Option 3:

AgI

Option 4:

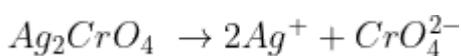
$AgCl$

Correct Answer:

Ag_2CrO_4

Solution:

Let us calculate the solubility of each salt



1 0 0

1-s 2s s

$$K_{sp} = \frac{(2s)^2 s}{1-s}, \quad s \ll 1$$

$$\Rightarrow 1.1 \times 10^{-12} = 4s^3$$

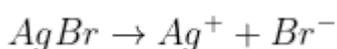
$$\Rightarrow s = 6.5 \times 10^{-5}$$



s s

$$1.8 \times 10^{-10} = s^2$$

$$\Rightarrow s = 1.34 \times 10^{-5}$$



s s

$$K_{sp} = s^2 = 5 \times 10^{-13}$$

$$s = 7.1 \times 10^{-7}$$



s s

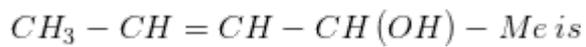
$$K_{sp} = s^2 = 8.3 \times 10^{-17}$$

$$s = 9 \times 10^{-9}$$

Since the solubility of Ag_2CrO_4 is the maximum hence, it will precipitate last.

The correct answer is option 2.

Q. 43 The number of stereoisomers possible for a compound of the molecular formula



Option 1:

3

Option 2:

2

Option 3:

4

Option 4:

6

Correct Answer:

4

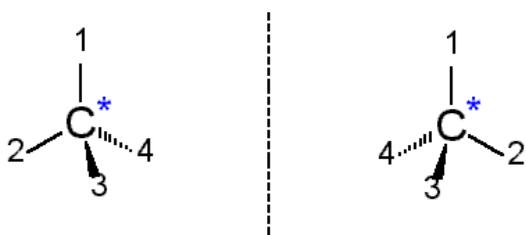
Solution:

As we learned

Chiral Carbon -

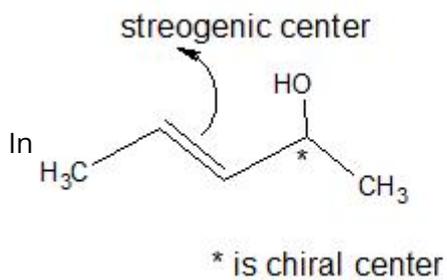
Those carbon on which four different groups are present.

- wherein



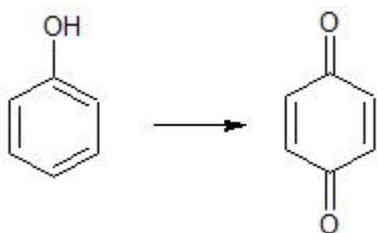
mirror
plane

* = chiral carbon atom



Total number of isomers (stereo) = $2^2 = 4$

Q. 44 Following conversion can be carryout using the reagent :



Option 1:

NaOH

Option 2:

NaOH/CaO, Δ

Option 3:

$K_2Cr_2O_7, H^+$

Option 4:

H_2/Pd

Correct Answer:

$K_2Cr_2O_7, H^+$

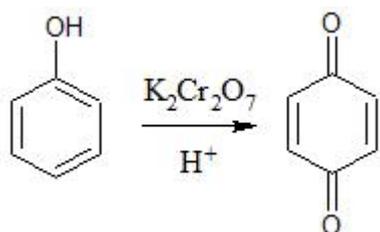
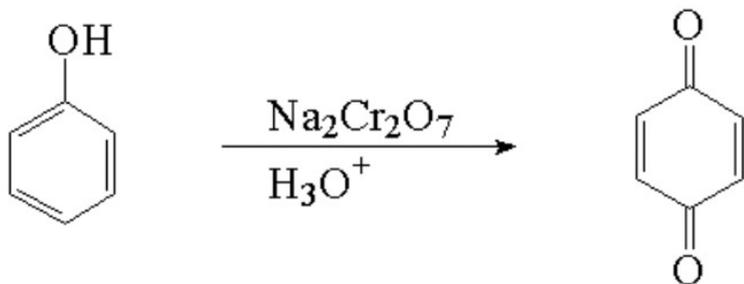
Solution:

As we learned

Oxidation of Phenol -

Product form is conjugated diketone known as benzoquinone.

- wherein



Hence, the option number (3) is correct.

Q. 45 Which has trigonal bipyramidal shape?

Option 1:
 XeOF_4

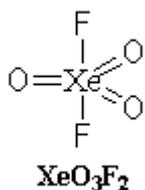
Option 2:
 XeO_3

Option 3:
 XeO_3F_2

Option 4:
 XeF_6

Correct Answer:
 XeO_3F_2

Solution:



Only one compound has a trigonal bipyramidal shape.

Biology

Q. 1 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. 2 During which phase(s) of cell cycle , amount of DNA in a cell remain at 4C level if the initial amount is denoted as 2C ?

Option 1:

G₀ and G₁

Option 2:

G₁ and S

Option 3:

only G₂

Option 4:

G₂ and M

Correct Answer:

only G₂

Solution:

As we have learned

Phases of Interphase: G₂ phase (Gap₂) -

Proteins are synthesised in preparation for mitosis while cell growth continues

-

G₁ is followed by S phase where DNA replication occurs and DNA doubles (2C → 4C). In G₂ DNA remains same. In M phase, division occurs and DNA content becomes either 2C (mitosis) or 1C (meiosis)

Q. 3 In mycorrhiza, the fungus may form colonies

Option 1:

Extracellularly

Option 2:

Intracellularly

Option 3:

Both 1 and 2

Option 4:

Depends on condition

Correct Answer:

Both 1 and 2

Solution:

Mycorrhiza -

Symbiotic association of a fungus with roots of higher plant.

- wherein

Divided into two groups.

1. Ectomycorrhiza.
2. Endomycorrhiza.

The association of fungus with roots of higher plants may be extracellularly or intracellularly

Q. 4 Which one of the following statements related to components/features of senescence in plants is incorrect?

Option 1:

Programmed cell death in plants may generate functional cells or tissues.

Option 2:

Senescence can be induced by application of cytokinins and delayed by overexpression of salicylic acid.

Option 3:

Plants defective in autophagy demonstrate accelerated plant senescence

Option 4:

Leaf senescence is regulated by NAC and WRKY gene families.

Correct Answer:

Plants defective in autophagy demonstrate accelerated plant senescence

Solution:

Autophagy is a cellular process involved in recycling and degradation of cellular components to maintain cellular homeostasis. It is known to play a crucial role in regulating senescence by removing damaged or unwanted cellular components. Therefore, plants defective in autophagy would typically show impaired or delayed senescence rather than accelerated senescence.

The correct statement is that plants defective in autophagy demonstrate impaired or delayed plant senescence. Hence, the correct answer is option 3.

Q. 5 Death leads to an increase in entropy by

Option 1:

Stopping heat production

Option 2:

Stoppage of mechanical work

Option 3:

Drastic change in chemical reactions

Option 4:

All of these

Correct Answer:

All of these

Solution:

Death -

Stoppage of various life activities and increase in entropy.

- wherein

Occurs due to aging, disease, accident or predation.

All of these are responsible for increase in entropy after death

Q. 6 Which of these glands is large at the time of birth but in adults, it reduces to a very small size?

Option 1:

Thyroid

Option 2:

Adrenal

Option 3:

Thymus

Option 4:

Spleen

Correct Answer:

Thymus

Solution:

As we have learned

Role of thymosins -

In addition, thymosins also promote production of antibodies to provide humoral immunity.

- wherein

Thymus is degenerated in old individuals resulting in a decreased production of thymosins. As a result, the immune responses of old persons become weak.

Q. 7 **Assertion:** Cyanide causes death in animals by blocking cytochrome oxidase, a mitochondrial enzyme required for cellular respiration.

Reason: This is an illustration of non-competitive inhibition.

Option 1:

Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.

Option 2:

Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.

Option 3:

Assertion is True but the Reason is False.

Option 4:

Both Assertion & Reason are false.

Correct Answer:

Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.

Solution:

The Assertion is true, as cyanide does cause death in animals by blocking cytochrome oxidase, an essential mitochondrial enzyme necessary for cellular respiration.

However, the Reason is not a correct explanation of the Assertion. The inhibition of cytochrome oxidase by cyanide is actually an example of non-competitive inhibition, not competitive inhibition as stated in the Reason. In non-competitive inhibition, the inhibitor binds to a site on the enzyme other than the active site, altering the enzyme's structure and function.

Therefore, while both the Assertion and Reason are true, the Reason does not provide an accurate explanation for the Assertion.

Hence, the correct answer is option 2.

Q. 8 Branchial respiration is respiration through_____.

Option 1:

lungs

Option 2:

gills

Option 3:
skin

Option 4:
trachea

Correct Answer:
gills

Solution:

Aquatic arthropods and molluscs respire through specialized structures through gills and this is Branchial respiration

Q. 9 Select the mismatch

Option 1:
Phloem transport – translocation

Option 2:
Transpiration – wind speed

Option 3:
Phloem sugar – glucose

Option 4:
Phloem transport – active transport

Correct Answer:
Phloem sugar – glucose

Solution:

Phloem transport -

Bi - directional, direction of movement of food can be upwards or downwards.

-

Phloem sugar is sucrose

Q. 10 Which of the following is correctly matched?

Option 1:

Agnatha - Jawless vertebrates

Option 2:

Gnathostomata - Vertebrates with jaw

Option 3:

. Both of these

Option 4:

None of these

Correct Answer:

. Both of these

Solution:

Phylum Vertebrata - Characteristics Features -

Phylum Vertebrata - Characteristics Features:

- They are also called higher chordates.
- The notochord is present only during the embryonic stage. It is replaced by the vertebral column or spine.
- They possess a well developed central nervous system with a brain and spinal cord.
- They possess a well-differentiated head. The brain is surrounded by cranium or skull.
- They have a closed circulatory system with two, three, or four chambered heart.
- They have well developed respiratory, digestive, muscular and endocrine system.
- The phylum Vertebrata is divided into two divisions as follows:
 - Agnatha : They lack true jaws and paired appendages. They have only one important class — Cyclostomata
 - Gnathostomata : They possess true jaws and paired appendages. They have two important superclasses — Pisces and Tetrapoda

-

Agnatha : They lack true jaws and paired appendages. They have only one important class

- Cyclostomata

Gnathostomata : They possess true jaws and paired appendages. They have two important superclasses

- Pisces and Tetrapoda

Q. 11 Sensory neurons carry

Option 1:

Message from brain to organs

Option 2:

Message from spinal cord to organs

Option 3:

Message from organs to CNS

Option 4:

All of these

Correct Answer:

Message from organs to CNS

Solution:

On the basis of function:

- Sensory neuron- These carry sensory impulses from sense organs to the central nervous system.
- Motor neurons- These carry motor impulses from the central nervous system to the effectors.
- Interneurons- These are neither sensory nor motor. They are responsible for connecting the two neurons and allow distant transmission of impulses. These are also called relay neurons.

Sensory neuron- These carry sensory impulses from sense organs to the central nervous system.

Q. 12 Proboscis gland in Balanoglossus is associated with

Option 1:

Digestion

Option 2:

Respiration

Option 3:

Excretion

Option 4:

Reproduction

Correct Answer:

Excretion

Solution:

As we have learned

Excretion in hemichordata -

Through proboscis gland.

-

Balanoglossus belongs to phylum hemichordata

Q. 13 Pacemaker of the heart is situated

Option 1:

In the wall of left atrium close to opening to pulmonary veins

Option 2:

In the wall of right atrium close to superior vena cava

Option 3:

On interauricular septum

Option 4:

On the interventricular septum

Correct Answer:

In the wall of right atrium close to superior vena cava

Solution:

Conducting system of the human heart

- In human heart, small groups of specialised neuromuscular cells are present within the myocardium.
- These neuromuscular cells initiate and conduct nerve impulses due to which a coordinated and synchronised contraction of the heart muscles is seen
- The components of conducting system of human heart includes sinoatrial node or SA node, Atrioventricular node or AV node, Bundle of His and Purkinje fibres

wherein,

Sinoatrial node or SA node

- It includes a mass of specialised self excitatory cells present in the wall of the right atrium near the opening of superior vena cava.
- SA node is also called as the pacemaker of the heart because of its involvement in the initiation of heartbeat impulses
- SA node initiates impulses more rapidly than any other neuromuscular cells of heart.

Hence, the correct answer is option b.

Q. 14 Which of the following do not have a respiratory system?

Option 1:

Hydra

Option 2:

Spongilla

Option 3:

Both A and B

Option 4:

None of the above

Correct Answer:

Both A and B

Solution:

Physiology of Cnidaria -

▸ **Respiration in Cnidaria:**

- The respiratory system is absent.
- The exchange of gases is facilitated through simple diffusion between cells and water.

-

Respiratory system is absent in both porifera and coelenterata.

Q. 15 Among bitter gourd, mustard, brinjal, pumpkin, china rose, lupin, cucumber, sunhemp, gram, guava, bean, chilli, plum, petunia, tomato, rose, withania, potato, onion, aloe and tulip, how many plants have hypogynous flowers?

Option 1:

Six

Option 2:

Ten

Option 3:

Fifteen

Option 4:

Eleven

Correct Answer:

Fifteen

Solution:

Mustard, brinjal, china rose, lupin, sunn hemp, gram, bean, chilli, Petunia, potato, tomato, Withania, onion, Aloe, and tulip have hypogynous flower while pumpkin, bittergourd, cucumber, and guava have epigynous flower and rose and plum have perigynous flower. So, the correct option is '**Fifteen**'.

Q. 16 Bilateral symmetry in the animal kingdom is best correlated with

Option 1:

An ability to sense equally in all directions

Option 2:

Symbiotic relationship

Option 3:

Ventral and dorsal differentiation

Option 4:

Motility and active predation

Correct Answer:

Ventral and dorsal differentiation

Solution:

Bilateral symmetrical: Such animals can be divided into two equal halves along any one plane, that is, either transversely or longitudinally. For example, annelids, arthropods, and vertebrates.

Wherein,

They show anterior-posterior and dorsal-ventral differentiation.

Q. 17 Assertion (A) : While centriole is missing from all higher plant cells, the centriole is present in certain lower plant cells.

Reason (R) : Since they have spindle fibre outside of the nuclear membrane.

Option 1:

Both A and R are true and R is the correct explanation of A.

Option 2:

Both A and R are true but R is not the correct explanation of A.

Option 3:

A is true but R is false.

Option 4:

A is false but R is true.

Correct Answer:

Both A and R are true and R is the correct explanation of A.

Solution:

While it is missing from all higher plant cells, the centriole is present in certain lower plant cells. Plant cells do not require centrioles during cell division since they have spindle fiber outside of the nuclear membrane. The protein filaments that make up the spindle are biological structures. When cell division begins, these microtubule-containing filaments join the chromosomes directly to arrange them in the cell

center. The filaments then contract, separating the chromosomes. **Hence, option 1 is the correct answer** which states that both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Q. 18 Read the given statements.

- 1) Outer exine is made up of sporopollenin
- 2) Inner intine is pectocellulosic in nature
- 3) Generative cell is bigger and contains abundant food reserve
- 4) Vegetative cell is small and floats in the cytoplasm of the generative cell

Which of the given statements are not true regarding structure of pollen grain

Option 1:

1 and 2

Option 2:

2 and 3

Option 3:

3 and 4

Option 4:

1 and 4

Correct Answer:

3 and 4

Solution:

As we have learned

Structure of pollen grains (intine) -

The inner wall of the pollen grains is called as intine. It is a thin and continuous layer made up of cellulose and pectin. Outer layer contains sporopollenin.

Vegetative cell is bigger, has abundant food reserve and a large irregularly shaped nucleus.

The generative cell is small and floats in the cytoplasm of the vegetative cell.

Q. 19 Name the stage in meiosis when there are two cells , each with sister chromatids aligned at the equator of the spindle

Option 1:
Prophase

Option 2:
Metaphase 2

Option 3:
Metaphase 1

Option 4:
Anaphase 2

Correct Answer:
Metaphase 2

Solution:

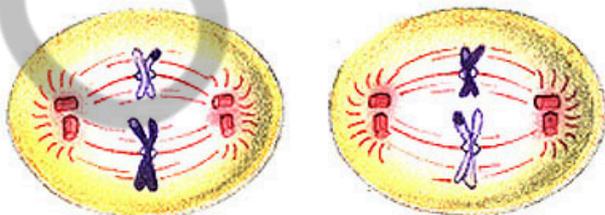
As we have learned

Metaphase II -

Second phase of Meiosis II. Chromosomes align at equator and the micotubules from opposite poles of spindle get attached to kinetochores of sister chromatids.

- wherein

Meiosis II



Metaphase II

Hence the correct option is b.

Q. 20 The face of the Golgi apparatus that receives vesicles from the ER is called ___face and one which gives off vesicles for the destination is called ___face.

Option 1:

Trans; cis

Option 2:

Cis; beta

Option 3:

Cis; trans

Option 4:

Cis; alpha

Correct Answer:

Cis; trans

Solution:

Components of the Endomembrane System: The Golgi Apparatus

- It is a stack of membranous bodies called cisternae. It was discovered by Camillo Golgi, an Italian physicist, in 1897.
- These are present in both plant cells and animal cells. In-plant cells, they occur as unconnected units called dictyosomes.
- Like the endoplasmic reticulum, they are also made up of tubules and vesicles apart from cisternae.
- The face of the Golgi apparatus that receives vesicles from the ER is called a cis face.
- The opposite of cis face is the trans face which gives off vesicles for the destination.
- The Golgi apparatus is primarily involved in the processing of proteins generated in the endoplasmic reticulum.
- It is also responsible for their transport to the different parts of the cell.
- The Golgi apparatus functions as a platform for the process of addition of sulfate groups into protein molecules, glycosylation and phosphorylation.

The face of the Golgi apparatus that receives vesicles from the ER is called a cis face. The opposite of cis face is the trans face which gives off vesicles for the destination.

Q. 21 The outermost sheath around a bone which is thick and tough by nature is

Option 1:
Endosteum

Option 2:
Ectosteum

Option 3:
Periosteum

Option 4:
Mesosteum

Correct Answer:
Periosteum

Solution:
Periosteum:

- It is the sheath around a bone which is thick and tough by nature.
- It contains osteoblasts which are the bone-forming cells and blood vessels.
- Periosteum possesses collagen fibres which penetrate the matrix and thus a connection is established between periosteum and matrix.

-

Periosteum is the sheath around a bone which is thick and tough by nature.

Q. 22 Which is not correct for sponges?

Option 1:

Internal fertilization

Option 2:

Gemmule formation

Option 3:

External fertilization

Option 4:

Gametes are formed from epidermal cells

Correct Answer:

External fertilization

Solution:

Reproduction and Development in Porifera -

Sponges reproduce both asexually and sexually. The asexual reproduction occurs through the following:

- Buds
- Gemmules
- fragmentation
- Sponges are hermaphroditic.
- Ovum and sperm are formed within the same individual.
- Development involves free-swimming larval stage, hence the development is indirect.
- Parenchymula larva is seen in Leucosolenia and Clathrina while Amphiblastula is seen in Sycon.

-

Fertilization occurs internally in the sponges.

Q. 23 Which of the following statements are correct ?

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

Choose the correct answer from the options given below:

Option 1:

D and E only

Option 2:

C and E only

Option 3:

B and C only

Option 4:

A and B only

Correct Answer:

B and C only

Solution:

Statement B is correct. Basophils secrete histamine, serotonin, and heparin. These substances are involved in inflammatory and immune responses.

Statement C is correct. Basophils are involved in the inflammatory response. They release histamine and other chemicals that cause blood vessels to dilate and increase blood flow to the site of inflammation.

For incorrect options,

Statement A is incorrect. Basophils are not the most abundant cells of the total white blood cells (WBCs). Neutrophils are the most abundant WBCs.

Statement D is incorrect. Basophils have a lobed or segmented nucleus, not a kidney-shaped nucleus.

Therefore, the correct statements are B and C.

Q. 24 If fatty acids were to be respired they would first be degraded to acetyl CoA and enter the pathway. This process of degradation of fatty acids into acetyl Co-A is called

Option 1:

Beta-oxidation of fatty acids

Option 2:

Gluconeogenesis

Option 3:

Alpha-oxidation of fats

Option 4:

Both a and c

Correct Answer:

Beta-oxidation of fatty acids

Solution:

Amphibolic Pathway -

- Glucose is the favoured substrate for respiration. All carbohydrates are usually first converted into glucose before they are used for respiration.
- Other substrates can also be respired, but then they do not enter the respiratory pathway at the first step.
- Fats would need to be broken down into glycerol and fatty acids first. If fatty acids were to be respired they would first be degraded to acetyl CoA and enter the pathway. This is called beta-oxidation of fats.
- Glycerol would enter the pathway after being converted to PGAL.
- The proteins would be degraded by proteases and the individual amino acids (after deamination) depending on their structure would enter the pathway at some stage within the Krebs' cycle or even as pyruvate or acetyl CoA.
- Since respiration involves the breakdown of substrates, the respiratory process has traditionally been considered a catabolic process and the respiratory pathway as a catabolic pathway.
- But the intermediates of the Krebs' cycle are used for anabolic processes.

Q. 25 Which of the following germ layers give rise to epithelia?

Option 1:

Ectoderm

Option 2:

Endoderm

Option 3:

Mesoderm

Option 4:

All of these

Correct Answer:

All of these

Solution:

Epithelium refers to the tissue composed of one or more layers of cells covering the external and internal surfaces of various body parts.

- **Origin:** The origin of epithelial tissue is from all the three germ layers i.e. ectoderm, mesoderm, and endoderm.

The origin of epithelial tissue from all three germ layers i.e. ectoderm, mesoderm and endoderm.

Q. 26 Which is fresh water Coelenterata?

Option 1:

Hydra

Option 2:

Euspongilla

Option 3:

Spongilla

Option 4:

Aurelia

Correct Answer:

Hydra

Solution:

The Hydra is a well-known freshwater coelenterate.

Q. 27 Animals that excrete nitrogenous wastes as uric acid in the form of a pellet or paste with a minimum loss of water are

Option 1:

Mammals, many terrestrial amphibians and marine fishes

Option 2:

bony fishes, aquatic amphibians and aquatic insects

Option 3:

Reptiles, mammals and fishes

Option 4:

Reptiles, birds, land snails and insects

Correct Answer:

Reptiles, birds, land snails and insects

Solution:

Types of Animals Based on Excretory Wastes -

Uricotelism:

- Reptiles, birds, land snails and insects excrete nitrogenous wastes as uric acid in the form of a pellet or paste with a minimum loss of water and are called uricotelic animals.

-

Reptiles, birds, land snails and insects excrete nitrogenous wastes as uric acid in the form of a pellet or paste with a minimum loss of water and are called uricotelic animals. Hence, the correct option is d. Reptiles, birds, land snails and insects

Q. 28 Elimination of ammonia as the body waste in Cnidaria takes place by

Option 1:

Nephridium

Option 2:

Protonephridium

Option 3:

Gills

Option 4:

Body surface

Correct Answer:

Body surface

Solution:

Physiology of Cnidaria -

Excretion in Cnidaria:

- The excretory system is absent.
- The nitrogenous waste, which is mainly composed of ammonia, is removed through the process of diffusion between the cells and water.

-

The excretory system is absent in cnidaria. The nitrogenous waste, which is mainly composed of ammonia, is removed through the process of diffusion between the cells and water.

Q. 29 Complete the following sentence with the most appropriate option.

Global analysis of a large number of plant species traits showed that with increase in leaf lifespan,

Option 1:

Specific leaf area increases whereas leaf nitrogen and net photosynthesis rate decrease.

Option 2:

Specific leaf area, leaf nitrogen and net photosynthesis rate increase.

Option 3:

Specific leaf area, leaf nitrogen and net photosynthesis rate decrease.

Option 4:

Specific leaf area decreases whereas leaf nitrogen and net photosynthesis rate increase.

Correct Answer:

Specific leaf area, leaf nitrogen and net photosynthesis rate decrease.

Solution:

Global analysis of a large number of plant species traits has shown that as leaf lifespan increases, there is a trend of decreasing specific leaf area, leaf nitrogen content, and net photosynthesis rate.

Specific leaf area refers to the leaf area per unit leaf dry mass. As leaf lifespan increases, leaves tend to become thicker and denser, resulting in a decrease in specific leaf area.

Leaf nitrogen content is an important indicator of the nutritional status of leaves. In many cases, as leaf lifespan increases, the nitrogen content of leaves tends to decrease. This is because older leaves may reabsorb and remobilize nitrogen before senescence, resulting in lower leaf nitrogen levels.

Net photosynthesis rate is the rate at which plants capture and convert carbon dioxide into organic compounds through photosynthesis. As leaf lifespan increases, the net photosynthesis rate typically decreases. This is because older leaves may have a reduced capacity for photosynthesis due to aging, structural changes, and lower chlorophyll content.

Therefore, option c correctly states that with an increase in leaf lifespan, specific leaf area, leaf nitrogen, and net photosynthesis rate decrease. Hence, the correct answer is option 3.

Q. 30 Eosinophils stain with _____ dyes while basophils stain with _____ dyes.

Option 1:

Acid , acid

Option 2:

Acidic , basic

Option 3:

Basic , acid

Option 4:

Basic, basic

Correct Answer:

Acidic , basic

Solution:

As we learned

Reaction of WBCs with dyes -

Eosinophils stain with acidic dyes while basophils stain with basic dyes.

Q. 31 Match the following column and select the correct option

	Column-1		Column -2
(a)	Floating Ribs	(i)	Located between Second and seventh Ribs
(b)	Acromion	(ii)	Head of the humerus
(c)	Scapula	(iii)	Clavicle
(d)	Glenoid cavity	(iv)	Do not connect with the sternum

Option 1:

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

Option 2:

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

Option 3:

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

Option 4:

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

Correct Answer:

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

Solution:

Option number 4 contains the correct match.

Q. 32 Pick the option having unrelated compounds.

Option 1:

Glucose, fructose, galactose

Option 2:

Glucose, mannose, fructose

Option 3:

Cellulose, glucose, mannose

Option 4:

Cellulose, glycogen, starch

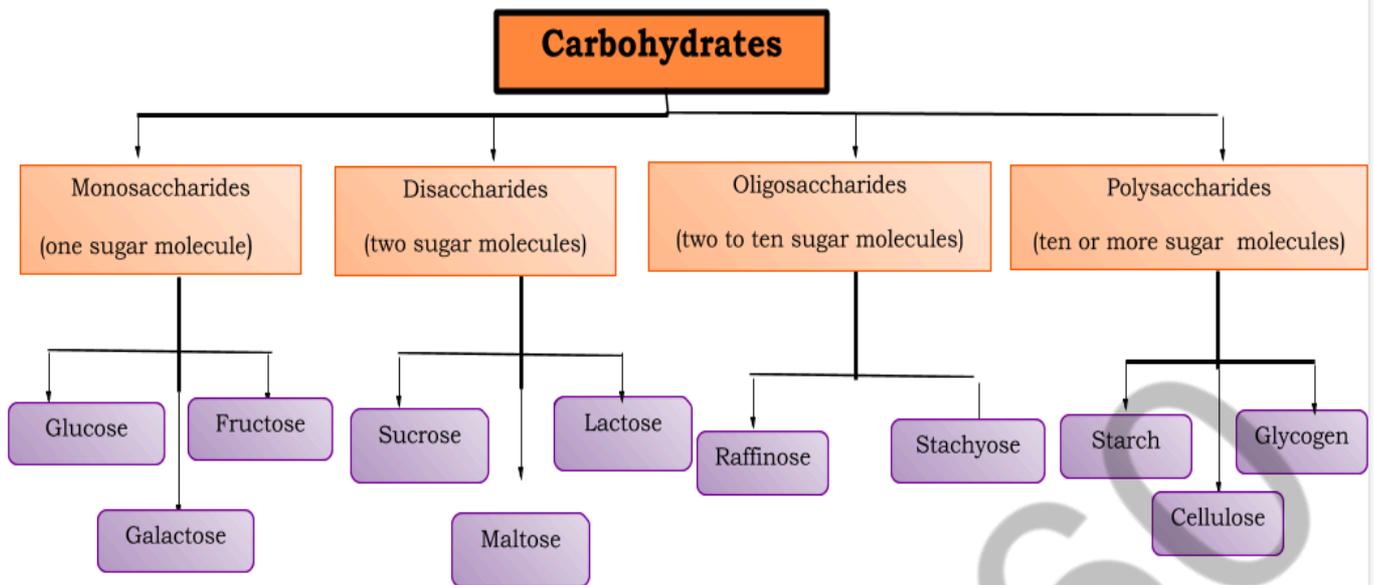
Correct Answer:

Cellulose, glucose, mannose

Solution:

Carbohydrates -

Carbohydrates are classified as follows:



Cellulose is a polysaccharide. Glucose is a monosaccharide and mannose is an oligosaccharide.

Q. 33 Which of the following is/are not correctly matched pairs?

- (i) Ball and socket joint - Between humerus and pectoral girdle
- (ii) Pivot joint - Between carpal and metacarpal
- (iii) Saddle joint - Between atlas and axis
- (iv) Gliding joint - Between the carpals
- (v) Fibrous joint - In flat skull bones

Option 1:
(ii) and (iii)

Option 2:
(i) and (iv)

Option 3:
(v) only

Option 4:
(ii) only

Correct Answer:

(ii) and (iii)

Solution:

As we learn

example of synovial joints -

Ball and socket joint.

- wherein

Joint between humerus and pectoral girdle.

Correct option is 1

Q. 34 Which one of the following is a correct statement?

Option 1:

Pteridophyte gametophyte has a protonemal and leafy stage

Option 2:

in gymnosperms female gametophyte is free-living

Option 3:

Antheridiophores and archegoniophores are present in pteridophytes

Option 4:

origin of seed habit can be traced in pteridophytes

Correct Answer:

origin of seed habit can be traced in pteridophytes

Solution:

Prothallus is the gametophytic stage of pteridophyte which is green, small, thalloid, and free living.

Protonemal and leafy stages are features of moss gametophytes. the male antheridium and archegonium are characteristics of bryophytes.

The origin of seed habit starts from pteridophytes. Hence option (4) is correct.

Q. 35 Identify the polysaccharide with α -1,4 glycosidic bonds.

Option 1:

Glycogen

Option 2:

Amylopectin

Option 3:

Both a and b

Option 4:

None of these

Correct Answer:

Both a and b

Solution:

Polysaccharides

- Polysaccharides are made up of ten or more than ten monosaccharides.
- These are the polymers of monosaccharides.
- These are also called glycans.
- Homopolysaccharides contain only a single type of monomeric unit.
- Heteropolysaccharides contain two or more different kinds of monomeric units

Starch:

- Starch is the stored form of sugar in plants.
- Starch is made up of amylose and amylopectin.
- Amylose is an unbranched polysaccharide that consists of glucose monomers connected via α -1,4 glycosidic bond.
- Amylopectin is a branched polysaccharide that consists of glucose monomers linked via α -1,4 glycosidic bond and branches via α -1,6 glycosidic bond.

Glycogen:

- It is a homopolymer consisting of glucose monomers linked via α -1,4 glycosidic bond and branches via α -1,6 glycosidic bond at every ten or so units.
- It is a branched polysaccharide.
- It is the stored form of food in animals and fungi.

Both amylopectin and glycogen have α -1,4 glycosidic bonds.

Q. 36 Binomial nomenclature means

Option 1:

one name given by two taxonomists

Option 2:

Two names , one latinized , other of a person

Option 3:

Two names , one scientific, other local

Option 4:

Two word names , the first indicates genus and other species

Correct Answer:

Two word names , the first indicates genus and other species

Solution:

Binomial Nomenclature -

It is a system of naming organism, in which it is given only one name consisting of two words. First word is the generic name and second is specific name.

- wherein

E.g Homo sapiens, Magnifera indica, Ocimum sanctum. It was given by Carolus Linnaeus.

Binomial nomenclature is the system of providing name consisting of two words -- first generic and second specific . Example - Homo sapiens ,

Homo =genus , sapiens = species

Q. 37 Where would you classify an organism having eukaryotic unicellular structure with saprophytic mode of nutrition?

Option 1:

Monera

Option 2:

Fungi

Option 3:

Protista

Option 4:

Both b and c

Correct Answer:

Both b and c

Solution:

Monera: it comprises of unicellular prokaryotic organisms

Fungi: it comprises of multicellular eukaryotic organisms except yeasts that is unicellular and has saprophytic mode of nutrition

Protista: it comprises of unicellular eukaryotic having saprophyte as one of the mode of nutrition

Hence the correct option is fungi and protista i.e. d.

Q. 38 JGA is the sensitive region between

Option 1:

DCT and afferent arteriole

Option 2:

PCT and afferent arteriole

Option 3:

PCT and DCT

Option 4:

PCT, DCT and afferent arteriole

Correct Answer:

DCT and afferent arteriole

Solution:

JGA is juxta glomerular apparatus and it is the region between Afferent arteriole, PCT and DCT

Q. 39 Out of the following enzymes, __ can be used for isolation of DNA from the bacteria.

Option 1:

Cellulase

Option 2:
Lysozyme

Option 3:
Both (a) and (b)

Option 4:
All of the above

Correct Answer:
Lysozyme

Solution:

As discussed in Isolation of DNA & Cutting of DNA at Specific Locations -

To isolate DNA, the cell at first is to be broken open by treating the cell with an enzyme such as lysozyme for bacteria, cellulase for the plant cell, chitinase for fungus so that DNA with other macromolecules are released. Hence, the correct option is (b).

Q. 40 Match **List I** with **List II**.

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

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

Option 1:

A-IV, B-III, C-II, D-I

Option 2:

A-III, B-II, C-IV, D-I

Option 3:

A-II, B-IV, C-I, D-III

Option 4:

A-IV, B-II, C-III, D-I

Correct Answer:

A-IV, B-III, C-II, D-I

Solution:

A. CCK - IV. Pancreas

CCK (cholecystokinin) is a hormone that is released by the small intestine and stimulates the pancreas to release digestive enzymes.

B. GIP - III. Gastric gland

GIP (gastric inhibitory peptide) is a hormone that is released by the small intestine and inhibits gastric acid secretion.

C. ANF - II. Heart

ANF (atrial natriuretic peptide) is a hormone that is produced by the heart and is involved in the regulation of blood pressure and fluid balance.

D. ADH - I. Kidney

ADH (antidiuretic hormone), also known as vasopressin, is produced by the hypothalamus and released by the pituitary gland. It acts on the kidneys to regulate water balance and urine concentration.

Therefore, the correct matching is:

A-IV, B-III, C-II, D-I, which corresponds to Option 1.

Q. 41 **Statement 1:** Ethylene is heavily synthesized in nodal regions.

Statement 2: Excess of auxin induces ethylene synthesis, and many effects of excess auxin are actually the effects produced by ethylene.

Option 1:

Statement 1 is true, and Statement 2 is false.

Option 2:

Statement 1 is false, and Statement 2 is true.

Option 3:

Both Statement 1 and Statement 2 are true.

Option 4:

Both Statement 1 and Statement 2 are false.

Correct Answer:

Both Statement 1 and Statement 2 are true.

Solution:

Statement 1 correctly states that ethylene is heavily synthesized in nodal regions of plants. Statement 2 is also true, as excess auxin can induce ethylene synthesis, and many effects attributed to excess auxin are actually the effects produced by ethylene.

Option 3 is the correct answer

Q. 42 Read the following statements and select the correct ones

- 1) Vaccine is a preparation (or suspension) of a dead/attenuated pathogen of a disease which on inoculation (or injection) into a healthy person , provides temporary/permanent active/passive immunity by inducing antibodies formation
- 2) Immunisation is the process by which the body produces antibodies against the vaccine preventable diseases through administration of specific vaccines
- 3) The principle of immunisation or vaccination is based on the property of 'memory' of the immune system
- 4) If a person is infected with some deadly microbes to which quick immune response is required ; in that case , we need to directly inject the performed antibodies or antitoxins e.g , in case of tetanus

Option 1:

1 and 2

Option 2:

3 and 4

Option 3:

1 , 2 and 3

Option 4:

All of these

Correct Answer:

All of these

Solution:

As we have learned

Vaccine -

Vaccines are either attenuated (live but weak) or dead (inert) agent of disease which when administered into a healthy person, provide temporary or permanent immunity to that particular disease.

- wherein

Ex. oral polio vaccine is an attenuated virus, was developed by Albertsabin.

Q. 43 Ductless glands are called

Option 1:

Alveolar glands

Option 2:

Tubular glands

Option 3:

Exocrine glands

Option 4:

Endocrine glands

Correct Answer:

Endocrine glands

Solution:

As we have learnt:

Endocrine Glands:

- Endocrine glands lack ducts and are hence, called ductless glands.
- Their secretions are called hormones.
- The classical definition of the hormone is a chemical produced by endocrine glands and released into the blood and transported to a distantly located target organ.
- Hormones are non-nutrient chemicals which act as intercellular messengers and are produced in trace amounts.

-Endocrine glands lack ducts and are hence, called ductless glands. Hence, the correct option is d. endocrine glands

Q. 44 At the conclusion of the first heart sound, which statement accurately describes the state of the mitral and tricuspid valves (left and right atrioventricular valves, respectively)?

Option 1:

Mitral valve is closed, tricuspid valve is open.

Option 2:

Mitral valve is open, tricuspid valve is closed.

Option 3:

Both mitral and tricuspid valves are open.

Option 4:

Both mitral and tricuspid valves are closed.

Correct Answer:

Both mitral and tricuspid valves are closed.

Solution:

At the end of the first heart sound (S1), both the mitral valve (left atrioventricular valve) and the tricuspid valve (right atrioventricular valve) are closed. The closure of these valves is responsible for producing the "lub" sound heard during auscultation.

The closure of the atrioventricular valves occurs during ventricular systole, which is the phase when the ventricles contract and pump blood out of the heart. The closure of these valves prevents the backflow of blood from the ventricles to the atria, ensuring that blood is ejected forward into the pulmonary artery and aorta.

Therefore, the correct statement is that both the mitral and tricuspid valves are closed at the end of the first heart sound (S1), indicating the onset of ventricular contraction and the initiation of the ejection phase of the cardiac cycle.

Hence, the correct answer is option 4.

Q. 45 Assertion (A): Saheli has minimal side effects and high contraceptive efficacy.

Reason (R): Saheli contains a non-steroidal preparation.

Option 1:

Both (A) and (R) are true, and (R) is the correct explanation of (A).

Option 2:

Both (A) and (R) are true, but (R) is not the correct explanation of (A).

Option 3:

(A) is true, but (R) is false.

Option 4:

Both (A) and (R) are false

Correct Answer:

Both (A) and (R) are true, but (R) is not the correct explanation of (A).

Solution:

In this case, Assertion (A) is true, stating that Saheli has minimal side effects and high contraceptive efficacy. The Reason (R) is also true, mentioning that Saheli contains a non-steroidal preparation.

However, Reason (R) is not the correct explanation of Assertion (A). While Saheli does contain a non-steroidal preparation, it is not solely the presence of a non-steroidal compound that accounts for its minimal side effects and high contraceptive efficacy. There are other factors and mechanisms involved in Saheli's effectiveness, such as its specific formulation, dosage, and mode of action. Hence, the correct answer is option 2.

Q. 46 Match the columns and identify the correct option:

Column I

(a) Thylakoids

(b) Cristae

(c) Cisternae

(d) Chromatin

Column II

(i) Disc-shaped sacs in Golgi apparatus

(ii) Condensed structure of DNA

(iii) Flat membranous sacs in stroma

(iv) Infoldings in mitochondria

Option 1:

(iii) (iv) (i) (ii)

Option 2:

(iii) (i) (iv) (ii)

Option 3:

(iii) (iv) (ii) (i)

Option 4:

(iv) (iii) (i) (ii)

Correct Answer:

(iii) (iv) (i) (ii)

Solution:

Components of the Endomembrane System: The Golgi Apparatus

- It is a stack of membranous bodies called cisternae. It was discovered by Camillo Golgi, an Italian physicist, in 1897.
- These are present in both plant cells and animal cells. In-plant cells, they occur as unconnected units called dictyosomes.
- Like the endoplasmic reticulum, they are also made up of tubules and vesicles apart from cisternae.
- The face of the Golgi apparatus that receives vesicles from the ER is called a cis face.
- The opposite of cis face is the trans face which gives off vesicles for the destination.
- The Golgi apparatus is primarily involved in the processing of proteins generated in the endoplasmic reticulum.
- It is also responsible for their transport to the different parts of the cell.
- The Golgi apparatus functions as a platform for the process of addition of sulfate groups into protein molecules, glycosylation and phosphorylation.

Thylakoids are the membranous system in the chloroplast. Cristae are the infoldings in the inner membrane of mitochondria. Cisternae are the disc shaped sacs in the Golgi apparatus. Chromatin is the condensed structure of DNA in the nucleus.

Q. 47 Hippuric acid is excreted when there is ____ in the diet.

Option 1:

Guanine

Option 2:

Benzoic acid

Option 3:
Glycine

Option 4:
Creatine

Correct Answer:
Benzoic acid

Solution:

Hippuric acid is seen among the excretory products only when benzoic acid is present in the diet. It reacts with glycine to form hippuric acid. It is present in traces in human urine. Hence, the correct option is benzoic acid which is option 2.

Q. 48 The chromosomes responsible for the determination of sex are called

Option 1:
Autosomes

Option 2:
Allosomes

Option 3:
Multiple alleles

Option 4:
Heterosis

Correct Answer:
Allosomes

Solution:

As we have discussed in Sex Determination -

- Sex chromosomes are also called the allosomes.

Hence, the correct answer is option b.

Q. 49 The chiral carbon formed due to reaction with -OH and -CHO is called

Option 1:
Alpha carbon

Option 2:

Anomeric carbon

Option 3:

Beta carbon

Option 4:

None of these

Correct Answer:

Anomeric carbon

Solution:

Ring Structure of Monosaccharides

- Monosaccharides can exist as a linear chain or as ring-shaped molecules.
- The ring shaped is formed in the aqueous solution.
- When the monosaccharides cyclize to form rings, they typically form two types of rings as furanose or pyranose.
- Furanose is a five-membered ring structure.
- Pyranose is a six-membered ring structure.
- In case of aldose sugars, the ring structure is formed when the alcohol group reacts with the aldehyde to produce a hemiacetal.
- In case of ketose sugars, the ring structure is formed when the alcohol group reacts with the ketone to produce hemiketal.
- Both reactions result in the ring-structure with a new asymmetric carbon called the anomeric carbon.

The chiral carbon formed due to reaction with -OH and -CHO is called anomeric carbon. It is denoted as C-1.

Q. 50 Which of the following is correct w.r.t carotenoids?

- i) These are water soluble
- ii) These are soluble in organic solvents
- iii) Carotenes contain oxygen
- iv) Xanthophylls contain oxygen

Choose the correct option:

Option 1:

i, ii and iii

Option 2:

i and ii only

Option 3:

ii and iv only

Option 4:

All of these

Correct Answer:

ii and iv only

Solution:

Carotenoids:

- Carotenoids are plant pigments responsible for bright red, yellow and orange hues.
- These act as shield pigments to prevent the chlorophyll from photooxidation.
- These help plants absorb light energy for use in photosynthesis.
- These are water-insoluble but soluble in organic solvents.
- There are two types of carotenoids: Carotenes and Xanthophylls.
- The difference between the two groups is chemical: xanthophylls ($C_{40}H_{56}O_2$) contain oxygen, while carotenes ($C_{40}H_{56}$) are hydrocarbons and do not contain oxygen.
- Also, the two absorb different wavelengths of light during a plant's photosynthesis process, so xanthophylls are more yellow while carotenes are orange.
- The common type of carotene is beta-carotene.
- The common type of xanthophyll is lutein.
- The ratio of xanthophyll to carotene in plants is 3:1 or 2:1.

-Carotenoids are water-insoluble but soluble in organic solvents. Xanthophylls ($C_{40}H_{56}O_2$) contain oxygen, while carotenes ($C_{40}H_{56}$) are hydrocarbons and do not contain oxygen. **Hence, the correct answer is option c.**

Q. 51 Apotracheal parenchyma is

Option 1:

Diffused xylem parenchyma

Option 2:

Present independent of xylem vessels

Option 3:

Both a and b

Option 4:

None of these

Correct Answer:

Diffused xylem parenchyma

Solution:

Xylem Parenchyma:

- These are the parenchymatous cells associated with xylem.
- These represent the only living component of the complex tissue xylem.
- These are of two types:
- Axial/wood parenchyma: these are vertically arranged parenchyma that can develop into vessels and other members.
- Ray parenchyma: these are horizontally arranged parenchyma that are responsible for the lateral conduction of water.
- If xylem parenchyma is present in the diffused form, it is called apotracheal parenchyma.
- If xylem parenchyma is present compactly around the xylem vessel, it is called paratracheal parenchyma.

If xylem parenchyma is present in the diffused form, it is called apotracheal parenchyma.

Q. 52 Nervous system of amphibian consists of

Option 1:

10 pairs of cranial nerves and monocondylic skull

Option 2:

12 pairs of cranial nerves and dicondylic skull

Option 3:

10 pairs of cranial nerves and dicondylic skull

Option 4:

12 pairs of cranial nerves and monocondylic skull

Correct Answer:

10 pairs of cranial nerves and dicondylic skull

Solution:

As we have learned

Nervous system of amphibia -

Brain poorly developed, ten pairs of cranial nerves are present.

- wherein

Skull is dicondylic.

Q. 53 Which of the following is associated with decrease in cardiac output?

Option 1:

Parasympathetic neutral signals

Option 2:

Pneumotoxic centre

Option 3:

Adrenal medullary hormones

Option 4:

Sympathetic nerves

Correct Answer:

Parasympathetic neutral signals

Solution:

- Parasympathetic neural signals decrease the rate of heart beat, speed of conduction, stroke volume and thus cardiac output
- Sympathetic system is antagonistic to parasympathetic and thus increase the heart rate and thus cardiac output
- Adrenal medullary hormones also increase the cardiac output
- Pneumotoxic centre is related to respiration

Q. 54 Which of the following is a pair of viral diseases ?

Option 1:

Common Cold, AIDS

Option 2:

Dysentery, Common Cold

Option 3:

Typhoid, Tuberculosis

Option 4:

Ringworm, AIDS

Correct Answer:
Common Cold, AIDS

Solution:

Viral diseases are extremely common infections caused by viruses (a type of microorganism). There are many types of viruses that cause a wide variety of viral illnesses. The most common type of viral illness is the common cold, which is caused by a viral infection of the upper respiratory tract (nose and throat). Human immunodeficiency virus (HIV/AIDS) is a lentivirus (a subgroup of retroviruses) that causes acquired immunodeficiency syndrome (AIDS), a life-threatening disease in which the body's immune system gradually fails. A disease in which sexual infections and cancer spread. Hence, option 1 is correct.

Q. 55 The visceral organs of cockroach are present in

Option 1:
Periphery of the body

Option 2:
Haemocoel

Option 3:
Pseudocoel

Option 4:
None of these

Correct Answer:
Haemocoel

Solution:

Circulatory system, Nervous System and Sense Organs in Arthropods -

- There is a tubular single-chambered heart that regulates the open circulatory system.
- The blood is pumped through arteries and reaches haemocoel where different organs are present.
- The scheme of blood flow can be shown as:



In arthropods, the blood is pumped through arteries and reaches haemocoel where different organs are present.

Q. 56 Pili are primarily involved in

Option 1:
Attachment

Option 2:
Conjugation

Option 3:
Movement

Option 4:
Stability

Correct Answer:
Conjugation

Solution:
Pili and Fimbriae

- Pili are not involved in locomotion.
- Pili are long, thick, tubular outgrowths that help in attachment of donor cell to a recipient cell and form conjugation tube.
- Pili consist of a protein called pillin.

-Pili are mainly involved in conjugation.

Q. 57 Which one of the following statements is correct?

Option 1:
Tapetum nourishes the developing pollen

Option 2:
Hard outer layer of pollen is called intine

Option 3:

Sporogenous tissue is haploid

Option 4:

Endothecium produces the microspores

Correct Answer:

Tapetum nourishes the developing pollen

Solution:

As we learnt in

Function of wall layers in a typical microsporangium -

The outer three wall layers perform the function of protection and help in dehiscence of anther to release the pollen. The innermost wall layer is the tapetum. It nourishes the developing pollen grains. Cells of the tapetum possess dense cytoplasm and generally have more than one nucleus.

Tapetum nourishes developing pollen grains.

Q. 58 Vacuole in a plant cell

Option 1:

Lacks membrane and contains air

Option 2:

Lacks membrane and contains water and excretory substances

Option 3:

Is membrane bound and contains proteins and lipids

Option 4:

Is membrane bound and contains water and excretory substances

Correct Answer:

Is membrane bound and contains water and excretory substances

Solution:

Components of the Endomembrane System: Lysosomes and Vacuoles -

Vacuoles:

- Vacuoles are membrane bound, enclosed compartments in the cells wherein water, nutrients and waste material are stored.

- These are very prominent in the plant cells.
- The fluid present in the vacuole of plant cells is called cell sap.
- The membrane of the vacuole is called tonoplast.

Formation of Vacuole:

These are formed through the pinching off from the ER.

Functions of Vacuole:

- In plants, vacuoles play a direct role in seed germination, water storage and giving specific structure to foliage and blooms.
- Some of the general vacuole functions include storage, maintenance of turgor pressure, regulation of internal pH and isolation of metabolic waste.

Vacuole in a plant cell is membrane bound organelle that contains water and excretory substances.

Q. 59 In a population of 1000 individuals, the frequency of the recessive allele for a particular trait is 0.2. What is the expected frequency of homozygous recessive individuals in the population, assuming Hardy-Weinberg equilibrium?

Option 1:

0.04

Option 2:

0.08

Option 3:

0.16

Option 4:

0.32

Correct Answer:

0.04

Solution:

In a population under Hardy-Weinberg equilibrium, the genotype frequencies can be determined using the Hardy-Weinberg equation:

$$p^2 + 2pq + q^2 = 1,$$

where:

p is the frequency of the dominant allele,

q is the frequency of the recessive allele, and

p^2 , $2pq$, and q^2 represent the frequencies of the three possible genotypes: homozygous dominant, heterozygous, and homozygous recessive, respectively.

Given that the frequency of the recessive allele (q) is 0.2, we can calculate the frequency of the dominant allele (p) as:

$$p = 1 - q = 1 - 0.2 = 0.8.$$

Using the Hardy-Weinberg equation, we can now calculate the expected frequency of homozygous recessive individuals (q^2) as:

$$q^2 = (0.2)^2 = 0.04.$$

To obtain the expected count of homozygous recessive individuals in a population of 1000 individuals, we multiply the expected frequency (0.04) by the population size:

$$\text{Expected count} = q^2 * \text{population size} = 0.04 * 1000 = 40.$$

Therefore, the expected frequency of homozygous recessive individuals in the population is 40/1000 or 0.04.

Option 1 is the correct answer

Q. 60 Spiracles found in cockroach are

Option 1:

Two pairs in thorax and four pairs in abdomen

Option 2:

Two pairs in neck and four pairs in abdomen

Option 3:

Two pairs in abdomen and four pairs in thorax

Option 4:

None

Correct Answer:

Two pairs in thorax and four pairs in abdomen

Solution:

Respiration in Arthropoda:

- There is a variety in the respiratory organs in arthropods depending on the habitat:
- The terrestrial arthropods breathe through network of tracheal tubes connected to the outside via spiracles. Two pairs of spiracles occur in thorax and four pairs occur in abdomen.



The terrestrial arthropods breathe through network of tracheal tubes connected to the outside via spiracles. Two pairs of spiracles occur in thorax and four pairs occur in abdomen.

Q. 61 The impulses from aorta and carotid sinus

Option 1:
Decreases the heart rate

Option 2:
Increases the heart rate

Option 3:
Initially increase and then decrease the heart rate

Option 4:
Show no change in heart rate

Correct Answer:

Decreases the heart rate

Solution:

- The impulses from the aorta and carotid sinus are involved in regulating and maintaining blood pressure. When the blood pressure in these areas increases, specialized nerve receptors called baroreceptors detect the change and send signals to the brain. In response, the brain sends impulses to the heart to decrease its rate, resulting in a decrease in heart rate. This mechanism helps to regulate blood pressure and maintain homeostasis. Hence, **option 1 is the correct answer.**

Explanation for the incorrect options :

- Option 2 is incorrect because it increases the heart rate.
- Option 3 is incorrect because it initially increases and then decreases the heart rate.
- Option 4 is incorrect because it shows no change in heart rate.

Q. 62 The precursor of ABA is

Option 1:

Tryptophan

Option 2:

Succinyl Co A

Option 3:

Methionine

Option 4:

Mevalonic acid

Correct Answer:

Mevalonic acid

Solution:

The hormone ABA is formed from mevalonic acid or xanthophyll.

Q. 63 Photoperiodic stimulus is perceived by

Option 1:

Leaves

Option 2:

Roots

Option 3:

Flowers

Option 4:

Stem

Correct Answer:

Leaves

Solution:

- Phytochromes are the chemicals which perceive the photoperiodic stimulus.
- The wavelength of light is perceived by the leaves.
- A defoliated plant does not flower.
- A single leaf is sufficient to stimulate the flowering.
- Phytochrome is present in roots, coleoptiles, stems, hypocotyls, cotyledons, petioles, leaf blades, vegetative buds, flower tissues, seeds and developing fruits of higher plants.

Hence, Photoperiodic stimulus is perceived by leaves

Q. 64 Favours rouleaux formation

Option 1:

fibrinogen

Option 2:

Thrombin

Option 3:

Plasma

Option 4:

lymph

Correct Answer:

fibrinogen

Solution:

As we learned

Rouleaux -

RBCs are piled on top of each other. Fibrinogen favors rouleaux formation.

- wherein

Through haemocytometer, we can count no of RBCs.

Q. 65 Assertion: The 2^o oocyte or ovum is covered by a membrane called corona radiata after ovulation.

Reason: Corona radiata probably increases the likelihood of the ovum being picked up by the uterine tube.

Option 1:

Both Assertion & Reason are true and the reason is the correct explanation of the assertion

Option 2:

Both Assertion & Reason are true but the reason is not the correct explanation of the assertion

Option 3:

Assertion is true statement but Reason is false

Option 4:

Assertion and Reason are false statements

Correct Answer:

Both Assertion & Reason are true and the reason is the correct explanation of the assertion

Solution:

The layer that forms around the ovum after ovulation is called the corona radiata. It is formed by the granulosa cells of the cumulus oophorus. The corona radiata serves as a protective layer around the ovum and helps increase the chances of the ovum being picked up by the uterine tube. It provides structural support and aids in the movement of the ovum through the reproductive tract.

Hence, the correct answer is option (1) - Both Assertion & Reason are true and the reason is the correct explanation of the assertion.

Q. 66 Secondary productivity is rate of formation of new organic matter by:

Option 1:

Decomposer

Option 2:
Producer

Option 3:
Parasite

Option 4:
Consumer

Correct Answer:
Consumer

Solution:

As we have already studied in Functions of Ecosystem: Productivity -

Secondary productivity -

Secondary productivity is defined as the rate of formation of new organic matter by consumers.

Hence, the correct option is (d).

Q. 67 Five gram moles of glucose on complete oxidation releases

Option 1:
3430 Kcal energy

Option 2:
343 Kcal energy

Option 3:
2020 Kcal energy

Option 4:
430 Kcal of energy

Correct Answer:
3430 Kcal energy

Solution:

Oxidation of 1 glucose molecule yields 686 Kcal energy. Thus, five gram moles of glucose on complete oxidation releases 3430 Kcal of energy

Q. 68 Which statement is **wrong** for viruses

Option 1:

All are parasites

Option 2:

All of them have helical symmetry

Option 3:

They have ability of synthesize nucleic acids and proteins

Option 4:

Antibiotics have no effect on them

Correct Answer:

All of them have helical symmetry

Solution:

Viruses are microorganisms that infect and persist as intercellular parasites in living hosts. They implant their genetic material, which replicates via host cell machinery and changes their structure, allowing them to affect other cells. Viruses have a type of symmetry called icosahedral and helical.

Q. 69 The Father of taxonomy is

Option 1:

Linnaeus

Option 2:

Aristotle

Option 3:

Julian Huxley

Option 4:

None of the above

Correct Answer:
Linnaeus

Solution:

Linnaeus is considered to be the father of taxonomy.

Hence, the correct option is (a).

Q. 70 The root that originated from the base of the stem are :

Option 1:
Fibrous root

Option 2:
Primary root

Option 3:
Prop root

Option 4:
Lateral root

Correct Answer:
Fibrous root

Solution:

Fibrous root originates from the base of the stem.

Q. 71 Identify the wrong statement in context of heartwood:

Option 1:
Organic compounds are deposited in it

Option 2:
It is highly durable

Option 3:
It conducts water and minerals efficiently

Option 4:
It comprises dead elements with highly lignified walls

Correct Answer:

It conducts water and minerals efficiently

Solution:

As we learnt in

Heart wood -

New secondary xylem tissues degenerated into the old secondary xylem. Waste materials like lignin, suberin, tannin and resin gums are formed due to degeneration. All waste materials are filled in lumen of tracheids and vessels of secondary xylem.

- wherein

Wood in center becomes dark coloured which is called heart wood or duramen.

and

Sap wood -

The peripheral or outer wood which looks light in color is known as Sap wood or Alburnum.

- wherein

The active work of sap wood is water conduction. Heart wood provides the mechanical strength.

Heartwood doesn't conduct water and minerals efficiently but provide mechanical strength.

Q. 72 Water - Vascular system is found in

Option 1:

Sea - anemone

Option 2:

sea- pen

Option 3:

Sea - cucumber

Option 4:

Sea - horse

Correct Answer:

Sea - cucumber

Solution:

Sea - cucumber is also member of phylum Echinodermata rest of them are coelenterata and lack water vascular system.

Q. 73 A process that makes important difference between C_3 and C_4 plants is :

Option 1:

Transpiration

Option 2:

Glycolysis

Option 3:

Photosynthesis

Option 4:

Photorespiration

Correct Answer:

Photorespiration

Solution:

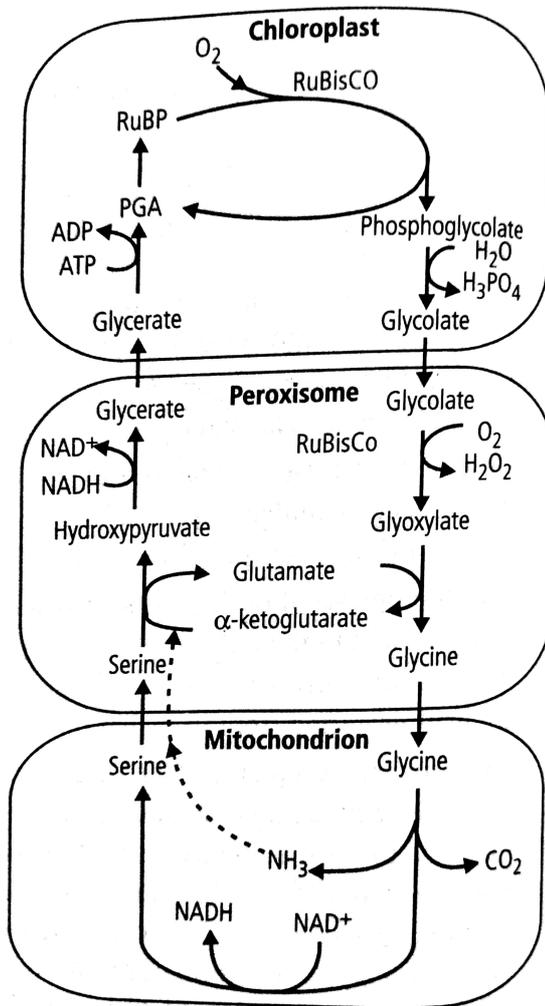
As we learnt in

Photorespiration -

A process in plant metabolism where enzyme RuBisCO oxygenates RuBP, causing some of the energy produced by photosynthesis to be wasted.

- wherein

O_2 enters Calvin cycle instead of CO_2 this results in reduced rate of photosynthesis.



Photorespiration is negligible in C4 but present in C3

Q. 74 The myofibrils are surrounded by a canalicular network of

Option 1:

Sarcolemma

Option 2:

Sarcoplasmic reticulum

Option 3:

T- tubules

Option 4:

Both b and c

Correct Answer:

Both b and c

Solution:

Structure of Skeletal Muscle -

- Each organised skeletal muscle in our body is made of a number of muscle bundles or **fascicles** held together by a common collagenous connective tissue layer called **fascia** or **epimysium**.
- Each muscle bundle or fascicle is surrounded by a **perimysium**.
- Each muscle bundle or fascicle contains a number of **muscle fibres or myofibers**. These are the muscle cells.
- The myofibres are covered with **endomysium**.
- Each myofiber is lined by the plasma membrane called **sarcolemma** enclosing the sarcoplasm.
- The muscle fibre is a **syncytium** as the sarcoplasm contains many nuclei.
- The endoplasmic reticulum, i.e., the sarcoplasmic reticulum of muscle fibres is the storehouse of calcium ions.
- A characteristic feature of the muscle fibre is the presence of a large number of parallelly arranged filaments in the sarcoplasm called **myofilaments or myofibrils**.
- Each myofibril has alternate dark and light bands on it.
- A detailed study of the myofibril has established that the striated appearance is due to the distribution pattern of two important proteins – Actin and Myosin.
- The light bands contain actin and are called I-band or Isotropic bands, whereas the dark band called 'A' or Anisotropic band contains myosin.

Hence the correct option is both b and c.

-

Q. 75 While isolating DNA from bacteria , which of the following enzymes is not used ?

Option 1:

Lysozyme

Option 2:

Ribonuclease

Option 3:

Deoxyribonuclease

Option 4:

Protease

Correct Answer:

Deoxyribonuclease

Solution:

As we have learned

Lysing Enzymes -

These enzymes are used to open up the cells to get DNA for genetic experiment. Lysozyme is used for bacterial cell. Cellulase is used for plant cell and chitinase used for fungi.

- wherein

Enzymes dissolve the outer cell walls.

Q. 76 Identify the correct description of the type of muscles present in the following areas:

Option 1:

The smooth muscle fibers present in the upper arm are fusiform in shape.

Option 2:

The smooth muscles present in the heart are involuntary and unstriated.

Option 3:

The muscles present in the intestine are striated and involuntary.

Option 4:

The muscles present in the thigh are striated and voluntary.

Correct Answer:

The muscles present in the thigh are striated and voluntary.

Solution:

The muscles in the thigh are indeed striated and voluntary. Striated muscles are also known as skeletal muscles which are responsible for voluntary movements and are under conscious control. The thigh muscles, such as the quadriceps and hamstrings, are examples of striated muscles that enable movements like walking, running, and jumping. Therefore, option (4) stating that the muscles in the thigh are striated and voluntary is the accurate description. Hence, the correct answer is option 4.

Q. 77 It is much easier for a small animal to run uphill than for a large animal, because

Option 1:

It is easier to carry a small body weight

Option 2:

Smaller animals have a higher metabolic rate

Option 3:

Small animals have a lower O₂ requirement

Option 4:

The efficiency of muscles in large animals is less than in the small animals

Correct Answer:

Smaller animals have a higher metabolic rate

Solution:

As we learnt in

Metabolism -

Sum total of all reaction occurring in organism.

- wherein

Includes anabolism and catabolism.

Metabolism results in release of energy. Metabolic rate is directly proportional to the size of an animal. Hence, smaller animals have more energy due to high metabolic rate.

Q. 78 Which of the following groups of animals use branchial respiration?

Option 1:

Mammals

Option 2:

Reptiles

Option 3:

Aquatic arthropods and molluscs

Option 4:

Insects

Correct Answer:

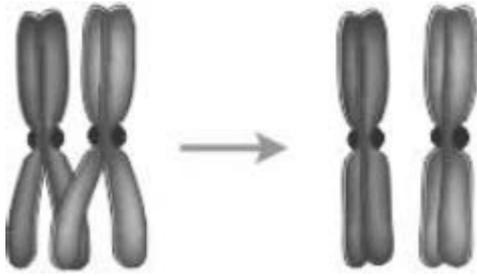
Aquatic arthropods and molluscs

Solution:

Most of the aquatic arthropods and molluscs use branchial respiration, which involves the use of vascularised structures called gills.

Option 3 is the correct answer.

Q. 79 Given below is the representation of a certain event at a particular stage of a type of cell division. Which is this stage?



Option 1:
Prophase I during meiosis

Option 2:
Prophase II during meiosis

Option 3:
Prophase of Mitosis

Option 4:
Both prophase and metaphase of mitosis

Correct Answer:
Prophase I during meiosis

Solution:

The given stage of cell division is the crossing over during pachytene of prophase I of meiosis - I.

Q. 80 At what stage of life, oogenesis initiate in a human Female

Option 1:
At puberty

Option 2:
During menarche

Option 3:
During menopause

Option 4:
During embryonic development

Correct Answer:

During embryonic development

Solution:

As we have learned

Process of oogenesis -

Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary; no more oogonia are formed and added after birth.

- Hence, the correct answer is option d.

Q. 81 The human kidneys are located in the

Option 1:

Abdominal cavity

Option 2:

Buccal cavity

Option 3:

Heart

Option 4:

Thorax

Correct Answer:

Abdominal cavity

Solution:

Human Excretory System: Kidneys and Their Exterior Aspects -

- In humans, the excretory system consists of a pair of kidneys, one pair of ureters, a urinary bladder and urethra.

Exterior Aspects of Kidneys:

- Kidneys are reddish-brown, bean-shaped structures situated between the levels of last thoracic and third lumbar vertebra.
- Each kidney of an adult human measures 10-12 cm in length, 5-7 cm in width, 2-3 cm in thickness with an average weight of 120- 170 g.

- These are located in the retroperitoneal space between the parietal peritoneum and the posterior abdominal wall, well protected by muscle, fat, and ribs.
- The kidneys are well vascularized, receiving about 25% of the cardiac output at rest

Human kidneys are located in the retroperitoneal space between the parietal peritoneum and the posterior abdominal wall, well protected by muscle, fat, and ribs. Hence, the correct option is a. abdominal cavity

Q. 82 Which one of the following helps in absorption of phosphorus from soil by plants ?

Option 1:
Anabaena

Option 2:
Glomus

Option 3:
Rhizobium

Option 4:
Frankia

Correct Answer:
Glomus

Solution:

Glomus aids plants in absorbing phosphorus from the soil.

- Producing enough the plant nutrients, such as phosphorus (P), to meet global food demand is a significant challenge for agriculture.
- **Glomus** aids the submersion of phosphorus from the dirt by plants. **Arbuscular mycorrhiza** is what it is.
- The primary nutrient that plants require to reach maturity is phosphorus.
- Since the phosphate transporter that was cloned from **Glomus vermiform (GvPT)** is not found in plant-fungal structures, it cannot be a potential candidate for the fungal P efflux mechanism.

Thus, the correct answer is **option 2).**

Q. 83 An annual ring is formed by

Option 1:
Two consecutive rings of spring wood

Option 2:

Two alternate rings of spring wood and autumn wood

Option 3:

Two consecutive rings of autumn wood

Option 4:

Two alternate rings of sapwood and heartwood

Correct Answer:

Two alternate rings of spring wood and autumn wood

Solution:

As we have learned

Annual ring -

Annual rings are formed due to unequal activity of vascular cambium. In winter or autumn season, the activity of the cambium is less and cuts off small sized xylem elements (vessels) which constitute late wood or autumn wood. The vascular cambium is highly active in spring or summer and secondary xylem is formed.

- wherein

Cells are large with wide lumen. The wood is known as spring wood or early wood. Spring wood is lighter in colour and less dense whereas autumn wood is darker and highly dense.

Q. 84 Synapsis occurs between:

Option 1:

mRNA and ribosomes

Option 2:

Spindle fibres and centromere

Option 3:

Two homologous chromosomes

Option 4:

A male and female gamete

Correct Answer:

Two homologous chromosomes

Solution:

As we learnt in

Zygotene -

The second stage of Prophase I. Chromosomes starts pairing together in a process called synapsis. Each paired chromosome is homologous. Synapsis is accompanied by the formation of the complex structures-synaptonemal complex.

Q. 85 Flippers of Penguins and Dolphins are examples of:

Option 1:

Adaptive radiation

Option 2:

Convergent evolution

Option 3:

Industrial melain

Option 4:

Natural selection

Correct Answer:

Convergent evolution

Solution:

Flippers of penguin and dolphins have different structures but similar functions and thus are categorized under analogous organs. Also, Penguin and dolphins are not closely related to each other but have evolved the similar traits (as per this question - flippers) therefore, show convergent type of evolution.

Q. 86 From which of the following layers, muscles are derived ?

Option 1:

Ectoderm

Option 2:

Endoderm

Option 3:

Mesoderm

Option 4:

Both ectoderm and endoderm

Correct Answer:

Mesoderm

Solution:

Muscles and Their Types -

- Muscle is a specialised tissue of mesodermal origin.
- About 40-50 percent of the bodyweight of a human adult is contributed by muscles.
- They have special properties like excitability, contractility, extensibility and elasticity.
- Muscles have been classified using different criteria, namely location, appearance and nature of regulation of their activities.
- Based on their location, three types of muscles are identified :
 - ▷ (i) Skeletal
 - ▷ (ii) Visceral and
 - ▷ (iii) Cardiac

Muscle is a specialised tissue of mesodermal origin. Hence, the correct option is c. mesoderm

Q. 87 When percentage saturation of haemoglobin with O_2 is plotted against the pO_2 , a _____ curve is obtained. Choose the correct option to fill in the blank.

Option 1:
Hyperbola

Option 2:
Straight

Option 3:
Sigmoid

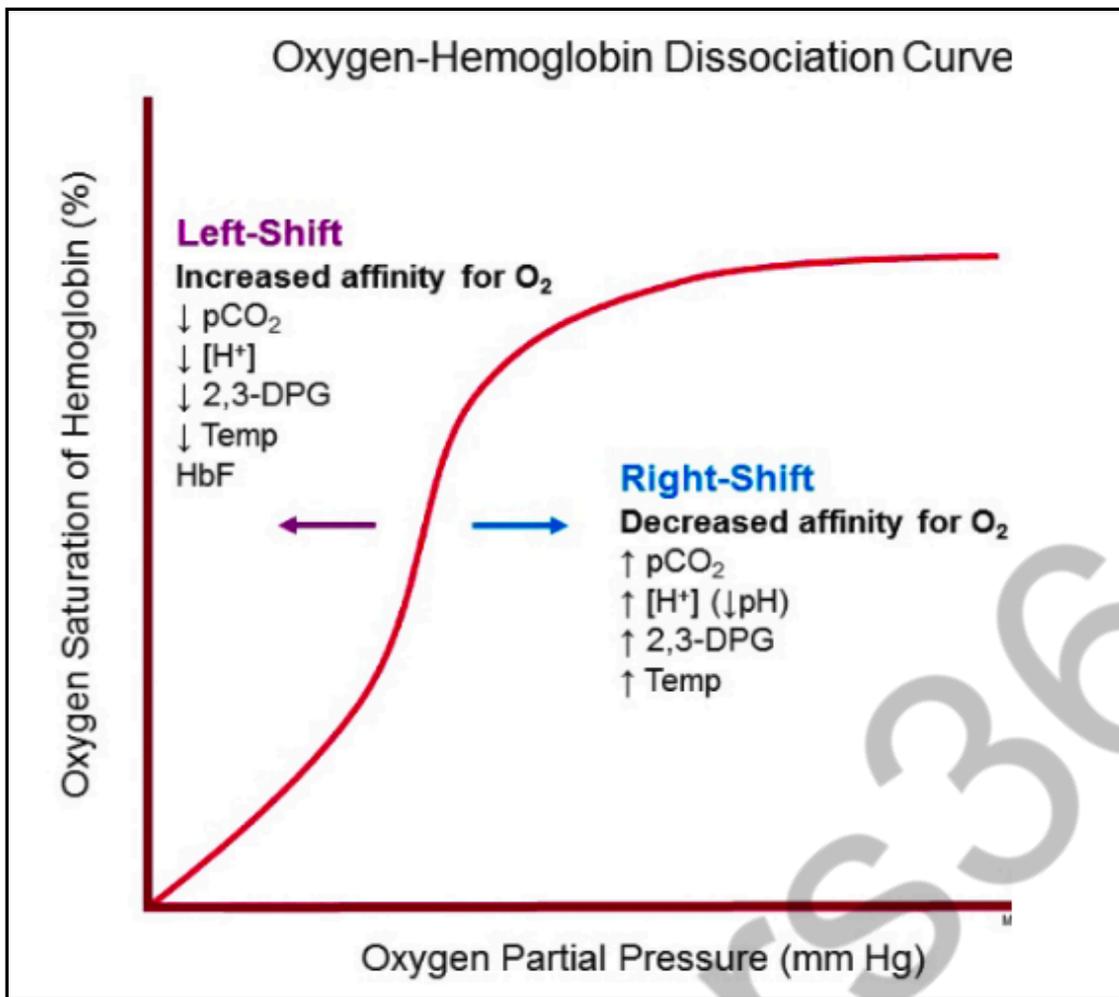
Option 4:
None of the above

Correct Answer:
Sigmoid

Solution:

Oxygen Transport and Oxygen Dissociation Curve -

- Blood is the medium of transport for O_2 and CO_2 .
- About 97 percent of O_2 is transported by RBCs in the blood.
- The remaining 3 percent of O_2 is carried in a dissolved state through the plasma.
- Haemoglobin is a red coloured iron-containing pigment present in the RBCs.
- O_2 can bind with haemoglobin in a reversible manner to form oxyhaemoglobin. This is called O₂-Hb association.
- Each haemoglobin molecule can carry a maximum of four molecules of O_2 .
- Binding of oxygen with haemoglobin is primarily related to the partial pressure of O_2 .
- pO_2 is high in alveoli so association occurs while at the tissues, the pO_2 decreases which cause dissociation of oxygen.
- The partial pressure of CO_2 , hydrogen ion concentration and temperature are the other factors which can interfere with this binding.
- A sigmoid curve is obtained when the percentage saturation of haemoglobin with O_2 is plotted against the pO_2 .
- This curve is called the Oxygen dissociation curve.
- This curve is highly useful in studying the effect of factors like pCO_2 , H⁺ concentration, etc, on the binding of O_2 100 with haemoglobin.



Hence, A sigmoid curve is obtained when percentage saturation of haemoglobin with O_2 is plotted against the pO_2 .

Q. 88 Which is an inhibitory hormone of GH

Option 1:
Insulin

Option 2:
Parathormone

Option 3:
Testosterone

Option 4:
Somatostatin

Correct Answer:
Somatostatin

Solution:
Somatostatin:

- It is the same substance as growth inhibiting hormones from the hypothalamus.
- One of the actions of somatostatin seems to suppress the release of other hormones from the pancreas.
- It also appears to suppress the release of hormones from the digestive tract.
- It acts on the cells of the pancreas.
- Somatostatin acts as an inhibitory hormone of GH

Q. 89 Which type of speciation occurs at the edges of the parent population?

Option 1:
Sympatric speciation

Option 2:
Allopatric speciation

Option 3:
Peripatric speciation

Option 4:
Parapatric speciation

Correct Answer:
Parapatric speciation

Solution:

Parapatric speciation happens when a species population enters a new place. Parapatric speciation takes place at the edges of the parent population.

Hence option 1, 2 and 3 does not take place at the edge of the parent population

Hence, option 4 is the correct answer.

Q. 90 Which of the following statements accurately describes the role of peripheral chemoreceptors in respiration regulation?

Option 1:

Peripheral chemoreceptors are primarily sensitive to changes in oxygen levels.

Option 2:

Peripheral chemoreceptors are located in the medulla oblongata.

Option 3:

Peripheral chemoreceptors are not involved in the regulation of respiration.

Option 4:

Peripheral chemoreceptors respond to changes in carbon dioxide and oxygen levels.

Correct Answer:

Peripheral chemoreceptors respond to changes in carbon dioxide and oxygen levels.

Solution:

Peripheral chemoreceptors are specialized sensory receptors located in the carotid bodies and aortic bodies. These chemoreceptors are primarily sensitive to changes in carbon dioxide and oxygen levels in the blood. When there is an increase in CO_2 or a decrease in O_2 , the peripheral chemoreceptors are activated and send signals to the respiratory centers in the brain, primarily the medulla oblongata, to increase the rate and depth of breathing. This helps to restore proper blood gas levels by increasing the removal of CO_2 and increasing the intake of O_2 . Hence, the correct answer is option 4.

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