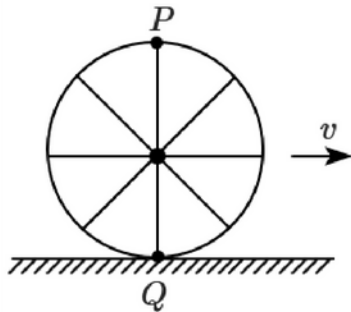


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PHYSICS SECTION A

A wheel of a bullock cart is rolling on a level road as shown in the figure below. If its linear speed is v in the direction shown, which one of the following options is correct (P and Q are any highest and lowest points on the wheel, respectively)?



1. Point P moves faster than point Q .
2. Both the points P and Q move with equal speed.
3. Point P has zero speed.
4. Point P moves slower than point Q .

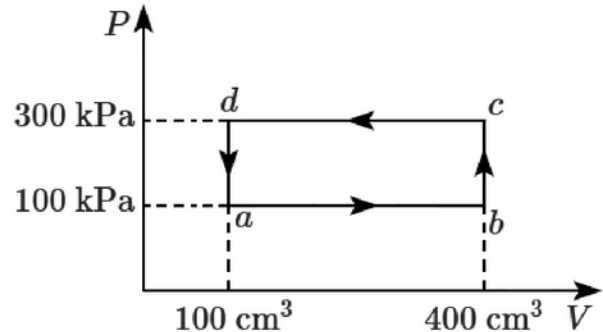
Match List I with List II.

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

Choose the correct answer from the options given below:

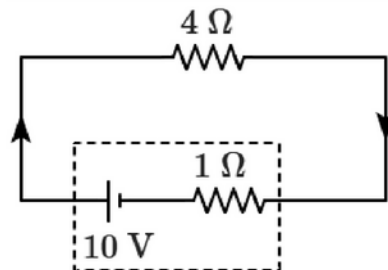
1. A-III, B-IV, C-II, D-I
2. A-IV, B-III, C-I, D-II
3. A-I, B-II, C-III, D-IV
4. A-II, B-I, C-IV, D-III

A thermodynamic system is taken through the cycle $abcda$. The work done by the gas along the path bc is:



1. 30 J
2. -90 J
3. -60 J
4. zero

The terminal voltage of the battery, whose emf is 10 V and internal resistance 1Ω , when connected through an external resistance of 4Ω as shown in the figure is:



1. 6 V
2. 8 V
3. 10 V
4. 4 V

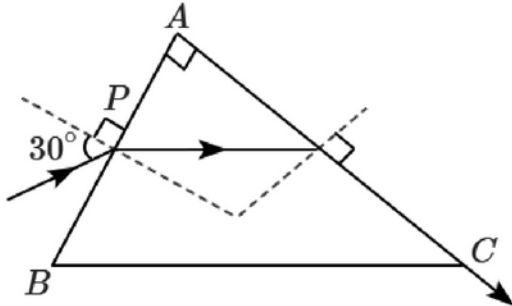
In an ideal transformer, the turns ratio is $\frac{N_p}{N_s} = 1.2$

The ratio $V_s:V_p$ is equal to (the symbols carry their usual meaning):

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

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A light ray enters through a right-angled prism at point P with the angle of incidence 30° as shown in figure. It travels through the prism parallel to its base BC and emerges along the face AC . The refractive index of the prism is:



1. $\frac{\sqrt{5}}{2}$
2. $\frac{\sqrt{3}}{2}$
3. $\frac{4}{\sqrt{3}}$
4. $\frac{\sqrt{3}}{2}$

The quantities which have the same dimensions as those of solid angle are:

1. stress and angle
2. strain and arc
3. angular speed and stress
4. strain and angle

A thin flat circular disc of radius 4.5 cm is placed

gently over the surface of water. If surface tension of water is 0.07 Nm^{-1} , then the excess force required to take it away from the surface is:

1. 198 N
2. 1.98 mN
3. 99 N
4. 19.8 mN

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

Assertion A: The potential (V) at any axial point, at 2 m distance (r) from the centre of the dipole, of dipole moment vector $P \rightarrow$ of magnitude, $4 \times 10^{-6} \text{ Cm}$, is

$\pm 9 \times 10^3 \text{ V}$ (Take $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ SI}$

units)

$V = \pm \frac{2P}{4\pi\epsilon_0 r^2}$, where r is the distance of

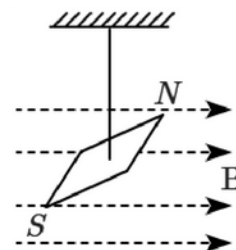
Reason R: any axial point situated at 2 m from the centre of the dipole.

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

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

explanation of **(A)**.

In a uniform magnetic field of 0.049 T , a magnetic needle performs 20 complete oscillations in 5 seconds as shown. The moment of inertia of the needle is $9.8 \times 10^{-6} \text{ kg m}^2$. If the magnitude of magnetic moment of the needle is $x \times 10^{-5} \text{ Am}^2$; then the value of 'x' is:



1. $128\pi^2$
2. $50\pi^2$
3. $1280\pi^2$
4. $5\pi^2$

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If the monochromatic source in Young's double slit experiment is replaced by white light, then:

1. there will be a central dark fringe surrounded by a few coloured fringes.
2. there will be a central bright white fringe surrounded by a few coloured fringes.
3. all bright fringes will be of equal width.
4. interference pattern will disappear.

Given below are two statements:

Atoms are electrically neutral as they

Statement I: contain equal number of positive and negative charges.

Statement II: Atoms of each element are stable and emit their characteristic spectrum.

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

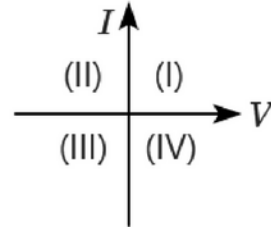
1. Both **Statement I** and **Statement II** are incorrect.
2. **Statement I** is correct but **Statement II** is incorrect.
3. **Statement I** is incorrect but **Statement II** is correct.
4. Both **Statement I** and **Statement II** are correct.

The maximum elongation of a steel wire of 1 m

length if the elastic limit of steel and its Young's modulus, respectively, are $8 \times 10^8 \text{ Nm}^{-2}$ and $2 \times 10^{11} \text{ N m}^{-2}$, is:

1. 0.4 mm
2. 40 mm
3. 8 mm
4. 4 mm

Consider the following Statements **A** and **B** and identify the correct answer:



- A.** For a solar-cell, the I - V characteristics lies in the IV quadrant of the given graph.
- B.** In a reverse-biased pn junction diode, the current measured in (μA), is due to majority charge carriers.

1. **A** is incorrect but **B** is correct.
2. Both **A** and **B** are correct.
3. **A** is correct but **B** is incorrect.
4. Both **A** and **B** are incorrect.

A particle moving with uniform speed in a circular path maintains:

1. constant acceleration.
2. constant velocity but varying acceleration.
3. varying velocity and varying acceleration.
4. constant velocity.

If c is the velocity of light in free space, the correct statements about photon among the following are:

- A.** The energy of a photon is $E = h\nu$.
- B.** The velocity of a photon is c .
- C.** The momentum of a photon, $p = \frac{h\nu}{c}$.
- D.** In a photon-electron collision, both total energy and total momentum are conserved.
- E.** Photon possesses positive charge.

Choose the correct answer from the options given below:

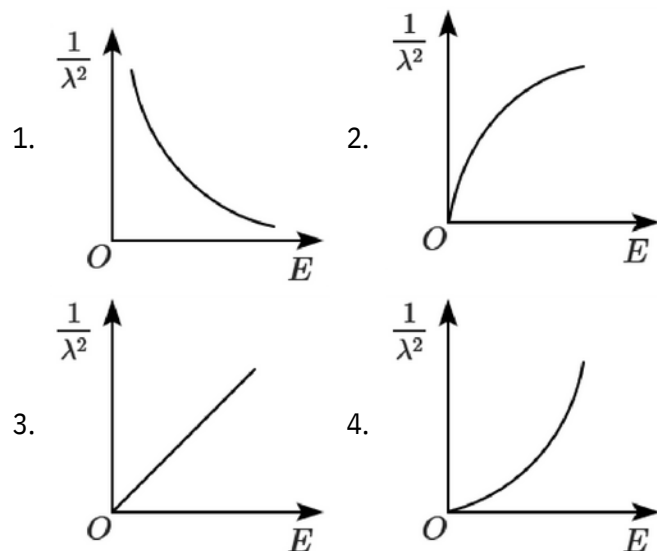
1. **A, B, C** and **D** only
2. **A, C** and **D** only
3. **A, B, D** and **E** only
4. **A** and **B** only

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Two bodies A and B of same mass undergo completely inelastic one dimensional collision. The body A moves with velocity v_1 while body B is at rest before collision. The velocity of the system after collision is v_2 . The ratio $v_1:v_2$ is:

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

The graph which shows the variation of $\frac{1}{\lambda^2}$ (1) and its kinetic energy, E is (where λ is de-Broglie wavelength of a free particle):



An unpolarised light beam strikes a glass surface at Brewster's angle. Then:

1. the refracted light will be completely polarised.
2. both the reflected and refracted light will be completely polarised.
3. the reflected light will be completely polarised but the refracted light will be partially polarised.
4. the reflected light will be partially polarised.

At any instant of time t , the displacement of any particle is given by $2t-1$ (SI unit) under the influence of force of 5 N. The value of instantaneous power is (in SI unit):

1. 5
2. 7
3. 6
4. 10

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

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

The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod is 2400 g cm^2 . The length of the 400 g rod is nearly:

1. 17.5 cm
2. 20.7 cm
3. 72.0 cm
4. 8.5 cm

A bob is whirled in a horizontal plane by means of a string with an initial speed of ω rpm. The tension in the string is T . If speed becomes 2ω while keeping the same radius, the tension in the string becomes:

1. $4T$
2. $\frac{T}{4}$
3. $\sqrt{2}T$
4. T

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

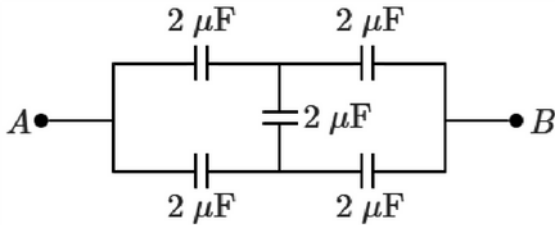
List-I (Material)	List-II (Susceptibility (χ))
A. Diamagnetic	I. $\chi = 0$
B. Ferromagnetic	II. $0 > \chi \geq -1$
C. Paramagnetic	III. $\chi \gg 1$
D. Non-magnetic	IV. $0 < \chi < \epsilon$ (a small positive number)

Choose the correct answer from the options given below:

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

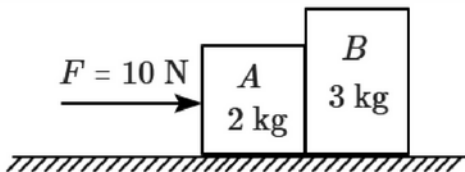
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In the following circuit, the equivalent capacitance between terminal A and terminal B is:

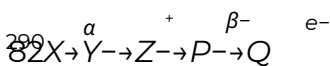


1. $1 \mu F$
2. $0.5 \mu F$
3. $4 \mu F$
4. $2 \mu F$

A horizontal force 10 N is applied to a block A as shown in figure. The mass of blocks A and B are 2 kg and 3 kg, respectively. The blocks slide over frictionless surface. The force exerted by block A on block B is :



1. 4 N
2. 6 N
3. 10 N
4. zero



In the nuclear emission stated above, the mass number and atomic number of the product Q respectively, are:

1. 286,80
2. 288,82
3. 286,81
4. 280,81

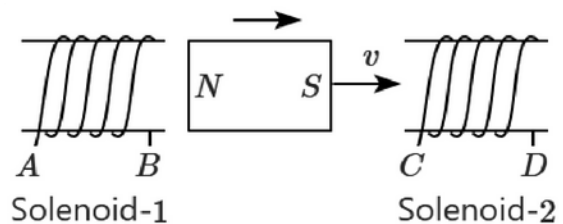
In a vernier calipers, $(N+1)$ divisions of vernier scale coincide with N divisions of main scale. If 1 MSD represents 0.1 mm, the vernier constant (in cm) is:

1. $\frac{1}{100(N+1)}$
2. $100N$
3. $10(N+1)$
4. $\frac{1}{10N}$

If $x = 5 \sin(\pi t + \pi)$ represents the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively are :

1. 5 m, 2 s
2. 5 cm, 1 s
3. 5 m, 1 s
4. 5 cm, 2 s

In the above diagram, a strong bar magnet is moving towards solenoid-2 from solenoid-1. The direction of induced current in solenoid-1 and that in solenoid-2, respectively, are through the directions:



1. BA and CD
2. AB and CD
3. BA and DC
4. AB and DC

Logic circuit provides the output Y as per the following truth table:

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

The expression for the output Y is :

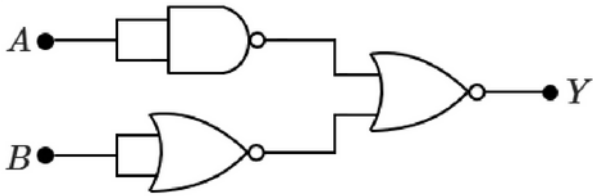
1. $A \cdot \bar{B} + \bar{A} \cdot \bar{B}$
2. $\bar{B}$
3. B
4. $A \cdot B + A \cdot \bar{B}$

A wire of length 'l' and resistance 100 Ω is divided into 10 equal parts. The first 5 parts are connected in series while the next 5 parts are connected in parallel. The two combinations are again connected in series. The resistance of this final combination is:

1. 52 Ω
2. 55 Ω
3. 60 Ω
4. 26 Ω

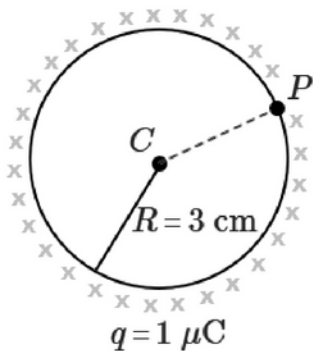
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The output (Y) of the given logic gate is similar to the output of an/a:



1. NOR gate
2. OR gate
3. AND gate
4. NAND gate

A thin spherical shell is charged by some source. The potential difference between the two points C and P (in V) shown in the figure is:
(Take $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$ SI units)



1. 1×10^5
2. 0.5×10^5
3. zero
4. 3×10^5

The mass of a planet is $\frac{1}{10}$ that of the earth and its diameter is half that of the earth. The acceleration due to gravity on that planet is:

1. 9.8 ms^{-2}
2. 4.9 ms^{-2}
3. 3.92 ms^{-2}
4. 19.6 ms^{-2}

PHYSICS SECTION B

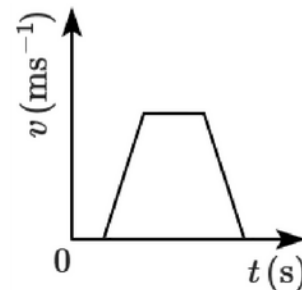
The minimum energy required to launch a satellite of mass m from the surface of earth of mass M and radius R in a circular orbit at an altitude of $2R$ from the surface of the earth is:

1. $\frac{2GmM}{3R}$
2. $\frac{GmM}{2R}$
3. $\frac{GmM}{3R}$
4. $\frac{5GmM}{6R}$

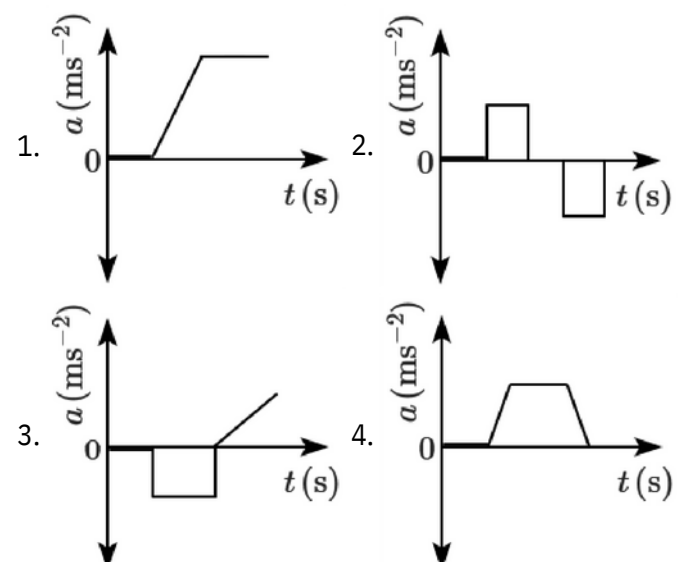
A small telescope has an objective of focal length 140 cm and an eye piece of focal length 5.0 cm. The magnifying power of telescope for viewing a distant object is:

1. 28
2. 17
3. 32
4. 34

The velocity (v)- time (t) plot of the motion of a body is shown below:



The acceleration (a)- time (t) graph that best suits this motion is:



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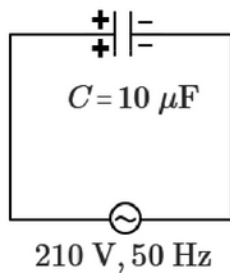
Two heaters A and B have power rating of 1 kW and 2 kW, respectively. Those two are first connected in series and then in parallel to a fixed power source. The ratio of power outputs for these two cases is:

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

A force defined by: $F = \alpha t^2 + \beta t$ acts on a particle at a given time t . The factor which is dimensionless, if α and β are constants, is:

1. $\alpha t / \beta$
2. $\alpha \beta t$
3. $\alpha \beta / t$
4. $\beta t / \alpha$

A $10 \mu\text{F}$ capacitor is connected to a 210 V, 50 Hz source as shown in the figure. The peak current in the circuit is nearly ($\pi = 3.14$):



1. 0.93 A
2. 1.20 A
3. 0.35 A
4. 0.58 A

A metallic bar of Young's modulus $0.5 \times 10^{11} \text{ Nm}^{-2}$ and coefficient of linear thermal expansion $10^{-5} \text{ }^\circ\text{C}^{-1}$ length 1 m and area of cross-section 10^{-3} m^2 is heated from 0°C to 100°C without expansion or bending. The compressive force developed in it is:

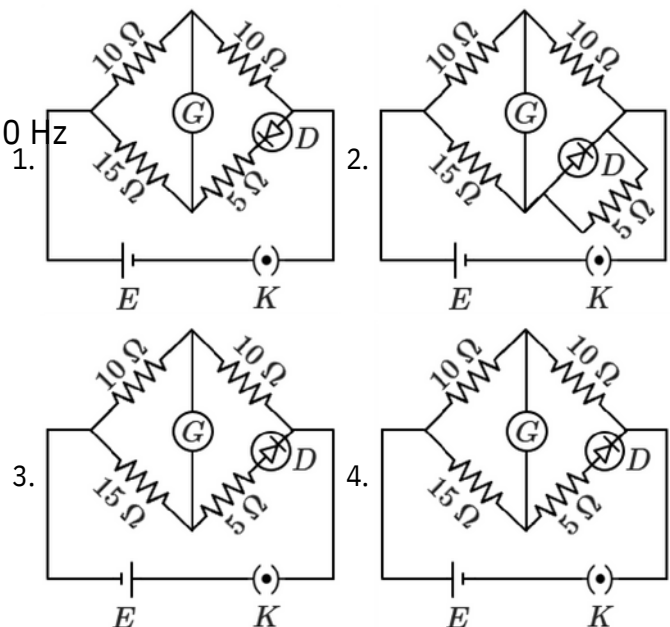
1. $50 \times 10^3 \text{ N}$
2. $100 \times 10^3 \text{ N}$
3. $2 \times 10^3 \text{ N}$
4. $5 \times 10^3 \text{ N}$

A parallel plate capacitor is charged by connecting it to a battery through a resistor. If i is the current in the circuit, then in the gap between the plates:

1. displacement current of magnitude equal to i flows in the same direction as i .
2. displacement current of magnitude equal to i flows in a direction opposite to that of i .
3. displacement current of magnitude greater than i flows but can be in any direction.
4. there is no current.

Choose the correct circuit which can achieve the

bridge balance :



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A sheet is placed on a horizontal surface in front of a strong magnetic pole. A force is needed to:

- hold the sheet there if it is magnetic.
- hold the sheet there if it is non-magnetic.
- move the sheet away from the pole with uniform velocity if it is conducting.
- move the sheet away from the pole with uniform velocity if it is both, non-conducting and non-polar.

Choose the correct statement(s) from the options given below:

1. A and C only
2. A, C and D only
3. C only
4. B and D only

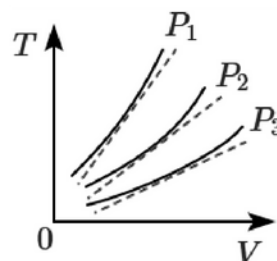
If the plates of a parallel plate capacitor connected to a battery are moved close to each other, then:

- the charge stored in it, increases.
- the energy stored in it, decreases.
- its capacitance increases.
- the ratio of charge to its potential remains the same.
- the product of charge and voltage increases.

Choose the most appropriate answer from the options given below:

1. A, C and E. only
2. B, D and E. only
3. A, B and C. only
4. A, B and E. only

The following graph represents the T - V curves of an ideal gas (where T is the temperature and V the volume) at three pressures P_1, P_2 and P_3 compared with those of Charles's law represented as dotted lines.



Then the correct relation is :

1. $P_1 > P_3 > P_2$
2. $P_2 > P_1 > P_3$
3. $P_1 > P_2 > P_3$
4. $P_3 > P_2 > P_1$

The property which is not of an electromagnetic wave travelling in free space is that :

1. the energy density in electric field is equal to energy density in magnetic field.
2. they travel with a speed equal to $\frac{1}{\mu_0 \epsilon_0}$.
3. they originate from charges moving with uniform speed.
4. they are transverse in nature.

An iron bar of length L has magnetic moment M . It is bent at the middle of its length such that the two arms make an angle 60° with each other. The magnetic moment of this new magnet is:

1. M
2. $2M$
3. $\frac{M}{\sqrt{3}}$
4. M

If the mass of the bob in a simple pendulum is increased to thrice its original mass and its length is made half its original length, then the new time period of oscillation is x times its original time period. Then the value of x is:

1. $\sqrt{2}$
2. $2\sqrt{3}$
3. 4
4. $\sqrt{3}$

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CHEMISTRY SECTION A

The reagents with which glucose does not react (Note) give the corresponding test/products are:

- Tollen's reagent
- Schiff's reagent
- HCN
- NH₂ OH
- NaHSO₃

Choose the correct options from the given below:-

- A and D
- B and E
- E and D
- B and C

The energy of electron in the ground state ($n=1$) for He⁺ ion is $-xJ$, then that for an electron in $n=2$ state for Be³⁺ ion in J is :

- $-x$
- $-4x$
- $-x/4$
- $-x/9$

Which reaction is **NOT** a redox reaction?

- $2KClO_3 + I_2 \rightarrow 2KIO_3 + Cl_2$
- $H_2 + Cl_2 \rightarrow 2HCl$
- $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$
- $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

Match List I with List II.

List I

List II

(Process)

(Conditions)

A. Isothermal process

I. No heat exchange

B. Isochoric process

II. Carried out at constant temperature

C. Isobaric process

III. Carried out at constant volume

D. Adiabatic process

IV. Carried out at constant pressure

Choose the correct answer from the options given below :

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

For the reaction $2A \rightleftharpoons B + C$, $K = 4 \times 10^{-3}$. At

a given time, the composition of reaction mixture is :

$[A] = [B] = [C] = 2 \times 10^{-3} M$.

Then, which of the following is correct?

- Reaction has a tendency to go in forward direction.
- Reaction has a tendency to go in backward direction.
- Reaction has gone to completion in forward direction.
- Reaction is at equilibrium.

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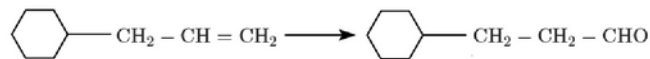
Match List I with List II.

List I (Complex)	List II (Type of isomerism)
A. $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$	I. Solvate isomerism
B. $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)] \text{Br}$	II. Linkage isomerism
C. $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$	III. Ionization isomerism
D. $[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$	IV. Coordination

Choose the correct from the options given below :

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

Identify the correct reagents that would bring about the following transformation.



1. (i) BH_3
(ii) $\text{H}_2\text{O}_2/\text{OH}^-$
2. (i) BH_3
(ii) $\text{H}_2\text{O}_2/\text{OH}^-$
(iii) alk. KMnO_4
(iv) $\text{H}^+/\text{H}_2\text{O}$
3. (i) $\text{H}^+/\text{H}_2\text{O}$
(ii) PCC
4. (i) $\text{H}^+/\text{H}_2\text{O}$
(ii) CrO_3

In which of the following processes entropy

increases?

- A. A liquid evaporates to vapour.
- B. Temperature of a crystalline solid lowered from 130 K to 0 K.
- C. $2\text{NaHCO}_3(\text{s}) \rightarrow \text{Na}_2\text{CO}_3(\text{s}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g})$
- D. $\text{Cl}_2(\text{g}) \rightarrow 2\text{Cl}(\text{g})$

Choose the correct answer from the options given below :

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

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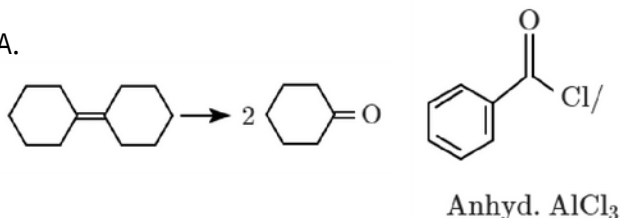
Match List I with List II.

**List I
(Reaction)**

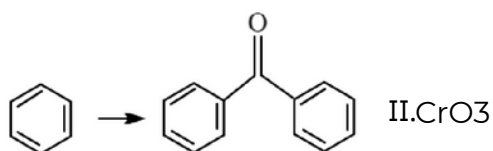
**List II
(Reagents/
Condition)**

I.

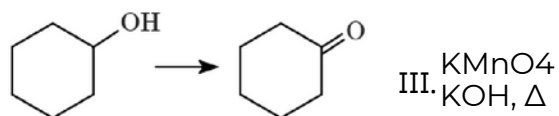
A.



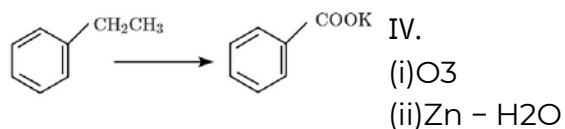
B.



C.



D.



In which of the following equilibria, K_p and K_c are **NOT** equal?

- $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$
- $\text{CO}(\text{g}) + \text{H}_2\text{O}(\text{g}) \rightleftharpoons \text{CO}_2(\text{g}) + \text{H}_2(\text{g})$
- $2\text{BrCl}(\text{g}) \rightleftharpoons \text{Br}_2(\text{g}) + \text{Cl}_2(\text{g})$
- $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$

Which one of the following alcohols reacts instantaneously with Lucas reagent?

- $$\begin{array}{c} \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{OH} \\ | \\ \text{CH}_3 \end{array}$$
- $$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_2\text{OH} \\ | \\ \text{CH}_3 \end{array}$$
- $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 - \text{C} - \text{OH} \\ | \\ \text{CH}_3 \end{array}$$
- $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2\text{OH}$

Choose the correct answer from the options given below

:

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

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Given below are two statements :

Statement I : The boiling point of three isomeric pentanes follows the order n-pentane > isopentane > neopentane (Rochelle's salt)

Statement II : When branching increases, the molecule attains a shape of sphere. This results in smaller surface area for contact, due to which the intermolecular forces between the spherical molecules are weak, thereby lowering the boiling point.

In the light of the above statements, choose the *most appropriate* answer from the option given below:
 1. Both Statement I and Statement II are incorrect.
 2. Statement I is correct but Statement II is incorrect.
 3. Statement I is incorrect but Statement II is correct.
 4. Both Statement I and Statement II are correct.

Given below are two statements:

Statement I : Aniline does not undergo Friedel-Crafts alkylation reaction.

Statement II : Aniline cannot be prepared through Gabriel synthesis.

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

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

The E° value for the Mn^{3+}/Mn^{2+} couple is more positive than that of Cr^{3+}/Cr^{2+} or Fe^{3+}/Fe^{2+} due to change of

1. d5 to d2 configuration
2. d4 to d5 configuration
3. d3 to d5 configuration
4. d5 to d4 configuration

On heating some solid substances change from solid to vapour state without passing through liquid state. The technique used for the purification of such solid substances based on the above principle is known as

1. Sublimation
2. Distillation
3. Chromatography
4. Crystallization

Fehling solution 'A' is

1. alkaline copper sulphate
2. alkaline solution of sodium potassium tartrate (Rochelle's salt)
3. aqueous sodium citrate
4. aqueous copper sulphate

Match List I with List II.

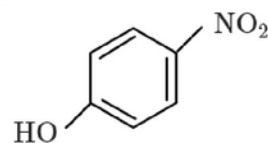
List I (Molecule)	List II (Number and types of bond/s between two carbon atoms)
A. ethane	I. one σ -bond and two π -bonds
B. ethene	II. two π -bonds
C. molecule, carbon C2	III. one σ -bond
D. ethyne	IV. one σ -bond and one π -bond

Choose the correct answer from the options given below:

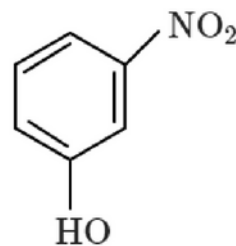
1. A-IV, B-III, C-II, D-I
2. A-III, B-IV, C-II, D-I
3. A-III, B-IV, C-I, D-II
4. A-I, B-IV, C-II, D-III

Intramolecular hydrogen bonding is present in

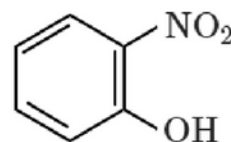
1.



2.



3. HF



4.

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The highest number of helium atoms is in:

1. 4 u of helium
2. 4 g of helium
3. 2.271098 L of helium at STP
4. 4 mol of helium

Match List I with List II.

List I (Conversion)	List II (Number of Faraday required)
A. 1 mol of H_2O to O_2	I. 3F
B. 1 mol of MnO_4^- to Mn^{2+}	II. 2F
C. 1.5 mol of Ca from molten $CaCl_2$	III. 1F
D. 1 mol of FeO to Fe_2O_3	IV. 5F

Choose the correct answer from the options given below:

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

Among Group 16 elements, which one does NOT

show -2 oxidation state?

1. Se
2. Te
3. Po
4. O

'Spin only' magnetic moment is same for which of

the following ions?

- A. Ti^{3+}
- B. Cr^{2+}
- C. Mn^{2+}
- D. Fe^{2+}
- E. Sc^{3+}

Choose the most appropriate answer from the options given below:

1. A and E only
2. B and C only
3. A and D only
4. B and D only

A compound with a molecular formula of C_6H_{14}

has two tertiary carbons. Its IUPAC name is:

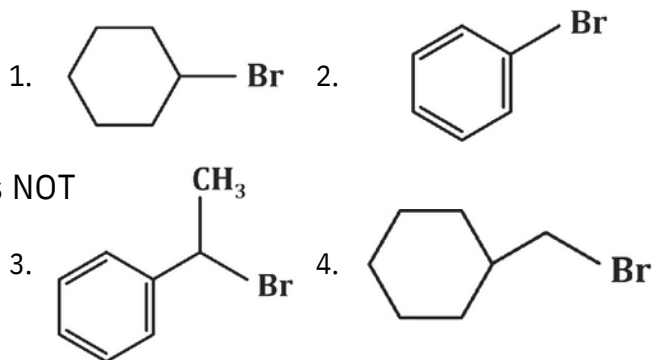
1. 2-methyl pentane
2. 2, 3-dimethylbutane
3. 2, 2-dimethylbutane
4. n-hexane

The Henry's law constant K_H values of three gases

(A, B, C) in water are 145, 2×10^{-5} and 35 kbar, respectively. The solubility of these gases in water follow the order:

1. $B > C > A$
2. $A > C > B$
3. $A > B > C$
4. $B > A > C$

The compound that will undergo SN_1 reaction with the fastest rate is



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The most stable carbocation among the following is :

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

Given below are two statements :

Statement I : Both $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$ complexes are octahedral but differ in their magnetic behaviour.

Statement II : $[\text{Co}(\text{NH}_3)_6]^{3+}$ is diamagnetic whereas $[\text{CoF}_6]^{3-}$ is paramagnetic.

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

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

1 gram of sodium hydroxide was treated with 25

mL of 0.75 M HCl solution, the mass of sodium hydroxide left unreacted is equal to :

1. 250 mg
2. Zero mg
3. 200 mg
4. 750 mg

Given below are two statements :

Statement I : The boiling point of hydrides of Group 16 elements follow the order

$\text{H}_2\text{O} > \text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S}$.

Statement II : On the basis of molecular mass, H_2O is expected to have lower boiling point than the other members of the group but due to the presence of extensive H-bonding in H_2O , it has higher boiling point.

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

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

Arrange the following elements in increasing order

of first ionization enthalpy: Li, Be, B, C, N Choose the correct answer from the options given below: 1. $\text{Li} < \text{B} < \text{Be} < \text{C} < \text{N}$

2. $\text{Li} < \text{Be} < \text{C} < \text{B} < \text{N}$
3. $\text{Li} < \text{Be} < \text{N} < \text{B} < \text{C}$
4. $\text{Li} < \text{Be} < \text{B} < \text{C} < \text{N}$

Activation energy of any chemical reaction can be

calculated if one knows the value of

1. Probability of collision.
2. Orientation of reactant molecules during collision.
3. Rate constant at two different temperatures.
4. Rate constant at standard temperature.

Arrange the following elements in increasing order

of electro negativity N, O, F, C, Si Choose the correct answer from the options given below : 1. $\text{Si} < \text{C} < \text{O} < \text{N} < \text{F}$

2. $\text{O} < \text{F} < \text{N} < \text{C} < \text{Si}$
3. $\text{F} < \text{O} < \text{N} < \text{C} < \text{Si}$
4. $\text{Si} < \text{C} < \text{N} < \text{O} < \text{F}$

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Match List I with List II.

List I Quantum Number	List II Information provided
A. ml	I. shape of orbital
B. ms	II. size of orbital
C. l	III. orientation of orbital
D. n	IV. orientation of spin of electron

Choose the correct answer from the options given below :

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

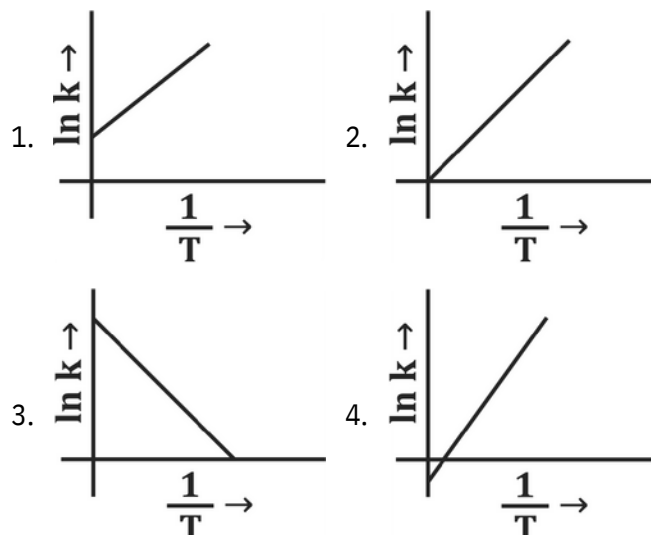
Match List I with List II.

List I (Compound)	List II (Shape/geometry)
A. NH_3	I. Trigonal Pyramidal
B. BrF_5	II. Square planar
C. XeF_4	III. Octahedral
D. SF_6	IV. Square Pyramidal

Choose the correct answer from the option given below:

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

Which plot of $\ln k$ vs $\frac{1}{T}$ is consistent with Arrhenius equation?



CHEMISTRY - SECTION B

The work done during reversible isothermal expansion of one mole of hydrogen gas at 25°C from pressure of 20 atmosphere to 10 atmosphere is :
(Given $R = 2.0 \text{ cal K}^{-1} \text{ mol}^{-1}$)

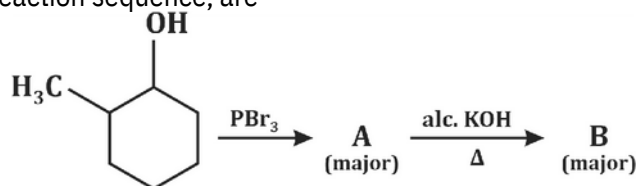
1. -413.14 calories
2. 413.14 calories
3. 100 calories
4. 0 calorie

Identify the **correct** answer.

1. BF_3 has non-zero dipole moment.
2. Dipole moment of NF_3 is greater than that of NH_3 .
3. Three canonical forms can be drawn for CO_2^{2-} ion.
4. Three resonance structures can be drawn for ozone.

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Major products A and B formed in the following reaction sequence, are



1. $A =$; $B =$
2. $A =$; $B =$
3. $A =$; $B =$
4. $A =$; $B =$

The pair of lanthanoid ions which are diamagnetic is

1. Ce^{3+} and Eu^{2+}
2. Gd^{3+} and Eu^{3+}
3. Pm^{3+} and Sm^{3+}
4. Ce^{4+} and Yb^{2+}

A compound X contains 32% of A, 20% of B and remaining percentage of C. Then, the empirical formula of X is :

(Given atomic mass of A=64; B=40; C=32u)

1. ABC_3
2. AB_2C_2
3. ABC_4
4. A_2BC_2

Given below are certain cations. Using inorganic qualitative analysis, arrange them in increasing group number from) to VI.

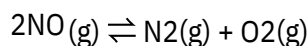
- Al^{3+}
- Cu^{2+}
- Ba^{2+}
- Co^{2+}
- Mg^{2+}

Choose the correct answer from the options given below

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

Consider the following reaction in a sealed vessel at equilibrium with concentrations of

$$\text{N}_2 = 3.0 \times 10^{-3} \text{ M}, \text{O}_2 = 4.2 \times 10^{-3} \text{ M} \text{ and } \text{NO} = 2.8 \times 10^{-3} \text{ M}$$



If 0.1 mol L^{-1} of $\text{NO}(\text{g})$ is taken in a closed vessel, what will be degree of dissociation (α) of $\text{NO}(\text{g})$ at equilibrium?

1. 0.8889
2. 0.8889
3. 0.717
4. 0.00889

The rate of a reaction quadruples when temperature changes from 27°C to 57°C . Calculate the energy of activation.

$$\text{Given } R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}, \log 4 = 0.6021$$

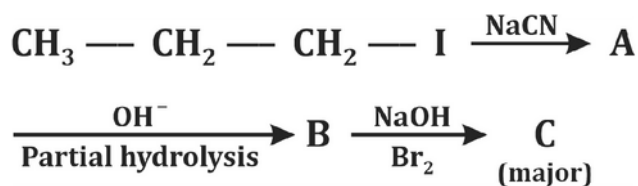
1. 380.4 kJ/mol
2. 3.80 kJ/mol
3. 3804 kJ/mol
4. 38.04 kJ/mol

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During the preparation of Mohr's salt solution (Ferrous ammonium sulphate), which of the following acid is added to prevent hydrolysis of Fe^{2+} ion?

1. Concentrated sulphuric acid
2. Dilute nitric acid
3. Dilute sulphuric acid
4. Dilute hydrochloric acid

Identify the major product C formed in the following reaction sequence:



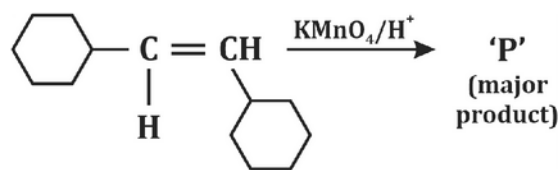
1. butylamine
2. butanamide
3. α - bromobutanoic acid
4. propylamine

Mass in grams of copper deposited by passing

9.6487 A current through a voltmeter containing copper sulphate for 100 seconds is : (Given : Molar mass of Cu: 63g mol^{-1} IF = 96487 C)

1. 0.315 g
2. 31.5 g
3. 0.0315 g
4. 3.15 g

For the given reaction:



'P' is

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

Given below are two statements :

Statement I: $[\text{Co}(\text{NH}_3)_6]^{3+}$ is a homoleptic complex whereas $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ is a heteroleptic complex

Statement II: Complex $[\text{Co}(\text{NH}_3)_6\text{Cl}_2]^{3+}$ has only one kind of ligands but $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ has more than one kind of ligands

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

1. Both Statement I and Statement II are false.
2. Statement I is true but Statement II is false.
3. Statement I is false but Statement II is true.
4. Both Statement I and Statement II are true.

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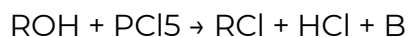
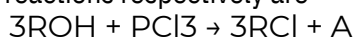
The plot of osmotic pressure (π) vs concentration (mol L⁻¹) for a solution gives a straight line with slope

25.73 L bar mol⁻¹. The temperature at which osmotic pressure measurement is done is:

(Use $R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$)

1. 310°C
2. 25.73°C
3. 12.05 °C
4. 37°C

The products A and B obtained in the following reactions respectively are



1. POCl_3 and H_3PO_4
2. H_3PO_4 and POCl_3
3. H_3PO_3 and POCl_3
4. POCl_3 and H_3PO_3

BIOLOGY - 1 - SECTION A

Auxin is used by gardeners to prepare weed-free lawns. But no damage is caused to grass as auxin:

1. promotes abscission of mature leaves only,
2. does not affect mature monocotyledonous plants.
3. can help in cell division in grasses, to produce growth.
4. promotes apical dominance

Lecithin, a small molecular weight organic compound found in living tissues, is an example of:

1. Phospholipids
2. Glycerides
3. Carbohydrates
4. Amino acids

Match List I and List II

List I

- A. Two or more alternative forms of a gene
- B. Cross of F1 progeny with homozygous recessive parent
- C. Cross of F1 progeny with any of the parents
- D. Number of chromosome sets in plant

List II

- (i) Back Cross
- (ii) Ploidy
- (iii) Allele
- (iv) Test cross

Choose the correct answer from the options given below:

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

Identify the set of correct statements:

A: The flowers of *Vallisneria* are colourful and produce nectar.

B: The flowers of waterlily are not pollinated by water.

C: In most of water-pollinated species, the pollen grains are protected from wetting.

D: Pollen grains of some hydrophytes are long and ribbon like.

E: In some hydrophytes, the pollen grains are carried passively inside water.

Choose the correct answer from the options given below:

1. **A, B, C** and **D** only
2. **A, C, D** and **E** only
3. **B, C, D** and **E** only
4. **C, D** and **E** only

List of endangered species was released by:

1. WWF
2. FOAM
3. IUCN
4. GEAC

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What is the fate of a piece of DNA carrying only gene of interest which is transferred into an alien organism?

- A:** The piece of DNA would be able to multiply itself independently in the progeny cells of the organism.
- B:** It may get integrated into the genome of the recipient.
- C:** It may multiply and be inherited along with the host DNA.
- D:** The alien piece of DNA is not an integral part of chromosome.
- E:** It shows ability to replicate.

Choose the correct answer from the options given below:

- 1. **D** and **E** only
- 2. **B** and **C** only
- 3. **A** and **E** only
- 4. **A** and **B** only

Which of the following are required for the dark reaction of photosynthesis?

- A:** Light
- B:** Chlorophyll
- C:** CO₂
- D:** ATP
- E:** NADPH

Choose the correct answer from the options given below:

- 1. **B**, **C** and **D** only
- 2. **C**, **D** and **E** only
- 3. **D** and **E** only
- 4. **A**, **B** and **C** only

The type of conservation in which the threatened species are taken out from their natural habitat and placed in special setting where they can be protected and given special care is called:

- 1. Biodiversity conservation
- 2. Semi-conservative method
- 3. Sustainable development
- 4. *in-situ* conservation

Statement I: Bt toxins are insect group specific and coded by a gene *cry IAC*.

Bt toxin exists as inactive protoxin in *B. thuringiensis*. However, after ingestion

Statement II: by the insect the inactive protoxin gets converted into active form due to acidic pH of the insect gut

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

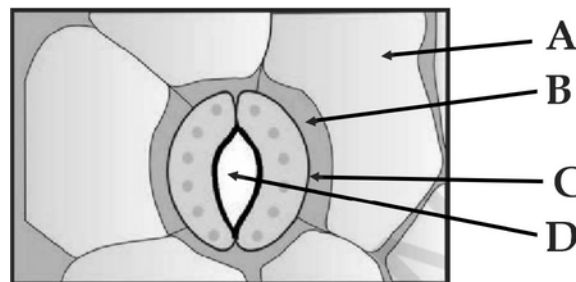
- 1. Both **Statement I** and **Statement II** are False
- 2. **Statement I** is True but **Statement II** is False
- 3. **Statement I** is False but **Statement II** is True
- 4. Both **Statement I** and **Statement II** are True

A transcription unit in DNA is defined primarily by

the three regions in DNA and these are with respect to upstream and down stream end:

- 1. Structural gene, Transposons, Operator gene
- 2. Inducer, Repressor, Structural gene
- 3. Promotor, Structural gene, Terminator
- 4. Repressor, Operator gene, Structural gene

In the given figure, which component has thin outer walls and highly thickened inner walls?



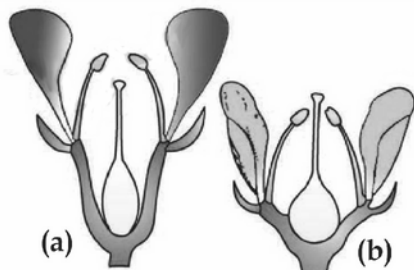
- 1. D
- 2. A
- 3. B
- 4. C

Hind II always cuts DNA molecules at a particular point called recognition sequence and it consists of:

- 1. 6 bp
- 2. 4 bp
- 3. 10 bp
- 4. 8 bp

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Identify the type of flowers based on the position of calyx, corolla and androecium with respect to the ovary from the given figures (a) and (b)



1. (a) Hypogynous; (b) Epigynous
2. (a) Perigynous; (b) Epigynous
3. (a) Perigynous; (b) Perigynous
4. (a) Epigynous; (b) Hypogynous

Which of the following is an example of actinomorphic flower?

1. *Cassia*
2. *Pisum*
3. *Sesbania*
4. *Datura*

Which one of the following is not a criterion for classification of fungi?

1. Mode of nutrition
2. Mode of spore formation
3. Fruiting body
4. Morphology of mycelium

The equation of Verhulst-Pearl logistic growth is

$$\frac{dN}{dt} = rN \left[\frac{K - N}{K} \right]$$

From this equation, K indicates:

1. Biotic potential
2. Carrying capacity
3. Population density
4. Intrinsic rate of natural increase

Which one of the following can be explained as the basis of Mendel's Law of dominance?

- A:** Out of one pair of factors one is dominant and the other is recessive.
B: Alleles do not show any expression and both the characters appear as such in F₂ generation.
C: Factors occur in pairs in normal diploid plants.
D: The discrete unit controlling a particular character is called factor.
E: The expression of only one of the parental characters is found in a monohybrid cross.

Choose the correct answer from the options given below:

1. **A, C, D** and **E** only
2. **B, C** and **D** only
3. **A, B, C, D** and **E**
4. **A, B** and **C** only

Match List I with List II

List I		List II
A. <i>Rhizopus</i>	(i)	Mushroom
B. <i>Ustilago</i>	(ii)	Smut fungus
C. <i>Puccinia</i>	(iii)	Bread mould
D. <i>Agaricus</i>	(iv)	Rust fungus

Choose the correct answer from the options given below:

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

Inhibition of Succinic dehydrogenase enzyme by malonate is a classical example of:

1. Feedback inhibition
2. Competitive inhibition
3. Enzyme activation
4. Cofactor inhibition

Formation of interfascicular cambium from fully developed parenchyma cells is an example for

1. Redifferentiation
2. Dedifferentiation
3. Maturation
4. Diffrentiation

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A pink flowered Snapdragon plant was crossed

with red flowered Snapdragon plant. What type of phenotype/s is/are expected in the progeny?

1. Red flowered as well as pink flowered plants
2. Only pink flowered plants
3. Red, Pink as well as white flowered plants
4. Only red flowered plants

In a plant, black seed color (BB/Bb) is dominant over white seed color (bb). In order to find out the genotype of black seed plant, with which of the following genotype will you cross it?

1. bb
2. Bb
3. BB/Bb
4. BB

Match List I with List II

List I	List II
A. <i>Clostridium butylicum</i>	I. Ethanol
B. <i>Saccharomyces cerevisiae</i>	II. Streptokinase
C. <i>Trichoderma Polysporum</i>	III. Butyric acid
D. <i>Streptococcus sp.</i>	IV. Cyclosporin-A

Choose the correct answer from the options given below:

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

How many molecules of ATP and NADPH are required for every molecule of CO₂ fixed in the Calvin cycle?

1. 2 molecules of ATP and 2 molecules of NADPH
2. 3 molecules of ATP and 3 molecules of NADPH
3. 3 molecules of ATP and 2 molecules of NADPH
4. 2 molecules of ATP and 3 molecules of NADPH

The capacity to generate a whole plant from any cell of the plant is called:

1. Micropropagation
2. Differentiation
3. Somatic hybridization
4. Totipotency

Tropical regions show greatest level of species richness because

Tropical latitudes have remained relatively

A:undisturbed for millions of years, hence more time was available for species diversification.

B:Tropical environments are more seasonal.
C:More solar energy is available in tropics.

D:Constant environments promote niche specialization.

E:Tropical environments are constant and predictable.

Choose the correct answer from the options given below:

1. **A, C, D** and **E** only
2. **A** and **B** only
3. **A, B** and **D** only
4. **A, B** and **E** only

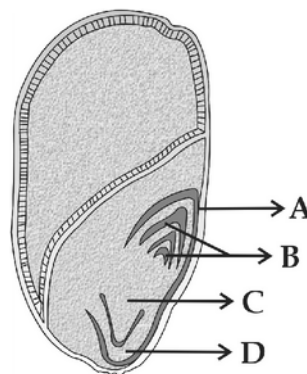
Match List I with List II

List I	List II
A. Nucleolus	I. Site of formation of glycolipid
B. Centriole	II. Organization like the cartwheel
C. Leucoplasts	III. Site for active ribosomal RNA
D. Golgi apparatus	IV. For storing nutrients

Choose the correct answer from the options give below:

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

Identify the part of the seed from the given figure which is destined to form root when the seed germinates.



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

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Spindle fibers attach to kinetochores of chromosomes during

1. Metaphase
2. Anaphase
3. Telophase
4. Prophase

Given below are two statements:

Chromosomes become gradually visible

Statement I: under light microscope during leptotene stage.

The beginning of diplotene stage is

Statement II: recognized by dissolution of synaptonemal complex.

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

1. Both **Statement I** and **Statement II** are False
2. **Statement I** is True but **Statement II** is False
3. **Statement I** is False but **Statement II** is True
4. Both **Statement I** and **Statement II** are True

Given below are two statements:

Statement I: Parenchyma is living but collenchyma is dead tissue.

Gymnosperms lack xylem vessels but

Statement II: presence of xylem vessels is the characteristic of angiosperms.

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

1. Both **Statement I** and **Statement II** are False
2. **Statement I** is True but **Statement II** is False
3. **Statement I** is False but **Statement II** is True
4. Both **Statement I** and **Statement II** are True

These are regarded as major causes of biodiversity

loss:

A: Over exploitation

B: Co-extinction

C: Mutation

D: Habitat loss and fragmentation

E: Migration

Choose the correct option:

1. **A, B, C** and **D** only
2. **A, B** and **E** only
3. **A, B** and **D** only
4. **A, C** and **D** only

The lactose present in the growth medium of bacteria is transported to the cell by the action of:

1. Acetylase
2. Permease
3. Polymerase
4. Beta-galactosidase

Bulliform cells are responsible for

1. Protecting the plant from salt stress.
2. Increased photosynthesis in monocots.
3. Providing large spaces for storage of sugars.
4. Inward curling of leaves in monocots.

The cofactor of the enzyme carboxypeptidase is:

1. Niacin
2. Flavin
3. Haem
4. Zinc

BIOLOGY - 1 - SECTION B

Read the following statements and choose the set of correct statements:

A: A sexual reproduction occurs usually by biflagellate zoospores.

B: Sexual reproduction is by oogamous method only.

C: Stored food is in the form of carbohydrates which is either mannitol or laminarin.

D: The major pigments foods are chlorophyll a, c and carotenoids and xanthophyll.

Vegetative cells have a cellulosic wall, usually

E: covered on the outside by gelatinous coating of algin.

Choose the correct answer from the options given

1. **B, C, D** and **E** only
2. **A, C, D** and **E** only
3. **A, B, C** and **E** only
4. **A, B, C** and **D** only

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Match List I with List II

List I	List II
A. Robert May	I. Species-Area relationship
B. Alexander von Humboldt	II. Long term ecosystem experiment using out door plots
C. Paul Ehrlich	III. Global species diversity at about 7 million
D. David Tilman	IV. Rivet popper hypothesis

Choose the correct answer from the options given below:

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

Given below are two statements:

Statement I: In C_3 plants, some O_2 binds to RuBisCO, hence CO_2 fixation is decreased.

Statement II: In C_4 plants, mesophyll cells show very little photorespiration while bundle sheath cells do not show photorespiration.

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

1. Both **Statement I** and **Statement II** are False
2. **Statement I** is True but **Statement II** is False
3. **Statement I** is False but **Statement II** is True
4. Both **Statement I** and **Statement II** are True

The DNA present in chloroplast is:

1. Circular, double stranded
2. Linear, single stranded
3. Circular, single stranded
4. Linear, double stranded

In an ecosystem if the Net Primary Productivity

(NPP) of first trophic level is $100x(\text{kcal m}^{-2}\text{yr}^{-1})$, what would be the GPP (Gross Primary Productivity) of the third trophic level of the same ecosystem?

1. $x(\text{kcal m}^{-2}\text{yr}^{-1})$
2. $\frac{100x}{3}(\text{kcal m}^{-2}\text{yr}^{-1})$
3. $\frac{100x}{5}(\text{kcal m}^{-2}\text{yr}^{-1})$
4. $\frac{x}{10}(\text{kcal m}^{-2}\text{yr}^{-1})$

Which of the following are fused in somatic hybridization involving two varieties of plants?

1. Somatic embryos
2. Protoplasts
3. Pollens
4. Callus

Match List I with List II

List I	List II
A. Citric acid cycle	I. Cytoplasm
B. Glycolysis	II. Mitochondrial matrix
C. Electron transport system	III. Intermembrane space of mitochondria
D. Proton gradient	IV. Inner mitochondrial membrane

Choose the correct answer from the option given below:

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

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Match List I with List II

List I	List II
A.Frederick Griffith	I. Genetic code
B.Francois Jacob & Jacques Monod	II.Semi-conservative mode of DNA replication
C.Har Gobind Khorana	III.Transformation
D.Meselson Stahl	IV.Lac operon

Choose the correct answer from the options given below:

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

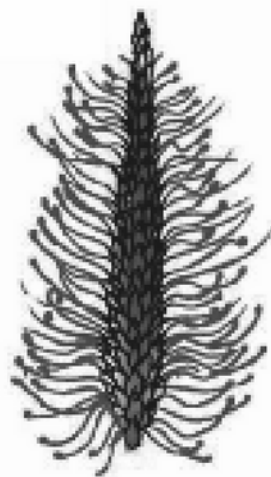
Match List I with List II

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

Choose the correct answer from the options given below:

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

Identify the correct description about the given figure:



- 1.Water pollinated flowers showing stamens with mucilaginous covering.
- 2.Cleistogamous flowers showing autogamy.
- 3.Compact inflorescence showing complete autogamy
- 4.Wind pollinated plant inflorescence showing flowers with well exposed stamens

Match List I with List II

List I	List II
A. GLUT-4	I. Hormone
B. Insulin	II. Enzyme
C. Trypsin	III.Intercellular ground substance
D. Collagen	IV.Enables glucose transport into cells

Choose the correct answer from the options given below:

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

Identify the step in tricarboxylic acid cycle, which does not involve oxidation of substrate.

1. Succinic acid $\rightarrow$ Malic acid
2. Succinyl-CoA $\rightarrow$ Succinic acid
3. Isocitrate $\rightarrow$ α - ketoglutaric acid
4. Malic acid $\rightarrow$ Oxaloacetic acid

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Spraying sugarcane crop with which of the following plant growth regulators, increases the length of stem. Thus, increasing the yield?

1. Gibberellin
2. Cytokinin
3. Absciscic acid
4. Auxin

Match the following

List I	List II
A. Rose	I. Twisted aestivation
B. Pea	II. Perigynous flower
C. Cotton	III. Drupe
D. Mango	IV. Marginal placentation

Choose the correct answer from the options given below:

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

Which of the following statement is correct regarding the process replication in *E. coli* ?

1. The DNA dependent RNA polymerase catalyses polymerization in one direction, that is $5' \rightarrow 3'$
- The DNA dependent DNA polymerase catalyses polymerization in $5' \rightarrow 3'$ as well as the $3' \rightarrow 5'$ direction.
3. The DNA dependent DNA polymerase catalyses polymerization in $5' \rightarrow 3'$ direction.
4. The DNA dependent DNA polymerase catalyses polymerization in one direction which is $3' \rightarrow 5'$.

BIOLOGY - 2 - SECTION A

Match List I with List II:

List I	List II
1. Pons	Provides additional space I. for Neurons, regulates posture and balance
2. Hypothalamus	II. Controls respiration and gastric secretions
3. Medulla	III. Connects different regions of the brain
4. Cerebellum	IV. Neuro secretory cells

Choose the correct answer from the options given below:

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

Which of the following is not a component of Fallopian tube?

1. Isthmus
2. Infundibulum
3. Ampulla
4. Uterine fundus

The "Ti plasmid" of *Agrobacterium tumefaciens* stands for

1. Tumor independent plasmid
2. Tumor inducing plasmid
3. Temperature independent plasmid
4. Tumour inhibiting plasmid

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Match List I with List II:

List I	List II
	Expiratory reserve
1. Expiratory capacity	I. volume + Tidal volume + Inspiratory reserve volume
2. Functional residual capacity	Tidal volume + II. Expiratory reserve volume
3. Vital capacity	III. Inspiratory reserve volume
4. Inspiratory capacity	Expiratory reserve IV. volume + Residual volume

Choose the correct answer from the options given below:

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

Given below are two statements : one is labelled as

Assertion (A) and the other is labelled as Reason (R):

Assertion (A): FSH acts upon ovarian follicles in female and Leydig cells in male. Growing ovarian follicles secrete

Reason (R): estrogen in female while interstitial cells secrete androgen in male human being.

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

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

Match List I and List II:

List I	List II
1. Lipase	I. Peptide bond
2. Nuclease	II. Ester bond
3. Protease	III. Glycosidic bond
4. Amylase	IV. Phosphodiester bond

Choose the correct answer from the options given below:

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

Given below are some stages of human evolution.

Arrange the in correct sequence. (Past to recent)

- A. *Homo habilis*
- B. *Homo sapiens*
- C. *Homo neanderthalensis*
- D. *Homo erectus*

Choose the correct sequence of human evolution from the options given below :

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

Which of the following are Autoimmune

disorders?

- A: Myasthenia gravis
- B: Rheumatoid arthritis
- C: Gout
- D: Muscular dystrophy
- E: Systemic Lupus Erythematosus (SLE)

Choose the most appropriate answer from the options given below :

1. A, B, & E only
2. B, C & E only
3. C, D & E only
4. A, B & D only

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Match List I with List II:

List I

- A. Common cold
- B. Haemozoin
- C. Widal test
- D. Allergy

List II

- I. *Plasmodium*
- II. Typhoid
- III. Rhinoviruses
- IV. Dust mites

Choose the correct answer from the options given below:

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

Match List I with List II:

List I

- A. Axoneme
- B. Cartwheel pattern
- C. Crista
- D. Satellite

List II

- I. Centriole
- II. Cilia and flagella
- III. Chromosome
- IV. Mitochondria

Choose the correct answer from the options given below:

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

Match List I with List II:

List I

- A. Pleurobrachia
- B. Radula
- C. Stomochord
- D. Air bladder

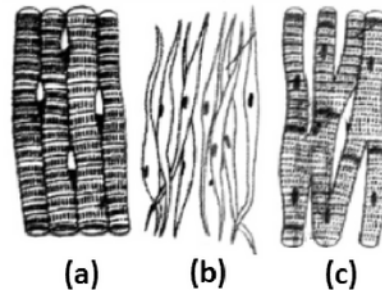
List II

- I. Mollusca
- II. Ctenophora
- III. Osteichthyes
- IV. Hemichordata

Choose the correct answer from the options given below:

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

Three types of muscles are given as a, b and c. Identify the correct matching pair along with their location in human body:



- | | |
|------------------------|-------------------------------|
| (a) Skeletal - Triceps | (a) Skeletal - Biceps |
| 1.(b) Smooth - Stomach | 2.(b) Involuntary - intestine |
| (c) Cardiac - Heart | (c) Smooth - Heart |
| (a) Involuntary - Nose | (a) Smooth - Toes |
| 3. tip | |
| (b) Skeletal - Bone | 4.(b) Skeletal - Legs |
| (c) Cardiac - Heart | (c) Cardiac - Heart |

Match List I with List II:

List I (Sub Phase of Prophase I)

- A. Diakinesis
- B. Pachytene
- C. Zygotene
- D. Leptotene

List II (Specific characters)

- I. Synaptonemal complex formation
- II. Completion of terminalisation of chiasmata
- III. Chromosomes look like thin threads
- IV. Appearance of recombination nodules

Choose the correct answer from the options given below:

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

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Match List I with List II:

List I

- A. Down's syndrome
- B. α -Thalassemia
- C. β -Thalassemia
- D. Klinefelter's syndrome

List II

- I. 11th chromosome
- II. 'X' chromosome
- III. 21st chromosome
- IV. 16th chromosome

Choose the correct answer from the options given below:

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

Which of the following statements is incorrect?

- 1. Most commonly used bio-reactors are of stirring type,
- 2. Bio-reactors are used to produce small scale bacterial cultures.
- 3. Bio-reactors have an agitator system, an oxygen delivery system and foam control system.
- 4. A bio-re actor provides optimal growth conditions for achieving the desired product.

Match List I with List II:

List I

- A. *Pterophyllum*
- B. *Myxine*
- C. *Pristis*
- D. *Exocoetus*

List II

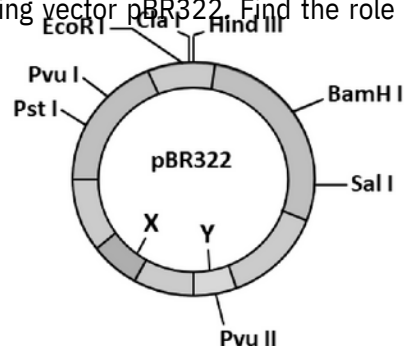
- I. Hag fish
- II. Saw fish
- III. Angel fish
- IV. Flying fish

Choose the correct answer from the options given below:

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

The following diagram showing restriction sites in

E.coli cloning vector pBR322. Find the role of 'X' and 'Y' genes :



The gene 'X' is responsible for controlling the copy number of the linked DNA and 'Y' for protein involved in the replication of Plasmid.

- 1. The gene 'X' is 'for protein involved in replication of Plasmid and 'Y' for resistance to antibiotics.
- 2. The gene 'X' is responsible for recognition sites and 'Y' is responsible for antibiotic resistance.

The gene 'X' is responsible for resistance to antibiotics and 'Y' for protein involved in the replication of Plasmid.

Given below are two statements:

Statement I: The presence or absence of hymen is not a reliable indicator of virginity.

Statement II: The hymen is torn during the first coitus only.

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

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

Consider the following statements:

- A. Annelids are true coelomates
- B. Poriferans are pseudocoelomates
- C. Aschelminthes are acoelomates
- D. Platyhelminthes are pseudocoelomates

Choose the correct answer from the options given below:

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

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Given below are statements:

Statement I: In the nephron, the descending limb of loop of Henle is impermeable to water and permeable to electrolytes.

Statement II: The proximal convoluted tubule is lined by simple columnar brush border epithelium and increases the surface area for reabsorption.

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

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

Following are the stages of cell division :

- A. Gap 2 phase B. Cytokinesis C. Synthesis phase D. Karyokinesis E. Gap I phase Choose the correct sequence of stages from the options given below :
1. E-B-D-A-C
 2. B-D-E-A-C
 3. E-C-A-D-B)
 4. C-E-D-A-B

In both sexes of cockroach, a pair of jointed filamentous structures called anal cerci are present on:

1. 10th segment
2. 8th and 9th segment
3. 11th segment
4. 5th segment

Match List I with List II:

- | List I | List II |
|---------------------------|--|
| A. Fibrous joints | I. Adjacent vertebrae, limited movement |
| B. Cartilaginous joints | II. Humerus and Pectoral girdle, rotational movement |
| C. Hinge joints | III. Skull, don't allow any movement |
| D. Ball and socket joints | IV. Knee, help in locomotion |

Choose the correct answer from the options given below:

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

Which of the following is not a steroid hormone?

1. Testosterone
2. Progesterone
3. Glucagon
4. Cortisol

Following are the stages of pathway for conduction of an action potential through the heart:

- A. AV bundle
B. Purkinje fibres
C. AV node D. Bundle branches
E. SA node

Choose the correct sequence of pathway from the options given below :

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

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Match List I with List II :

List I	List II
A. Non-medicated IUD I.	Multiload 375
B. Copper releasing IUD	II. Progestogens
C. Hormone releasing IUD	III. Lippes loop
D. Implants	IV. LNG-20

Choose the correct answer from the options given below:

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

Which of the following is not a natural/traditional contraceptive method?

1. Periodic abstinence
2. Lactational amenorrhea
3. vaults
4. Coitus interruptus

Which one is the correct product of dependent

RNA polymerase to the template?

- 3'TACATGGCAAATATCCATTCA5'
1. 5'AUGUAAAGUUUAUAGGUAAGU3'
2. 5'AUGUACCGUUUAUAGGGAAGU3'
3. 5'ATGTACCGTTTATAGGTAAGT3'
4. 5'AUGUACCGUUUAUAGGUAAGU3'

Which one of the following factors will not affect

the Hardy-Weinberg equilibrium?

1. Genetic drift
2. Gene migration
3. Constant gene pool
4. Genetic recombination

Match List I with List II:

List I	List II
A. Cocaine	I. Effective sedative in surgery
B. Heroin	II. <i>Cannabis sativa</i>
C. Morphine	III. <i>Erythroxylum</i>
D. Marijuana	IV. <i>Papaver somniferum</i>

Choose the correct answer from the options given below:

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

Match List I with List II:

List I	List II
A. Typhoid	I. Fungus
B. Leishmaniasis	II. Nematode
C. Ringworm	III. Protozoa
D. Filariasis	IV. Bacteria

Choose the correct answer from the options given below:

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

Match List I with List II:

List I	List II
A. α -1 antitrypsin	I. Cotton bollworm
B. Cry IAb	II. ADA deficiency
C. Cry IAc	III. Emphysema
D. Enzyme replacement therapy	IV. Corn borer

Choose the correct answer from the options given below:

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

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BIOLOGY - 2 - SECTION B

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

Assertion (A): Breast-feeding during initial period of infant growth is recommended by doctors for bringing a healthy baby. Colostrum contains several antibodies absolutely essential to develop resistance for the new born baby.

Reason (R):

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

- Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
- (A)** is correct but **(R)** is not correct.
- (A)** is not correct but **(R)** is correct.
- Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.

The flippers of the Penguins and Dolphins are the example of the

- Natural selection
- Convergent evolution
- Divergent evolution
- Adaptive radiation

Which of the following factors are favourable for the formation of oxyhaemoglobin in alveoli?

- High pO_2 and Lesser H^+ concentration
- Low pCO_2 and High H^+ concentration
- Low pCO_2 and High temperature
- High pO_2 and High pCO_2

Match List I with List II:

List I	List II
A. Unicellular glandular epithelium	I Salivary glands
B. Compound epithelium	II Pancreas
C. Multicellular	III Goblet cells of alimentary canal
D. Endocrine glandular epithelium	IV Moist surface of buccal cavity

Choose the correct answer from the options given below:

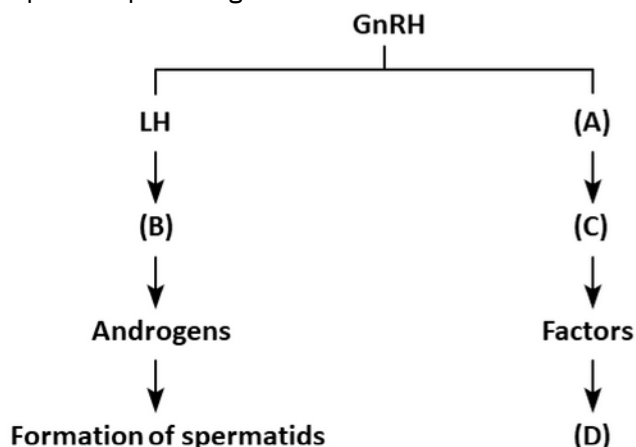
- A-IV, B-III, C-I, D-II
- A-III, B-IV, C-I, D-II
- A-II, B-I, C-IV, D-III
- A-II, B-I, C-III, D-IV

Choose the correct statement given below regarding juxta medullary nephron.

- Renal corpuscle of juxta medullary nephron lies in the outer portion of the renal medulla.
- Loop of Henle of juxta medullary nephron runs deep into medulla.
- Juxta medullary nephrons outnumber the cortical nephrons.
- Juxta medullary nephrons are located in the columns of Bertini.

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Identify the correct option (A), (B), (C), (D) with respect to spermatogenesis. Given below are two statements:



1. ICSH, Interstitial cells, Leydig cells, spermiogenesis.
2. FSH, Sertoli cells, Leydig cells, spermatogenesis.
3. ICSH, Leydig cells, Sertoli cells, spermatogenesis.
4. FSH, Leydig cells, Sertoli cells, spermiogenesis

Match List I with List II :

List I	List II
A.P wave	I. Heart muscles are electrically silent
B.QRS complex	II. Depolarisation of ventricles.
C.T wave	III. Depolarisation of atria.
D.T-P gap	IV. Repolarisation of ventricles.

Choose the correct answer from the options given below:

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

Bone marrow is the main lymphoid

Statement I: organ where all blood cells including lymphocytes are produced.

Both bone marrow and thymus provide

Statement II: micro environments for the development and maturation of T-lymphocytes.

In the light of the above statements, choose the most

appropriate answer from the options given below:

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

Given below are two statements:

Gause's competitive exclusion principle

Statement I: states that two closely related species competing for different resources cannot exist indefinitely.

According to Gause's principle, during

Statement II: competition, the inferior will be eliminated. This may be true if resources are limiting.

In the light of the above statements, choose the most

appropriate answer from the options given below:

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

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Match List I with List II:

List I	List II
A. Exophthalmic goiter	I. Excess secretion of 6.7.10.0 face & hyperglycemia
B. Acromegaly	II. Hypo-secretion of thyroid hormone and stunted growth.
C. Cushing's syndrome	III. Hyper secretion of thyroid hormone & protruding eye balls.
D. Cretinism	IV. Excessive secretion of growth hormone.

Choose the correct answer from the options given below:

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

Match List I with List II related to digestive system of cockroach.

List I	List II
A. The structures used for storing of food.	I. Gizzard
B. Ring of 6-8 blind tubules at junction of foregut and midgut.	II. Gastric Caeca
C. Ring of 100-150 yellow coloured thin filaments at junction of midgut and hindgut.	III. Malpighian tubules
D. The structures used for grinding the food.	IV. Crop

Choose the correct answer from the options given below:

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

As per ABO blood grouping system the blood

group of father is B+, mother is A+ and child is O+.

Their respective genotype can be

- A. $I^B i / I^A i / ii$
- B. $I^B I^B / I^A I^A / ii$
- C. $I^A I^B / i I^A / I^B i$
- D. $I^A i / I^B i / I^A i$
- E. $i I^B / i I^A / I^A I^B$

Choose the most appropriate answer from the options given below:

1. B only
2. C & B only
3. D & E only
4. A only

Match List I with List II :

List I	List II
A. RNA polymerase III	I. snRNPs
B. Termination of transcription	II. Promotor
C. Splicing of Exons	III. Rho factor
D. TATA box	IV. SnRNAs, tRNA

Choose the correct answer from the options given below:

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

Match List I with List II:

List I	List II
A. Mesozoic Era	I. Lower invertebrates
B. Proterozoic Era	II. Fish & Amphibia
C. Cenozoic Era	III. Birds & Reptiles
D. Paleozoic Era	IV. Mammals

Choose the correct answer from the options given below:

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

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Given below are two statements:

Statement I: The cerebral hemispheres are connected by nerve tract known as corpus callosum.

Statement II: The brain stem consists of the medulla oblongata, pons and cerebrum.

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

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

Regarding catalytic cycle of an enzyme action,

select the correct sequential steps:

- A. Substrate enzyme complex formation.
- B. Free enzyme ready to bind with another substrate.
- C. Release of products.
- D. Chemical bonds of the substrate broken.
- E. Substrate binding to active site.

Choose the correct answer from the options given below:

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

Given below are two statements:

Statement I: Mitochondria and chloroplasts are both

double membrane bound organelles.

Inner membrane of mitochondria is

Statement II: relatively less permeable, as compared to chloroplast.

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

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

The following are the statements about non-chordates:

- A. Pharynx is perforated by gill slits.
- B. Notochord is absent.
- C. Central nervous system is dorsal.
- D. Heart is dorsal if present.
- F. Post anal tail is absent.

Choose the most appropriate answer from the options given below:

1. A, B & D only
2. B, D & E only
3. B, C & D only
4. A & C only