CBSE EXAMINATION PAPER-2024

NEET-ZOOLOGY

(Solved)

Time allowed : 3 hours | Maximum Marks : 800

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **200 questions.** All questions are **compulsory.**

ii. This question paper is divided into **1 sections.**

iii. **Section A** – questions number **1 to 200** are multiple choice questions

iv. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

v. Use of calculator is NOT allowed.

Section A

Question 1.

Match List I with List II. Choose the correct answer from the options given below

[4 Marks]

List I (Molecule)	List II (Number and types of bonds between two carbon atoms)
A. ethane	I. one σ-bond and two π-bonds
B. ethene	II. two π-bonds
C. carbon molecule, C_2	III. one σ-bonds
D. ethyne	IV. one σ-bond and one π-bond

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

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

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

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

Explanation:

$CH_3–CH_3$: 1σ, $CH_2 = CH_2$: 1σ, 1π C_2 : 2π, CH= CH :1σ, 2π

Question 2.

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 follows the order:

[4 Marks]

(A) A > B > C

(B) B > C > A

(C) A > C > B

(D) B > A > C

Explanation:

According to Henry's Law: P = K_H x Thus, a lower value of K_H indicates a higher value of x (mole fraction/concentration) for a given pressure and therefore higher solubility. Since, K_H : B < C < A ; Solubility : B > C > A

Question 3.

Statement I: The boiling points of hydrides of Group 16 elements follow the order $H_2O > H_2Te > H_2Se > H_2S$

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

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

[4 Marks]

(A) Statement I is true but Statement II is false

(B) Statement I is false but Statement II is true

(C) Both Statement I and Statement II are false

(D) Both Statement I and Statement II are true

Explanation:

H_2O has the highest boiling point due to extensive intermolecular H-bonding, and H_2Te comes next due to its highest molecular mass. Thus, both statement I and II are correct.

Question 4.

Statement I : The boiling point of three isomeric pentanes follows the order n-pentane > isopentane > neopentane

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 options given below:

[4 Marks]

(A) Statement I is false but Statement II is true

(B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are false

(D) Both Statement I and Statement II are true

Explanation:

The boiling point of isomeric alkanes decreases with branching due to a decrease in the exposed surface area, which decreases the strength of intermolecular forces. Thus, the boiling point order for isomers of pentane is: n-pentane > iso-pentane > neo-pentane Thus, both statement I and II are correct.

Question 5. 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:

[4 Marks]

(A) 750 mg

(B) 250 mg

(C) Zero mg

(D) 200 mg

Explanation: $NaOH+HCl \rightarrow NaCl+H2O$ Thus, 1 mole of NaOH reacts with 1 mole of HCl. Now, the number of moles present are: NaOH = 1g/40g mol^{-1} = 0.025 mol HCl = 0.025 L × 0.75 M = 0.01875 mol ⇒ Number of moles of NaOH left = Number of moles of NaOH present −
Number of moles of HCl present (limiting reagrnt) = 0.025 − 0.01875 = 0.00625 mol ⇒
Mass of NaOH left =0.00625 × 40 = 0.25g = 250mg

Question 6. 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:

[4 Marks]

(A) Li < Be < B < C < N

(B) Li < Be < C < B < N

(C) Li < Be < N < B < C

(D) Li < B < Be < C < N

Explanation: Ionization enthalpy increases in a period from left to right due to an increase in the effective nuclear charge and also depends on the electronic configuration of the species. The configurations of the given species are: Li = $1s^2\ 2s^1$ Be = $1s^2\ 2s^2$ B = $1s^2\ 2s^2\ 2p^1$ C = $1s^2\ 2s^2\ 2p^2$ N = $1s^2\ 2s^2\ 2p^3$ Thus, it is easier to remove the first electron from Li and B but difficult from C and N (due to attainment of stable configuration in Li and B and disturbance of it in N).

Question 7. Activation energy of any chemical reaction can be calculated if one knows the value of

[4 Marks]

(A) probability of collision

(B) rate constant at standard temperature

(C) rate constant at two different temperatures

(D) orientation of reactant molecules during collision

Explanation: We can use the Arrhenius equation to calculate the activation energy: $\log K_2/K_1 = E_a/2.303R[1/T_1 - 1/T_2]$

Question 8.

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 options given below:

[4 Marks]

(A) Statement I is correct but Statement II is false

(B) Statement I is incorrect but Statement II is true

(C) Both statement I and Statement II are false

(D) Both statement I and Statement II are true

Explanation:

Aniline does not undergo Friedel–Crafts reactions as the $–NH_2$ group reacts with acidic groups to form salts instead.

The $–NH_3^+$ group acts as a strong deactivating group. Thus, statement I is true.

Aromatic primary amines (aniline here) cannot be prepared by Gabriel–phthalimide synthesis as aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide. Thus, statement II is true.

Question 9. Arrange the following elements in increasing order of electronegativity: N, O, F, C, Si
Choose the correct answer from the options given below:

[4 Marks]

(A) Si < C < N < O < F

(B) O < F < N < C < Si

(C) F < O < N < C < Si

(D) Si < C < O < N < F

Explanation: Electronegativity increases from left to right in a period and decreases down the group.

Question 10.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	List I (Conversion required)	List II (Number of Faraday
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

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

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

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

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

Explanation:

$\overset{+1}{H_2O} \longrightarrow \overset{0}{H_2} + \frac{1}{2}O_2$,

2 moles of e^- required

= 2 F electricity (For two H^+ ions)

$\overset{+7}{Mn}O_4^- \longrightarrow \overset{+2}{Mn}^{2+}$;

2 moles of e^- required = 5 F

$CaCl_2 \longrightarrow Ca^{2+} + 2Cl^- \xrightarrow{2e^-} Ca$

Thus, $\frac{3}{2}Ca^{2+} \longrightarrow \frac{3}{2}Ca$

which requires 3 moles of $e^- = 3F$ of electricity

$\overset{+3}{Fe_2O_3} \longrightarrow \overset{+2}{FeO}$; requires 1 mole of $e^- = 1F$

Question 11. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	List I (Complex)		List II (Type of isomerism)
A.	$[Co(NH_3)_5(NO_2)]Cl_2$	I.	Solvate isomerism
B.	$[Co(NH_3)_5(SO_4)]Br$	II.	Linkage isomerism
C.	$[Co(NH_3)_6][Cr(CN)_6]$	III.	Ionization isomerism
D.	$[Co(H_2O)_6]Cl_3$	IV.	Coordination isomerism

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

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

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

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

Explanation: $[Co(NH_3)_5(NO_2)]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ → Linkage isomerism B. $[Co(NH_3)_5(SO_4)]Br$ and $[Co(NH_3)_5Br]SO_4$ → Ionization isomerism. C. $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CNH)_6]$ → Coordination isomerism D. $[Co(H_2O)_6]Cl_3$ and $[Co(H_2O)_6]Cl_3$ and $[Co(H_2O)_5Cl]Cl_2\ H_2O$ → Solvate (Hydrate) isomerism

Question 12.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

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

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

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

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

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

Explanation:

NH_3 (1 lp, 3 bp) → Trigonal pyramidal (shape) BrF_5 (1 lp, 5 bp) → Square pyramidal (shape) XeF_4 (2 lp, 4 bp) → Square planar (shape) SF_6 (0 lp, 6 bp) → Octahedral shape (geometry)

Question 13. The energy of an electron in the ground state (n=1) for He^+ ion is −x J, then that for an electron in n=2 state for Be^{3+} ion in J is

[4 Marks]

(A) - x

(B) - x/9

(C) - 4/9 x

(D) - 4x

Explanation: For hydrogen-like species: $E = -2.18 \times 10^{-18}(Z^2/n^2)$ J For n = 1 of He^+: $E = -2.18 \times 10^{-18}(2^2/1^2)$ J $= -2.18 \times 10^{-18} \times 4 = -x$ (given) For n = 2 of Be^{3+} : $E = -2.18 \times 10^{-18}(4^2/2^2) = -2.18 \times 10^{-18} \times 4 = -x$ Thus, the energy of Be^{3+} for n = 2 would be −x Joules.

Question 14.

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. $2\ NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(g)$

D. $Cl_2(g) \rightarrow 2Cl(g)$

Choose the correct answer from the options given below:

[4 Marks]

(A) C and D

(B) A, C and D

(C) A and C

(D) A, B and D

Explanation:

Entropy represents degree of Randomness. Thus, it increases for those processes that involve a decrease in the order of arrangement or stability of the system.

Process A involves change of state from liquid to gas which is less ordered, so entropy increases. Process B involves lowering of T which makes the system more stable so entropy decreases.

Process C involves formation of gaseous products from solid reactant, so entropy increases.

Process D involves an increase in the number of gaseous moles so disorderliness or entropy increases.

Question 15.

Which reaction is NOT a redox reaction?

[4 Marks]

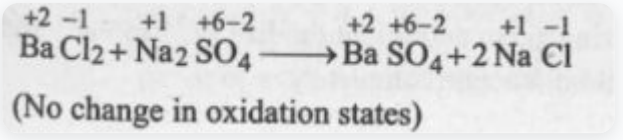
(A) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

(B) $H_2 + Cl_2 \rightarrow 2HCl$

(C) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

(D) $2KClO_3 + I_2 \rightarrow 2KIO_3 + Cl_2$

Explanation:



Question 16.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

Match List I with List II.

List I (Quantum Number)		List II (Information provided)	
A.	m_l	I.	Shape of orbital
B.	m_s	II.	Size of orbital
C.	l	III.	Orientation of orbital
D.	n	IV.	Orientation of spin of electron

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

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

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

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

Explanation:

n = Principal quantum number → Size of orbital/shell

l = Azimuthal quantum number → Shape of orbital

m_l = Magnetic orbital quantum number → Orientation of orbital m_s = Magnetic spin quantum number → Spin of electron

Question 17.

'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:

[4 Marks]

(A) A and D only

(B) A and E only

(C) B and D only

(D) B and C only

Explanation:

$\mu = \sqrt{n(n+2)}$ B.M., where n = number of unpaired electrons.

$Ti^{3+} = [Ar]\ 3d^1 \Rightarrow n = 1$, $Cr^{2+} = [Ar]\ 3d^4 \Rightarrow n = 4$

$Mn^{2+} = [Ar]\ 3d^5 \Rightarrow n = 5$, $Fe^{2+} = [Ar]\ 3d^6 \Rightarrow n = 4$

$SC^{3+} = [Ar]\ 3d^0 \Rightarrow n = 0$

Thus, Cr^{2+} and Fe^{2+} will have the same μ. (magnetic moment)

Question 18.

The highest number of helium atoms is in

[4 Marks]

(A) 2.271098 L of helium at STP

(B) 4 g of helium

(C) 4 u of helium

(D) 4 mol of helium

Explanation:

For helium: 4 g of He/4 g mol^{-1} = 1 mol

2.271 L of He = 2.271/22.7 = 0.1 mol

Thus, 4 g of He has the highest number of atoms.

Question 19. Among Group 16 elements, which one does NOT show −2 oxidation state?

[4 Marks]

(A) Te

(B) Se

(C) Po

(D) O

Explanation: Polonium (Po) does not show −2 oxidation state due to its low electron affinity and large atomic size.

Question 20. 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

[4 Marks]

(A) d^5 to d^2 configuration

(B) d^3 to d^5 configuration

(C) d^4 to d^5 configuration

(D) d^5 to d^4 configuration

Explanation: $Mn^{3+} = [Ar]3d^4 \rightarrow Mn^{2+} = [Ar]3d^5$ (more stable configuration)

Question 21.

The reagents with which glucose does NOT react to give the corresponding test/products are

A. Tollen's reagent

B. Schiff's reagent

C. HCN

D. NH_2OH

E. $NaHSO_3$

Choose the correct options from the given below:

[4 Marks]

(A) B and E

(B) E and D

(C) A and D

(D) B and C

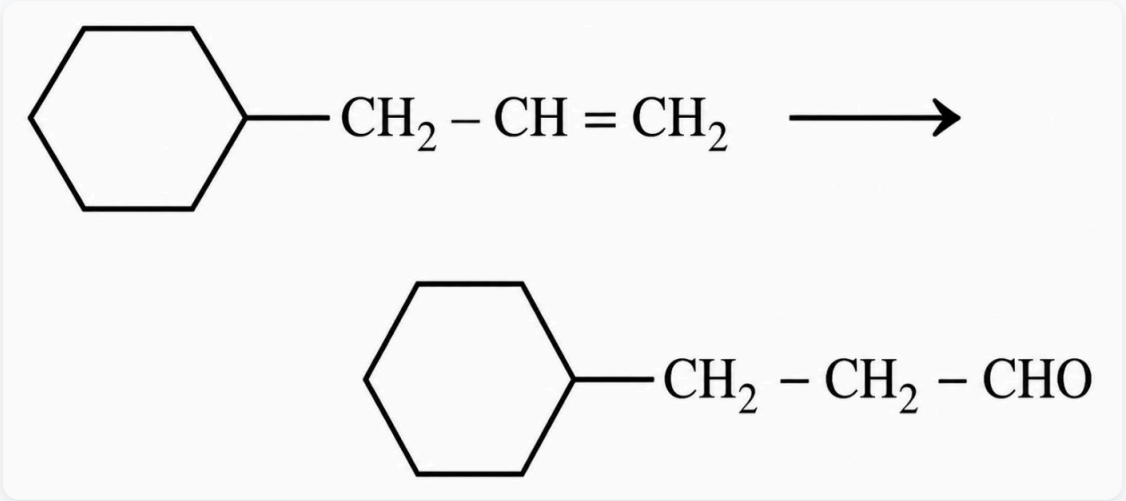
Explanation:

Glucose does not give Schiff's test and does not form a hydrogen sulphite addition product with $NaHSO_3$ due to its cyclic structure (absence of a free –CHO group). Glucose reacts with NH_2OH, but its pentaacetate does not react with NH_2OH due to the absence of a free –CHO group.

Question 22.

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

[4 Marks]



(A)

(i) H_2O/H^+
(ii) CrO_3
(iii) PCC

(B)

(i) BH_3
(ii) $H_2O_2/\overset{\ominus}{O}H$

(C)

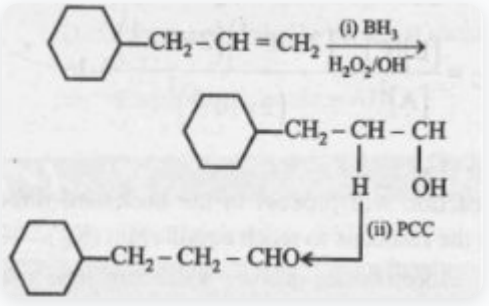
(i) BH_3
(ii) $H_2O_2/\overset{\ominus}{O}H$
(iii) alk.$KMnO_4$
(iv) $H_3O^{\oplus}$

(D)

(i) H_2O/H^+
(ii) PCC

Explanation:

Hydroboration - oxidation gives Anti-Markovnikoff product (alcohol) which is then oxidized to aldehyde by a mild oxidizing agent, which is Pyridinium chlorochromate (PCC) here.



Question 23. In which of the following equilibria, K_p and K_C are NOT equal?

[4 Marks]

(A) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

(B) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

(C) $CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$

(D) $2BrCl(g) \rightleftharpoons Br_2(g) + Cl_2(g)$

Explanation: K_p = K_C(RT)^Δng. Thus, K_p and K_C will not be equal if (RT)^Δng ≠ 1 For, $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ Δng = (1+1) - 1 = 2-1 =1

Question 24.

A compound with a molecular formula of C_6H_{14} has two tertiary carbons. Its IUPAC name is:

[4 Marks]

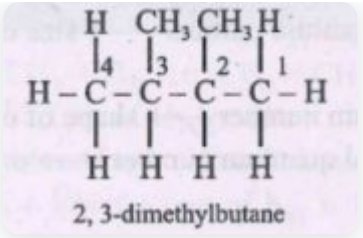
(A) 2,2-dimethylbutane

(B) 2-methylpentane

(C) 2,3-dimethylbutane

(D) n-hexane

Explanation:



2, 3-dimethylbutane

Question 25. Fehling's solution 'A' is

[4 Marks]

(A) aqueous copper sulphate

(B) alkaline copper sulphate

(C) aqueous sodium citrate

(D) alkaline solution of sodium potassium tartrate (Rochelle's salt)

Explanation: Fehling solution 'A' = Aqueous $CuSO_4$ solution. Fehling solution 'B' = Alkaline sodium potassium tartrate (Rochelle salt).

Question 26.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List-I (Process)	List-II (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

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

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

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

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

Explanation:

Isothermal ⇒ Constant T, Isochoric ⇒ Constant V ,Isobaric ⇒ Constant P ,Adiabatic ⇒ Constant heat/no exchange of heat

Question 27. Statement I: Both $[Co(NH_3)_6]^{3+}$ and $[CoF_6]^{3-}$ complexes are octahedral but differ in their magnetic behaviour. Statement II: $[Co(NH_3)_6]^{3+}$ is diamagnetic whereas $[CoF_6]^{3-}$ is paramagnetic. In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

(A) Both Statement I and Statement II are true

(B) Both Statement I and Statement II are false

(C) Statement I is true but Statement II is false

(D) Statement I is false but Statement II is true

Explanation: $[Co(NH_3)_6]^{3+}$ ⇒ $Co^{3+} = [Ar]_3d_6$ Due to strong field NH_3 ligand, all six electrons are paired and the complex is diamagnetic. In case of $[CoF_6]^{3-}$, weak field F^- ligand is present and there are four unpaired electrons making the complex paramagnetic. Due to both complexes having the same number of ligands and the hybridizations of $d^2 sp^3$ and sp^3 and $sp^3 d^2$ respectively, they are both octahedral. Thus, both statements I and II are true.

Question 28. 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

[4 Marks]

(A) Crystallization

(B) Distillation

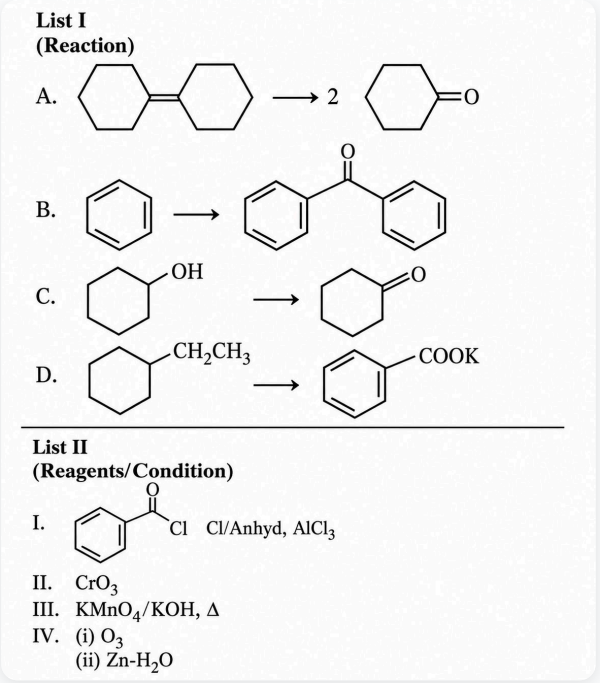
(C) Chromatography

(D) Sublimation

Explanation: The process of directly changing into a gas from solid state is called sublimation. Thus, such substances can be separated from other substances by sublimation.

Question 29. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]



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

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

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

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

Explanation: Reaction 'A' represents ozonolysis of an alkene which requires O_3 and $Zn-H_2O$. Reaction 'B' represents Friedel–Crafts acylation of benzene which requires ArCOCl in anhydrous $AlCl_3$. Reaction 'C' represents oxidation of an alcohol to ketone which needs CrO_3 reagent. Reaction 'D' represents side-chain oxidation of ethyl benzene which requires $KMnO_4$ in KOH and heating.

Question 30. For the reaction $2A \rightleftharpoons B + C$, $K_c = 4\times10^{-3}$. 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?

[4 Marks]

(A) Reaction is at equilibrium.

(B) Reaction has a tendency to go in forward direction.

(C) Reaction has a tendency to go in backward direction.

(D) Reaction has gone to completion in forward direction.

Explanation: $Q_C = [B][C]/[A]^2 = (2 \times 10^{-3})(2 \times 10^{-3})/(2 \times 10^{-3})^2 = 1 \Rightarrow Q_C > K_C$ Thus, reaction will process in the backward direction, towards the reactants to reach equilibrium (K_C).

Question 31.

The pair of lanthanoid ions which are diamagnetic is

[4 Marks]

(A) Ce^{3+} and Eu^{2+}

(B) Ce^{4+} and Yb^{2+}

(C) Gd^{3+} and Eu^{3+}

(D) Pm^{3+} and Sm^{3+}

Explanation:

Ce^{4+} = [Xe] $4f^0$ Yb^{2+} = [Xe] $4f^{14}$ Ce^{3+} = [Xe] $4f^1$ Eu^{2+} = [Xe] $4f^7$ Gd^{3+} = [Xe] $4f^7$ $Er4^{3+}$ = [Xe] $4f^6$ Pm^{3+} = [Xe] $4f^4$ Sm^{3+} = [Xe] $4f^5$ Thus, Ce^{4+} and Yb^{2+} are diamagnetic due to all electrons being paired.

Question 32.

Statement I: $[Co(NH_3)_6]^{3+}$ is a homoleptic complex whereas $[Co(NH_3)_4Cl_2]^+$ is a heteroleptic complex. Statement II: Complex $[Co(NH_3)_6]^{3+}$ has only one kind of ligands but $[Co(NH_3)_4Cl_2]^+$ has more than one kind of ligands. In the light of the above statements, choose the correct answer from the options given below.

[4 Marks]

(A) Statement I is false but Statement II is true

(B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are false

(D) Both Statement I and Statement II are true

Explanation:

Homoleptic complex ⇒ has only one type of ligand. $[Co(NH_3)_6]^{3+}$ Heteroleptic complex ⇒ has different types of ligands. $[Co(NH_3)_4Cl_2]^+$ Thus, Statement I and II, both are correct.

Question 33.

Mass in grams of copper deposited by passing 9.6487 A current through a voltameter containing copper sulphate solution for 100 seconds is (Given : Molar mass of Cu : 63 g mol^{-1}, 1 F = 96487 C)

[4 Marks]

(A) 31.5 g

(B) 3.15 g

(C) 0.0315 g

(D) 0.315 g

Explanation:

t = 100 seconds, I = 9.6487 A.

Charge (Q) = I × t = 9.6487 × 100 = 964.87 C

Now, $Cu^{+2}(aq) + 2e^{-} \rightarrow Cu(s)$

Thus, 2 moles of electrons = 2 × 96487 C of electricity give 1 mole (63 g) of Cu.

Therefore, 964.87 C of electricity will give:

M = 63 × 964.87/2 × 96487

M = 0.315g of Cu

Question 34.

The products A and B obtained in the following reactions, respectively, are $3ROH + PCl_3 \rightarrow RCl + A$ $ROH + PCl_5 \rightarrow RCl + HCl + B$

[4 Marks]

(A) H_3PO_3 and $POCl_3$

(B) H_3PO_4 and $POCl_3$

(C) $POCl_3$ and H_3PO_4

(D) $POCl_3$ and H_3PO_3

Explanation:

$3ROH + PCl_3 \rightarrow (3RCl , A) + H_3PO_3$

$ROH + PCl_5 \rightarrow RCl + (HCl ,$**B)+** $POCl_3$

Question 35.

The rate of a reaction quadruples when temperature changes from 27°C to 57°C. Calculate the energy of activation. Given: $R=8.314\ J\ K^{-1}\ mol^{-1}$, log4=0.6021

[4 Marks]

(A) 3804 kJ/mol

(B) 3.80 kJ/mol

(C) 380.4 kJ/mol

(D) 38.04 kJ/mol

Explanation:

Using Arrhenius equation:

Log $k_2 / k_1 = E_a / 2.303R [T_2 - T_1 / T_1 T_2]$

Log $4k_1 / k_1$ = log (4) = $E_a / 2.303(8.314)$

[330-300/300×330]

$0.6021 = E_a \times (1.582 \times 10^{-5}) \Rightarrow E_a = 38040$ j = 38.04kj

Question 36.

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?

[4 Marks]

(A) dilute sulphuric acid

(B) dilute nitric acid

(C) concentrated sulphuric acid

(D) dilute hydrochloric acid

Explanation:

Dilute sulphuric acid (**H_2SO_4**) is added to aqueous solutions of **Mohr's salt** to prevent the hydrolysis of ferrous sulphate.

This is in accordance with **Le-Chatelier's principle**, according to which the addition of more **SO_4^{2-} ions** to the solution will favour the formation of more **$FeSO_4$** to decrease the concentration of **SO_4^{2-} ions** and thus prevent hydrolysis.

Concentrated H_2SO_4 is not added because it is an oxidizing agent and might oxidize **Fe^{2+}** to **Fe^{3+}** and also does not dissociate completely.

Question 37. 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 the osmotic pressure measurement is done is: (Use R = 0.083 L bar mol^{-1} K^{-1})

[4 Marks]

(A) 37°C

(B) 25.73°C

(C) 12.05°C

(D) 310°C

Explanation: Osmotic pressure (π) = CRT ⇒ Slope = RT = 25.73 L bar mol^{-1} ⇒ T = 25.73/R = 25.73 L bar mol^{-1}/0.083 L bar mol^{-1} K^{-1} = 310 K = 37°C

Question 38.

Identify the correct answer.

[4 Marks]

(A) Three canonical forms can be drawn for CO_3^{2-} ion.

(B) Dipole moment of NF_3 is greater than that of NH_3.

(C) Three resonance structures can be drawn for ozone.

(D) BF_3 has non-zero dipole moment.

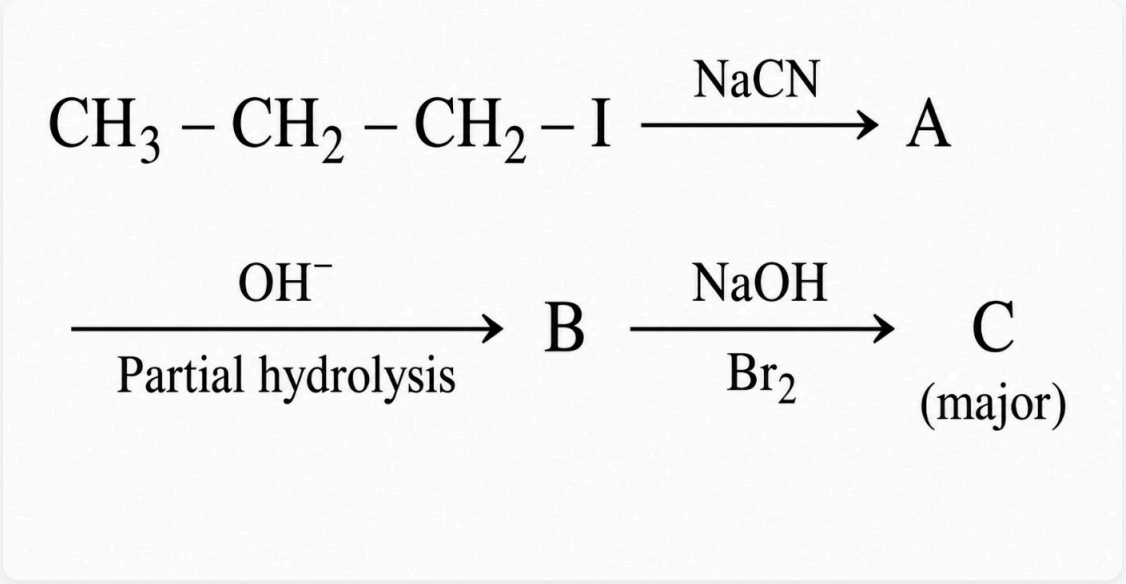
Explanation:

Ozone has only two resonance structures. BF_3 is a non-polar molecule due to zero dipole moment. The dipole moment of NF_3 is less than that of NH_3 due to F being more electronegative than H and pulling electrons towards itself, resulting in cancellation of bond dipoles. Carbonate ion (CO_3^{2-}) has three canonical structures, with each oxygen atom forming a double bond with carbon in one of the structures.

Question 39.

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

[4 Marks]



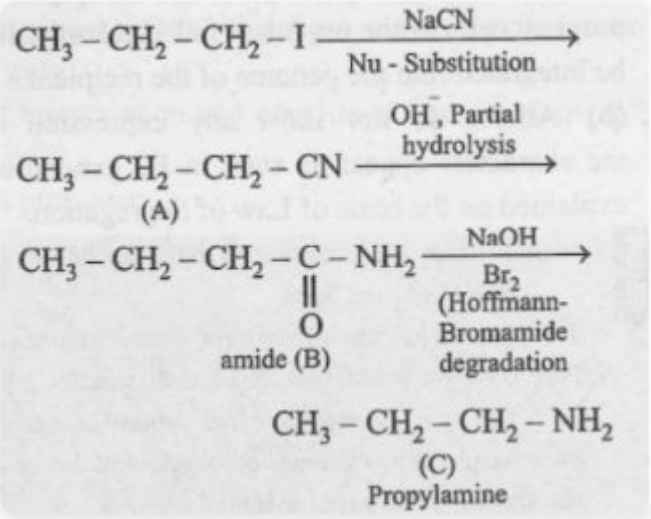
(A) propylamine

(B) butanamide

(C) butylamine

(D) α-bromobutanoic acid

Explanation:



Question 40.

Given below are certain cations. Using inorganic qualitative analysis, arrange them in increasing group number from 0 to VI.

A. Al^{3+}

B. Cu^{2+}

C. Ba^{2+}

D. Co^{2+}

E. Mg^{2+}

Choose the correct answer from the options given below.

[4 Marks]

(A) E, C, D, B, A

(B) E, A, B, C, D

(C) B, C, A, D, E

(D) B, A, D, C, E

Explanation:

Al^{3+} = Group III, Cu^{2+} = Group II, Ba^{2+} = Group V, Co^{2+} = Group IV, Mg^{2+} = Group VI Thus, the correct increasing order is B→ A→ D→C→E

Question 41. 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 cal K^{-1} mol^{-1})

[4 Marks]

(A) 0 calorie

(B) –413.14 calories

(C) 413.14 calories

(D) 100 calories

Explanation: For Reversible isothermal process: $W = -2.303\ n\ RT \log(P_1/P_2) = -2.303(1)(2.0)(298)\log(20/10) = -413.14$ cal.

Question 42.

Consider the following reaction in a sealed vessel at equilibrium with concentrations of $N_2 = 3.0 \times 10^{-3}$ M, $O_2 = 4.2 \times 10^{-3}$ M and NO = 2.8×10^{-3} M. $2NO(g) \rightleftharpoons N_2(g) + O_2(g)$ If 0.1 mol L^{-1} of NO(g) is taken in a closed vessel, what will be the degree of dissociation (α) of NO(g) at equilibrium?

[4 Marks]

(A) 0.0889

(B) 0.00889

(C) 0.8889

(D) 0.717

Explanation:

$$K_C = \frac{[N_2][O_2]}{[NO]^2}$$

$$= \frac{(3.0\times10^{-3})(4.2\times10^{-3})}{(2.8\times10^{-3})^2} = 1.607$$

Now,

	$2NO$	$\rightleftharpoons$	N_2	+	O_2
Initial	0.1		0		0
at equilibrium	$0.1 - 0.1\,\alpha$		$0.05\,\alpha$		0.05α

$$\Rightarrow K_C = \frac{(0.05\alpha)^2}{0.01(1-\alpha)^2} = 1.607$$

$$\Rightarrow \frac{\alpha^2}{(1-\alpha)^2} = \frac{1.607\times(0.1)^2}{(0.05)^2}$$

$$\Rightarrow \frac{\alpha}{1-\alpha} = \frac{1.27\times0.1}{0.05}$$

$$\Rightarrow \alpha = 2.54 - 2.54\,\alpha \Rightarrow \alpha = \frac{2.54}{3.54} = 0.717$$

Question 43.

A compound X contains 32% of A, 20% of B and remaining percentage of C. Then the empirical formula of X is: (Given atomic masses of A = 64; B = 40; C = 32 u)

[4 Marks]

(A) ABC_3

(B) AB_2C_2

(C) ABC_4

(D) A_2BC_2

Explanation:

Let us take 100 g of this compound.

⇒ Masses present: A = 32 g B = 20 g C = 48 g

⇒ Number of moles: A = 32/64 = 0.5 B = 20/40 = 0.5 C = 48/32 = 1.5 Dividing these moles by the smallest mole value: A:B:C = 1:1:3

⇒ Empirical Formula = ABC_3

Question 44.

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

[4 Marks]

(A) 10 (N+1)

(B) 1/100(N+1)

(C) 100 N

(D) 1/10 N

Explanation:

Vernier Constant V.C. = MSD – VSD …(i) where MSD = Main scale division and VSD = Vernier scale division Given : (N+1) VSD = N MSD VSD = (N/N+1)MSD ...(ii) From eq. (i) and (ii), V.C. = MSD - N/N+1(MSD) = MSD(1 - N/N+1) = MSD/N+1 = 0.01/N+1 = 1/100(N+1)

Question 45. If the monochromatic source in Young's double slit experiment is replaced by white light, then

[4 Marks]

(A) There will be a central dark fringe surrounded by a few coloured fringes.

(B) Interference pattern will disappear.

(C) There will be a central bright white fringe surrounded by a few coloured fringes.

(D) All bright fringes will be of equal width.

Explanation: Central bright fringe is white as at central point on screen, path difference is zero for all wavelengths. Other fringes depend on wavelength as $\beta = \lambda D/d$ so other fringes will be coloured.

Question 46.

A logic circuit provides the output Y as per the following truth table:

The expression for the output Y is :

[4 Marks]

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

(A) B

(B) $\overline{B}$

(C) A.B+$\overline{A}$

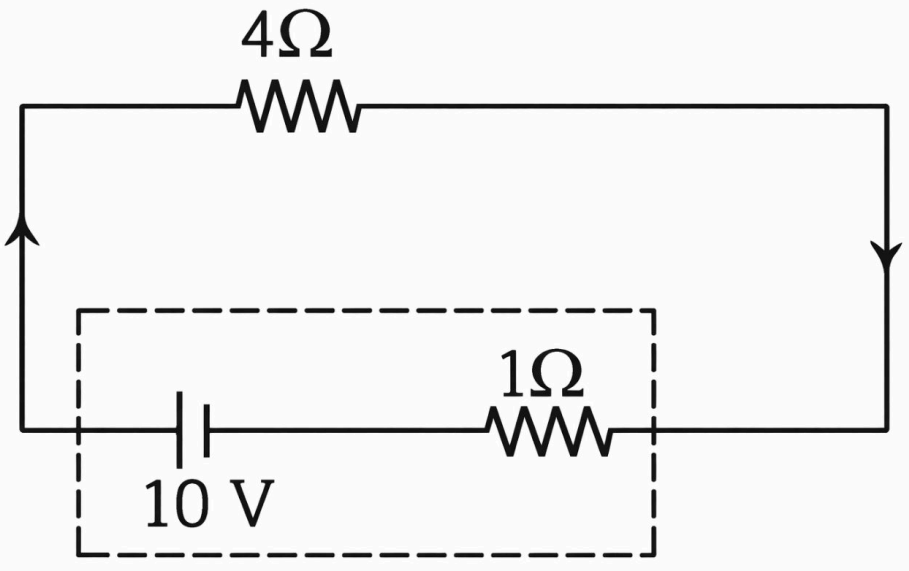
(D) A.$\overline{B}$+$\overline{A}$

Explanation:

As per given truth table, output is independent of input A. ∴ Output Y = $\overline{B}$

Question 47. The terminal voltage of the battery, whose emf is 10 V and internal resistance 1 Ω, when connected through an external resistance of 4 Ω as shown in the figure, is:

[4 Marks]



(A) 4V

(B) 6V

(C) 8V

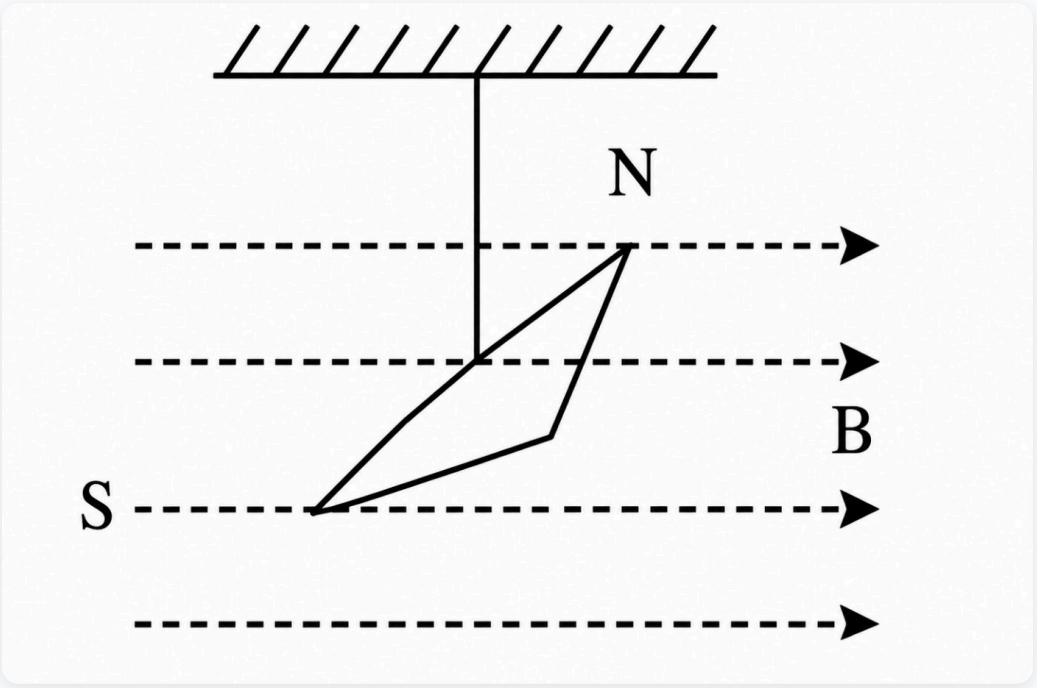
(D) 10V

Explanation: Current in circuit i = E/R+r = 10/4+1 = 2A Terminal voltage V = E - iR = 10 − 2 × 1 = 8V

Question 48.

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 9.8×10^{-6} kg m². If the magnitude of magnetic moment of the needle is 1×10^{-5} A m², then the value of ' x' is:

[4 Marks]



(A) 5 π²

(B) 1280 π²

(C) 128 π²

(D) 50 π²

Explanation:

Time period of oscillation, $T = 2\pi\sqrt{(I/MB)} \Rightarrow 1/4 = 2\pi(\sqrt{9.8\times10^{-6}/M\times0.049}) \Rightarrow 1/16 = 4\pi^2 \times 9.8 \times 10^{-6}/ M \times 49 \times 10^{-3}$

$M = 4\pi^2 \times 9.8 \times 10^{-6} /49 \times 10^{-3} \times 16$

$= 4\pi^2 \times 9.8 \times 16 \times 10^{-3}/49$

$= 12.8\pi^2 \times 10^{-3} \times 10^{-2} \times 10^2 = 1280\pi^2 \times 10^{-5}\ Am^2$

$\therefore x = 1280\ \pi^2$

Question 49.

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:

[4 Marks]

(A) 52 Ω

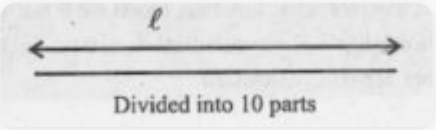
(B) 60 Ω

(C) 26 Ω

(D) 55 Ω

Explanation:

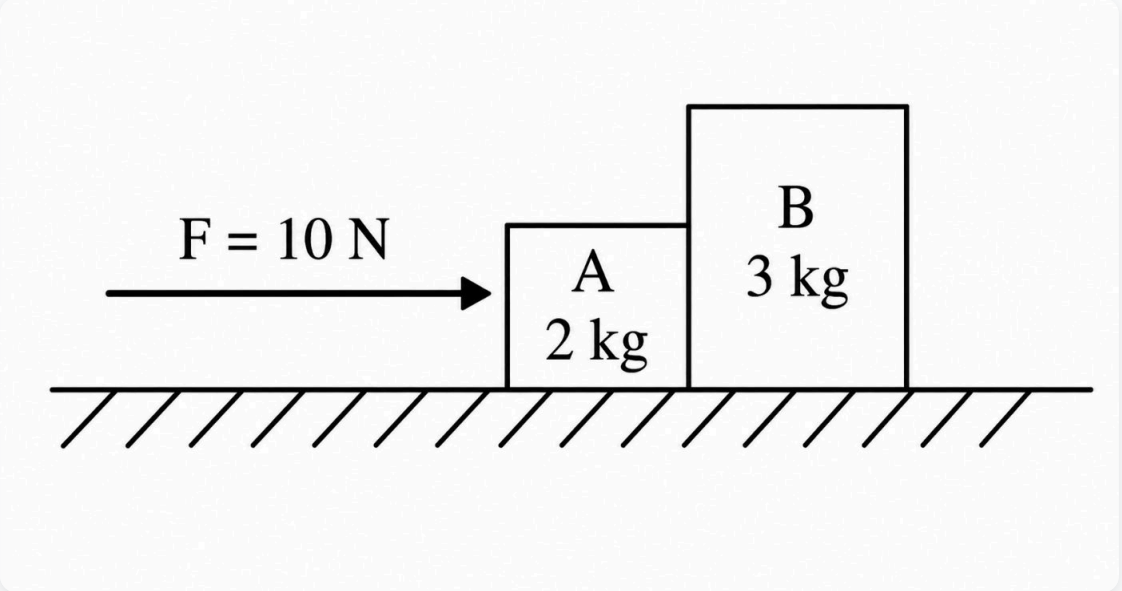
Resistance R = ρl/A Divided into 10 parts ∴ Resistance of each part = 5Ω Resistance in series, $R_s = 5 \times 10 = 50\ \Omega$ Resistance in parallel, $R_p = 10/5 = 2\Omega$ ∴ R_eq = $R_s + R_p = 52\Omega$



Question 50.

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

[4 Marks]



(A) 10N

(B) 6N

(C) Zero

(D) 4N

Explanation:

Force (F) = $(M_1+M_2)a \Rightarrow a = F/M_1+M_2$ or $a = 10/2+3 = 2\ ms^{-2}$ ∴Force exerted by block A on block B

$F' = M_2(2) = 3\times2 = 6$ N

Question 51. 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 $4\pi\times10^{-7}$ SI units):

[4 Marks]

(A) 44 mT

(B) 4.4 T

(C) 4.4 mT

(D) 44 T

Explanation: The magnitude of magnetic field due to a circular coil of N turns: $B_C = \mu_0 iN/2R = 4\pi \times 10^{-7} \times 7 \times 100/2 \times 0.1 = 4.4 \times 10^{-3}$ T = 4.4 mT

Question 52. In an ideal transformer, the turns ratio is $N_P/N_S = 1/2$ The ratio $V_S : V_P$ is equal to (the symbols carry their usual meaning):

[4 Marks]

(A) 1:2

(B) 2:1

(C) 1:1

(D) 1:4

Explanation: Transformer ratio, $N_P/N_S = V_P/V_S = 1/2 \therefore V_S : V_P = 2:1$

Question 53.

Statement I: Atoms are electrically neutral as they 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.

[4 Marks]

(A) Statement I is correct but Statement II is incorrect

(B) Statement I is incorrect but Statement II is correct

(C) Both Statement I and Statement IT are incorrect

(D) Both Statement I and Statement II are correct

Explanation:

Statement I is correct as atoms are electrically neutral as they contain equal number of positive and negative charges. Statement II is incorrect as atom of most of the elements but not every atom are stable and emit characteristic spectrum. This statement is not true for every atom.

Question 54.

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

[4 Marks]

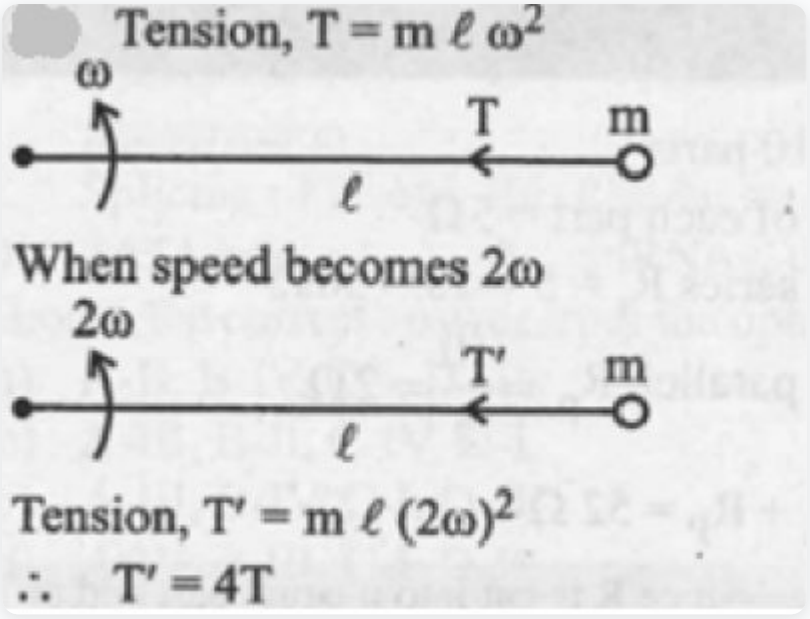
(A) T

(B) T/4

(C) √ 2T

(D) 4T

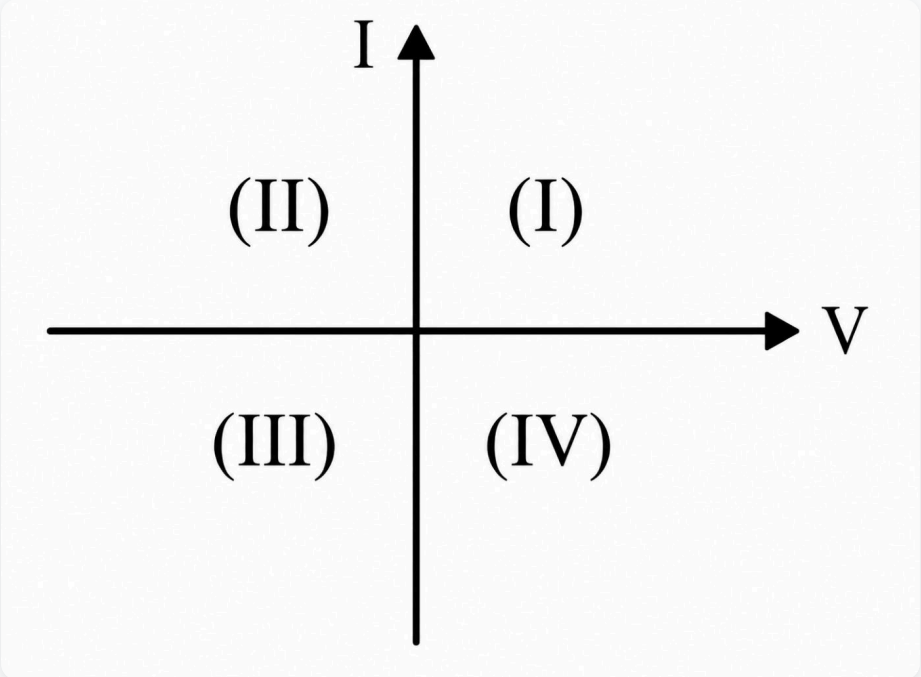
Explanation:



Question 55.

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.

[4 Marks]



(A) Both A and B are incorrect

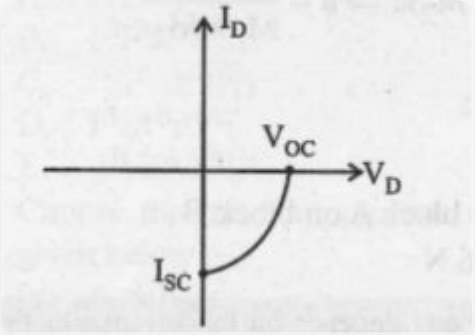
(B) A is correct but B is incorrect

(C) Both A and B are correct

(D) A is incorrect but B is correct

Explanation:

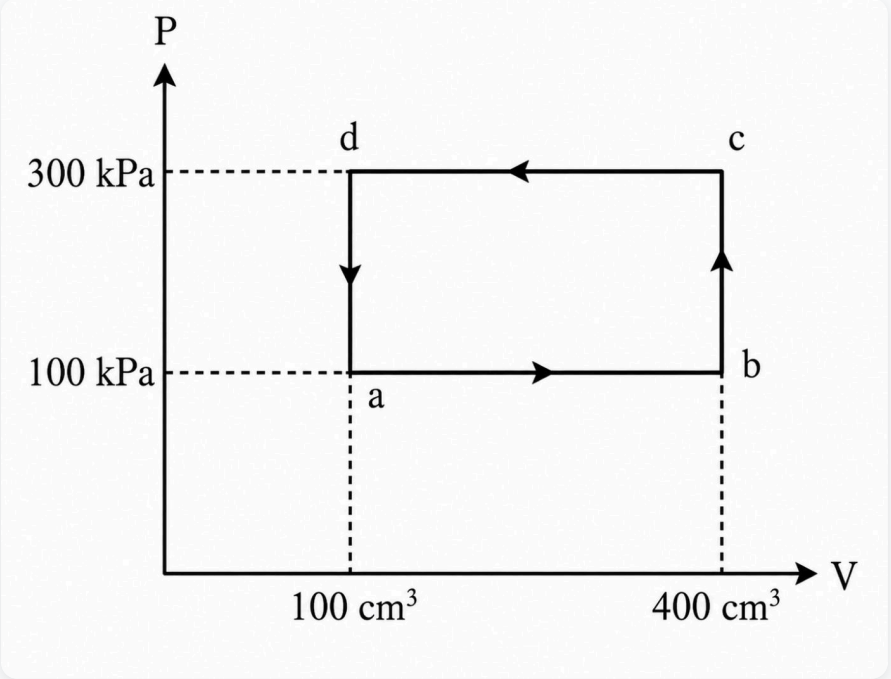
In a reverse biased pn junction diode, the current measured in μA is due to minority charge carriers.
Solar cell: The I–V characteristics is as shown in figure.



Question 56.

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

[4 Marks]



(A) - 60 J

(B) -90 J

(C) Zero

(D) 30 J

Explanation:

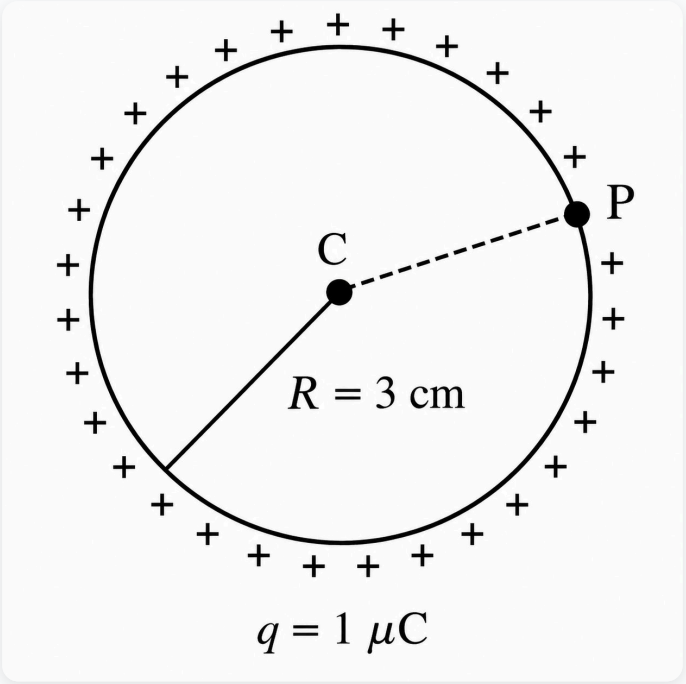
Path bc is an isochoric process, i.e., volume is constant. ΔV=0

∴ Work done by gas along path bc,

$W_{bc} = P.\ \Delta V = 0$

Question 57. 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 $1/4\pi\varepsilon_0 = 9 \times 10^9$ SI units)

[4 Marks]



(A) 3×10^5

(B) 1×10^5

(C) 0.5×10^5

(D) zero

Explanation: For uniformly charged spherical shell, Potential V= kq/R (For r ≤ R) ∴ $V_C = V_P$ or $V_C - V_P = 0$

Question 58. 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:

[4 Marks]

(A) 8.5 cm

(B) 20.7 cm

(C) 72.0 cm

(D) 17.5 cm

Explanation: Moment of inertia of rod = $I = ml^2/12 \Rightarrow 2400 = 400\ l^2/12 \Rightarrow 72 = l^2 \therefore l = \sqrt{72} = 8.48$ cm = 8.5 cm

Question 59. A particle moving with uniform speed in a circular path maintains:

[4 Marks]

(A) Constant velocity

(B) Constant acceleration

(C) Constant velocity but varying acceleration

(D) Varying velocity and varying acceleration

Explanation: When a particle is moving with uniform speed in a circular path then direction changes continuously. Therefore particle maintains varying velocity and varying acceleration.

Question 60.

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, $p= h\nu/c$

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:

[4 Marks]

(A) A, C and D only

(B) A and B only

(C) A, B, C and D only

(D) A, B, D and E only

Explanation:

(A) The energy of a photon E = hv

(B) Velocity of photon is equal to velocity of light i.e. c.

(C) Since $\lambda = h/p \Rightarrow p = h/\lambda \Rightarrow p = hv/c$

(D) In photon-electron collision both total energy and total momentum are conserved.

Question 61. 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):

[4 Marks]

(A) 10

(B) 5

(C) 6

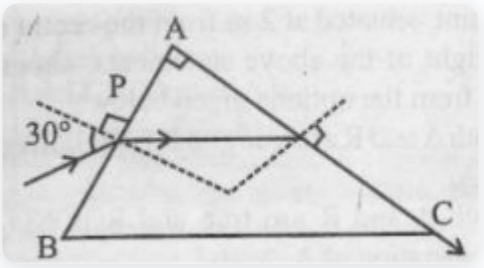
(D) 7

Explanation: Given, displacement x = 2t - 1 ∴ velocity v = dx/dt = 2 ms^{-1} ∴ power P = F.v = 2 × 5 = 10 W

Question 62.

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

[4 Marks]



(A) √5/4

(B) √3/2

(C) √5/2

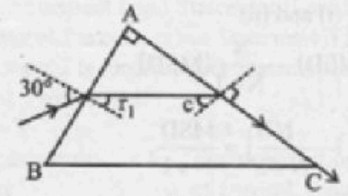
(D) √3/4

Explanation:

In prism, $r_1 + c = A$

$\Rightarrow r_1 = 90° - c$ ... (i)

$\sin c = \frac{1}{\mu} \Rightarrow \cos c = \frac{\sqrt{\mu^2 - 1}}{\mu}$



From Snell's law, on incidence surface

$1 \sin 30° = \mu \sin(r_1) \Rightarrow 1 \times \frac{1}{2} = \mu \times \sin(90° - c)$

or, $\frac{1}{2} = \mu \times \frac{\sqrt{\mu^2 - 1}}{\mu}$ ... (ii)

On squaring eq. (ii)

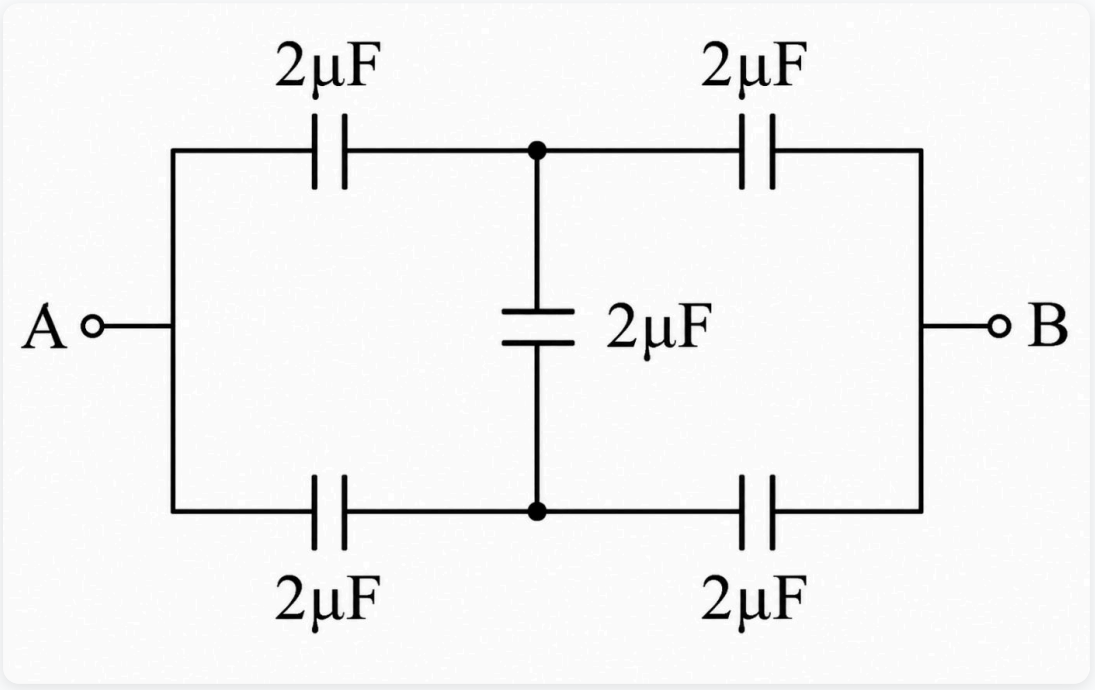
$\frac{1}{4} = \mu^2 - 1 \quad \Rightarrow \mu^2 = \frac{5}{4} \therefore \mu = \frac{\sqrt{5}}{2}$

NOTE: The angle of deviation depends on the angle of incidence. At the minimum deviation δ_m, the refracted ray inside the prism becomes parallel to its base.

Question 63.

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

[4 Marks]



(A) 4 μF

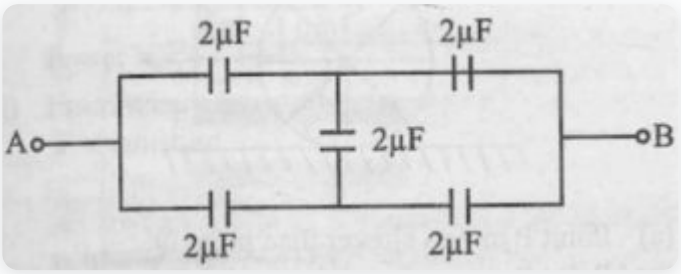
(B) 1 μF

(C) 0.5 μF

(D) 2 μF

Explanation:

Given circuit is balanced Wheatstone bridge so equivalent circuit is as shown ∴ Equivalent capacitance C_AB = (1/2 + 1/2) + (1/2 + 1/2) = 2μF



Question 64.

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

[4 Marks]

(A) Strain and arc

(B) angular speed and stress

(C) Stress and angle

(D) Strain and angle

Explanation:

Solid angle, $d\Omega = dA/r^2$ has dimensions $[M^0L^0T^0]$ Strain, Strain$=\Delta\ell/\ell$ has dimensions $[M^0L^0T^0]$ Angle measured in radians, $\theta = \ell/r$ is also dimensionless, $[M^0L^0T^0]$ Solid angle, strain, and angle are dimensionless .

Question 65.

The maximum elongation of a steel wire of 1 m length if the elastic limit of steel and its Young's modulus, respectively, are 8×10^8 N m^{-2} and 2×10^{11} N m^{-2}, is:

[4 Marks]

(A) 8 mm

(B) 40 mm

(C) 0.4 mm

(D) 4 mm

Explanation:

For maximum elongation, Stress = Elastic limit

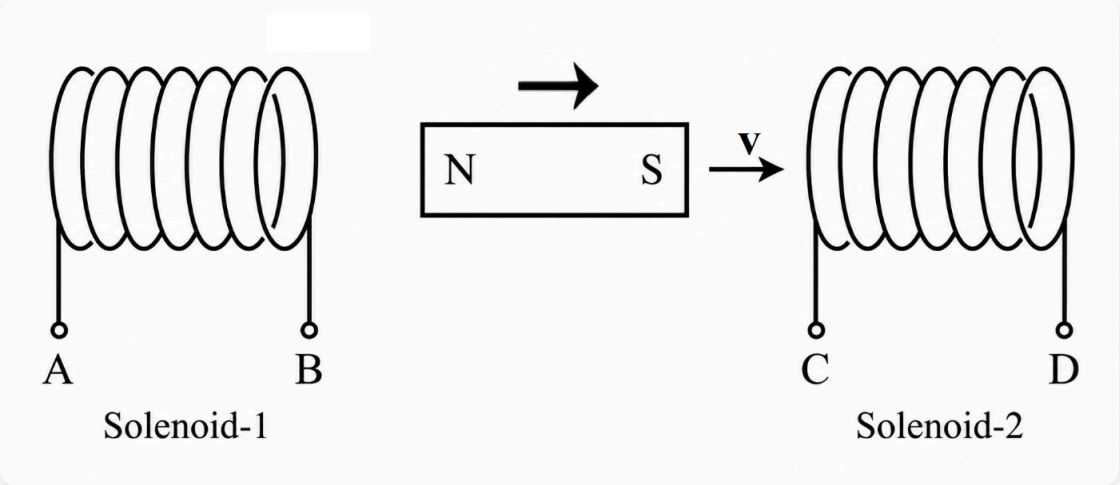
Maximum elongation

= σelastic × L / Young's modulus = $8 \times 10^{8} \times 1 / 2 \times 10^{11} = 4 \times 10^{-3}$ m =4 mm

Question 66.

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:

[4 Marks]



(A) AB and CD

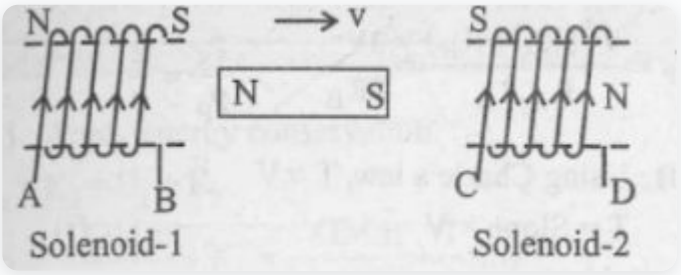
(B) BA and DC

(C) BA and CD

(D) AB and DC

Explanation:

North of magnet is moving away from solenoid 1 so end B of solenoid 1 is South and as south of magnet is approaching solenoid 2 so end C of solenoid 2 is South.



Question 67.

The mass of a planet is 1/10that of the Earth and its diameter is half that of the Earth. The acceleration due to gravity on that planet is:

[4 Marks]

(A) 9.8 m s^{-2}

(B) 3.92 m s^{-2}

(C) 4.9 m s^{-2}

(D) 19.6 m s^{-2}

Explanation:

Acceleration due to gravity g = GM/R^2 So acceleration due to gravity on the surface of the planet g' = GM'/R'^2 = GM/10$(R/2)^2$ or g' = 4/10.GM/R^2 = 0.4 × g = 0.4 × 9.8 ∴ g' = 3.92 m s^{-2}

Question 68.

Match List I with List II.Choose the correct answer from the options given below:

[4 Marks]

List I (Spectral Lines of Hydrogen for transitions from)	List II (Wavelengths (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

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

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

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

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

Explanation:

Energy of transition, $\Delta E = hc/\lambda \therefore \lambda \propto 1/\Delta E$ As, $(\Delta E)_{6-2} > (\Delta E)_{5-2} > (\Delta E)_{4-2} > (\Delta E)_{3-2}$

$\Rightarrow \lambda_{6-2} < \lambda_{5-2} < \lambda_{4-2} < \lambda_{3-2}$ A-III, B-IV, C-II, D-I

Question 69.

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

[4 Marks]

(A) The reflected light will be completely polarised but the refracted light will be partially polarised.

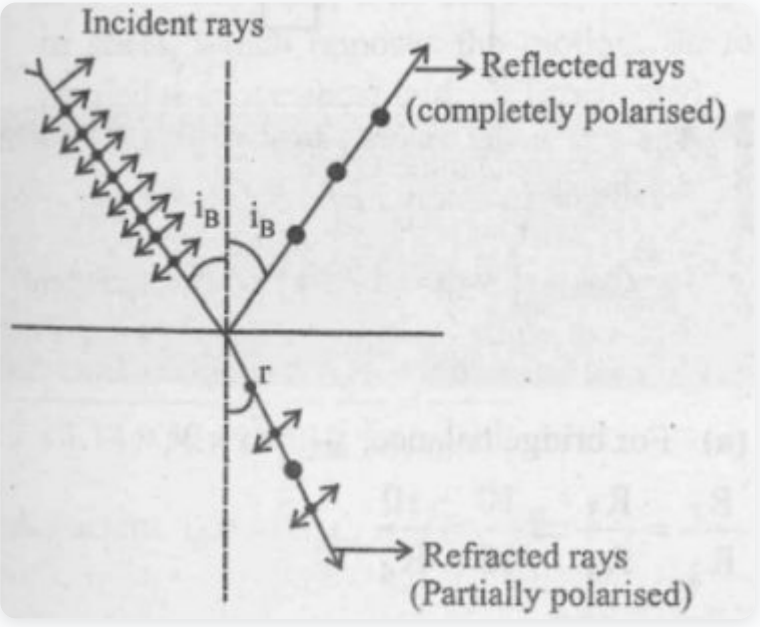
(B) Both the reflected and refracted light will be completely polarised.

(C) The reflected light will be partially polarised.

(D) The refracted light will be completely polarised.

Explanation:

According to Brewster's law when an unpolarised light beam strikes a glass at Brewster's angle, then reflected rays are completely polarized and refracted rays are partially polarized.



Question 70.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List-I (Material)	List-II (Susceptibility (χ))
A. Diamagnetic	I. $\chi = 0$
B. Ferromagnetic	II. $0 > \chi \geq -1$
C. Paramagnetic	III. $\chi >> 1$
D. Not-magnetic	IV. $0 < \chi < \varepsilon$ (ε small positive number)

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

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

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

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

Explanation:

The susceptibility of different magnetic materials are given below

Material	Susceptibility
Diamagnetic	(II) $0 > \chi \geq -1$
Ferromagnetic	(III) $\chi >> 1$
Paramagnetic	(IV) $0 < \chi < \varepsilon$
Non-magnetic	(I) $\chi = 0$

Question 71.

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:

[4 Marks]

(A) 4:1

(B) 1:4

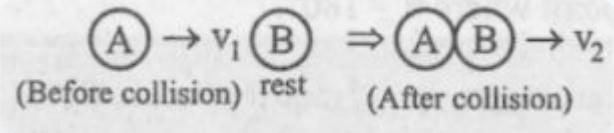
(C) 2:1

(D) 1:2

Explanation:

By conservation of linear momentum, $P_i = P_f \Rightarrow mv_1 = mv_2 + mv_2 \Rightarrow mv_1 = 2mv_2$

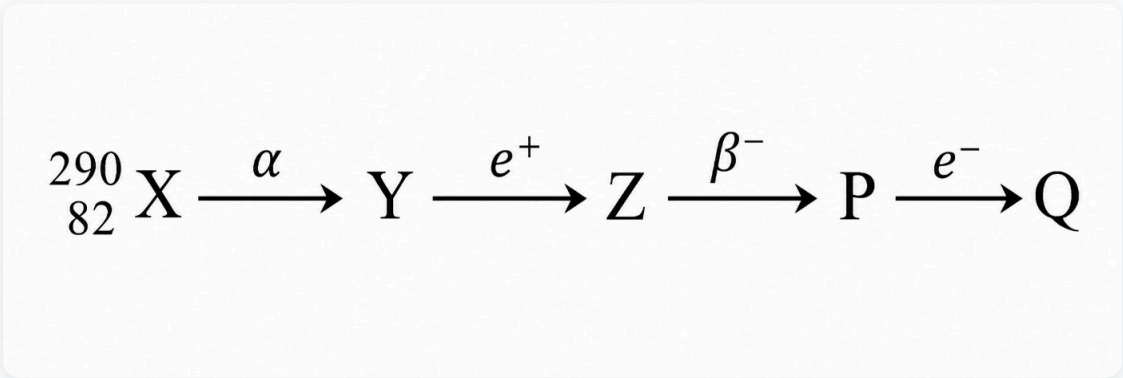
$\therefore v_1/v_2 = 2/1$



Question 72.

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

[4 Marks]



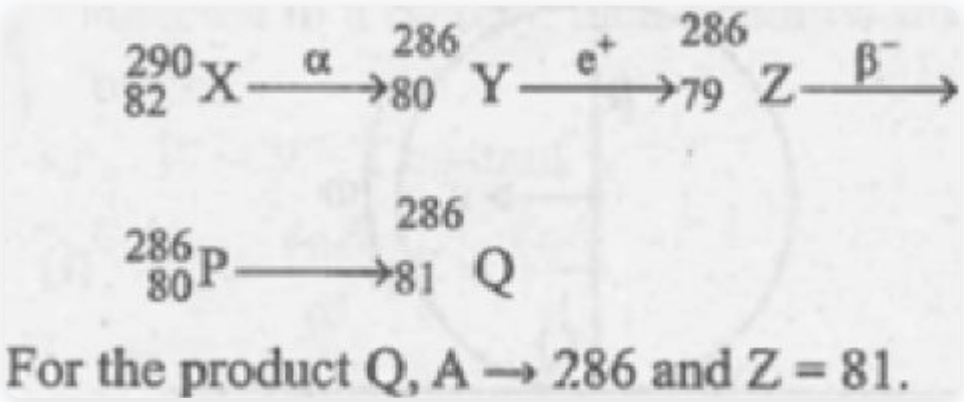
(A) 288, 82

(B) 280, 81

(C) 286, 80

(D) 286, 81

Explanation:



Question 73.

If x = 5sin (πt +π/3) m represents the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively, are

[4 Marks]

(A) 5 m, 1 s

(B) 5 m, 2 s

(C) 5 cm, 1 s

(D) 5 cm, 2 s

Explanation:

x = 5 sin (πt +π/3) m

Amplitude, A = 5 m

Time perind T = 2π/ω = 2π/π = 2 s

Question 74.

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 N m^{-1}, then the excess force required to take it away from the surface is:

[4 Marks]

(A) 99 N

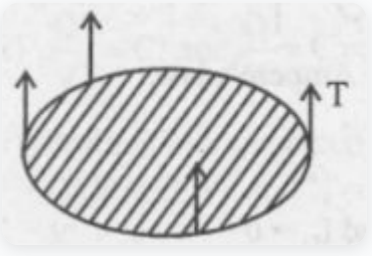
(B) 1.98 mN

(C) 198 N

(D) 19.8 mN

Explanation:

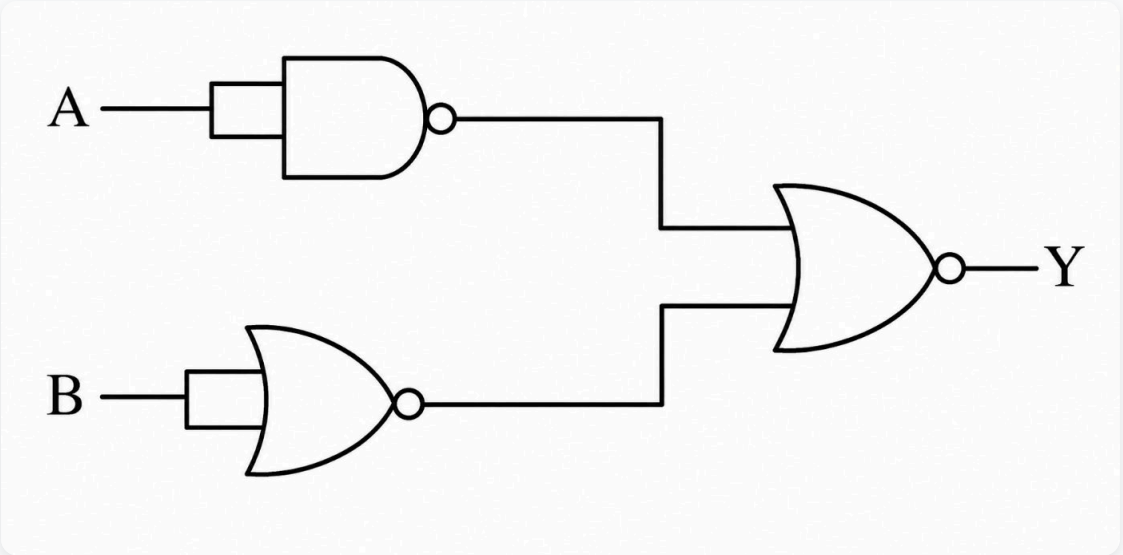
Excess force = T × length = T × 2πR = 7/100 × 2 × 3.14 × 4.5/100 = 19.8 mN



Question 75.

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

[4 Marks]



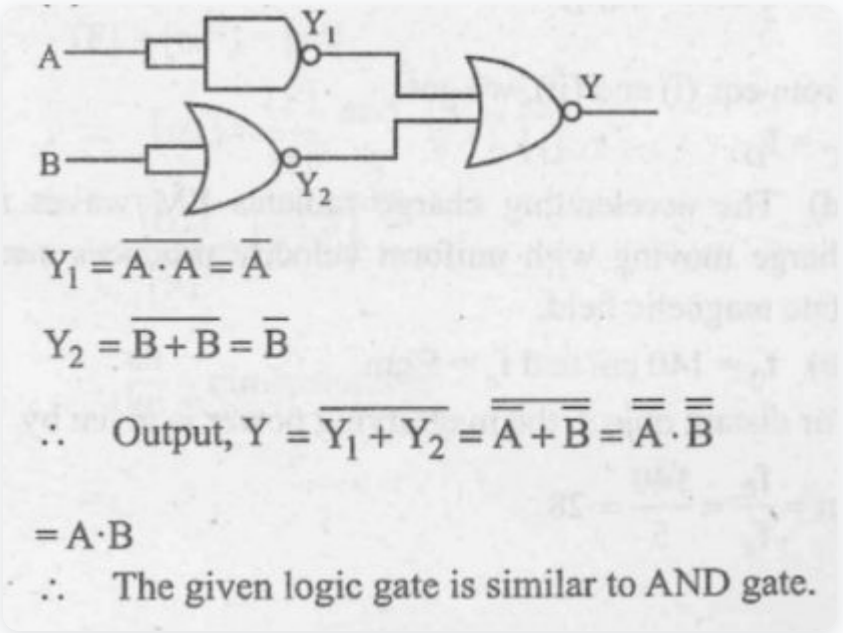
(A) OR gate

(B) AND gate

(C) NOR gate

(D) NAND gate

Explanation:



Question 76.

Assertion A: The potential (V) at any axial point, at 2 m distance (r) from the centre of the dipole of dipole moment vector □□ of magnitude 4×10^{-6} Cm, is $\pm 9 \times 10^{3}$V.

(Take $1/4\pi\varepsilon_0 = 9 \times 10^9$ SI units)

Reason R: $V = \pm 2P/4\pi\varepsilon_0 r^2$, where r is the distance of 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:

[4 Marks]

(A) A is false but R is true.

(B) A is true but R is false.

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

(D) Both A and R are true and R is NOT the correct explanation of A.

Explanation:

The potential V at any point, at distance r from centre of dipole = $1/4\pi\varepsilon_0.P\cos\theta/r^2$

At axial point where $\theta = 0°$; $V = 1/4\pi\varepsilon_0.P/r^2$

$= 9 \times 10^9 \times 4 \times 10^{-6}/2^2 = 9 \times 10^3$ V

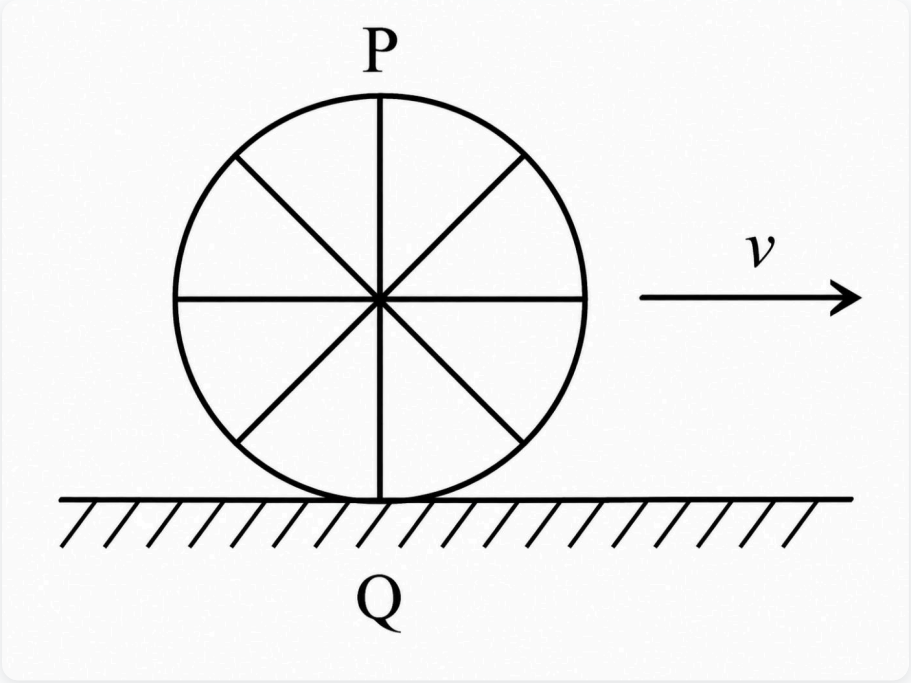
$V = -1/4\pi\varepsilon_0.P/r^2 = -9 \times 10^3$ V

At the axial point where $\theta = 180°$

Question 77.

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)?

[4 Marks]



(A) Both the points P and Q move with equal speed

(B) Point P has zero speed

(C) Point P moves faster than point Q

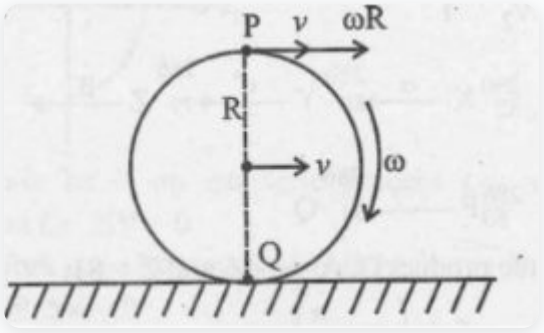
(D) Point P moves slower than point Q

Explanation:

In the case of pure rolling, $v = \omega R \therefore v_p = V + \omega R = 2v$

$v_Q = v - \omega R = 0$

Hence, point P moves faster than point Q.



Question 78.

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:

[4 Marks]

(A) Displacement current of magnitude equal to I flows in the same direction as I

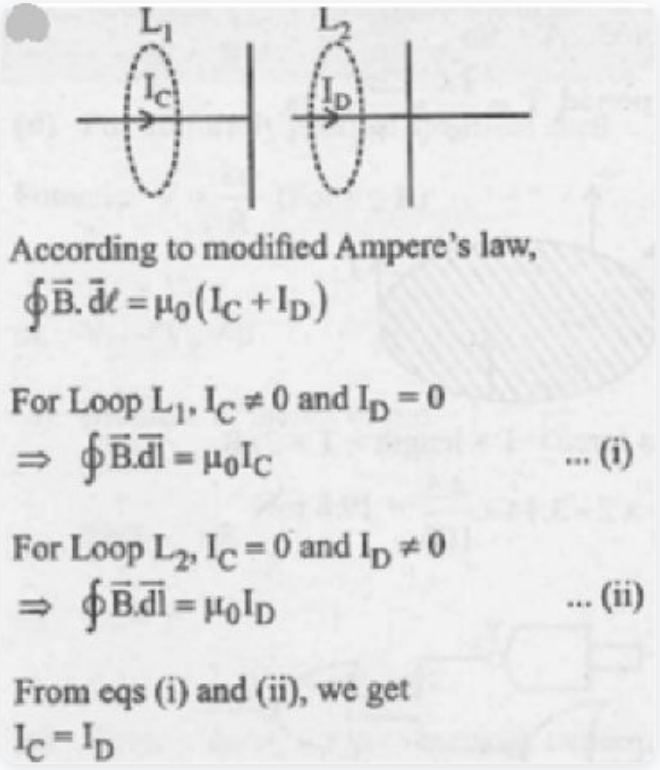
(B) Displacement current of magnitude equal to I flows in a direction opposite to that of I

(C) Displacement current of magnitude greater than I flows but can be in any direction

(D) There is no current

Explanation:

.



Question 79. The property which is not of an electromagnetic wave travelling in free space is that:

[4 Marks]

(A) They are transverse in nature

(B) The energy density in electric field is equal to energy density magnetic field

(C) They travel with a speed equal to $1/\sqrt{\mu_0\varepsilon_0}$

(D) They originate from charges moving with uniform speed

Explanation: The accelerating charge radiates EM waves and charge moving with uniform velocity produces steady state magnetic field.

Question 80.

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:

[4 Marks]

(A) 17

(B) 32

(C) 28

(D) 34

Explanation:

f_0 = 140 cm and f_e = 5 cm

For distant object, the magnifying power is given by m = f_0/f_e = 140/5 = 28 cm

Question 81. 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:

[4 Marks]

(A) 1:1

(B) 2:9

(C) 1:2

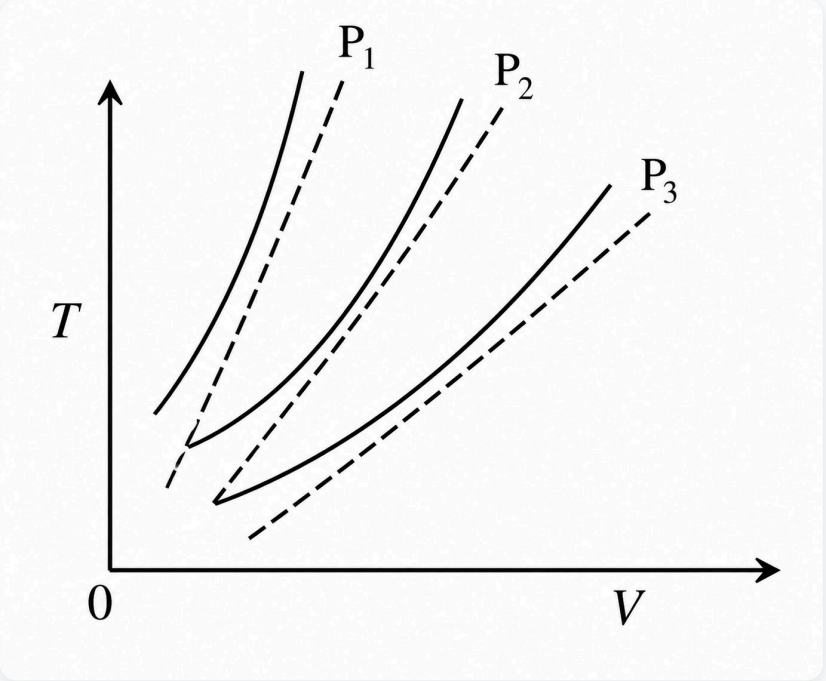
(D) 2:3

Explanation: Rated power, $P = V^2/R \Rightarrow P \propto 1/R$ $P_A/P_B = R_B/R_A \Rightarrow R_A = 2 R_B$ For Series Combination, $P_S = V^2/R_A+R_B = V^2/3R_B$ For Parallel Combination, $P_P = V^2(R_A+R_B)/R_A+R_B = 3V^2/2R_B$ $\therefore P_S/P_P = 2/9$

Question 82.

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' law represented as dotted lines. Then the correct relation is:

[4 Marks]



(A) $P_2 > P_1 > P_3$

(B) $P_1 > P_2 > P_3$

(C) $P_1 > P_3 > P_2$

(D) $P_3 > P_2 > P_1$

Explanation:

Using Charles' law, $T \propto V$

$\therefore T = \text{Slope} \times V$ ...(i)

From the ideal gas equation, $PV = nRT \Rightarrow T = (P/nR)V$ ...(ii)

From equations (i) and (ii), we get: Slope $\propto P$

As, $(\text{slope})_1 > (\text{slope})_2 > (\text{slope})_3 \Rightarrow P_1 > P_2 > P_3$

Question 83.

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/2 times its original time period. Then the value of x is:

[4 Marks]

(A) $2\sqrt{3}$

(B) 4

(C) $\sqrt{3}$

(D) √2

Explanation:

Time period of simple pendulum is $T = 2\pi\sqrt{(l/g)} \Rightarrow T \propto \sqrt{l}$

$\Rightarrow T_2/T_1 = \sqrt{(l_2/l_1)} = 1/2$ [$\because l_2 = l_1/2$]

$\Rightarrow T_2 = 1/\sqrt{2}\ T_1 = x/2\ T_1$(given)

$\therefore x = \sqrt{2}$

Question 84. 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:

[4 Marks]

(A) 5GmM/6R

(B) 2GmM/3R

(C) GmM/2R

(D) GmM/3R

Explanation: Apply energy conservation, $U_i + K_i = U_f + K_f \Rightarrow - GMm/R + K_i = - GMm/3R = 1/2\ mv^2_0$ $\Rightarrow - GMm/R + K_i = - GMm/3R = 1/2 \times m \times GM/R$ [$\because v_0 = \sqrt{GM/r}$ and $r = 3R$] $\Rightarrow K_i = -$ 1/6.GMm/R+GMm/R $\therefore$ Minimum energy required, $K_i = 5/6.GMm/R$

Question 85.

A sheet is placed on a horizontal surface in front of a strong magnetic pole.

A force is needed to: A. hold the sheet there if it is magnetic.

B. hold the sheet there if it is non-magnetic.

C. move the sheet away from the pole with uniform velocity if it is conducting.

D. 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:

[4 Marks]

(A) A, C and D only

(B) C only

(C) A and C only

(D) B and D only

Explanation:

A. A magnetic pole will repel or attract magnetic sheet, so force is need to hold the sheet.

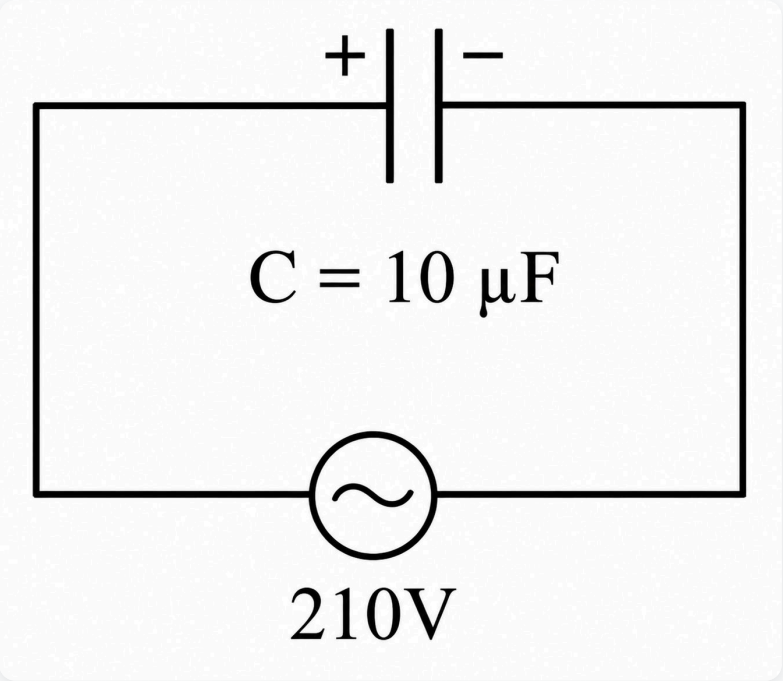
B. If sheet is non-magnetic, then magnetic pole will not exert force on it.

C. If it is conducting, then there will be eddy current in sheet, which opposes the motion. So forces is needed to move sheet with uniform speed.

D. The non-conducting and non-polar sheet do not interact with magnetic poles of magnet.

Question 86. A 10 μF capacitor is connected to a 210 V, 50 Hz source as shown in the figure. The peak current in the circuit is nearly (π = 3.14):

[4 Marks]



(A) 0.58 A

(B) 0.93 A

(C) 1.20 A

(D) 0.35 A

Explanation: Capacitive Reactance, $X_C = 1/\omega C = 1/2\pi fC = 1/2\times3.14\times50\times10\times10^{-6} = 1000/3.14$
Peak current, $i_0 = \sqrt{2}.i_{rms} = \sqrt{2}.V_{rms}/X_C = \sqrt{2} \times 210/100 \times 3.14 = 0.932 \approx 0.93$ A

Question 87.

A metallic bar of Young's modulus 0.5×10^{11} N m^{-2} and coefficient of linear thermal expansion $10^{-5}°C^{-1}$, 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:

[4 Marks]

(A) 2×10^3 N

(B) 5×10^3 N

(C) 100×10^3 N

(D) 50×10^3 N

Explanation:

The compressive force developed in the metallic bar is $F = YA\alpha\Delta T = 0.5 \times 10^{11} \times 10^{-3} \times 10^{-5} \times 100 = 50 \times 10^3$ N

Question 88.

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 :

[4 Marks]

(A) 2M

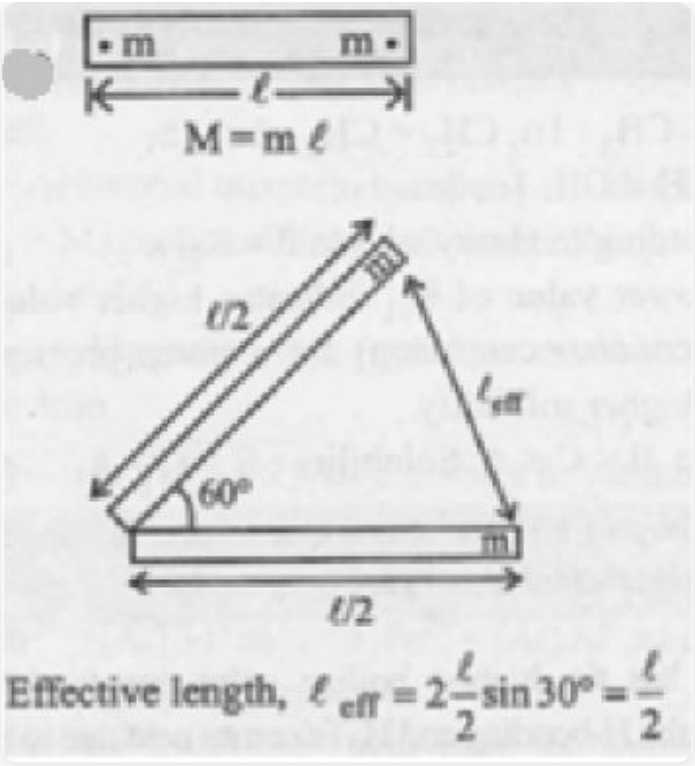
(B) M/√3

(C) M

(D) M/2

Explanation:

The compressive force developed in the metallic bar is $F = YA\alpha\Delta T = 0.5 \times 10^{11} \times 10^{-5} \times 10^{-3} \times 100 = 50 \times 10^3$ N



Question 89.

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

A. the charge stored in it, increases.

B. the energy stored in it, decreases.

C. its capacitance increases.

D. the ratio of charge to its potential remains the same.

E. the product of charge and voltage increases.

Choose the most appropriate answer from the options given below:

[4 Marks]

(A) A, B and E only

(B) A, C and E only

(C) A, B and C only

(D) B, D and E only

Explanation:

When the plates of a parallel plate capacitor is connected to a battery, then potential difference remains constant.

V′=V=Constant

(i) $C' = \varepsilon_0 A/d'$, $C = \varepsilon_0 A/d$

Since, $d' < d \Rightarrow C' > C$

Hence, the final capacitance is greater than the initial capacitance. (ii) $U' = 1/2\ C'V^2$ and $U = 1/2CV^2$

$\Rightarrow U' > U$ [$\because C' > C$] Hence, the final energy is greater than the initial energy.

(iii) $Q'/V' = C'$ and $Q/V = C \Rightarrow Q'/V' \neq Q/V$

(iv) Product of charge and voltage: $X' = Q'V = C$

$'V^2$ and $X = QV = CV^2 \Rightarrow X' > X$

[$\because C' > C$]

Question 90.

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:

[4 Marks]

(A) $\alpha\beta/t$

(B) $\alpha\beta t$

(C) $\alpha t/\beta$

(D) $\beta t/\alpha$

Explanation:

From principle of homogeneity $[F] = [\alpha t^2] = [\beta t] \Rightarrow [\alpha t] = [F]/[t]$ and $[\beta] = [F]/[t] \therefore [\alpha t]/[\beta] = [F^0 t^0] \therefore \alpha t/\beta$ = dimensionless

Question 91. Lecithin, a small molecular weight organic compound found in living tissues, is an example of:

[4 Marks]

(A) Amino acids

(B) Phospholipids

(C) Glycerides

(D) Carbohydrates

Explanation: Lecithin is a low molecular weight phospholipid found in living tissues. Glycerides are esters formed from glycerol and fatty acids, and are generally very hydrophobic. Amino acids and carbohydrates belong to separate classes of biomolecules.

Question 92. How many molecules of ATP and NADPH are required for every molecule of CO_2 fixed in the Calvin cycle?

[4 Marks]

(A) 2 molecules of ATP and 3 molecules of NADPH

(B) 2 molecules of ATP and 2 molecules of NADPH

(C) 3 molecules of ATP and 3 molecules of NADPH

(D) 3 molecules of ATP and 2 molecules of NADPH

Explanation: Three molecules of ATP and two molecules of NADPH are required for fixing one molecule of carbon dioxide.

Question 93.

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

[4 Marks]

(A) 10 bp

(B) 4 bp

(C) 6 bp

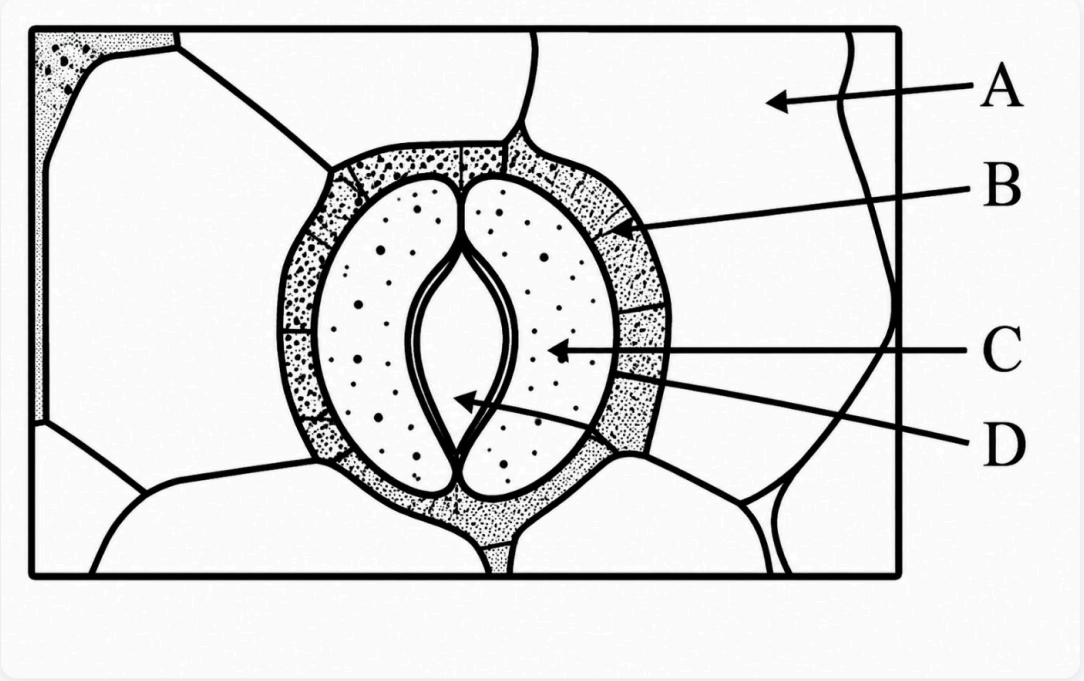
(D) 8 bp

Explanation:

Hind II was the first restriction endonuclease discovered. The functioning of restriction endonuclease depends on a specific DNA nucleotide sequence that was isolated. Hind II is a 6-base pair cutter.

Question 94. In the given figure, which component has thin outer walls and highly thickened inner walls?

[4 Marks]



(A) C

(B) D

(C) B

(D) A

Explanation: C represents the Guard cells of stomata that have thin outer wall and highly thickened inner walls. These are the structural modification to facilitate opening and closing of stomata.

Question 95. The cofactor of the enzyme carboxypeptidase is:

[4 Marks]

(A) Niacin

(B) Zinc

(C) Flavin

(D) Haem

Explanation: Zinc is the cofactor of enzyme carboxypeptidase. Niacin is related with coenzyme NAD and NADP. Haem represents the prosthetic group of enzymes peroxidase and catalase.

Question 96. The capacity to generate a whole plant from any cell of the plant is called:

[4 Marks]

(A) Totipotency

(B) Micropropagation

(C) Differentiation

(D) Somatic hybridization

Explanation: Totipotency is the ability of plants to generate whole plant body from any cell of the plant.

Question 97.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List-I		List-II	
A.	Rhizopus	I.	Mushroom
B.	Ustilago	II.	Smut fungus
C.	Puccinia	III.	Bread mould
D.	Agaricus	IV.	Rust fungus

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

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

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

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

Explanation:

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

Question 98.

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

Statement II : Bt toxin exists as inactive protoxin in B. thuringiensis. However, after ingestion 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:

[4 Marks]

(A) Both Statement I and Statement II are false

(B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are true

(D) Statement I is false but Statement II is true

Explanation:

Sol. Bt toxin exists as inactive protoxins in B. thuringiensis. However, after ingestion by the insect the inactive protoxin gets converted into active form due to alkaline pH of the insect gut.

Question 99. Which of the following is an example of actinomorphic flower?

[4 Marks]

(A) Datura

(B) Cassia

(C) Pisum

(D) Sesbania

Explanation: Actinomorphic condition is observed in flowers of Datura. Rest plants given in option b, c and d have, zygomorphic flowers .

Question 100. 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;

[4 Marks]

(A) in-situ conservation

(B) Biodiversity conservation

(C) Semi-conservative method

(D) Sustainable development

Explanation: Ex-situ conservation is the type of conservation in which threatened species are taken out from their natural habitat and placed in special setting where they can be protected and given special care . Although from the point of conservation in-situ conservation is more favourable.

Question 101.

Identify the set of correct statement: 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.

[4 Marks]

(A) B, C, D and E only

(B) A, C, D and E only

(C) C, D and E only

(D) A, B, C and D only

Explanation:

As flowers of Vallisneria are pollinated by water so they are not colourful and do not produce nectar.

Question 102. The lactose present in the growth medium of bacteria is transported to the cell by the action of

[4 Marks]

(A) Beta-galactosidase

(B) Acetylase

(C) Polymerase

(D) Permease

Explanation: The permease enzyme is responsible for the permeability of cell to lactoses. So, the lactose present in the growth medium of bacteria is transported into the cell by the action of permease.

Question 103.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Clostridium butylicum	I.	Ethanol
B.	Saccharomyces cerevisiae	II.	Streptokinase
C.	Trichoderma polysporum	III.	Butyric acid
D.	Streptococcus sp.	IV.	Cyclosporin-A

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

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

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

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

Explanation:

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

Question 104.

The equation of Verhulst-Pearl logistic growth is dN/dt = rN[K-N/K]. From this equation, K indicates:

[4 Marks]

(A) Population density

(B) Carrying capacity

(C) Intrinsic rate of natural increase

(D) Biotic potential

Explanation:

In the given equation K denotes the carrying capacity.

Question 105. Auxin is used by gardeners to prepare weed-free lawns. But no damage is caused to grass as auxin

[4 Marks]

(A) promotes apical dominance.

(B) promotes abscission of mature leaves only.

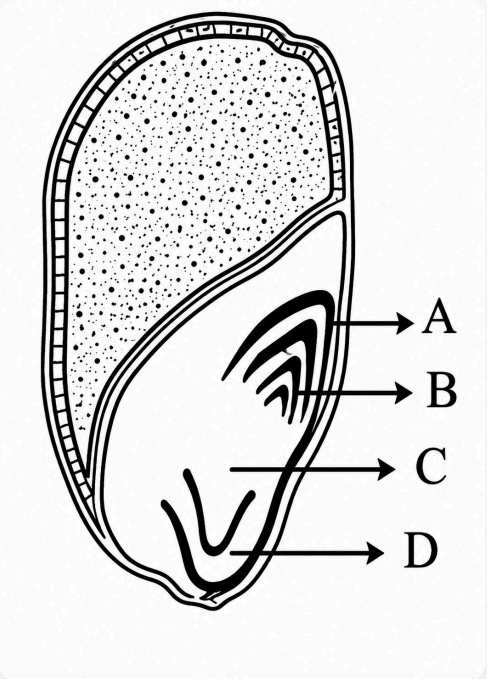
(C) does not affect mature monocotyledonous plants.

(D) can help in cell division in grasses, to produce growth.

Explanation: Auxins have no effect on mature ‘monocotyledonous plants as they show very limited translocation and they degrade the auxins that are applied externally.

Question 106. Identify the part of the seed from the given figure which is destined to form root when the seed germinates.

[4 Marks]



(A) B

(B) A

(C) C

(D) D

Explanation: C represents the radicle that is destined to form root.

Question 107.

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

Statement II : Gymnosperms lack xylem vessels but 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:

[4 Marks]

(A) Statement I is false but Statement II is true

(B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are true

(D) Both Statement I and Statement II are false

Explanation:

Collenchyma is also a living tissue.

Question 108.

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:

[4 Marks]

(A) A, B and D only

(B) A, B and E only

(C) A, B, C and D only

(D) A, C and D only

Explanation:

Habitat loss and fragmentation , Over-exploitation , Alien species invasions ,and Co-extinctions are the major causes of biodiversity losses. So, correct options are A, B and D only.

Question 109. Which one of the following is not a criterion for classification of fungi?

[4 Marks]

(A) Morphology of mycelium

(B) Mode of nutrition

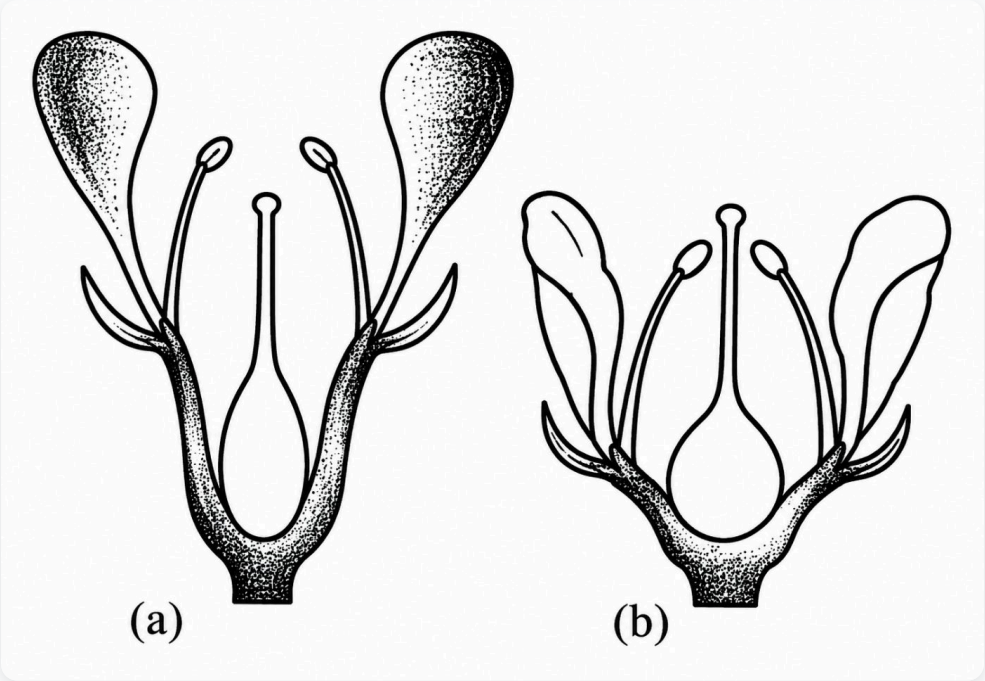
(C) Mode of spore formation

(D) Fruiting body

Explanation: Mode of nutrition is not considered for classifying fungi as they are classified on the basis of 1. Morphology of mycelium 2. Mode of spore formation 3. Fruiting Body

Question 110. 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)

[4 Marks]



(A) (a) Epigynous; (b) Hypogynous

(B) (a) Hypogynous; (b) Epigynous

(C) (a) Perigynous; (b) Epigynous

(D) (a) Perigynous; (b) Perigynous

Explanation: Both diagram a and b shows perigynous condition. If gynoecium and other parts of the flower are almost at the same level then it is called perigynous condition.

Question 111. List of endangered species was released by-

[4 Marks]

(A) GEAC

(B) WWF

(C) FOAM

(D) IUCN

Explanation: IUCN (International Union for Conservation of Nature) is the organisation that releases list of endangered species.

Question 112.

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:

[4 Marks]

(A) A and E only

(B) D and E only

(C) A and B only

(D) B and C only

Explanation:

The DNA carrying only gene of interest which may get integrated into the genome of the recipient, hence multiply and be inherited along with the host DNA . The piece of DNA not be able to multiply itself in the progeny cells of the organism independently. It needs to be integrated into the genome of the recipient.

Question 113. Wich one of the following can be explained on 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 F, 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:

[4 Marks]

(A) A, B and C only

(B) A, C, D and E only

(C) A, B, C, D and E

(D) B, C and D only

Explanation: Alleles do not show any expression and both the characters appear as such in F2 generation can be explained on the basis of Law of Segregation.

Question 114. Inhibition of Succinic dehydrogenase enzyme by malonate is a classical example of:

[4 Marks]

(A) Cofactor inhibition

(B) Competitive inhibition

(C) Feedback inhibition

(D) Enzyme activation

Explanation: Malonate shows structural similarity with the substrate Succinic Dehydrogenase and it competes with the substrate for the active site of the enzyme succinic dehydrogenase.

Question 115. Formation of interfascicular cambium from. fully developed parenchyma cells is an example for

[4 Marks]

(A) Differentiation

(B) Redifferentiation

(C) Dedifferentiation

(D) Maturation

Explanation: When parenchyma cells that are fully differentiated forms interfascicular cambium, they represents the phenomenon of dedifferentiation.

Question 116. Spindle fibers attach to kinetochores of chromosomes during

[4 Marks]

(A) Prophase

(B) Metaphase

(C) Telophase

(D) Anaphase

Explanation: Attachment of spindle fibres to kinetochores of chromosomes is observed in Metaphase stage.

Question 117.

Tropical regions show greatest level of species richness because

A. Tropical latitudes have remained relatively 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.

[4 Marks]

(A) A, B and D only

(B) A, B and E only

(C) A, C, D and E only

(D) A and B only

Explanation:

Tropical environment are less seasonal, and relatively more constant and predictable when compared to temperate or other environments.

Question 118.

Statement I: Chromosomes become gradually visible under light microscope during leptotene stage.
Statement II: The beginning of diplotene stage is recognized by dissolution of synaptonemal complex.

In the light of the above statements,

choose the correct answer from the options given below:

[4 Marks]

(A) Statement I is true but Statement II is false

(B) Statement I is false but Statement II is true

(C) Both Statement I and Statement II are false

(D) Both Statement I and Statement II are true

Explanation:

Both the statement I and II are true.

Question 119. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

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 synthesis
D. Golgi apparatus	IV. For storing nutrients

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

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

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

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

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

Question 120. Bulliform cells are responsible for

[4 Marks]

(A) Inward curling of leaves in monocots.

(B) Protecting the plant from salt stress.

(C) Increased photosynthesis in monocots.

(D) Providing large spaces for storage of sugars.

Explanation: In monocots, some particular epidermal cells present adaxially modify themselves into large, empty, colourless cells. These are called bulliform cells. When these cells in the leaves have absorbed water and becomes turgid, the Jeaf surface is exposed. When Bulliform Cells are flaccid due to water stress, they make the leaves curl inwards to minimise transpiritaional loss.

Question 121.

A pink flowered Snapdragon plant was crossed with a red flowered Snapdragon plant. What type of phenotype/s is/are expected in the progeny?

[4 Marks]

(A) Red, Pink as well as white flowered plants

(B) Only pink flowered plants

(C) Red flowered as well as pink flowered plants

(D) Only red flowered plants

Explanation:

Both red as well as pink flowered plants are expected in the progeny as per the below cross: Pink colour flower in snapdragon : Rr Red flowered snapdragon : RR when both pink and red are crossed Phenotype Red : Pink : White , 2 : 2 : 0

So the progeny that we get are red and pink flowered plants only.

Question 122. 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;

[4 Marks]

(A) Repressor, Operator gene, Structural gene

(B) Structural gene, Transposons, Operator gene

(C) Inducer, Repressor, Structural gene

(D) Promotor, Structural gene, Terminator

Explanation: A transcription unit ccnsists of three regions in the DNA: (i) A promoter (ii) The structural gene (iii) A terminator

Question 123. In a plant, black seed color (BB/Bb) is dominant over white seed color (bb). In order to find out the genotype of the black seed plant, with which of the following genotype will be cross it?

[4 Marks]

(A) BB

(B) bb

(C) Bb

(D) BB/Bb

Explanation: To determine the genotype of the black seed plant, test cross is performed . So the given black seed plant is crossed with white seed plant (recessive parent) having genotype bb.

Question 124.

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

A. Light

B. Chlorophyll

C. CO_2 D. ATP

E. NADPH

Choose the correct answer from the options given below:

[4 Marks]

(A) D and E only

(B) C, D and E only

(C) B, C and D only

(D) A, B and C only

Explanation:

Light and chlorophyll are required in light reaction not in dark reaction.

Question 125.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Two or more alternative forms of a gene	I.	Back cross
B.	Cross of F_1 progeny with homozygous recessive parent	II.	Ploidy
C.	Cross of F_1 progeny with any of the parents	III.	Allele
D.	Number of chromosome sets in plant	IV.	Test cross

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

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

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

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

Explanation:

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

Question 126. The DNA present in chloroplast is:

[4 Marks]

(A) Linear, double stranded

(B) Circular, double stranded

(C) Linear, single stranded

(D) Circular, single stranded

Explanation: Double stranded circular DNA is present in chloroplast.

Question 127. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Charles Darwin	I.	Long term ecosystem experiment using out door plots
B.	Alexander von Humboldt	II.	Global species diversity at about 7 million
C.	Paul Ehrlich	III.	Rivet popper hypothesis
D.	David Tilman	IV.	Developed the theory of natural selection

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

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

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

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

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

Question 128.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

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

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

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

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

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

Explanation:

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

Question 129. Which of the following statement is correct regarding the process of replication in E. coli?

[4 Marks]

(A) The DNA dependent DNA polymerase catalyses polymerization in one direction, that is 3′ → 5′

(B) The DNA dependent RNA polymerase catalyses polymerization in one direction, that is 5′ → 3′

(C) The DNA dependent DNA polymerase catalyses polymerization in 5′ → 3′ as well as 3′ → 5′ direction

(D) The DNA dependent DNA polymerase catalyses polymerization in 5′ → 3′ direction only.

Explanation: In replication in Prokaryotes, like E.coli, DNA dependent DNA polymerase catalyse polymerization only in one direction, that is In replication in Prokaryotes, like E.coli, DNA dependent DNA polymerase catalyse polymerization only in one direction, that is 5′ → 3′

Question 130.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	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

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

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

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

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

Explanation:

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

Question 131.

Read the following statements and choose the set of correct statements: In the members of Phaeophyceae,

A. Asexual 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 found are chlorophyll a, c and carotenoids and xanthophyll.

E. Vegetative cells have a cellulosic wall, usually covered on the outside by gelatinous coating of algin. Choose the correct answer from the options given below:

[4 Marks]

(A) A, B, C and E only

(B) A, C, D and E only

(C) B, C, D and E only

(D) A, B, C and D only

Explanation:

In Phaeophyceae sexual reproduction can occur by oogamy, isogamy or anisogamy . Hence correct statements are A, C, D and E.

Question 132.

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

[4 Marks]

(A) 10x (kcal m^{-2} yr^{-1})

(B) 100x/3X (kcal m^{-2} yr^{-1})

(C) x (kcal m^{-2} yr^{-1})

(D) x/10 (kcal m^{-2} yr^{-1})

Explanation:

NPP of first trophic level can act as GPP for second trophic level and NPP of second trophic level can act as GPP for third trophic level. So, 100x (kcal/m^2/yr) would be GPP of second trophic level and 100x × 10% (kcal/m^2/yr) i.e., 10x (kcal/m^2/yr) energy would be GPP of third trophic level.

Question 133.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	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

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

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

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

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

Explanation:

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

Question 134. Identify the step in tricarboxylic acid cycle, which does not involve oxidation of substrate.

[4 Marks]

(A) Succinic acid → Malic acid

(B) Malic acid → Oxaloacetic acid

(C) Succinyl-CoA → Succinic acid

(D) Isocitrate → α-ketoglutaric acid

Explanation: Oxidation refers to the loss of electrons from a molecule resulting in increase in its oxidation state. So the electron is transferred to an electron acceptor which is reduced in the process. During formation of succinic acid from succinyl CoA does not involve oxidation of substrate.

Question 135.

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 options given below:

[4 Marks]

(A) Statement 1is false but Statement II is true

(B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are true

(D) Both Statement I and Statement II are false

Explanation:

In C4 plants photorespiration does not occur

Question 136. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

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

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

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

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

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

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

Question 137. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

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

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

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

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

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

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

Question 138.

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

[4 Marks]

(A) Callus

(B) Somatic embryos

(C) Pollens

(D) Protoplasts

Explanation:

Somatic hybridization involves the fusion of protoplasts isolated from two varieties of plants.

Question 139. Spraying sugarcane crop with which of the following plant growth regulators, increases the length of stem, thus, increasing the yield?

[4 Marks]

(A) Auxin

(B) Gibberellin

(C) Cytokinin

(D) Abscisic acid

Explanation: Gibberellin helps in increasing the lengths of internode, hence increasing the yield of sugarcane crops as they store carbohydrates in stem.

Question 140.

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

[4 Marks]

(A) E-A-D-B-C

(B) B-D-E-C-A

(C) A-E-C-B-D

(D) E-C-A-D-B

Explanation:

The pathway that action potential follows when generated in heart is Sino Atrial Node > Atrio Ventricular Node > Atrio Ventricular Bundle > Bundle Branches >Purkinje Fibres

Question 141. In both sexes of cockroach, a pair of jointed filamentous structures called anal cerci are present on

[4 Marks]

(A) 5^{th} segment

(B) 10^{th} segment

(C) 11^{th} segment

(D) 8^{th} and 9^{th} segment

Explanation: The 10th segment present in abdomen region have anal cerci that represents a pair of jointed filamentous structures in both sexes of cockroach.

Question 142.

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

[4 Marks]

(A) Divergent evolution

(B) Convergent evolution

(C) Natural selection

(D) Adaptive radiation

Explanation:

Similar function is performed by the flippers of the Penguins and Dolphins perform but structurally they are not similar. Hence these structures represents convergent evolution.

Adaptive radiation occurs when different species in a given geographical area starting from a point and literally radiating to the other areas of geography in terms of evolution.

According to natural selection is the key mechanism behind evolution.

Divergent evolution represents homology.

Question 143. Which of the following is not a component of Fallopian tube?

[4 Marks]

(A) Isthmus

(B) Uterine fundus

(C) Ampulla

(D) Infundibulum

Explanation: Uterine fundus is the part of the uterus, Isthmus, Infundibulum and Ampulla are the different components of fallopian tube.

Question 144.

Given below are some stages of human evolution. Arrange them 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:

[4 Marks]

(A) A-D-C-B

(B) C-B-D-A

(C) B-A-D-C

(D) D-A-C-B

Explanation:

The sequence of Human Evolution from past to recent is as follows: Homo habilis → Homo erectus → Homo neanderthalensis → Homo sapiens

Question 145. Which of the following is not a steroid hormone?

[4 Marks]

(A) Cortisol

(B) Testosterone

(C) Progesterone

(D) Glucagon

Explanation: Glucagon belongs to class of proteinaceous hormone and it is secreted from pancreas. Cortisol, Testosterone and Progesterone are the steroidal hormone.

Question 146. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

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

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

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

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

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

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

Question 147.

Following are the stages of cell division :

A. Gap 2 phase

B. Cytokinesis

C. Synthesisphase

D. Karyokinesis

E. Gap I phase

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

[4 Marks]

(A) E-C-A-D-B

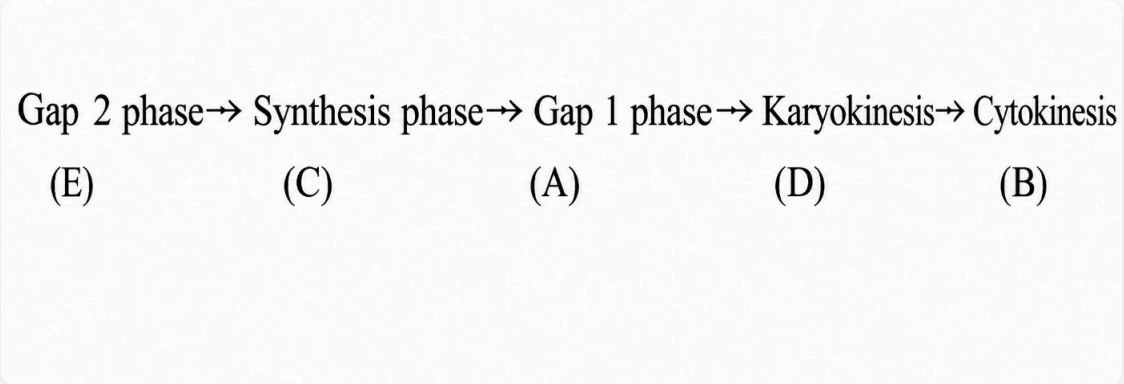
(B) B-D-E-A-C

(C) E-B-D-A-C

(D) C-E-D-A-B

Explanation:

The following sequence represents the stages of cell division in correct order:



Question 148. Which one of the following factors will not affect the Hardy-Weinberg equilibrium?

[4 Marks]

(A) Genetic recombination

(B) Genetic drift

(C) Gene migration

(D) Constant gene pool

Explanation: The following factors affects the Hardy-Weinberg equilibrium: 1. Genetic recombination 2. Genetic Drift 3. Gene Migration 4. Mutation 5. Natural Selection

Question 149.

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:

[4 Marks]

(A) C, D & E only

(B) B, C & E only

(C) A, B & D only

(D) B & E only

Explanation:

Myasthenia gravis, Rheumatoid arthritis and Systemic Lupus Erythematosus (SLE) are the examples of auto immune disorders. Muscular dystrophy is a genetic disorder which progressively affects the skeletal muscles,

Gout is the inflammation of joints due to deposition of uric acid crystals.

Question 150. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

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

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

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

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

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

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

Question 151. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Expiratory capacity	I.	Expiratory reserve volume + Tidal volume + Inspiratory reserve volume
B.	Functional residual capacity	II.	Tidal volume +Expiratory reserve volume
C.	Vital capacity	III.	Tidal volume + Inspiratory reserve volume
D.	Inspiratory capacity	IV.	Expiratory reserve volume + Residual volume

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

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

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

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

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

Question 152. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Down's syndrome	I.	11^{th} chromosome
B.	α–Thalassemia	II.	X chromosome
C.	β–Thalassemia	III.	21^{st} chromosome
D.	Klinefelter's syndrome	IV.	16^{th} chromosome

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

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

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

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

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

Question 153.

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.

Reason R : Growing ovarian follicles secrete 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 :

[4 Marks]

(A) Both A and R are true but R is NOT the correct explanation of A

(B) A is false but R is true

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

(D) A is true but R is false

Explanation:

FSH acts on ovarian follicles in females and stimulating the growth of follicles. In males LH affects Leydig cells leading to secretion of androgens.

Question 154. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Pleurorhrachia	I.	Mollusca
B.	Radula	II.	Ctenophora
C.	Stomochord	III.	Osteichthyes
D.	Air bladder	IV.	Hemichordata

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

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

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

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

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

Question 155. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I (Sub Phases of Prophase I)	List II (Specific characters)
A. Diakinesis	I. Synaptonemal complex formation
B. Pachytene	II. Completion of terminalisation of chiasmata
C. Zygotene	III. Chromosomes look like thin threads
D. Leptotene	IV. Appearance of recombination nodules

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

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

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

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

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

Question 156. The “Ti plasmid” of Agrobacterium tumefaciens stands for

[4 Marks]

(A) Tumor independent plasmid

(B) Tumor inducing plasmid

(C) Tumour inhibiting plasmid

(D) Temperature independent plasmid

Explanation: The Ti plasmid stands for Tumor inducing plasmid. Hence option a, b and d are incorrect.

Question 157.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Cocaine	I.	Effective sedative in surgery
B.	Heroine	II.	Erythroxylum
C.	Morphine	III.	Erythroxylum
D.	Marijuana	IV.	*Papaver somniferum*

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

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

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

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

Explanation:

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

Question 158. Which one is the correct product of DNA dependent RNA polymerase to the given template: 3′ TACATGGCAAATATCCATTCA 5′

[4 Marks]

(A) 5′ AUGUACCGUUUAUAGGUAAGU 3′

(B) 5′ AUGUAAAGUUUAUAGGUAAGU 3′

(C) 5′ AUGUACCGUUUAUAGGGAAGU 3′

(D) 5′ ATGTACCGTTTATAGGTAAGT 3′

Explanation: The mRNA synthesised from the given DNA template is 5′ AUGUACCGUUUAUAGGUAAGU 3′

Question 159. Which of the following is not a natural/traditional contraceptive method?

[4 Marks]

(A) Coitus interruptus

(B) Lactational amenorrhea

(C) Periodic abstinence

(D) Vaults

Explanation: Vault belongs to the category of barrier method of contraception. Vault is made of rubber that is inserted into the female reproductive tract to cover the cervix during the coitus. The traditional methods of contraception includes: 1. Coitus interruptus 2. Periodic abstinence 3. Lactational amenorrhoea

Question 160. Which of the following statements is incorrect?

[4 Marks]

(A) A bio-reactor provides optimal growth conditions for achieving the desired product

(B) Bio-reactors are used to produce small scale bacterial cultures

(C) Most commonly used bio-reactors are of stirring type

(D) Bio-reactors have an agitator system, an oxygen delivery system foam control system

Explanation: Bioreactors are used for large scale production i.e, processing of large volumes (100 — 1000 litres) of culture.

Question 161.

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.

Reason R : Colostrum contains several antibodies absolutely essential to develop resistance for the new born baby.

In the light of the above statements,

choose the most appropriate answer from the options given below:

[4 Marks]

(A) A is correct but R is not correct

(B) A is not correct but R is correct

(C) Both A and R are correct but R is NOT the correct explanation of A

(D) Both A and R are correct and R is the correct explanation of A

Explanation:

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

Question 162. Which of the following factors are favourable for the formation of oxyhaemoglobin in alveoli?

[4 Marks]

(A) High pO_2 and High pCO_2

(B) High pO_2 and Lesser H^+ concentration

(C) Low pCO_2 and High H^+ concentration

(D) Low pCO_2 and High temperature

Explanation: High partial pressure of oxygen, Less H+ concentration, low partial pressure of carbon dioxide and low temperature are the favourable conditions required for the formation of oxyhaemoglobin.

Question 163. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	List-I		List-II
A.	Pons	I.	Provides additional space for Neurons, regulates posture and balance.
B.	Hypothalamus	II.	Controls respiration and gastric secretions.
C.	Medulla	III.	Connects different regions of the brain.
D.	Cerebellum	IV.	Neurosecretory cells

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

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

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

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

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

Question 164.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List-I		List-II	
A.	Lipase	I.	Peptide bond
B.	Nuclease	II.	Ester bond
C.	Proteases	III.	Glycosidic bond
D.	Amylase	IV.	Phosphodiester bond

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

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

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

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

Explanation:

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

Question 165.

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:

[4 Marks]

(A) D only

(B) C only

(C) B only

(D) A only

Explanation:

Poriferans are the acoelomates. Aschelminths are pseudocoelomates. Platyhelminths are acoelomates.

Question 166. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

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

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

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

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

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

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

Question 167. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Common cold	I.	Plasmodium
B.	Haemozoin	II.	Typhoid
C.	Widal test	III.	Rhinoviruses
D.	Allergy	IV.	Dust mites

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

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

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

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

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

Question 168.

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:

[4 Marks]

(A) Statement I is false but Statement II is true

(B) Statement I is true but Statement II is false

(C) Both Statement I and Statement II are true

(D) Both Statement I and Statement II are false

Explanation:

Descending limb of loop of Henle is impermeable to electrolytes and permeable to water. Simple cuboidal brush -border epithelium lines the proximal convoluted tubule and increases the surface area for reabsorption.

Question 169. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Axoneme	I.	Centriole
B.	Cartwheel pattern	II.	Cilia and flagella
C.	Crista	III.	Chromosome
D.	Satellite	IV.	Mitochondria

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

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

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

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

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

Question 170.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Pterophyllum	I.	Hag fish
B.	Myxine	II.	Saw fish
C.	Pristis	III.	Angel fish
D.	Exocoetus	IV.	Flying fish

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

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

(C) A-II, B-I, C-II, D-IV

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

Explanation:

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

Question 171. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	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

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

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

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

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

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

Question 172.

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 above statements,

choose the correct answer from the options given below :

[4 Marks]

(A) Statement I is true but Statement II is false

(B) Statement I is false but Statement II is true

(C) Both Statement I and Statement II are false

(D) Both Statement I and Statement II are true

Explanation:

It is not necessary that hymen is torn during the first coitus only it can be torn due to sudden jolt, insertion of a vaginal tampon, active participation in some sports and in some women the hymen persists even after coitus.

Question 173.

Statement I: Gause's competitive exclusion principle states that two closely related species competing for different resources cannot exist indefinitely.

Statement II: According to Gause's principle, during competition, the inferior will be eliminated. This may be true if resources are limiting.

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

[4 Marks]

(A) Statement I is false but Statement II is true.

(B) Statement I is true but Statement II is false.

(C) Both Statement I and Statement II are true.

(D) Both Statement I and Statement II are true.

Explanation:

Gause's competitive exclusion principle states that two closely related species competing for the same resources cannot exist indefinitely. Due to the competition the superior species will outnumber the inferior one leading to their elimination.

Question 174. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	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

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

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

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

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

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

Question 175.

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.

E. Postanal tail is absent.

Choose the most appropriate answer from the options given below:

[4 Marks]

(A) B, C & D only

(B) A & C only

(C) B, D & E only

(D) A, B & D only

Explanation:

Perforated pharyngeal gill slits and dorsal central nervous system are the characteristics of chordates.

Question 176. Choose the correct statement given below regarding juxta medullary nephron.

[4 Marks]

(A) Juxtamedullary nephrons are located in the columns of Bertini.

(B) Renal corpuscle of juxta medullary nephron lies in the outer portion of the renal medulla.

(C) Loop of Henle of juxta medullary nephron runs deep into medulla.

(D) Juxta medullary nephrons outnumber the cortical nephrons.

Explanation: Juxta medullary nephrons have Renal corpuscle in inner cortical region. Their loop of Henle lies deep in medulla and they are fewer in number as compared to cortical nephrons.

Question 177.

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:

[4 Marks]

(A) Statement I is incorrect but Statement II is correct.

(B) Statement I is correct but Statement II is incorrect.

(C) Both Statement I and Statement II are correct.

(D) Both Statement I and Statement II are incorrect.

Explanation:

Mid brain, pons and medulla oblongata forms the brain stem.

Question 178.

Statement I : Bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced. Statement II : Both bone marrow and thymus provide micro environments for the development and maturation of T-lymphocytes. In the light of above statements,

choose the most appropriate answer from the options given below :

[4 Marks]

(A) Statement I s incorrect but Statement II is correct.

(B) Statement I is correct but Statement II is incorrect.

(C) Both Statement I and Statement II are incorrect.

(D) Both statement I and II are correct.

Explanation:

Both statement I and II are correct.

Question 179.

Rgarding 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:

[4 Marks]

(A) B,A,C,D,E

(B) A,E,B,D,C

(C) E,A,D,C,B

(D) E,D,C,B,A

Explanation:

The correct sequence of catalytic cycle of an enzyme action is: (1) The substrate binds to the active site of the enzyme. (2) The binding of the substrate causes the change in shape of the enzyme to alter its shape. (3) Chemical bonds break and Enzyme Product complex is formed. (4)Product is released by enzyme and enzyme becomes ready for the next substrate.

Question 180. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	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

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

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

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

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

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

Question 181.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

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

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

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

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

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

Explanation:

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

Question 182. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	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

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

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

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

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

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

Question 183. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List - I		List - II	
A.	Exophthalmic goiter	I.	Excess secretion of cortisol, moon 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.

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

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

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

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

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

Question 184. 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^Bi / I^Ai / ii B. I^BI^B / I^AI^A / ii C. I^AI^B / iI^A / I^Bi D. I^Ai / I^Bi / I^Ai E. iI^B / ii / I^AI^B Choose the most appropriate answer from the options given below:

[4 Marks]

(A) A only

(B) B only

(C) D & E only

(D) C & B only

Explanation: Genotype of child with blood group O+ = ii So, genotype of father with blood group B+ will be = I^Bi and genotype of mother with blood group A+ will be = I^Ai So only 'A' is correct.

Question 185.

Statement I: Mitochondria and chloroplasts both double membranes bound organelles.

Statement II: Inner membrane of mitochondria is relatively less permeable, as compared chloroplast.

In the light of the above statements, choose the m is appropriate answer from the options given below

[4 Marks]

(A) Statement I is incorrect but Statement II is correct.

(B) Both Statement I and Statement II are incorrect.

(C) Statement I is correct but Statement II is incorrect.

(D) Both Statement I and Statement II are correct.

Explanation:

The inner membrane of mitochondria is relatively more permeable, as compared to chloroplast.

Question 186.

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

[4 Marks]

(A)



(B)



(C)



(D)



Answer:

de-Broglie wavelength $\lambda = \frac{h}{p} = \frac{h}{mv}$

$= \frac{h}{\sqrt{2mE}}$ where $E = \frac{1}{2}mv^2$

Squaring both sides,

$\lambda^2 = \frac{h^2}{4m^2E} \quad \Rightarrow \quad \frac{1}{\lambda^2} \propto E.$

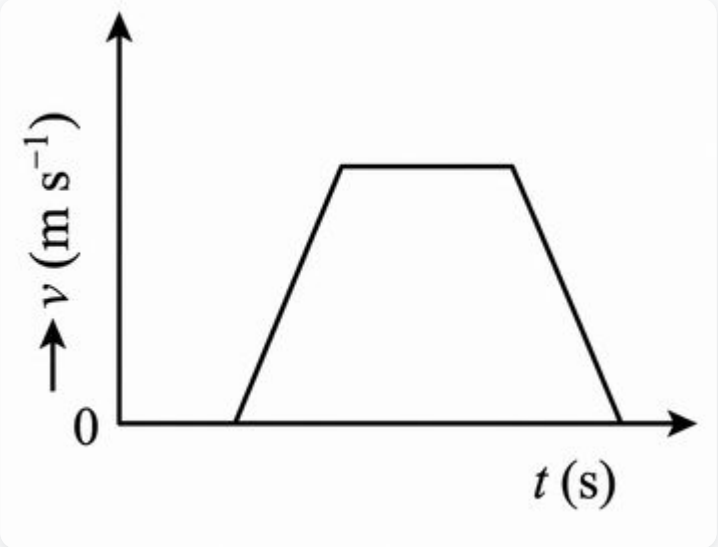
Hence $\frac{1}{\lambda^2}$ versus E graph is a straight line passes through the origin.

Question 187.

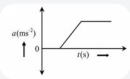
The velocity (v) — time (t) plot of the motion of a body is shown below:

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

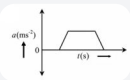
[4 Marks]



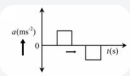
(A)



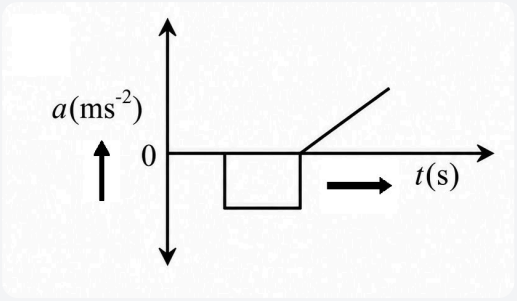
(B)



(C)



(D)



Explanation:

As acceleration is the slope of the **v–t** curve:

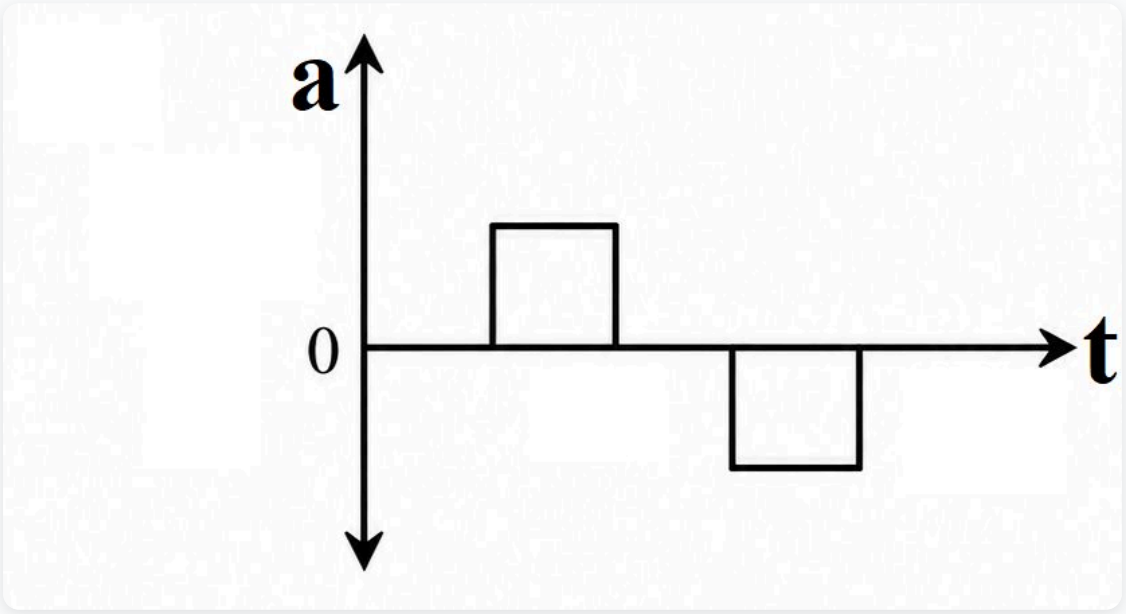
∴ Initially, a = 0

After some time, a = constant (+ve)

Again, a = 0

Again, a = constant (−ve)

∴ The corresponding **a-t** graph is:



Question 188.

Choose the correct circuit which can achieve the bridge balance.

[4 Marks]

(A)



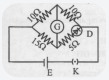
(B)



(C)



(D)



Explanation:

For bridge balance,

$R_1/R_2 = R_3/R_4 \Rightarrow 10/15 = 10/R_4$

$\therefore R_4 = 15\,\Omega$

As R_4 is a combination of **5 Ω resistance** and **diode resistance**,

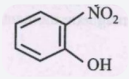
∴ The diode should be **forward biased** and connected **in series with the 5 Ω resistance**.

Question 189.

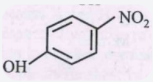
Intramolecular hydrogen bonding is present in

[4 Marks]

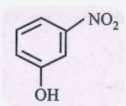
(A)



(B)



(C)



(D) HF

Explanation:

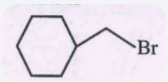
- **o-Nitrophenol** → Intramolecular hydrogen bonding.
- **p-Nitrophenol**, **m-Nitrophenol**, **HF** → Intermolecular hydrogen bonding.

Question 190.

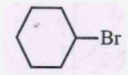
The compound that will undergo S_N1 reaction with the fastest rate is

[4 Marks]

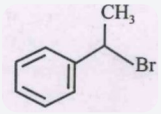
(A)



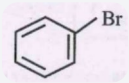
(B)



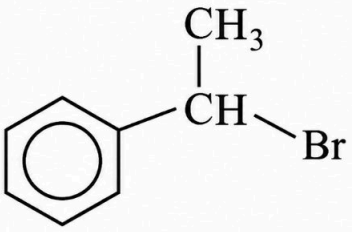
(C)



(D)



Explanation:

The compound  will react towards S_N1 the fastest as it will form a secondary carbocation which will also be stabilized by resonance of the aromatic ring attached so the α carbon.

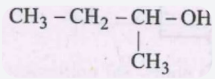
Question 191.

Which one of the following alcoholreacts instantaneously with Lucas reagent?

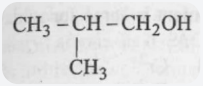
[4 Marks]

(A) $CH_3 – CH_2 – CH_2 – CH_2OH$

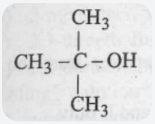
(B)



(C)



(D)



Explanation:

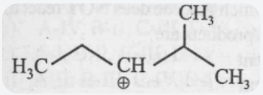
Reaction of alcohols with **Lucas reagent** (Anhydrous $ZnCl_2$ + conc. HCl) follows the **S_N1 mechanism**. Therefore, a **3° alcohol**, which forms the most stable carbocation, reacts **instantaneously** with Lucas reagent.

Question 192.

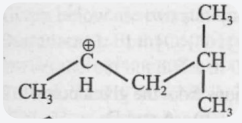
The most stable carbocation among the following is :

[4 Marks]

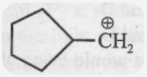
(A)



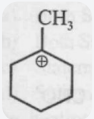
(B)



(C)

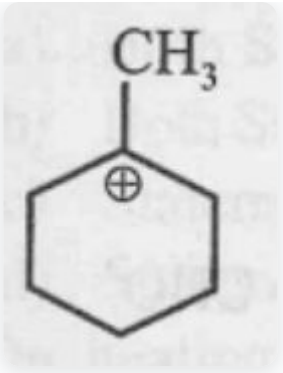


(D)



Explanation:

is most stable as it is a tertiary carbocation stabilized by three + I groups. The stability follows the order: 1° < 2° < 3°,

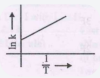


Question 193.

Which plot of In k vs 1/T is consistent with Arrhenius equation?

[4 Marks]

(A)



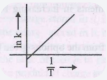
(B)



(C)



(D)



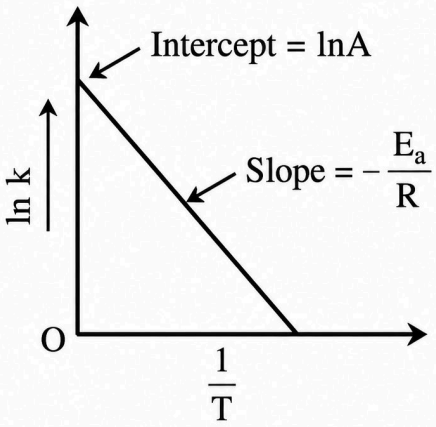
Explanation:

Arrhenius equation:

$$\ln k = -\frac{E_a}{RT} + \ln A$$

(equivalent to $y = mx + c$)

Thus, the representative graph will be:

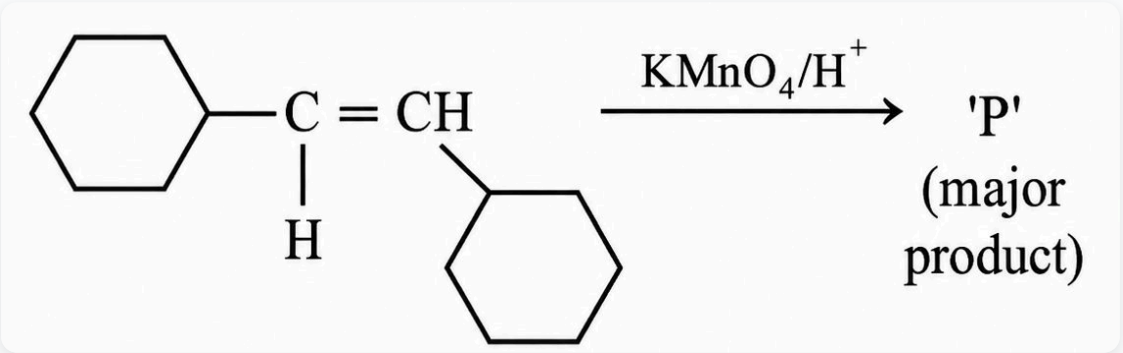


Question 194.

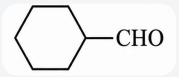
For the given reaction:

'P' is

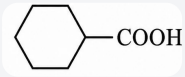
[4 Marks]



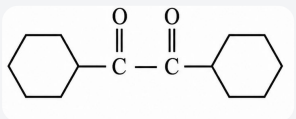
(A)



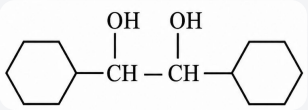
(B)



(C)



(D)

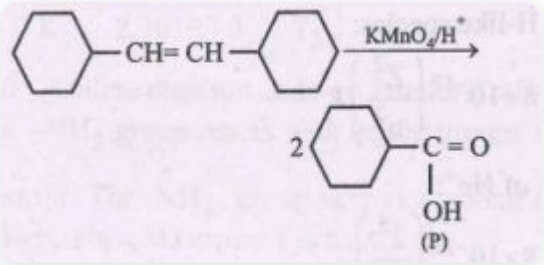


Explanation:

Acidic **$KMnO_4$** oxidizes alkenes that are substituted to **carboxylic acids** or **ketones**.

Both doubly bonded carbon atoms having one H-atom will also get oxidized to **–OH**.

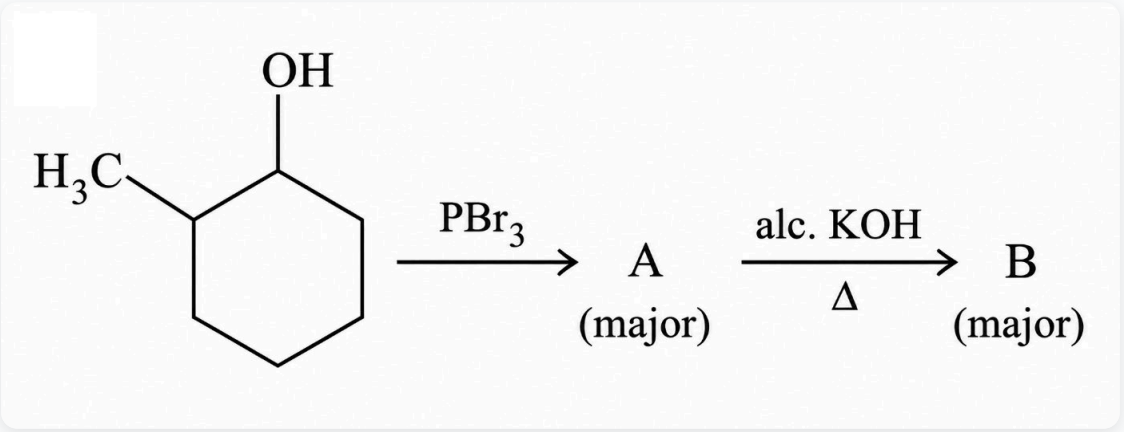
Thus,



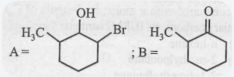
Question 195.

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

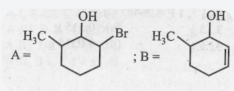
[4 Marks]



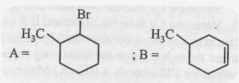
(A)



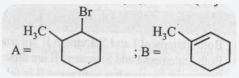
(B)



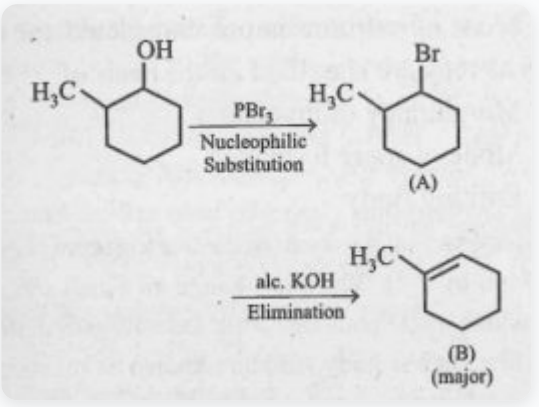
(C)



(D)



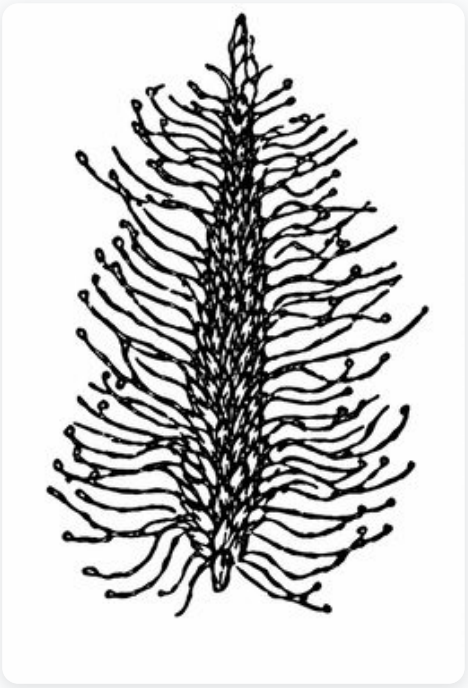
Explanation:



Question 196.

Identify the correct description about the given figure:

[4 Marks]



(A) Wind pollinated plant inflorescence showing flowers with well exposed stamens.

(B) Water pollinated flowers showing stamens with mucilaginous covering.

(C) Compact inflorescence showing complete autogamy

(D) Cleistogamous flowers showing autogamy.

Explanation:

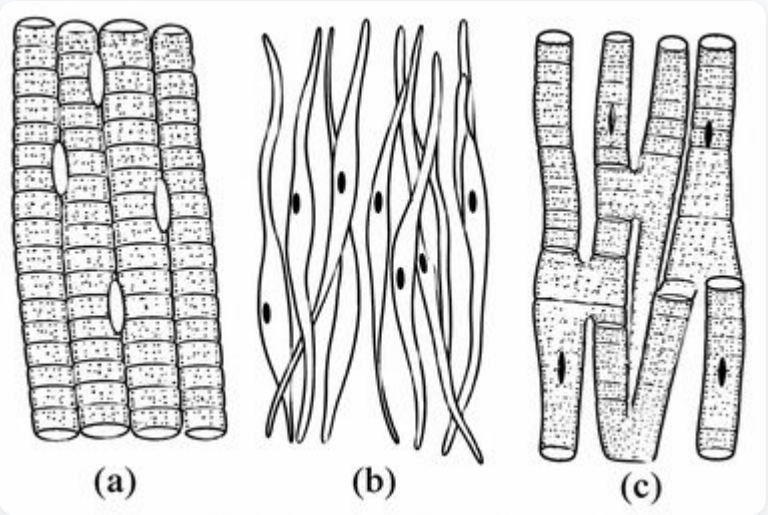
The depicted diagram shows a wind pollinated plant showing flowers with well exposed stamens. Stamens are exposed to assist pollination by wind.

Question 197.

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

Name of muscle/location

[4 Marks]



(A) (a) Smooth – Toes (b) Skeletal – Legs (c) Cardiac – Heart

(B) (a) Skeletal – Biceps (b) Involuntary – Intestine (c) Smooth – Heart

(C) (a) Skeletal – Triceps (b) Smooth – Stomach (c) Cardiac – Heart

(D) (a) Involuntary — Nose tip (b) Skeletal — Bone (c) Cardiac — Heart

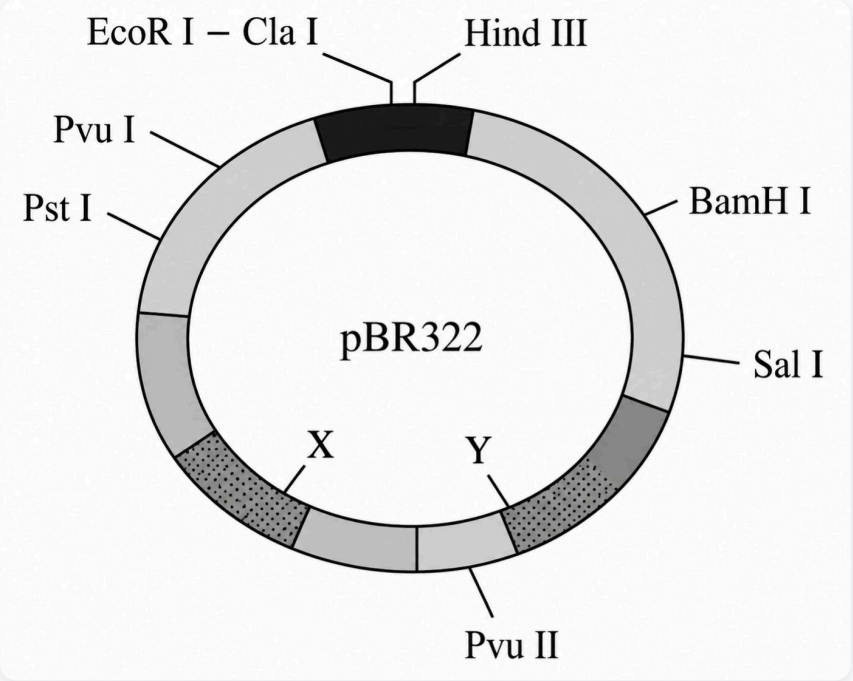
Explanation:

Figure (a) depicts skeletal muscle fibres .These muscles are closely attached to skeletal bones. They are found in voluntary organs like triceps muscles .Figure (b) depicts smooth muscle fibres .They are found in walls of internal organs such as the blood vessels, stomach and intestine. Figure (c) depicts cardiac muscle fibres ,they are only found in heart.

Question 198.

The following diagram shows restriction sites in *E. coli* cloning vector pBR322. Find the role of 'X' and 'Y' genes:

[4 Marks]



(A) The gene 'X' is responsible for resistance to antibiotics and 'Y' for protein involved in the replication of plasmid.

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

(C) The gene 'X' is responsible for recognition sites and 'Y' is responsible for antibiotic resistance.

(D) The gene 'X' is for protein involved in the replication of plasmid and 'Y' for resistance to antibiotics.

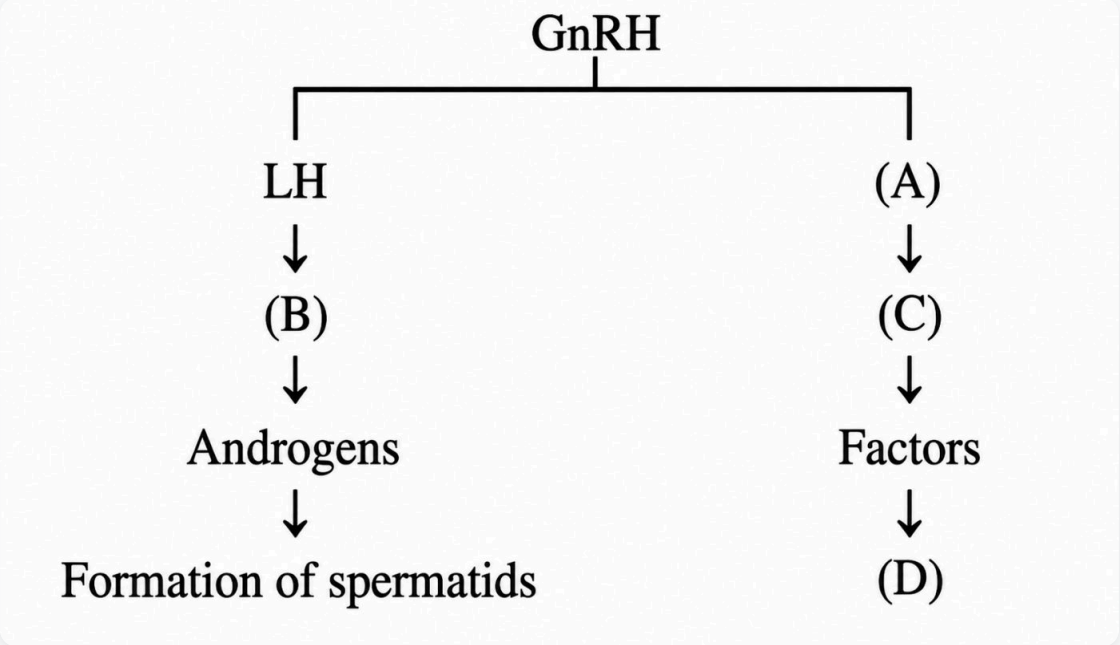
Explanation:

T'X' in the given diagram represents the ori region which controls the copy number of plasmid and hence the copy number of linked DNA. 'Y' is rop region that codes for protein involved in replication of plasmid.

Question 199.

Identify the correct option (A), (B), (C), (D) with respect to spermatogenesis.

[4 Marks]



(A) FSH, Leydig cells, Sertoli cells, Spermiogenesis.

(B) ICSH, Interstitial cells, Leydig cells, Spermiogenesis.

(C) ICSH, Leydig cells, Sertoli cells, Spermatogenesis.

(D) FSH, Sertoli cells, Leydig cells, Spermatogenesis.

Explanation:

(A) represents FSH (Follicle stimulating hormone) acts on sertoli cells in males.

(B) represents Leydig cells involved in synthesis of androgens.

(C) represents Sertoli cells plays vital role in secretion of factors inovolved in spermiogenesis.

(D) represents Spermiogenesis, the process of formation of sperms from spermatozoa.

Question 200.

which one of the following factors will not affect the hardy - weinberg equilibrium?

[4 Marks]

(A) genetic drift

(B) genetic recombination

(C) gene migeation

(D) constant gene pool

Explanation:

The following factors affects the Hardy-Weinberg equilibrium:

1. Genetic recombination

2. Genetic Drift

3. Gene Migration

4. Mutation

5. Natural Selection