JEE (Main) CHEMISTRY SOLVED PAPER

2023
12th April Shift 1

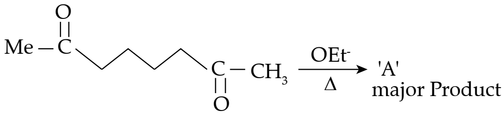
Section A

1. Match list I with list II

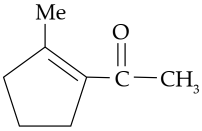
List I	List II
(A) Nitrogen oxides in air	I. Eutrophication
(B) Methane in air	II. pH of rain water becomes 5.6
(C) Carbon dioxide	III. Global warming
(D) phosphate fertilisers in water	IV. Acid rain

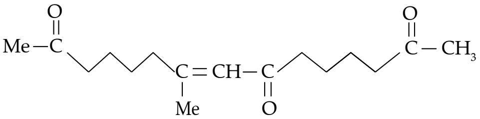
Choose the correct answer from the options given below:

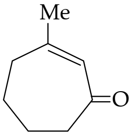
(1) A-IV, B-III, C-II, D-I **(2)** A-I, B-II, C-III, D-IV
(3) A-II, B-III, C-I, D-IV **(4)** A-IV, B-II, C-III, D-I

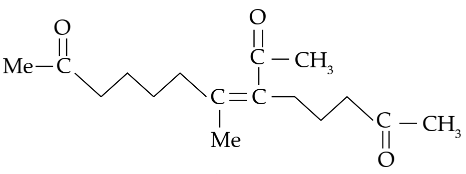
2. 

A in the above reaction is:

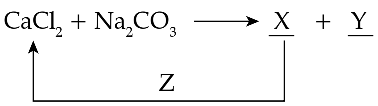
(1) 

(2) 

(3) 

(4) 

3. In the given reaction cycle



X, Y and Z respectively are

(1) X-CaO, Y-NaCl+CO_2, Z-NaCl
(2) X-$CaCO_3$, Y-NaCl, Z-HCl
(3) X-CaO_3, Y-NaCl, Z-KCl
(4) X-CaO, Y-NaCl+CO_2, Z-KCl

4. Given below are two statements:

Statement I: $SbCl_5$ is more covalent than $SbCl_3$

Statement II: The higher oxides of halogens also tend to be more stable than lower ones.

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

(1) Statement I is correct but statement II is incorrect
(2) Both statement I and statement II are incorrect
(3) Both statement I and statement II are correct
(4) Statement I is incorrect but statement II is correct

5. A metal chloride contains 55.0% of chlorine by weight. 100 mL vapours of the metal chloride at STP Weight 0.57 g. The molecular formula of the metal chloride is (Given: Atomic mass of chlorine is 35.5u)

(1) MCl **(2)** MCl_3 **(3)** MCl_2 **(4)** MCl_4

6. Four gases A, B, C and D have critical temperature 5.3, 33.2, 126.0 and 154.3K respectively. For their adsorption on a fixed amount of charcoal, the correct order is:

(1) D > C > B > A **(2)** C > B > D > A
(3) D > C > A > B **(4)** C > D > B > A

7. The bond order and magnetic property of acetylide ion are same as that of

(1) N_2^+ **(2)** O_2^+ **(3)** NO^+ **(4)** O_2^-

8. For lead storage battery pick the correct statements

A. During charging of battery, $PbSO_4$ on anode is converted into PbO_2
B. During charging of battery, $PbSO_4$ on cathode is converted into PbO_2
C. Lead storage battery consists of grid of lead packed with PbO_2 as anode
D. Lead storage battery has ~38% solution of sulphuric acid as an electrolyte

Choose the correct answer from the options given below:

(1) B, D only **(2)** B, C only
(3) B, C, D only **(4)** A,B,D only

9. Match List I with List II

LIST-I Complex	LIST-II CFSE (Δ_0)
(A) $[Cu(NH_3)_6]^{2+}$	I. –0.6
(B) $[Ti(H_2O)_6]^{3+}$	II. –2.0
(C) $[Fe(CN)_6]^{3-}$	III. –1.2
(D) $[NiF_6]^{4-}$	IV. –0.4

Choose the correct answer from the options given below:

(1) A–III, B–IV, C–I, D–II
(2) A–II, B–III, C–I, D–IV
(3) A–I, B–IV, C–II, D–III
(4) A–I, B–II, C–IV, D–III

10. The density of alkali metals is in the order

(1) Na < K < Cs < Rb **(2)** K < Na < Rb < Cs
(3) Na < Rb < K < Cs **(4)** K < Cs < Na < Rb

11. Match List I with List II

LIST I Type of Hydride	LIST II Example
(A) Electron deficient hydride	I. MgH_2
(B) Electron rich hydride	II. HF
(C) Electron precise hydride	III. B_2H_6
(D) Saline hydride	IV. CH_4

Choose the correct answer from the options given below:

(1) A–II, B–III, C–IV, D–I **(2)** A–III, B–II, C–IV, D–I
(3) A–II, B–III, C–I, D–IV **(4)** A–III, B–II, C–I, D–IV

12. Match List I with List II

LIST-I (Examples)	LIST-II (Type)
(A) 2–Chloro–1, 3–butadiene	I. Biodegradable polymer
(B) Nylon 2–nylon 6	II. Synthetic Rubber
(C) Polyacrylonitrile	III. Polyester
(D) Dacron	IV. Addition Polymer

Choose the correct answer from the options given below:

(1) A–IV, B–I, C–III, D–II **(2)** A–II, B–IV, C–I, D–III
(3) A–II, B–I, C–IV, D–III **(4)** A–IV, B–III, C–I, D–II

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

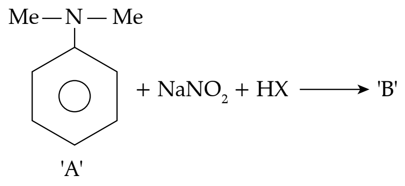
Assertion A: In the Ellingham diagram, a sharp change in slope of the line is observed for Mg → MgO at ~1120^0 C

Reason R: There is a large change of entropy associated with the change of state

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

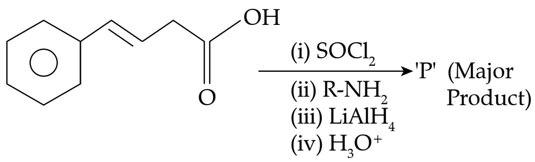
(1) Both A and R are true but R is NOT the correct explanation of A
(2) A is false but R is true
(3) A is true but R is false
(4) Both A and R are true and R is the correct explanation of A

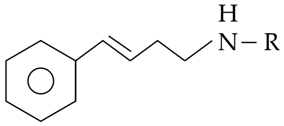
14. The incorrect statement regarding the reaction given below is

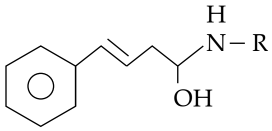


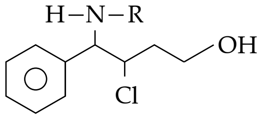
(1) The product ' B ' formed in the above reaction is p-nitroso compound at low temperature
(2) ' B ' is N-nitroso ammonium compound
(3) The electrophile involved in the reaction is NO^+
(4) The reaction occurs at low temperature

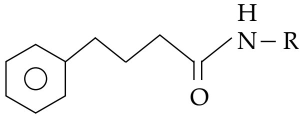
15. The major product 'P' formed in the following sequence of reactions is



(1) 

(2) 

(3) 

(4) 

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

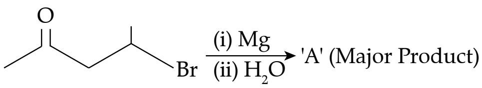
Assertion A: 5f electrons can participate in bonding to a far greater extent than 4f electrons

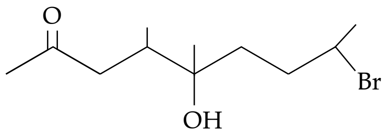
Reason R: 5f orbitals are not as buried as 4f orbitals

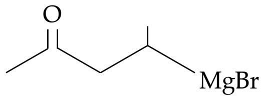
In the light of the above statements, choose the correct answer from the options given below

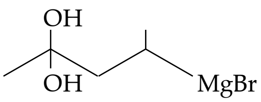
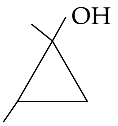
(1) Both A and R are true and R is the correct explanation of A
(2) Both A and R are true but R is NOT the correct explanation of A
(3) A is true but R is false
(4) A is false but R is true

17. In the following reaction



(1) 

(2) 

(3)  **(4)** 

18. Given below are two statements:

Statement I: Boron is extremely hard indicating its high lattice energy

Statement II: Boron has highest melting and boiling point compared to its other group members.

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

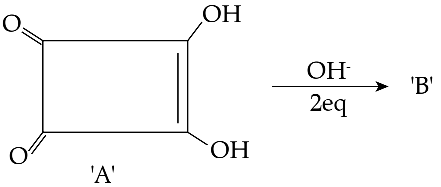
(1) Both Statement I and Statement II are incorrect

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

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

(4) Both statement I and Statement II are correct

19. Correct statements for the given reaction are :



(A) Compound ' B ' is aromatic

(B) The completion of above reaction is very slow

(C) 'A' shows tautomerism

(D) The bond lengths of C-C in compound B are found to be same

Choose the correct answer from the options given below:

(1) A,B and C only **(2)** A, C and D only

(3) B, C and D only **(4)** A, B and D only

20. $\text{2-hexene} \xrightarrow[\text{(ii) } H_2O]{\text{(i) } O_3} \text{Products}$

The two products formed in above reaction are -

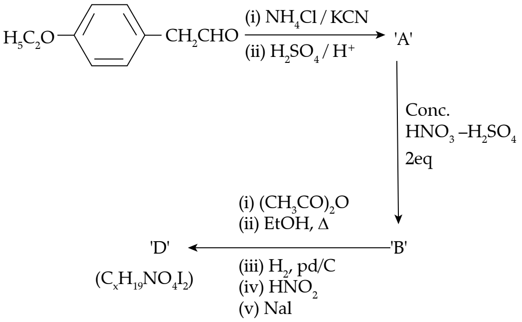
(1) Butanal and acetaldehyde

(2) Butanal and acetic acid

(3) Butanoic acid and acetaldehyde

(4) Butanoic acid and acetic acid

Section B

21. 

The value of x in compound 'D' is__________

22. The reaction $2NO+Br_2 \rightarrow 2NOBr$ takes places through the mechanism given below:

$NO + Br_2 \rightleftharpoons NOBr_2$(fast)

$NOBr_2 + NO \rightarrow 2NOBr$ (slow)

The overall order of the reaction is____________.

23. At 600 K, the root mean square (rms) speed of gas X (molar mass = 40) is equal to the most probable speed of gas Y at 90 K. The molar mass of the gas Y is_________ $gmol^{-1}$.(Nearest integer)

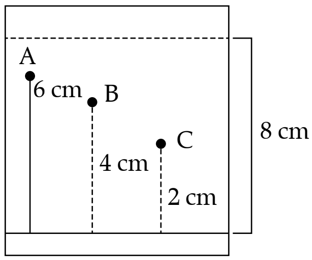
24. An analyst wants to convert 1L HCl of pH=1 to a solution of HCl of pH 2. The volume of water needed to do this dilution is________mL. (Nearest integer)

25. In an oligopeptide named Alanylglycylphenyl alanyl isoleucine, the number of sp^2 hybridised carbons is_________

26. 80 mole percent of $MgCl_2$ is dissociated in aqueous solution. The vapour pressure of 1.0 molal aqueous solution of $MgCl_2$ at 38^0 is _________ mmHg. (Nearest integer)

Given: Vapour pressure of water at 38°C is 50 mm Hg.

27. Three organic compounds A, B and C were allowed to run in thin layer chromatography using hexane and gave the following result (see figure). The R_f value of the most polar compound is _________$\times 10^{-2}$



28. One mole of an ideal gas at 350 K is in a 2.0 L vessel of thermally conducting walls, which are in contact with the surroundings. It undergoes isothermal reversible expansion from 2.0 L to 3.0 L against a constant pressure of 4 atm. The change in entropy of the surroundings (ΔS) is_________ JK^{-1} (Nearest integer)

Given: R = 8.314 J K^{-1} mol^{-1}

29. Values of work function (W_0) for a few metals are given below

Metal	Li	Na	K	Mg	Cu	Ag
W_0/eV	2.42	2.3	2.25	3.7	4.8	4.3

The number of metals which will show photoelectric effect when light of wavelength 400 nm falls on it is__________

Given: h = 6.6×10^{-34}Js

30. The mass of NH_3 produced when 131.8 kg of cyclohexanecarbaldehyde undergoes Tollen's test is _________ kg. (Nearest Integer)

Molar Mass of C = 12 g/mol

N = 14 g/mol

O = 16 g/mol

Answer Key

Q. No.	Answer	Topic name	Chapter name
1	(1)	Air and Water Pollution	Environmental Chemistry
2	(1)	Nucleophilic addition Reaction	Aldehyde and Ketones
3	(2)	Chemical reactions of substance	s Block Elements
4	(3)	Covalent character of compounds	Chemical Bonding
5	(3)	Molecular Formula of the Substance	Some Basic Concepts of Chemistry
6	(1)	Relationship Between the Critical Temperature and Adsorption	Surface Chemistry
7	(3)	Relationship Between Bond Order and Magnetic Moment	Chemical Bonding
8	(1)	Charging and discharging reaction of Lead Storage Battery	Electro Chemistry
9	(3)	CFSE Value of Various Coordination Compounds	Coordination Chemistry
10	(2)	Comparison of Densities of Metals	s Block
11	(2)	Classification of Metals Hydrides	Hydrogen
12	(3)	Classification of Polymer	Polymer
13	(4)	Ellingham Diagram	Metallurgy
14	(2)	Chemical properties of aniline	Amines
15	(1)	Nucleophilic Acyl Substitution	Aldehyde and Ketones
16	(1)	Property of f Block Elements	d and f Block
17	(1)	Nucleophilic Addition Reaction of Grignard Reagent	Aldehyde and Ketones
18	(4)	Abnormal Behaviour of Boron Atom	p Block
19	(2)	Acid Base Reaction of Organic Acids	General Organic Chemistry
20	(4)	Oxidative Ozonolysis of Alkene	Hydrocarbon
21	[15]	Mixed reactions of Carbonyl Compounds	Aldehyde and Ketones
22	[3]	Calculation of finding order of Reaction	Chemical Kinetics
23	[4]	Calculation to find Molar Mass Through Root Mean Square Velocity	States of Matter
24	[9000]	Dilution Law	Liquid Solution
25	[10]	Calculation of Number of Atoms in a given Peptides	Biomolecules
26	[48]	Lowering of Vapour Pressure	Liquid Solution
27	[25]	R_f Value	Some Basic Concepts of Chemistry
28	[3]	Entropy change Calculation	Thermodynamics and Thermochemistry
29	[3]	Photo Electric Effect	Structure of Atom
30	[60]	Stoichiometry relationship	Some Basic Concepts of Chemistry

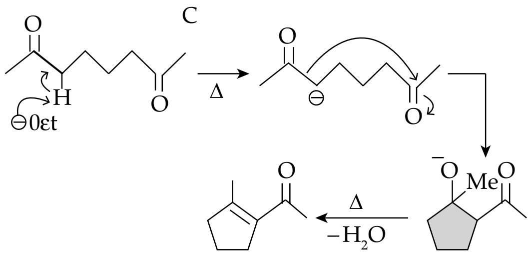
Solutions

Section A

1. Option (1) is correct.

List I	List II
A. Nitrogen oxides in air	IV. Acid rain
B. Methane in air	III. Global warming
C. Carbon dioxide	II. pH of rain water becomes 5.6
D. Phosphate fertilizer in water.	I. Eutrophication

2. Option (1) is correct.



Here EtO^- reacts as a base to abstract H-atom to obtain carbanion which act as a nucleophile to attack on carbonyl group to obtain α, β unsaturated carbonyl group.

3. Option (2) is correct.

$$CaCl_2 + Na_2CO_3 \rightarrow \underset{X}{CaCO_3} + \underset{Y}{2NaCl}$$

$$CaCO_3 + \underset{Z}{2HCl} \rightarrow CaCl_2 + CO_2 + H_2O$$

Here formation of $CaCO_3$ and NaCl takes place on reaction of $CaCl_2$ and Na_2CO_3.

The reaction of $CaCO_3$ and HCl is an acid base reaction to form salt, CO_2 and H_2O.

4. Option (3) is correct.

(I) is correct, $SbCl_5$ is more covalent than $SbCl_3$ because Sb^{5+} has higher effective nuclear charge compared to Sb^{3+} and according to fajan's rule smaller cation has higher covalent character due to higher value of polarizing power.

(II) is also correct.

Due to the presence of higher oxidation state, the reactivity of the halogen oxide decreases which makes it more stable than the lower one.

5. Option (3) is correct.

Given at STP

100 ml vapours of metal chloride weigh 0.57 gm so 22400 ml vapours of metal chloride weigh

$$= \frac{0.57 \text{ gm} \times 22700 \text{ ml}}{100 \text{ ml}} = 129.40 \text{ gm}$$

$$\% \text{ of Cl} = \frac{\text{mass of chlorine}}{\text{molar mass of metal chloride}} \times 100$$

$$55 = \frac{\text{mass of chlorine}}{129.40} \times 100$$

Mass of chlorine = 71.1 gm

$$\text{Mole of chlorine} = \frac{71.1}{35.5} = 2$$

Hence formula of metal chloride=MCl_2

6. Option (1) is correct.

The extent of adsorption of gas on a fixed amount of charcoal is directly related with the critical temp because higher the critical temp, easier will be the liquefaction of gas.

Gas	Critical temperature	
A	5.3 K	Adsorption increases ↓
B	33.2 K	
C	126 K	
D	154.3 K	

So, decreasing order of adsorption of gas-

D>C>B>A

7. Option (3) is correct.

Here the bond order of $H-C\equiv C^-$ is 3.0

The bond order of ^+NO is 3.0

The number of electron present in ^+NO and $H-C\equiv C^-$ is 14 and both are diamagnetic in nature as they both do not contain unpaired e^-

8. Option (1) is correct.

Lead storage battery consists of lead anode and a grid of lead packed with lead oxides (PbO_2)as cathode, a 38% solution of H_2SO_4 is used as an electrolyte.

When battery is in use both Pb & PbO_2 reacts with H_2SO_4 to give $PbSO_4$.

$Pb(s) + PbO_2(s) + 2H_2SO4(aq) \rightarrow 2PbSO_4(s) + 2H_2O(l)$

On charging the battery, the reaction is reversed & $PbSO_4$ on anode and cathode is converted into Pb and PbO_2 respectively.

$$2PbSO_4(s) + 2H_2O(l) \rightarrow Pb(s) + PbO_2(s) + 2H_2SO_4(aq)$$

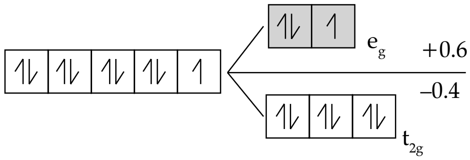
So, statement B and D is correct.

9. Option (3) is correct.

In $[Cu(NH_3)_6]^{2+}$ complex, oxidation state of copper is +2 i.e, Cu^{2+}

Cu(z=29) – $3d^{10}4s^1$

Cu^{2+} – $3d^9 4s^0$



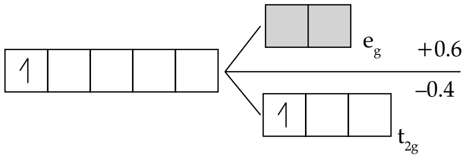
$CFSE(\Delta_0) = -0.4 \times 6 + 3 \times +0.6 + \times P$

$= -2.4 + 1.8 = -0.6$

In $[Ti(H_2O)_6]^{3+}$ complex, the oxidation state of metal is +3, i.e, Ti^{3+}

Ti(z = 22) – $3D^2 4s^2$

Ti^+ – $3d^1 4s^0$

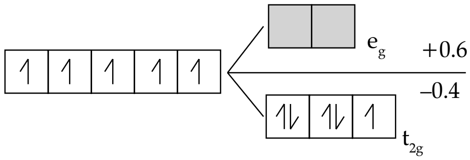


$CFSE(\Delta_0) = -0.4 \times 1 = -0.4$

In $[Fe(CN)_6]^{3-}$ complex, the oxidation state of metal is +3 i.e., Fe^{3+}

Fe(z=26) – $3d^6 4s^2$

Fe^{3+} – $3d^5 4s^0$

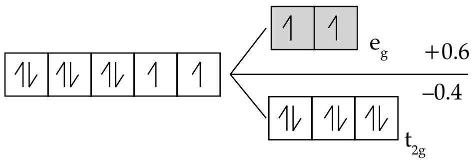


$CFSE(\Delta_0) = -0.4 \times 5 = -2.0$

In $[NiF_6]^{4-}$ the oxidation state of metal is +2 i.e., Ni^{2+}

Ni(z=28) – $3d^8 4s^2$

Ni^{+2} – $3d^8$



$CFSE(\Delta_0) = -0.4 \times 6 + 0.6 \times 2$
$-2.4 + 1.2 = -1.2$
From above the final answer is

A. $[Cu(NH_3)_6]^{2+}$	I. -0.6
B. $[Ti(H_2O)_6]^{3+}$	II. -0.4
C. $[Fe(CN)_6]^{3-}$	III. -2.0
D. $[NiF_6]^{4-}$	IV. -1.2

Correct answer is A-1, B-IV, C-II, D-III

10. **Option (2) is correct.**
Mostly density of the substance increases down the group. The density of alkali metal do not follow the regular trend. The density of the alkali metal is

$$K < Na < Rb < Cs$$
$$\longrightarrow$$

Here the volume of potassium is extra due to the presence of vacant 3d-orbital.

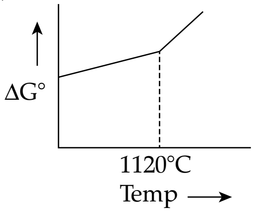
11. **Option (2) is correct.**

Type of hydride	Example
A. electron deficient hydride	III. B_2H_6
B. electron rich hydride	II. HF
C. electron precise hydride	IV. CH_4
D. saline hydride	I. MgH_2

12. **Option (3) is correct.**

List-I Examples	**List II types**
A. 2-chlolro-1,3-butadiene	II. synthetic rubber
B. Nylon-2,6	I. Biodegradable polymer
C. Polyacrylonitrile	IV. Addition polymer
D. Dacron	III. Polyester

13. **Option (4) is correct.**



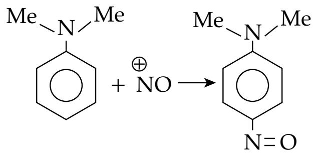
In the Ellingham diagram, a sharp change in slope of the line is observed for $Mg \rightarrow MgO$ at 1120°C which show change in the physical state of the substance so Assertion is correct.
Reason is also correct,
The sharp change is observed due to the change in physical state of the substance. As a result, entropy change becomes positive.

14. **Option (2) is correct.**

$$NaNO_2 + HX \xrightarrow{0-5°C} HO-N=O + Nax$$

$$HO\text{-}NO + H^+ \rightarrow H_2\overset{\oplus}{O} - NO$$
$$\downarrow$$
$$^{\oplus}NO + H_2O$$
(electrophile)

Option 3 and 4 is correct, as $NO^{\oplus}$ is an electrophile which forms at low temperature.



P-nitroso-N,N-dimethyl aniline

Option (I) is also correct
Here the option 2 is not correct because we do not obtain N-nitroso ammonium compound.

15. **Option (1) is correct.**

$$Ph-CH=CH-CH_2-\underset{\underset{O}{||}}{C}-OH \xrightarrow{SOCl_2} Ph-CH=CH-CH_2-\underset{\underset{O}{||}}{C}-Cl$$

The reaction is nucleophillic acyl substitution reaction

$$Ph-CH=CH-CH_2-\underset{\underset{O}{||}}{C}-Cl \xrightarrow{R\text{-}NH_2} Ph-CH=CH-CH_2-\underset{\underset{O}{||}}{C}-NH-R$$

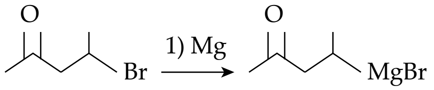
The reaction is nucleophillic acyl substitution reaction

$$Ph-CH=CH-CH_2-\underset{\underset{O}{||}}{C}-NH-R \xrightarrow[H_3O^+]{LiAlH_4} Ph-CH=CH-CH_2-CH_2-NH-R$$

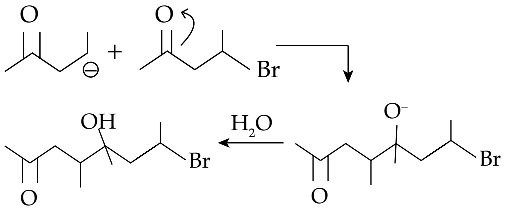
Here reduction of $-\underset{\underset{O}{||}}{C}-NHR$ group takes place into $-CH_2-NHR$ in the presence of $LiAlH_4/H_3O^+$

16. **Option (1) is correct.**
Both Assertion and Reason are correct
5f e^- can participate in bonding to a far greater extent than 4f electrons because they are not as buried as 4f orbitals although the 5f orbitals resembles the 4f orbitals in their angular part of the wave function

17. **Option (1) is correct.**



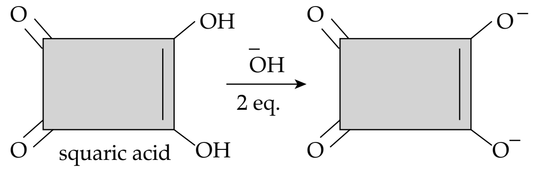
Formation of Grignard reagent takes place which acts as a nucleophile for the some molecule to form a tertiary alcohol.



18. **Option (4) is correct.**
Statement I is correct
Due to smaller size of boron atom boron is extremely hard and due to which its lattice energy is high.
Statement II is correct
Due to small size and high charge density boron atom show abnormal behavior with the other member of group. Its melting and bling point is

also high as compared to the other member of group.

19. Option (2) is correct.



(A) (B)

The compound (B) is aromatic in nature because it follow huckel rule aromaticity. It contains $6\pi e^-$ and it is cyclic, planar and have complete conjugation.

It also shows tautomerism to form keto-enol compound.

The reaction is very fast because it is an example of acid-base reaction.

Due to the presence of conjugation, the bond length of C-C bond is same in throughout the molecules.

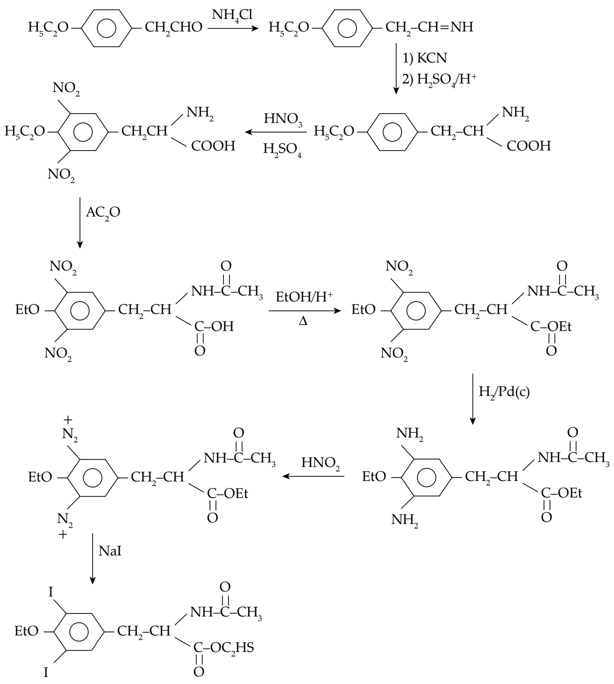
20. Option (4) is correct.

The oxidative ozonolysis of alkene gives rise to the formation of alkanoic acid

$$H_3C{-}CH{=}CH{-}CH_2CH_2CH_3 \xrightarrow[2)\ H_2O]{1)\ O_3} CH_3{-}\overset{O}{\overset{||}{C}}{-}OH + CH_3CH_2CH_2{-}\overset{O}{\overset{||}{C}}{-}OH$$

Section B

21. Correct answer is [15].



Molecular formula of the above compound is $C_{15}H_{19}NO_4I_2$

Here the value of $x=15$

22. Correct answer is [3].

Given $NO + Br_2 \rightleftharpoons NOBr_2$ (fast)

$NOBr_2 + NO \rightarrow 2NOBr$ (slow)

For slow step rate = $K[NOBr_2][NO]$ ...(1)

In the rate low expression, reaction intermediate never participates $\therefore$ we have to replace the intermediate with the reactant or product.

The intermediate appear in the fast step so form the fast step.

$$K_{eq} = \frac{[NOBr_2]}{[NO][Br_2]}$$

Or $[NOBr_2] = Keq[NO][Br_2]$ ...(2)

Put the value of $NOBr_2$ from (2) to (1)

Rate = $K[NO] \times K_{eq}[NO][Br_2]$

$= K.K_{eq}.[NO]^2[Br_2]$

Or Rate$=K^1[NO]^2[Br_2]$

Where $K^1 = K.K_{eq}$

From above the overall order is (3)

With respect to NO, order = 2

With respect to Br_2, order = 1

23. Correct answer is [4].

$$\mu_{rms} = \sqrt{\frac{3RT}{M}} \qquad \text{where } M=40$$

T=600k

$$\mu_{rms} = \sqrt{\frac{3R\times 600}{40}} \qquad ...(1)$$

$$\mu_{mp} = \sqrt{\frac{2RT}{M}} \qquad \text{Where } T=90k$$

M=?

$$\mu_{mp} = \sqrt{\frac{2R\times 90}{M}} \qquad ...(2)$$

Given $\mu_{rms} = \mu_{mp}$

From (1) & (2)

$$\sqrt{\frac{3R\times 600}{40}} = \sqrt{\frac{2R\times 90}{M}}$$

$$\frac{1800R}{40} = \frac{180R}{M}$$

$$M = \frac{180R\times 40}{1800R}$$

$M = 4$ gm mol^{-1}

24. Correct answer is [9000].

Given pH = 1 $\quad [H^+]=10^{-1}M$

V= 1L

pH=2 $\quad [H^+]=10^{-2}M$

V= ?

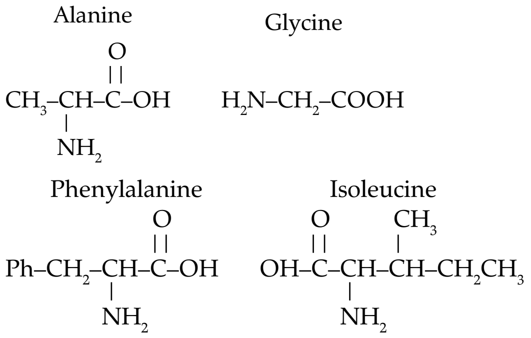
From $M_1V_1 = M_2V_2$ (dilution law)

$10^{-1}\times 1L = 10^{-2}M \times V(L)$

V(L) = 10 L

Final volume = 10 L
Amount of water needed = (final-initial)volume
= 10 L – 1 L
= 9 L
= 9000 mL

25. Correct answer is [10].
Given oligopeptide is
Alanyl glycyl phenylalanyl isoleucine
On the hydrolysis of above oligopeptide we got



Number of sp^2 hybridised carbon-
In alanine – (1)
In glycine – (1)
In phenyl alanine – (7)
In Isoleucine – $\frac{1}{10}$

26. Correct answer is [48].

Given $MgCl_2 \rightarrow Mg^{2+} + 2Cl^-$

Initial	1	–	–
Change	–α	+α	+2α
Final	1–α	α	2α

Total no. of particle (i) = 1 – α + α + 2α = 1 + 2α
= 1 + 2α
Given (α = 0.8)
So i = 1+ 2 × 0.8 = 2.6

from $\frac{\Delta P}{P^o} = \frac{i \times n_2}{n_1}$

i = 2.6, P° = 50 mm Hg, n_2 = 1 mole, n_1 = 55.5 mol

$\Delta P = \frac{i \times n_2 \times P^\circ}{55.5} = \frac{2.6 \times 50 \times 1}{55.5} = 2.34$ mmHg

As ΔP = P° – Ps = 50 – 2.34 = 47.66
≈ 48 mm Hg

27. Correct answer is [25].
The R_f value of most polar compound is—

$R_f = \frac{\text{Distance covered by compound}}{\text{Distance covered by solvent}} = \frac{2}{8} = 0.25$

or $R_f = 25 \times 10^{-2}$

28. Correct answer is [3].

From $\Delta S_{system} = nR\ln\left(\frac{V_2}{V_1}\right)$

Given n = 1 mole
R = 8.314 JK^{-1} mol^{-1}
V_1 = 2L, V_2 = 3L

$\Delta S_{system} = 1 \times 8.314 \ln\left(\frac{3}{2}\right)$

$\Delta S_{system} = 3.37$

As $\Delta S_{system} = \Delta S_{surrounding}$

So, $\Delta S_{surrounding} = 3.37$

29. Correct answer is [3].

From $E = \frac{hc}{\lambda}$

H = 6.626×10^{-34} Js
C = 3 × 10^8 m/s
λ = 400 nm = 400 × 10^{-9} m

$E = \frac{6.626 \times 10^{-34}\,\text{Js} \times 3 \times 10^8\,\text{m/s}}{400 \times 10^{-9}\,\text{m}}$

$E = \frac{6.626 \times 3}{4} \times 10^{-9}$ J

E = 4.97×10^{-19} J
We know lev = 1.6×10^{-19} J

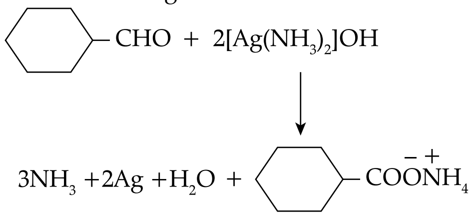
$E = \frac{4.97 \times 10^{-19}\,\text{J}}{1.6 \times 10^{-19}\,\text{J}}$ eV

E = 3.1eV

The carbon atom of benzene and –C(=O)–OH group are sp^2 hybridized.

Only those metal will show photoelectric effect whose value of work function is less than 3.1 eV from the given value of work function of a few metal only Li, Na and K will show photoelectric effect because their work function is less than 3.1 eV.

30. Correct answer is [60].
The reaction between cyclohexane carbaldehyde and tollen's reagent is as follows-



Molar mass of cyclohexane carbaldehyde ($C_7H_{12}O$)
= 12 × 7 + 12 × 1 + 1 × 16
= 84 + 12 + 16
= 112 g mol^{-1}
From reaction
112 g Cyclohexane carbaldehyde produces 3 × 17 g NH_3
So 131.8 kg Cyclohexane carbaldehyde produces

$\frac{3 \times 17 \text{ gm} \times 131.8}{112}$ kg = 60 kg

Mass of NH_3 produced = 60 kg