Answer Key

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12 P

Register No.

Second Revision Examination- 2025

Time : 3.00 Hrs. 29.1.25 +2 CHEMISTRY Marks : 70

PART - I

Choose the correct answer. 15x1=15

1. Which of the following is used for concentrating ore in metallurgy?
   a) Leaching b) Roasting c) Froth Floatation d) Both (a) and (c)
2. Which of these is not a monomer for a high molecular mass silicone polymer?
   a) Me_3SiCl b) $PhSiCl_3$ c) $MeSiCl_3$ d) Me_2SiCl_2
3. P_4O_6 reacts with cold water to give
   a) H_3PO_3 b) $H_4P_2O_7$ c) HPO_3 d) H_3PO_4
4. Which of the following lanthanoid ion is diamagnetic?
   a) Eu^{2+} b) Yb^{2+} c) Ce^{2+} d) Sm^{2+}
5. Oxidation state of Iron and the charge on the ligand No in $[Fe(H_2O)_5No]SO_4$ are
   a) +2 and o respectively b) +3 and o respectively c) +3 and -1 respectively
   d) +1 and +1 respectively
6. What is the activation energy for a reaction if its rate doubles when the temperature is raised from 200k to 400k ? ($R=8.314\ JK^{-1}\ mol^{-1}$)
   a) 234.65 KJ mol^{-1} b) 434.65 KJ mol^{-1} c) 2.305 KJ mol^{-1} d) 334.65 J mol^{-1}
7. The pH of 10^{-5}M KOH solution will be a) 9 b) 5 c) 19 d) none of these
8. Faraday constant is defined as
   a) Charge carried by 1 electron b) Charge carried by one mole of electrons
   c) Charge required to deposit one mole of substance d) Charge carried by 6.22×10^{10} electrons.
9. In the reaction ethanol $\xrightarrow{PCl_5}$ X $\xrightarrow{\text{alc. KOH}}$ Y $\xrightarrow[298K]{H_2SO_4/H_2O}$ Z The 'Z' is
   a) ethane b) ethoxyethane c) ethylbisulphite d) ethanol
10. The reagent used to distinguish between acetaldehyde and benzaldehyde is
    a) Tollens reagent b) Fehling's solution c) 2, 4-dinitrophenyl hydrazine d) Semicarbazide
11. Which one of the following will not undergo Hofmann bromamide reaction:
    a) $CH_3CONHCH_3$ b) $CH_3CH_2CONH_2$ c) CH_3CONH_2 d) $C_6H_5CONH_2$
12. In aqueous solution of amino acids mostly exists in
    a) $NH_2-CH(R)-COOH$ b) $NH_2-CH(R)-COO^-$ c) $H_3N^+-CH(R)-COOH$ d) $H_3N^+-CH(R)-COO^-$
13. Which one of the following is a bio-degradable polymer?
    a) HDPE b) PVC c) Nylon 6 d) PHBV
14. Packing efficiency of Body Centred Cube (BCC):
    a) 52.31% b) 68% c) 86% d) 52.13%
15. The mechanism proposed for the enzyme catalysis reaction is: I Volume Page NO: 88
    a) $P+E \rightarrow E+S \rightleftharpoons ES$ b) $E+S \rightleftharpoons ES \rightarrow P+E$ c) $ES \rightleftharpoons P+E \rightarrow E+S$ d) $E+S \rightarrow ES \rightleftharpoons P+E$

1marks Answers:
1.d 2.a 3.a 4.b 5.d 6.c 7.b 8.b 9.d 10.b 11.a 12.d 13.d 14.b 15.b

BB-13 Int-02 15

PART - II

Answer the following any six questions. Question number 24 is compulsory. 6x2=12

16. What are interhalogen compounds? Give two examples. F-38-5
17. Out of $Lu(OH)_3$ and $La(OH)_3$ which is more basic and why? F-56-15
18. Write the IUPAC names for the following compounds

(i) $[Cu(NH_3)_4]SO_4$ (ii) $Na_2[Ni(EDTA)]$

19. Define packing efficiency.
20. What are conjugate acid base pair? Give an example.
21. Write a note on tyndall effect.
22. What is metamerism and give one example.
23. Write the resenmund reduction?
24. From the following reaction, identify A and B.

$CH_3 - NO_2$ —(Sn/HCl, 6[H])→ A

$CH_3 - NO_2$ —(Zn/NH_4Cl, 4[H])→ B

PART - III

Answer the following any six questions. Question number 33 is compulsory. 6x3=18

25. What are the factors responsible for the anomalous behavior of first element of the P- block?
26. What is lanthanoide contraction and explain its consequences?
27. Write a short note on postulates of Werner's theory.
28. Derive the Relation between p^H and p^{OH}.
29. State Faraday's Law of Electrolysis?
30. Write any three characters of catalysts?
31. Differentiate primary secondary and tertiary alcohols using Lucas test.
32. Write a note on peptide bond.
33. Write the mechanism of aldol condensation reaction.

PART - IV

Answer the following all questions. 5x5=25

34. a) i) Describe mond process for refining nickel. (3)
    ii) How will you identify borate radical? (2) **(OR)**
    b) i) Write the balanced equation for the overall reaction of chlorine with cold, NaOH and hot,NaOH. (2)
    ii) What are interstitial compounds? Give example. (3)
35. a) $[Ni(CN)_4]^{2-}$ is diamagnetic, while $[NiCl_4]^{2-}$ is paramagnetic. Explain. (5) **(OR)**
    b) i) Classify molecular crystal with an example for each type. (3).
    ii) Explain hume-rothery rule for formation of alloys. (2)
36. a) i) Derive an expression for Ostwald dilution law. (3)
    ii) Ionic conductance at infinite dilution of Al^{3+} and So_4^{2-} 189 and 160 mho cm^2 equal calculate the equivalent and molar conductance of the electrolyte $Al_2(So_4)_3$ at infinite dilution. (2) **(OR)**
    b) i) Derive integrated rate law for a first order reaction A → product. (3)
    ii) What is Baeyer's regent? Write down its use. (2)
37. a) i) How are the following conversion effected? 1) ethylene glycol → 1.4 dioxane. (1½)
    2) glycerol → acrolein. (1½)
    ii) How does ammonia react with formaldehyde? Draw the structure of products. (2) **(OR)**
    b) i) Explain the mechanism of cannizaro reaction. (3)
    ii) Give any two test for carboxylic acid group. (2)
38. a) i) What is isoelectric point? (2) ii) Mention the importance of carbohydrate. (3) **(OR)**
    b) i) Write short note on Gabriel phtholimide synthesis. (3)
    ii) Write the zwitter ion structure of alanine. (2)

29.1.25 — II Revision Exam - Jan-2025

Chemistry — +2 EM (Tiruppur district) Answerkey

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1 marks: Part-I 15×1=15

1. d) Both (a) and (c)
2. a) Me_3SiCl
3. a) H_3PO_3
4. b) Yb^{2+}
5. d) +1 and +1 respectively
6. c) 2.305 KJ mol^{-1}
7. a) 9
8. b) Charge Carried by one mole of e⁻s
9. d) ethanol
10. b) Fehling's solution
11. a) $CH_3CONHCH_3$
12. d) H_3N^+
13. d) PHBV
14. b) 68%
15. b) $E+S \rightleftharpoons ES \rightarrow P+E$

Part-II 6×2=12

16. **2 Marks: Interhalogen compounds:** Each halogen combines with other halogen to form a series of compounds: eg: ClF, ClF_3, IF_7

17. $La(OH)_3$ is more basic. As we from Ce^{3+} to Lu^{3+}, the basic Character of Ln^{3+} ions decrease. Due to the decrease in the size of Ln^{3+} ions the ionic character of Ln-OH bond decreases (Covalent Character increases) which results in the decrease in the basicity.

18. IUPAC Name:-

(i) $[Cu^{+2}(NH_3)_4]^{+2}SO_4^{-2}$ ⇒ Tetraamminecopper(II) Sulphate

(ii) $Na_2[Ni^{+2}(EDTA)^{-4}]^{-2}$ ⇒ Sodium 2,2',2'',2'''-(ethane-1,2-diyldinitrilo) tetraacetatonickate(II)

19. Packing efficiency ⇒ $\frac{\text{Total volume occupied by spheres in a unit cell}}{\text{Volume of the unit cell}} \times 100$

20. Conjugate acid-base pair: Chemical species that differ only by a proton.

Ex: $HCl + H_2O \rightleftharpoons H_3O^+ + Cl^-$

acid(a) Base(b) Acid(b) Base(a) ? Conjugate Acid-Base Pairs.

21. Tyndall effect:- When light pass through colloidal solution, it is scattered in all directions.

22. **Metamerism:**

It is isomerism in which molecules with same Molecular formula, same functional group, differing only in the nature of the alkyl group attached to oxygen.

eg: 2-methoxy Propane ⇒ $CH_3-O-\overset{CH_3}{\underset{|}{CH}}-CH_3$

Ethoxy ethane ⇒ $CH_3CH_2OCH_2CH_3$

1-methoxy propane ⇒ $CH_3OCH_2CH_2CH_3$

} ⇒ $C_4H_{10}O$

23. **Rosenmund reduction:**

$$CH_3COCl + H_2 \xrightarrow[-HCl]{\underset{BaSO_4}{Pd}} CH_3CHO$$

$BaSO_4$ → Catalytic Poison.

24. **[Compulsory]:-**

CH_3NO_2 —
- $\xrightarrow[6[H]]{Sn/HCl}$ CH_3NH_2 → methylamine (A)
- $\xrightarrow[4[H]]{Zn/NH_4Cl}$ CH_3NHOH → N-methyl hydroxylamine (B)

3 Marks: **Part-III** **6×3=18**

25. **The Factors responsible for the anamalous behaviour of first element Of the P-block:-**

1. Small size. 2. High ionisation enthalpy and high electronegativity
3. Absence of 'd' orbitals in their Valence shell.

26. **Lanthanoide Contraction:**

As We move across 4f series, the atomic and ionic radii of lanthanoids show gradual decrease with increase in atomic number. This decrease in ionic size is Called lanthanoide Contraction.

Consequences of Lanthanoide contraction:

1. **Basicity differences:** As We from Ce^{3+} to Lu^{3+}, the basic character of Ln^{3+} ions decrease. Due to the decrease in the size of Ln^{3+} ions, the ionic character of Ln-OH bond decreases (Covalent character increases)

2. **similarities among Lanthanoids:**

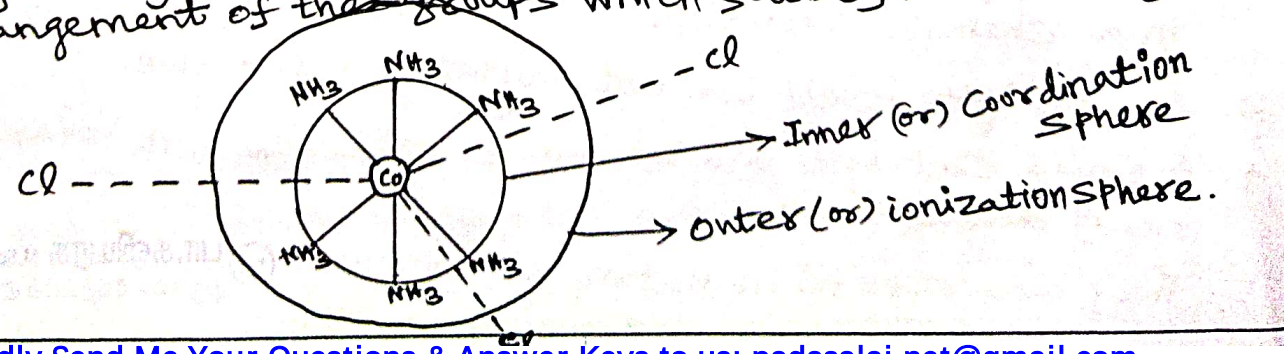
In the complete f-series Very

small change in radii of lanthanoids, are observed and their Chemical properties are quite similar.

3. The elements of the second and third transition series resemble each other more closely than the elements of the first and second transition series.

27. Werner's theory:-

* Most of the elements exihibit, two types of Valence namely Primary Valence and secondary Valence and each element tend to satisfy both the Valences.
* The Primary Valence is refered as the oxidation state of the metal atom.
The secondary Valence as the coordination number.
* The Primary Valence of a metal ions in are always satisfied by negative ions. The secondary Valence is satisfied by negative ions, neutral molecules, positive ions (or) the Combination of these
* According to werner, there are 2 spheres of attraction around a metal atom/ion in a Complex.
* The inner (or) coordination sphere: The groups present in this Sphere are firmly attached to the metal.
The outer (or) ionisation sphere: The groups present in this Sphere are loosely bound to the central metal ion and hence can be separated into ions upon dissolving the complex in a suitable solvent.
* The primary Valences are non-directional while the secondary Valences are directional.
* The geometry of the complex is determined by the spacial arrangement of the groups which satisfy the secondary Valence.



28. Relation between pH and pOH:-

$$pH = -\log_{10}[H_3O^+] \quad \text{——(1)} \qquad pOH = -\log_{10}[OH^-] \quad \text{——(2)}$$

Adding equ (1), (2) $pH + pOH = -\log_{10}[H_3O^+] - \log_{10}[OH^-]$

$$= -(\log_{10}[H_3O^+] + \log_{10}[OH^-])$$

$$pH + pOH = -\log_{10}[H_3O^+][OH^-]$$

We know that $[H_3O^+][OH^-] = K_w$

$$pH + pOH = -\log_{10} K_w, \quad \boxed{pH + pOH = pK_w} \quad \text{——(3)} \quad \left(\because pK_w = -\log_{10} K_w\right)$$

at 25°c, the ionic product of water, $K_w = 1 \times 10^{-14}$

$$pK_w = -\log_{10} 10^{-14} \Rightarrow 14 \log_{10} 10 \Rightarrow 14$$

∴ At 25°c, $\boxed{pH + pOH = 14}$ ——(4)

29. Faraday's Law of Electrolysis:-

First Law: The mass of the substance (m) liberated at an electrode during electrolysis is directly proportional to the quantity of charge (Q) passed through the cell.

(i.e.,) $m \propto Q$, $m \propto It$, $(Q = It)$, $m = ZIt$.

Second Law:- When the same quantity of charge is passed through the solutions of different Electrolytes, the amount of substances liberated at the respective electrodes are directly proportional to their electrochemical equivalent.

$m_{Ni} \propto Z_{Ni}$, $m_{Cu} \propto Z_{Cu}$ and $m_{Co} \propto Z_{Co}$ (or) $\frac{m_{Ni}}{Z_{Ni}} = \frac{m_{Cu}}{Z_{Cu}} = \frac{m_{Co}}{Z_{Co}}$

30. Characteristics of a Catalyst:-

1. For a chemical reaction, catalyst is needed in very small quantity.
2. The catalyst remains unchanged in mass and chemical composition in a chemical reaction.
3. A catalyst itself can not initiate a reaction.
4. A solid catalyst will be more effective if it is taken in a finely divided form.
5. They are specific in nature.

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6. A Catalyst is highly effective at a particular temperature.

7. Presence of a catalyst generally doesnot change the nature of products.

31. **Lucas Test:-**

$(CH_3)_3C-OH \xrightarrow[anhyd.\ ZnCl_2]{Conc.HCl} (CH_3)_3C-Cl + H_2O$

3° alcohol — (immediate appearance of turbidity)

$(CH_3)_2CHOH \xrightarrow[anhyd.\ ZnCl_2]{Conc.HCl} (CH_3)_2CHCl + H_2O$

2° alcohol — (slow appearance of turbidity)

$CH_3CH_2OH \xrightarrow[anhyd.\ ZnCl_2]{Conc.HCl}$ No reaction at room temperature

1° alcohol — (Turbidity appears only on heating).

32. **Peptide bond:-**

The Carboxyl group of the first amino acid reacts with the amino group of the second amino acid to give an amide linkage between these amino acids. This amide linkage is called peptide bond. The resulting compound is called a dipeptide

$H_2N-CH_2-COOH + HNH-\underset{CH_3}{CH}-COOH \xrightarrow{-H_2O} H_2N-CH_2-\boxed{CO-NH}-\underset{CH_3}{CH}-COOH$

Glycine + Alanine → Glycyl alanine (Dipeptide)

→ Peptide bond.

33. **[Compulsory]: Aldol Condensation:-**

$CH_3CHO + HCH_2CHO \xrightarrow{dil\ NaOH} CH_3\underset{OH}{CH}-CH_2CHO$

Aldol.

Mechanism:

Step1: α-Hydrogen removal

$CH_3CHO \xrightarrow{OH^-} {}^{\ominus}CH_2CHO + H_2O$

Step2:- $CH_3\overset{\curvearrowleft}{CH}=\overset{\curvearrowright}{O} + {}^{\ominus}CH_2CHO \longrightarrow CH_3\underset{CH_2CHO}{CH}-O^-$

Step3: $CH_3\underset{CH_2CHO}{CH}-O^- \xrightarrow{H-OH} CH_3\underset{CH_2CHO}{CH}-OH + OH^-$

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5 Marks: Part-IV 5×5=25

34. a) (i) **Mond Process for refining nickel:-**

The impure nickel is heated with stream of CO at around 350K to form a highly volatile nickel tetracarbonyl. The solid impurities are left behind. On heating the nickel tetracarbonyl around 460K, the complex decomposes to give pure metal.

$$\underset{\text{Impure}}{Ni_{(s)}} + 4CO_{(g)} \xrightarrow{350K} \underset{\text{Nickel tetracarbonyl.}}{[Ni(CO)_4]_{(g)}} \xrightarrow{460K} \underset{\text{(pure)}}{Ni_{(s)}} + 4CO_{(g)}$$

34. a) (ii) **Identification of Borate Radical:**

When H_3BO_3 (or) borate salt is heated with C_2H_5OH in presence of Conc. H_2SO_4, an ester, trialkyl borate is formed. This vapour burns with a green edged flame and it is used to identify the presence of borate.

$$H_3BO_3 + 3C_2H_5OH \xrightarrow[H_2SO_4]{\text{conc.}} B(OC_2H_5)_3 + 3H_2O$$

(OR)

34. b) (i) **Chlorine with cold NaOH, Hot NaOH:-**

a) $Cl_2 + 2NaOH \xrightarrow{\text{cold}} \underset{\text{Sodium hypochlorite}}{NaOCl} + NaCl + H_2O$

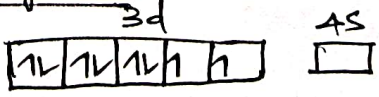
b) $Cl_2 + 6NaOH \xrightarrow{\text{Hot}} \underset{\text{Sodium hypochlorate.}}{NaClO_3} + 5NaCl + 3H_2O$

34. b) (ii) **Interstitial Compounds:**

An interstitial compound (or) alloy is a compound that is formed when small atoms like H, B, C (or) N are trapped in the interstitial holes in a metal lattice. They are non-stoichiometric compounds. eg: TiC, $ZrH_{1.92}$, Mn_4N.

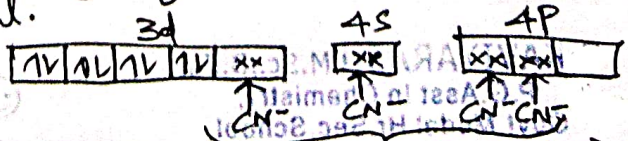
35. a) (i) **$[Ni(CN)_4]^{2-}$ is diamagnetic:-**

$Ni^{2+} \longrightarrow 3d^8 4s^0$



CN^- is strong ligand. It forces the unpaired e⁻s to pair up in 3d orbital.

$[Ni(CN)_4]^{2-} \rightarrow$



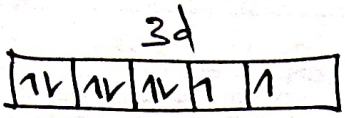
$\rightarrow dsp^2$ hybridisation

Square planar, Diamagnetic, $\mu_s = \sqrt{n(n+2)} = 0$

$[Ni(Cl)_4]^{2-}$ → Paramagnetic:-

$Ni^{2+} \longrightarrow 3d^8 4s^0$, Cl^- → weak ligand, It cannot forces the unpaired e⁻s to pairup in 3d orbitals.

$[Ni(Cl)_4]^{2-}$ →



Tetrahedral, Paramagnetic, n = 2, $\mu_s = \sqrt{n(n+2)}$ BM

$\mu_s = \sqrt{2(2+2)} \Rightarrow \sqrt{8} \Rightarrow 2.83\ \mu_B$

(OR)

35.b)(i) **Molecular Crystal Classification:-**

- → Non polar molecular solids Ex: Napthalene, anthracene etc.
- → Polar molecular solids Ex: solid CO_2, solid NH_3 etc.
- → Hydrogen bonded molecular solids: Ex: solid ice (H_2O), glucose, urea.

35.b)(ii) **Hume-Rothery rules to form an Alloy:**

1. The difference between the atomic radii of solvent and solute is less than 15%.
2. Both the solvent (bulk metal) and solute (other metals) must have the same crystal structure and valence.
3. Their electronegativity difference must be close to zero.

36. a)(i) **Ostwald's dilution law:-**

	CH_3COOH	CH_3COO^-	H^+
Initial no of moles	1 mole	—	—
Degree of dissociation of CH_3COOH	α	—	—
No of moles at equilibrium	$1-\alpha$	α	α
Equilibrium Concentration	$c(1-\alpha)$	$c\alpha$	$c\alpha$

$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$

$$K_a = \frac{[CH_3COO^-][H^+]}{[CH_3COOH]}$$

$$K_a = \frac{c\alpha \cdot c\alpha}{(1-\alpha)c} = \frac{\alpha^2 c}{1-\alpha}$$

If α is too small and $1-\alpha = 1$

$K_a = \alpha^2 c$, $\alpha^2 = \frac{K_a}{c}$, $\alpha = \sqrt{\frac{K_a}{c}}$

$[H^+] = c \cdot \alpha$

$= c \cdot \sqrt{\frac{K_a}{c}} = \sqrt{\frac{K_a c^2}{c}} = \sqrt{K_a \cdot c}$

For weak base,

$[OH^-] = \sqrt{K_b \cdot c}$, $\alpha = \sqrt{\frac{K_b}{c}}$.

36. a)(ii) The electrolyte is $Al_2(SO_4)_3$ $\Lambda^\circ Al_2(SO_4)_3 = \frac{1}{3}\lambda^\circ_{Al^{3+}} + \frac{1}{2}\lambda^\circ_{SO_4^{2-}}$

Equivalent Conductance $\Rightarrow \Lambda^\circ_{Al_2(SO_4)_3} = \frac{189}{3} + \frac{160}{2} = 143$ mho cm^2 gm. equi^{-1}

Molar Conductance $\Rightarrow \Lambda^\circ_m\, Al_2(SO_4)_3 = 2\lambda^\circ_m Al^{3+} + 3\lambda^\circ_m SO_4^{2-}$

$\Lambda^\circ_m\, Al_2(SO_4)_3 = 2 \times 189 + 3 \times 160$

$\rightarrow 858$ mho Cm^2 mol^{-1}

(OR)

36. b)(i) Integrated Rate law for first order reaction:

$A \longrightarrow$ Product

$\text{Rate} = k[A]^1$; $-\frac{d[A]}{dt} = k[A]^1 \Rightarrow -\frac{d[A]}{[A]} = kdt$ ①

Integrate above equation between the limits of time $t=0$ and $t=t$, while the concentration varies from $[A_0]$ to $[A]$ at the later time

$$\int_{[A_0]}^{[A]} -\frac{d[A]}{[A]} = k\int_0^t dt \;,\; (-\ln[A])_{[A_0]}^{[A]} = k(t)_0^t$$

$$-\ln[A] + \ln[A_0] = kt - k(0)$$

$$\ln\frac{[A_0]}{[A]} = kt$$

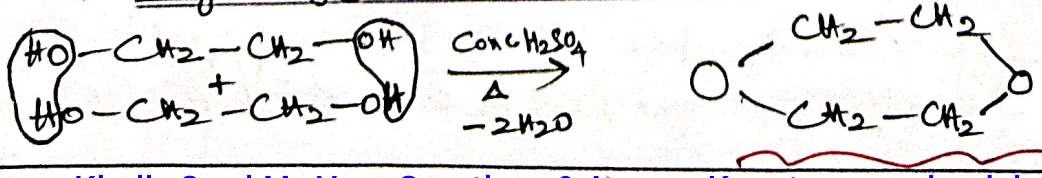
$$k = \frac{1}{t}\ln\frac{[A_0]}{[A]} \quad \left(\because \ln = 2.303 \log\right)$$

$$\boxed{k = \frac{2.303}{t}\log\frac{[A_0]}{[A]}}$$

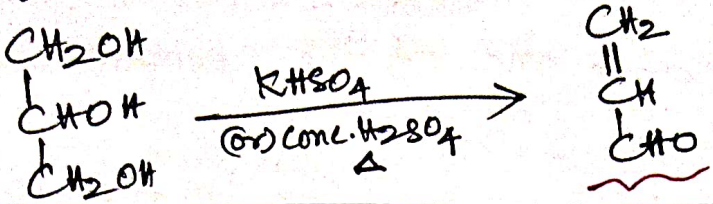
36. b)(ii) Baeyer's reagent: Cold dilute alkaline $KMnO_4$ is known as Baeyer's reagent. It is used to oxidise alkenes into diols. For example, ethylene can be converted into ethylene glycol and this reaction is used as a test for unsaturation.

$CH_2=CH_2 + H_2O \xrightarrow[(O)]{\text{Baeyer's reagent}} \underset{\text{Ethylene glycol}}{CH_2(OH)-CH_2(OH)}$

37. a) (i) Ethylene glycol $\longrightarrow$ 1,4-dioxane:



37.a)(i) 2. Glycerol → acrolein :-

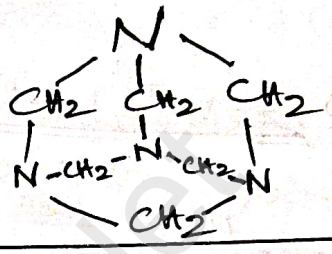


37. a)(ii) $NH_3 + HCHO$:- [Urotropine ⇒ Hexamethylene tetramine]

$$6CH_2O + 4NH_3 \longrightarrow (CH_2)_6N_4 + 6H_2O$$

Urotropine

Structure :-



(OR)

37.b) (i) Cannizaro reaction :

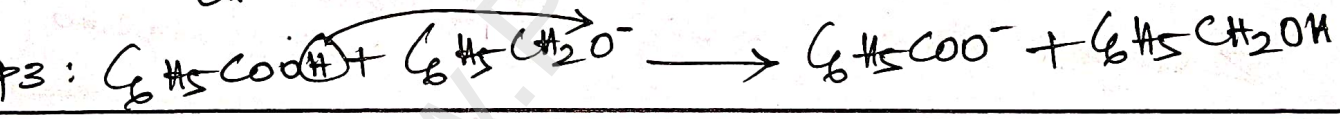
$$C_6H_5CHO + C_6H_5CHO \xrightarrow[NaOH]{50\%} C_6H_5COONa + C_6H_5CH_2OH$$

Mechanism :

Step 1 :

Step 2 :

Step 3 :



37.b)(ii) Tests for Carboxylic acids :

1. It turns blue litmus into red colour.
2. $RCOOH + NaHCO_3 \longrightarrow$ Brisk effervescence ($-CO_2$)
3. $RCOOH + ROH \xrightarrow[\Delta]{Conc.H_2SO_4}$ Ester (It is identified from its fruity odour).

38.a)(i) Iso electric point :-

At a specific pH value the net charge of an amino acid is neutral. That pH is called Iso electric point

38.a)(ii) Importance of Carbohydrates :

1. It acts mainly as energy sources and structural polymers
2. It is stored in the body as glycogen and in plant as starch

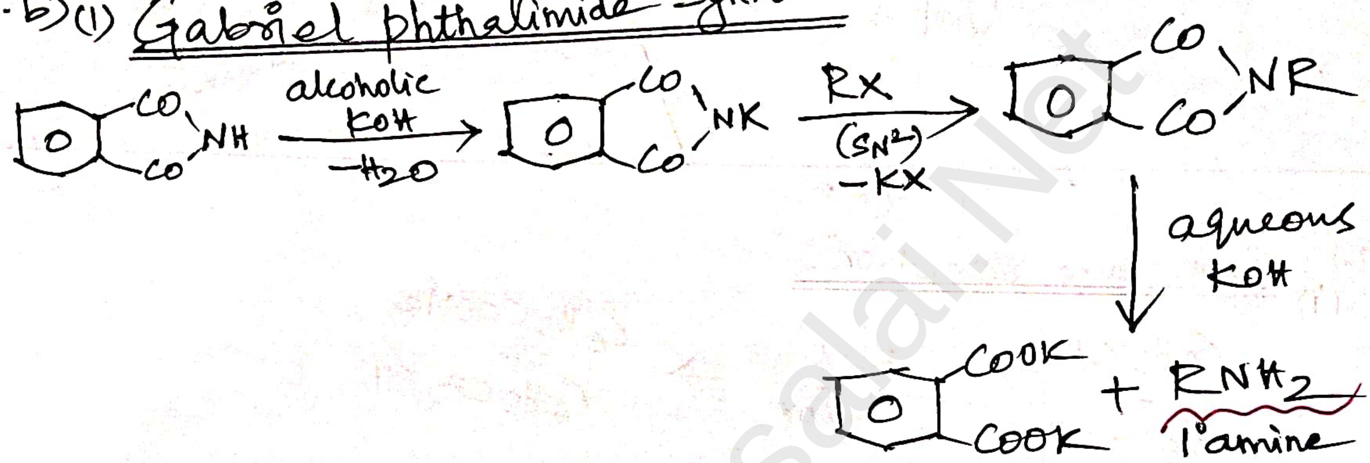
3. Simple sugar glucose serves as an instant source of energy

4. Ribose sugars are one of the components of nucleic acids.

5. Modified carbohydrates such as hyaluronate act as shock absorber and lubricant.

(OR)

38. b)(i) **Gabriel phthalimide synthesis:**



38. b)(ii) **Zwitter ion structure of alanine :-**

Alanine → $H_2N-CH(CH_3)-COOH$

Zwitter ion → $H-C(COO^-)(CH_3)-NH_3^+$ → Neutral pH, Net charge = 0

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[illegible]

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