COMMOM QUARTERLY EXAMINATION - 2024

XI STANDARD

CHEMISTRY ANSWER KEY

PART - I

I. CORRECT ANSWERS:-

1 . (C) . Galena

2 . (B) Van Arkel Process

3 . (C) Four

4 . (D) Dry ice

5 . (B) F_2

6 . (B) H_2SO_4

7 . (B) Carbon di oxide

8 . (B)+3

9 . (A) 8

10. (B) Strongly acidic

11. (C) Methanal

12. (D) 1.5625%

13. (C)The two bulkier alkyl group

14. (B) Acylation

15. (C) Aceto phenome

PART – II

16. Explain the following terms with suitable examples. (i) Gangue (ii) slag

(i) Gangue : The nonmetallic impurities and rocky materials associated with ore - SiO_2

(ii) Slag : The flux combines with gangue to form calcium slag - $CaSiO_3$

$$CaO + SiO_2 \longrightarrow CaSiO_3$$

17. How will you identify borate radical ? (or) Give Ethyl borate test

Boric acid + Ethanol $\xrightarrow{\text{Con. Sulpuric acid}}$ Tri Ethyl borate (greeen flame)

$$B(OH)_3 + 3C_2H_5OH \xrightarrow{\text{con. } H_2SO_4} B(OC_2H_5)_3 + 3H_2O$$

18. **Write a short notes on Holmes signal**

- In a ship, a pierced container with a mixture of calcium carbide and calcium phosphide.
- When it thrown into sea, liberates phosphine and acetylene
- The liberated phosphine catches fire and ignites acetylene.
- These burning gases serve as a signal to the approaching ships.

19. **CAUSES OF LANTHANOID CONTRACTION:**

The Shielding Effect of 4f electrons are Poor.

20. **Define Packing efficiency.**

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

sc - 52.38 %, bcc - 68 %, fcc - 74 %

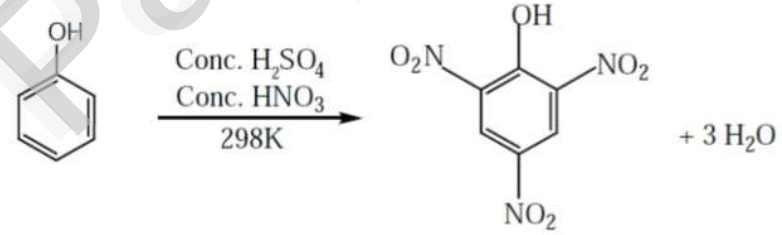
21.
- Decomposition of N_2O_5
- Decomposition of SO_2Cl_2
- Decomposition of H_2O_2 aqueous solution
- Isomerisation of cyclopropane to propene

22. **What are Lewis acids and bases? Give two example for each.**

	Lewis acids	Lewis bases
1	Electron deficient molecule	Molecule with pair of electrons
2	Accepts an electron pair	Donates an electron pair
3	Positive ion	Anion (or) neutral molecule
4	Ex.- BF_3, $AlCl_3$, CO_2, Fe^{2+}	Ex.- NH_3, H_2O, F^-, $CH_2{=}CH_2$

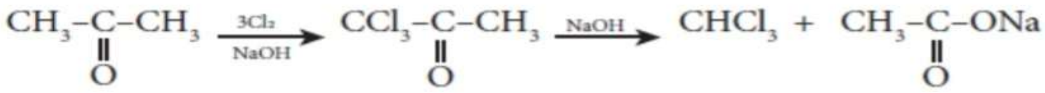
23. **Preparation of Picric acid from Phenol (Nitration of Phenol))**

Phenol $\xrightarrow{\text{con.}HNO_3/\ H_2SO_4}$ Picric acid (2,4,6 - trinitro phenol)



24. **Haloform reaction**

Acetaldehyde and methyl ketone containing $CH_3C(=O)-$ group only participate this reaction



PART – III

25. Give the limitations of ellingham diagram.

- It does not explain rate of reaction.
- It does not give any idea about the possibility of other reactions taking place.
- ΔG is assume at equilibrium condition, but it is not always true.

26. Write a note on Fischer Tropsch synthesis

Carbon monoxide + H_2 $\xrightarrow[500\ K - 700\ K]{Cu\ /\ 50atm}$ Hydrocarbon

$$nCO + 2nH_2 \xrightarrow[500\ K - 700\ K]{Cu\ /\ 50atm} C_nH_{2n} + nH_2O$$

27. Write about the bleaching action of sulphur dioxide.

$$SO_2 + 2H_2O \longrightarrow H_2SO_4 + 2(H)$$

$$\underset{\text{Coloured}}{X} + 2(H) \longrightarrow \underset{\text{Colourless}}{XH_2}$$

28. Write chromyl chloride test.

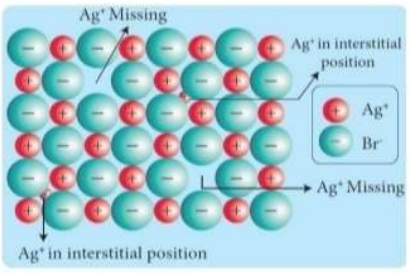
Potassium-di-chromate + Potassium chloride $\xrightarrow{con\ H_2SO_4}$ Chromyl chloride (orange red vapours)

$$K_2Cr_2O_7 + 4KCl + 6H_2SO_4 \rightarrow 2CrO_2Cl_2 + 6\,KHSO_4 + 3H_2O$$

This reaction is used to confirm the presence of chloride ion in qualitative analysis.

29. Frenkel defect

- ❖ Arises due to dislocation of ions from its crystal lattice
- ❖ The ion which is missing from the lattice point occupies an interstitial position.
- ❖ Ex : AgBr
- ❖ Size of anion and cation differ
- ❖ Does not affect the density of crystal



30. Explain pseudo first order reaction with an example.

In a second order reaction, when one of the reactants concentration is in excess of the other then the reaction follows a first order kinetics, such reactions are called Pseudo first order reactions.

Ex- Acid hydrolysis of an ester.

$$CH_3COO\,CH_3 + H_2O \xrightarrow{H^+} CH_3COOH + CH_3OH$$

31.

$$CaF_{2(s)} \rightleftharpoons Ca^{2+}_{(aq)} + 2F^-_{(aq)}$$

$$[F^-] = 2\,[Ca^{2+}] = 2 \times 33 \times 10^{-4}\ M$$

$$= 6.6 \times 10^{-4}\ M$$

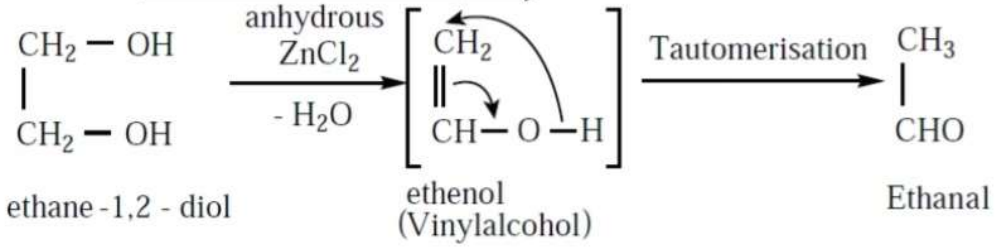
$$= [Ca^{2+}]\,[F^-]^2$$

$$= (3.3 \times 10^{-4})\,(6.6 \times 10^{-4})^2$$

$$= 1.44 \times 10^{-10}$$

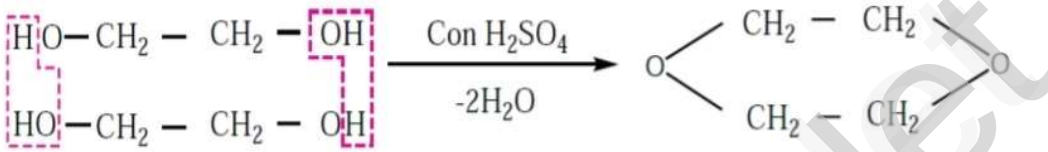
32.a. Convert Glycol to Acetaldehyde

Glycol —(Anhydrous Zinc chloride)→ **Acetaldehyde**

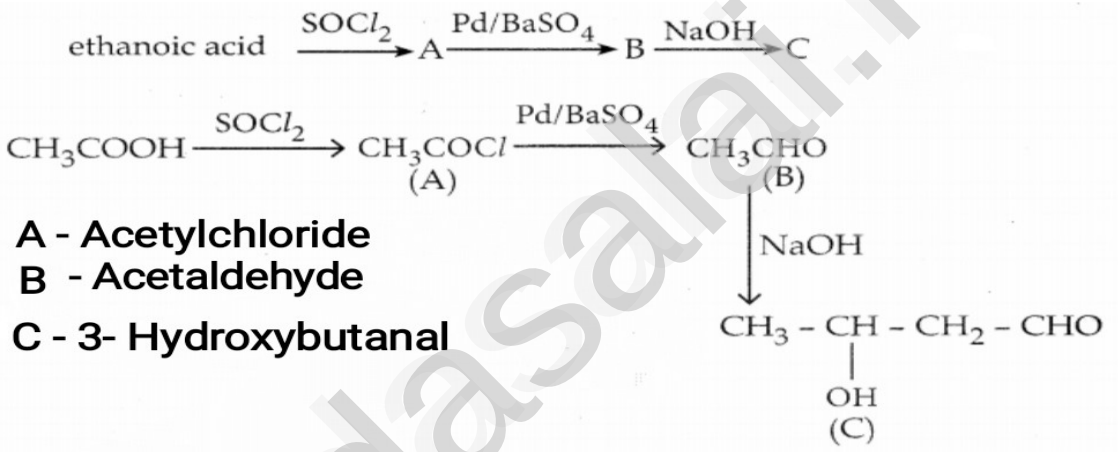


b. Convert Glycol to 1,4 - dioxane

Glycol —(con H_2SO_4)→ **1,4 - dioxane**



33. Identify A, B, and C



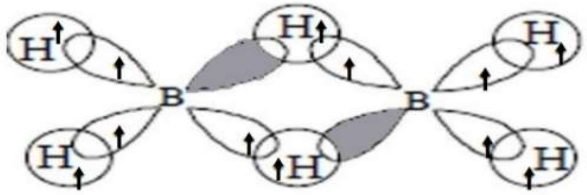
A - Acetylchloride
B - Acetaldehyde
C - 3- Hydroxybutanal

PART – IV

34.A. Explain zone refining process with an example

- Principle - Fractional crystallisation
- The impure metal is taken in the form of a rod
- When the metal rod is heated with mobile induction heater, the metal melts.
- The heater is slowly moved from one end to the other end, the pure metal crystallises.
- The impurity dissolves in the molten zone.
- When the heater moves the molten zone also moves.
- This process is repeated again and again to get the pure metal.
- This process is carried out in an inert gas atmosphere to prevent the oxidation of metals.
- Eg. Silicon (Si), Germanium (Ge) and Gallium (Ga)

34.B. **Describe the structure of Diborane**



- Two BH_2 units are linked by two bridged hydrogens.
- It has eight B-H bonds and 12 valance electrons
- The four terminal B-H bonds are 2c-2e bond
- The remaining four electrons have to be used for the two bridged B-H-B bonds (3C – 2e)
- In diborane, the boron is SP^3 hybridised
- The bridging hydrogen atoms are in a plane
- B–H–B bond formed by overlapping the half filled hybridised orbital of one boron, the empty hybridised orbital of the other boron and the half filled s orbital of hydrogen.
- It is also called as banana bond.

35.A.i. **Explain the manufacture of chlorine by Deacon's process**

A mixture of air and HCl is passed through cuprous chloride chamber to form chlorine.

$$4HCl + O_2 \xrightarrow[Cu_2Cl_2]{400^0C} 2H_2O + Cl_2 \uparrow$$

35.A.ii. **Give the uses of chlorine**

- Chlorine is used in Purification of drinking water
- Bleaching of cotton textiles, paper and rayon
- Extraction of gold and platinum

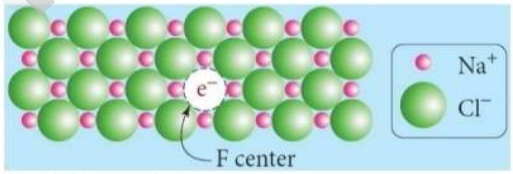
35.B. **Compare lanthanoids and actinoids.**

	Lanthanoids	Actinoids
1.	Colourless	Coloured
2.	They show less tendency to form complexes.	They show greater tendency to form complexes
3.	They do not form oxocations	They do form oxocations
4.	Differentiating electrons enters in 4f orbital.	Differentiating electrons enters in 5forbital.
5.	Binding energy of 4f orbitals are higher	Binding energy of 5f orbitals are lower
6.	Oxidation state +2, +3, +4	Oxidation state +2, +3, +4, +5, +6, +7

36.A. (i) **Metal excess defect**

Arises due to presence of more number of metal ions as compared to anions

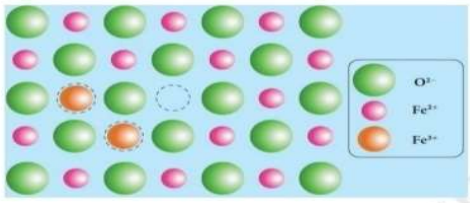
Ex : NaCl, ZnO



(ii) **Metal deficiency defect**

Arises due to the presence of less number of cations than the anions

Ex : FeO



36.B. Derive integrated rate law for a first order reaction.

$A \longrightarrow$ Products

Rate = $K[A]^1$ (K - rate constant)

$$\frac{-d[A]}{dt} = k[A]^1$$

$$\frac{-d[A]}{[A]} = k\,dt$$

At, $t = 0 \Rightarrow [A] = [A_0]$

$t = t \Rightarrow [A] = [A]$

$$\int_{[A_0]}^{[A]} \frac{-d[A]}{[A]} = k\int_0^t dt$$

$$(-\ln[A])_{[A_0]}^{[A]} = k(t)_0^t$$

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

$$-\ln[A] + \ln[A_0] = kt$$

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

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

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

37.A. Derive Henderson – Hasselbalch equation

$HA + H_2O \rightleftharpoons [H_3O^+] + [A^-]$

$$[H_3O^+] = K_a\frac{[acid]_{eq}}{[base]_{eq}}$$

due to common ion effect

$[Acid]_{aq} = [Acid]$; $[Base]_{aq} = [Salt]$

$$[H_3O^+] = K_a\frac{[acid]}{[salt]}$$

Reverse the sign on both sides

$$-\log[H_3O^+] = -\log K_a - \log\frac{[acid]}{[salt]}$$

We know that

$pH = -\log[H_3O^+]$ and $pK_a = -\log K_a$

$$pH = pK_a - \log\frac{[acid]}{[salt]}$$

$$pH = pK_a + \log\frac{[salt]}{[acid]}$$

Similarly for a basic buffer

$$pOH = pK_b + \log\frac{[salt]}{[base]}$$

37.B. Derive an expression for the hydrolysis constant and degree of hydrolysis of salt of strong acid and weak base

- The reactions between a strong acid and a weak base,

  $HCl_{(aq)} + NH_4OH_{(aq)} \rightleftharpoons NH_4Cl_{(aq)} + H_2O_{(l)}$

  $NH_4Cl_{(s)} \longrightarrow NH_4^+{}_{(aq)} + Cl^-{}_{(aq)}$

- NH_4^+ is a strong conjugate acid of the weak base NH_4OH and it has a tendency to react with OH^- from water to produce unionised NH_4OH

  $NH_4^+(aq) + H_2O(l) \rightleftharpoons NH_4OH(aq) + H^+(aq)$

- There is no such tendency shown by Cl^- and therefore $[H^+] > [OH^-]$ the solution is acidic and the pH is less than 7.

- The relationship between the K_h and K_b as

  $K_h \cdot K_b = K_w$

  $$K_h = \frac{K_w}{K_b}$$

- Let us calculate the K_h value in terms of degree of hydrolysis (h) and the concentration of salt

  $K_h = h^2C$ மற்றும் $[H^+] = \sqrt{K_h \cdot C}$

  $$[H^+] = \sqrt{\frac{K_w}{K_b}\cdot C}$$

  $$pH = -\log[H^+]$$

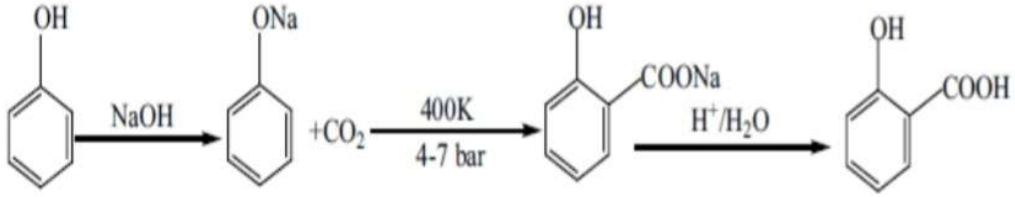
  $$= -\log\left(\frac{K_w \cdot C}{K_b}\right)^{1/2}$$

  $$= -\tfrac{1}{2}\log K_w - \tfrac{1}{2}\log C + \tfrac{1}{2}\log K_b$$

  $$pH = 7 - \tfrac{1}{2}pK_b - \tfrac{1}{2}\log C.$$

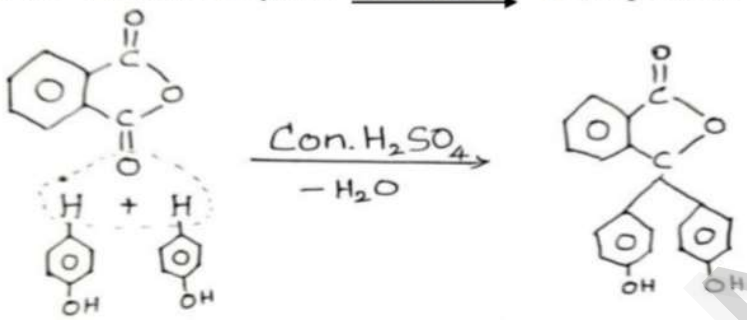
38.A.i Kolbe's (or) Kolbe's Schmit reaction (Preparation of Salicyclic acid from Phenol)

Phenol $\xrightarrow{NaOH}$ Sodium phenoxide $\xrightarrow[400K]{CO_2}$ Sodium salicylate $\xrightarrow{H^+ / H_2O}$ Salicyclic acid



38.A.ii. How will you prepare Phenolphthalein (or) Write a note on Phthalein reaction.

Phenol + Phthalic anhydride $\xrightarrow{\text{con. } H_2SO_4}$ Phenolphthalein

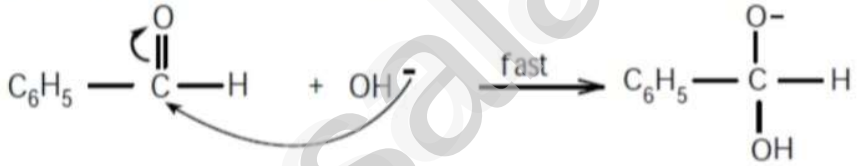


38.B. Mechanism of Cannizaro reaction (disproportionation reaction)

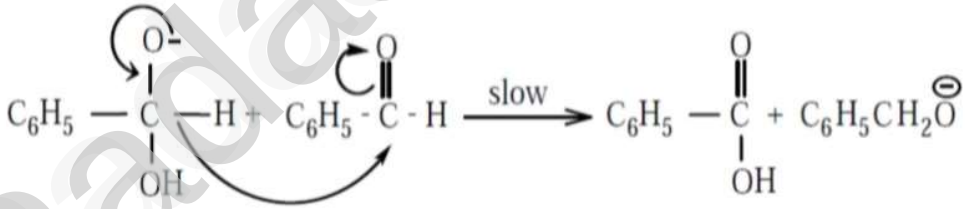
Cannizaro reaction is a characteristic reaction of aldehyde having no α – hydrogen.

$C_6H_5CHO + C_6H_5CHO \xrightarrow{\text{dil NaOH}} C_6H_5CH_2OH + C_6H_5COONa$

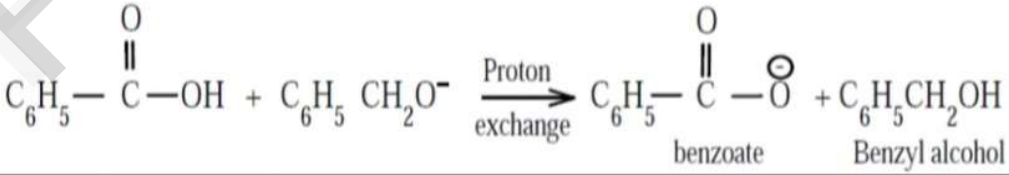
Step 1 : Attack of OH^- on the carbonyl carbon.



Step 2 : Hydride ion transfer



Step 3 : Acid – base reaction.



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