DINDIGUL DISTRICT

QUARTERLY EXAMINATION - 2024

CLASS : 12

Reg.No

Time : 3.00 Hours

CHEMISTRY

Total Marks : 70

I) Answer all the questions: 15x1=15

1. Wolframite ore is separated from tinstone by the process of
   a) Smelting b) Calcination c) Roasting d) Electromagnetic separation
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. In acidic medium, Potassium permanganate oxidizes oxalic acid to
   a) Oxalate b) Carbon dioxide c) acetate d)acetic acid
5. Potassium has a bcc structure with nearest neighbour distance 4.52A^0 Its atomic weight is 39. Its density will be
   a) 915 kgm^{-3} b) 2142 kgm^{-3} c) 452 kgm^{-3} d) 390 kgm^{-3}
6. If the Intial concentration of the reactent is doubled, the time for half reaction is also doubled. Then the order of the reaction is
   a) Zero b) one c) Fraction d) none
7. For the reaction $2A+B \rightarrow 3C+D$ which of the following does not express the reaction rate
   a) $\frac{d[D]}{dt}$ b) $-\frac{d[A]}{2dt}$ c) $-\frac{d[C]}{3dt}$ d) $-\frac{d[B]}{dt}$
8. Equal volumes of three acid solutions of PH 1,2 and 3 are mixed in a vessel. What will be the H^+ ion concentration in the mixture?
   a) $3.7x10^{-2}$ b) 10^{-6} c) 0.111 d) None of these
9. Asseration : Tertiary alcohols undergo dehydration more readily than primary alcohol
   Reason : Tertiary alcohols are less acidic than primary alcohols
   a) Both assertion and reason are true and reason is the correct explanetion of assertion
   b) Both assertion and reason are true and reason is not the correct explenation of assertion
   c) Assertion is true but reason is false d) Both assertion and reason are false
10. $HO-CH_2-CH_2-OH$ on heating with Periodic acid gives
    a) methanol b) ethanol c) Methanal d) CO_2
11. The IUPAC name of 
    a) but-3-enoic acid b) but-1-ene-4-oic acid
    c) but-2-ene-1-oic acid d) but-3-ene-1-oic acid
12. Which one of the following pairs is not correctly Matched ;

Reducing agent	Name of the reaction
a) Zn /Hg/ConHCl	Clemension redution
b) $LiAlH_4$	wolf -kisher's reduction
c) Pd /$BaSO_4$	Rosenmund's reduction
d) $SnCl_2$ / Con HCl	Stephen's reduction

13. The oxidation state of chlorine in Cl_2O_7 is
    a) +6 b) +7 c) +4 d) +5
14. Reason of Lanthanoid contraction is
    a) Increasing nuclear charge b) decreasing nuclear charge
    c) Imperfect shilding effect of 4f orbitals d) both (a) & (c)
15. In diboarane, the number of electrons that account for banana bonds is
    a) six b) two c) four d) three

II) Note : Answer any six questions. Q.No.24 compulsory. 6x2=12

16. Give the basic requirement for vapour phase refining
17. CO is a reducing agent, justify with an example.
18. What are interhologen compounds? Give example.
19. Why d-block elements form co-ordination complexes?
20. Define unit cell.
21. Identify the order for the following reaction.
    i) Rusting of Iron b) Radio active disintegration of $_{92}U^{238}$
22. Write the limitation of Arrhenius concept
23. Write Benzoin condensation
24. Alchols having higher boiling point than aldehydes, alkanes and ethers of comparable molecular masses. why?

III) Note : Answer any six questions. Q.No.33 Compulsory . 6x3=18

25. Give the limitations of Ellingham diagram.
26. Explain McAfee process of preparation of $AlCl_3$
27. Write the use of $KMnO_4$.
28. Write short note on Frenkel defect.
29. Derive intergrated rate law for a zero order reaction $A \rightarrow$ products.
30. Distinguish Lewis acid and Lewis bases.
31. What is TNG? How it is prepared?
32. Write the test for carboxilic acids.
33. Write the molecular formula and draw the structure of sulphurous acid and Marshall's acid.

IV) Note : Answer all the questions. 5x5=25

34. a) Explain froth flotation process. **(OR)**
    b) i) How will you prepare inorganic benzene? (2)
    ii) Write uses of silicones. (3)
35. a) i) How bleaching powder is prepared? (2)
    ii) Write a short note on Holmes signal. **(OR)** (3)
    b) Describe the preparation of potassium dichromate
36. a) Calculate the percentage efficiency of packing in case of simple cubic crystal. **(OR)**
    b) Define half life of a reaction. Show that for a first order reaction half life is independent of initial concentraction.
37. a) Derive Henderson equation **(OR)**
    b) An organic compound (A) molecular formula (C_2H_6O) react with con H_2SO_4 at 443K to give compound (B) react with Bayer's reagent to give compound (C) moleular formula ($C_2H_6O_2$). Identify (A), (B) and (C) and write the equation.
38. a) Explain Saytzeff's rule with example. **(OR)**
    b) Explain Cannizaro reaction mechanhanism.

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QUARTERLY EXAM ANSWER KEY-2024

STD: XII (DINDIGUL) CHEMISTRY

S.NO	ANSWER	S.NO	ANSWER
1	d) Electromagnetic seperation	9	b) Both assertion and reason are true and reason is not the correct explanationof assertion
2	a) Me_3SiCl		
3	a) H_3PO_3	10	c) Methanal
4	b) Carbon Dioxide	11	a) but-3-enoic acid
5	a) 915 kgm^{-3}	12	b) $LiAlH_4$ - Wolf-kishner reduction
6	a) Zero	13	b)+7
7	c) - d [C] / 3 dt	14	d) both (a) & (c)
8	a) 3.7×10^{-2}	15	c) four

Very Short Answer

16 **Give the basic requirement for vapour phase refining.**
The metal is treated with a suitable reagent to form a volatile compound. Then the volatile compound is decomposed to give the pure metal at high temperature.

17 **CO is a reducing agent . justify with an example.**
Carbon monoxide acts as a strong reducing agent. Carbon monoxide thus has a relatively high tendency to be oxidised to form carbon dioxide.

$$3CO + Fe_2O_3 \longrightarrow 2Fe + 3CO_2$$

18 **What are interhalogen compounds? Give examples.**
Each halogen combines with other halogens to form a series of compounds called inter halogen compounds. Example : ClF_3 ,IF_7

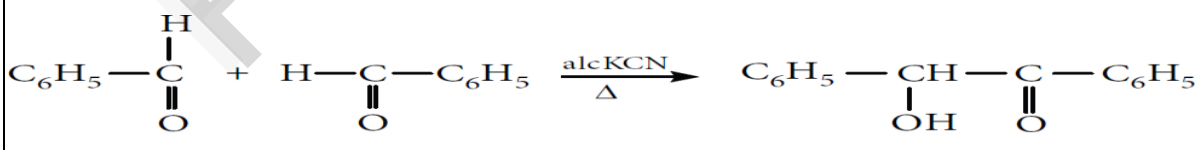
19 **Why d-block elements form complexes?**
i. Transition metal ions are small and highly charged
ii. They have vacant low energy orbitals to accept an electron pair donated by other group. Examples: $[Fe(CN)_6]^{4-}$, $[Co(NH_3)_6]^{3+}$, etc..

20 **Define unit cell.** A basic repeating structural unit of a crystalline solid is called a unit cell.

21 **Order of reactions:**
a) Rusting of iron - First order reaction
b)$_{92}U^{238}$ Dadioactive Disintegration - First order reaction

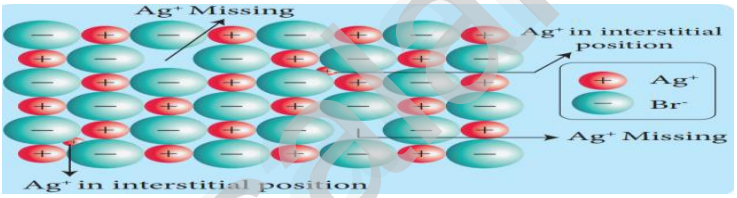
22 **What are the Limitations of Arrhenius concept?**
i. Arrhenius theory does not explain the behaviour of acids and bases in non aqueous solvents such as acetone, Tetrahydrofuran etc…
ii. This theory does not account for the basicity of the substances like ammonia (NH_3) which do not possess hydroxyl group.

23 **Benzoin Condensation :**



Benzaldehyde — Benzoin (2-hydroxy – 1, 2 – diphenyl ethanone)

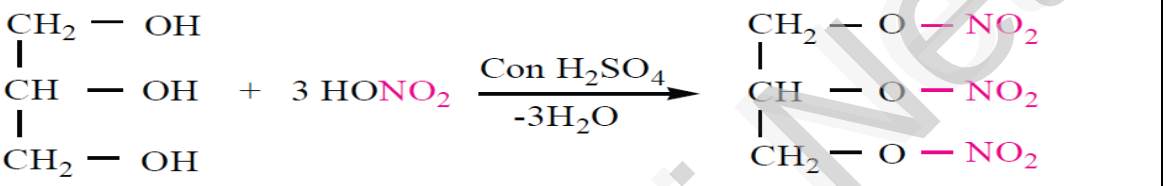
24 **Alcohols having higher boiling point than aldehydes, alkanes and ethers- Why?**
Because of Intermolecular Hydrogen bonding between alcohol, They are having higher boiling point than others.

III	*Short Answer*
25	**Give the limitations of Ellingham diagram**. 1. It gives information about the thermodynamic feasibility of a reaction. 2. It does not tell anything about the rate of the reaction. 3. More over it does not give any idea about the possibility of other reactions that might be taking place. 4. The interpretation of ΔG is based on the assumption that the reactants are in equilibrium with the product which is not always true.
26	**Explain McAfee process** Aluminium chloride is obtained by heating a mixture of alumina and coke in a current of chlorine $2Al_2O_3 + 3C + 6Cl_2 \xrightarrow{\text{heat}} 4AlCl_3 + 3CO_2$
27	**Uses of potassium permanganate:** 1. It is used as a strong oxidizing agent. 2. It is used for the treatment of various skin infections and fungal infections of the foot. 3. It used in water treatment industries to remove iron and hydrogen sulphide from well water. 4. It is used as a Bayer's reagent for detecting unsaturation in an organic compound. 5. It is used in quantitative analysis for the estimation of ferroussalts, oxalates, hydrogen peroxide and iodides.
28	**Write a note on Frenkel defect**. Frenkel defect arises due to the dislocation of ions from its crystal lattice. The ion which is missing from the lattice point occupies an interstitial position. This defect occurs when cation and anion differ in size. Unlike Schottky defect, this defect does not affect the density of the crystal. Ex: AgBr 
29	**Derive integrated rate law for a zero-order reaction A ⟶ product.** $A \longrightarrow \text{Product}$ $\text{Rate} = k[A]^0 \quad \therefore [A]^0 = 1$ $\frac{-d[A]}{dt} = k$ $-d[A] = kdt$ integrating between the limits of concentration $[A_0]$ to $[A]$ and time t = 0 to t = 1. $-\int_{[A_0]}^{[A]} d[A] = K \int_0^t dt$ $-([A])_{[A_0]}^{[A]} = k\,(t)_0^t$ $[A_0] - [A] = kt$ $\boxed{k = \frac{[A_0]-[A]}{t}}$

30 **Distinguish Lewis acids and Lewis Bases :**

S.NO	Lewis acids	Lewis bases
1.	Electron deficient molecules Ex: BF_3 , $AlCl_3$	Molecules with one (or) more lone pairs of electrons. Ex:NH_3 ,H_2O, R-O-H
2.	All metal ions (or) atoms. Ex: Fe^{2+},Fe^{3+} , Cr^{3+}	All anions. Ex: F^-, Cl^-, CN^-
3.	Molecules that contain a polar double bond. Ex: SO_2 ,CO_2	Molecules that contain carbon – carbon multiple bond. Ex: $CH_2=CH_2$,$CH \equiv CH$
4.	Molecules in which the central atom can expand its octet due to the availability of empty d – orbitals Ex: SiF_4, SF_4 ,$FeCl_3$ etc.	All metal oxides Ex: CaO,MgO,Na_2O etc...
5.	Carbonium ion: $(CH_3)_3C^+$	Carbanion: CH_3^-

31 **Preparation of Trinitroglycerine (TNG)?**



Propan - 1,2,3 - triol
glycerol

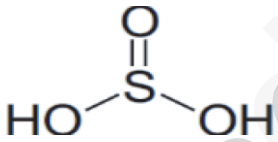
1,2,3 - trinitroxy propane

32 **Tests for carboxylic acid group?**

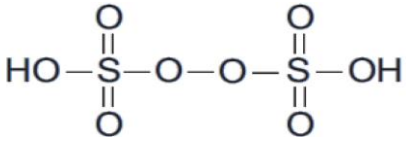
i) In aqueous solution carboxylic acid turn blue litmus red.
ii) Carboxylic acids give brisk effervescence with sodium bicarbonate due to the evolution of CO_2.
iii) When carboxylic acid is warmed with alcohol and Con H_2SO_4 it forms an ester, which is detected by its fruity odour.

33

Sulphurous Acid H_2SO_3



Marshall's Acid ($H_2S_2O_8$)



IV. DETAIL

34 (a) **Explain froth floatation method.**

This is used to concentrate sulphide ores such as galena (PbS) Zinc blende (ZnS) etc.

Metallic ore particles preferentially wetted by oil can be separated from gangue. Crushed ore is mixed with water and a frothing agent like pine oil or eucalyptus oil.

A small amount of sodium ethyl xanthate is added as a collector. A froth is formed by blowing air through the mixture. The collector molecules attach to the ore particles and make them water repellent. As a result ore particles wetted by the oil rise to the surface along with the froth. The froth is skimmed off and dried to recover the concentrated ore.

Gangue particles preferentially wetted by water settle at the bottom. When sulphide ore contains other metal sulphides as impurities, depressing agents such as sodium cyanide, sodium carbonate etc. are used to selectively prevent other from coming to the froth.

For example , When impurities such as ZnS is present in Galena (PbS) , Sodium cyanide NaCN is added to depresses the flotation property of ZnS) by forming a layer of zinc complex Na2 [Zn(CN)4] on the surface of ZnS.

(b)

(i) What is Inorganic benzene? How it is obtained?

When treated with excess ammonia at low temperatures diborane gives diboranediammonate. On heating at higher temperatures it gives borazole.

$3B_2H_6 + 6NH_3 \xrightarrow{-153\ K} 3B_2H_6.2NH_3$ (or) $3[BH_2(NH_3)_2]^+[BH_4]^-$

$3B_2H_6 + 2NH_3 \xrightarrow{\text{High temp / Clossed vessel}} 2B_3N_3H_6$ (Borazole or Borazine - Inorganic benzene)

(ii) uses of silicones.

i) Silicones are used for high temperature oil baths.
ii) They are used for making water proofing clothes.
iii) They are used as insulting material in electrical motor and other electrical appliances.
iv) They are mixed with paints and enamels to make them resistant towards high temperature, sunlight, dampness and chemicals.

35 (a)

(a) How bleaching powder is prepared?

It is prepared by passing chlorine gas through dry slaked lime (calcium hydroxide).

$Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$

(b) Holmes signal:

Phosphine is used for producing smoke screen.

In a ship, a container with a mixture of **calcium carbide** and **calcium phosphide**, liberates **phosphine** and **acetylene** when thrown into the sea. The liberated Phosphine catches fire and ignites acetylene. These burning gases serves as a signal to the approaching ships. This is known as Holmes signal.

(b)

Explain the preparation of potassium dichromate.

Extraction of Potassium dichromate from its ore:

1. Ore: Chromite - $FeO.Cr_2O_3$

2. Conversion of chrome iron ore to sodium chromate

$4FeO.Cr_2O_3 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2\uparrow$

3. Conversion of Na_2CrO_4 to $Na_2Cr_2O_7$

$2Na_2CrO_4 + H_2SO_4 \rightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$

4.Conversion of sodium dichromate into potassium dichromate

$Na_2Cr_2O_7 + 2KCl \rightarrow K_2Cr_2O_7 + 2NaCl$

36 (a)

Percentage efficiency of packing in Simple Cupic Crystal:

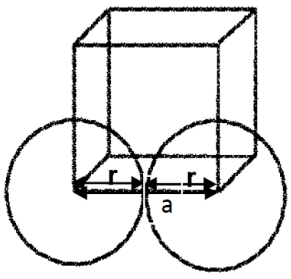
$$\text{Packing efficiency} = \frac{\text{total volume occupied by spheres in a unit cell}}{\text{volume of the unit cell}} \times 100$$

Volume of cube = a x a x a = a^3

Radius of the sphere from figure, $a = 2r \Rightarrow r = \frac{a}{2}$

Volume of the sphere with radius 'r' = $\frac{4}{3}\pi r^3$

$$= \frac{4}{3}\pi\left(\frac{a}{2}\right)^3 = \frac{\pi a^3}{6}$$



The number of spheres belongs to a unit cell in sc arrangement is 1.

$$\text{Packing efficiency} = \frac{1 \times \frac{\pi a^3}{6}}{a^3} \times 100 = 52.31\%$$

(b) **Define half-life of a reaction?** It is defined as the time required for the reactant concentration to reach half its initial value.

Half-life of a first order reaction.

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

if $t = t_{1/2}$ then, $[A] = \frac{[A_0]}{2}$

$$k = \frac{2.303}{t_{1/2}} \log \frac{[A_0]}{\frac{[A_0]}{2}}$$

$$k = \frac{2.303}{t_{1/2}} \log 2$$

$$k = \frac{2.303 \times 0.3010}{t_{1/2}} = \frac{0.6932}{t_{1/2}}$$

$$\boxed{t_{1/2} = \frac{0.6932}{k}}$$

For a first order reaction, the half-life is a constant ie., it does not depend on the initial concentration.

37 (a)

Henderson – Hasselbalch equation

In an acidic buffer solution, $[H_3O^+] = K_a \frac{[acid]_{eq}}{[base]_{eq}}$

Due to common ion effect, $[acid]_{eq} = [acid]$; $[base]_{eq} = [salt]$

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

Taking logarithm on both sides,

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

reverse the sign on both sides,

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

(b)

An Organic compound (A)of Molecular formula (C_2H_6O) is Ethanol = CH_3CH_2-OH

CH_3CH_2-OH $\xrightarrow{\text{CON-}H_2SO_4}$ CH_2=CH_2

$$CH_2 = CH_2 + H_2O \xrightarrow[[O]]{\text{Cold alkaline } KMnO_4} \underset{\text{OH}}{\overset{\text{OH}}{CH_2 - CH_2}}$$

ethene

ethane-1,2-diol

A - CH_3CH_2-OH Ethanol

B - CH_2=CH_2 Ethylene

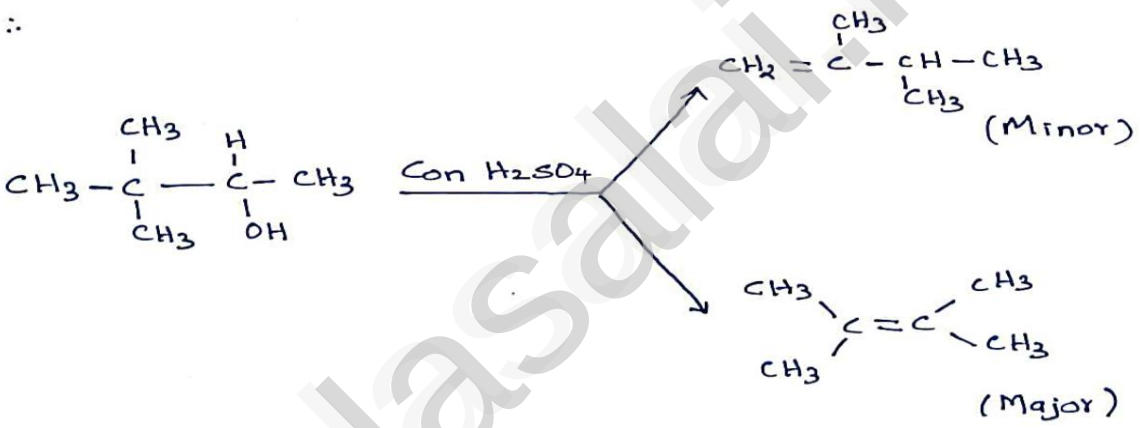
C - $\underset{\text{OH}}{\overset{\text{OH}}{CH_2 - CH_2}}$ Glycol

38 (a)

Explian Saytzeff's rule?

During intramolecular dehydration, if there is a possibility to form a carbon – carbon double bond at different locations, the preferred location is the one that gives the more (highly) substituted alkene i.e., the stable alkene.

∴



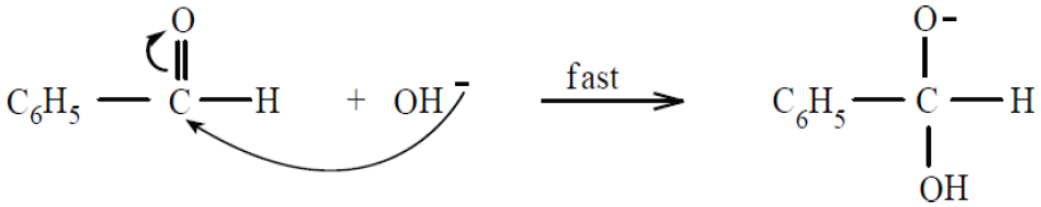
(b)

Cannizaro reaction

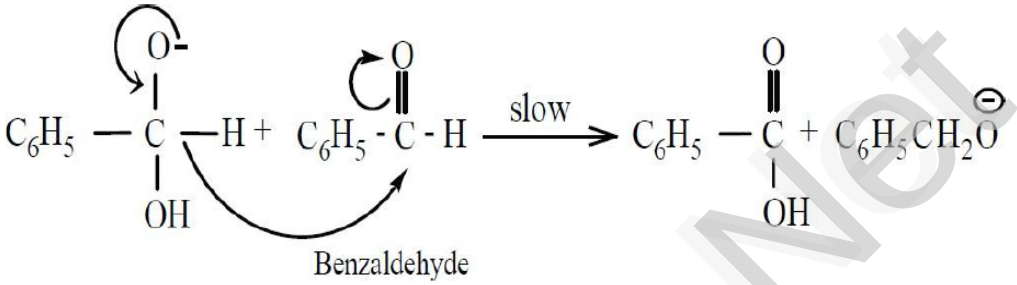
$$C_6H_5CHO + C_6H_5CHO \xrightarrow{50\%\ NaOH} C_6H_5CH_2OH + C_6H_5COONa$$

Benzaldehyde — Benzyl alcohol — Sodium Benzoate

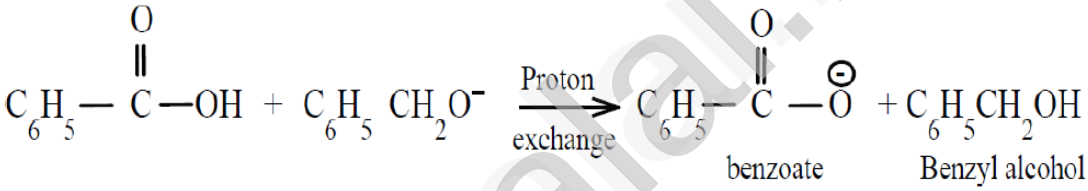
Step – 1:



Step – 2:



Step – 3:



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