XIITH HALF YEARLY EXAMINATION CHEMISTRY ANSWER KEY - 2024 DINDIGUL DISTRICT

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PART -A

I. CHOOSE THE CORRECT ANSWER. (15 x 1 =15)

1. Considering Ellingham diagram, which of the following metals can be used to reduce Alumina?

Answer: (c) Mg

2. The correct order of the thermal stability of hydrogen halides is:

Answer: (b) HF> HCl> HBr> HI

3. Duralumin is an alloy of:

Answer: (d) Al, Cu, Mn, Mg

4. The actual position of Lanthanides in the Periodic Table is at:

Answer: (d) Group number 3 and Period number 6

5. How many geometrical isomers are possible for [Pt(Py)(NH_3)BrCl]?

Answer: (a) 3

6. Match the following:

Answer:

- Ionic Solid → (i) NaCl
- Covalent Solid → (iv) Diamond
- Non-Polar Molecular Solid → (ii) Anthracene
- Metallic Solid → (iii) Cu-Zn

a) 1 – iii, 2 – 1, 3 -iv, 4 -i

7. For a reaction of zero order x-> product, if the initial concentration is 0.02M and has a half-life of 10 minutes, then with a concentration of 0.04M, the half-life is:

Answer: (c) 20 minutes

8. Which of the following compounds is most likely to behave as a Lewis base?

Answer: (b) PF_3

9. During electrolysis of molten sodium chloride, the time required to produce 0.1 mol of chlorine gas with a current of 3A is:

Answer: (b) 107.2 minutes

10. Which one of the following is incorrect for physisorption?

Answer: (b) Increase with increase in T

11. Which one of the following will react with phenol to give salicylaldehyde after hydrolysis?

Answer: (c) Trichloromethane

12. $CH_3Br + KCN \rightarrow A + H_3O^+ + B \rightarrow PCl_5 \rightarrow (C)$, product is:

Answer: (a) Acetyl chloride

13. Which one of the following will not undergo Hofmann bromamide reaction?

Answer: (a) $CH_3CONHCH_3$

14. Cheilosis is a vitamin deficiency disease caused by:

Answer: (d) Vitamin B_2

15. Which of the following is a co-polymer?

Answer: (d) PHBV

PART-II

II ANSWER ANY 6 QUESTIONS (Q.NO:24 IS COMPULSORY).

16. What is calcination?

- Calcination is the process in which the concentrated ore is strongly heated in the absence of air.
- During calcination of carbonate ore, carbon dioxide is expelled.

$$CaCO_3 \longrightarrow CaO + CO_2\uparrow$$

17. Write a short note on anamolous properties of the first element of p-block.

- Small size
- High ionisation enthalpy and high electronegativity
- Absence of d-orbitals

18. What is inert pair effect?

- As we move down the group in p–block elements the outer ns^2 electrons become inert and do not involve in chemical combination.
- Only np electrons take part in chemical combination.
- This is known as inert pair effect.

19. Define Solubility Product.

The solubility product of a compound is defined as the product of the molar concentration of the constituent ions, each raised to the power of its stoichiometric co–efficient in a balanced equilibrium equation.

$$X_mY_n \rightleftharpoons mX^{n+} + nY^{m-}$$

$$K_{sp} = [X^{n+}]^m [Y^{m-}]^n$$

20. A solution of silver nitrate is electrolysed for 20 minutes with a current of 2 amperes. Calculate the mass of silver deposited at the cathode.

Electrochemical reaction at cathode is $Ag^+ + e^- \rightarrow Ag$ (reduction)

$m = ZIt$

$m = \frac{108\ gmol^{-1}}{96500\ C\ mol^{-1}} \times 2400C$

$m = 2.68\ g.$

$Z = \frac{\text{molarmass of Ag}}{(96500)} = \frac{108}{1 \times 96500}$

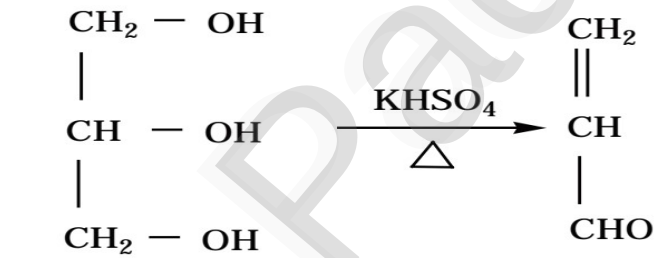
$I = 2A$

$t = 20 \times 60S = 1200\ S$

$It = 2A \times 1200S = 2400C$

21. How is acrolein prepared from glycerol?

When glycerol is heated with dehydrating agents such as Con H_2SO_4, $KHSO_4$ etc...., it undergoes dehydration to form acrolein.



Propane - 1,2,3 - triol Prop - 2- enal (acrolein)

22. What are hormones? Give Examples.

- Hormone is an organic substance that is secreted by one tissue.
- It limits the blood stream and induces a physiological response in other tissues.
- Endocrine glands, which are special groups of cells make hormones.
- It is an intercellular signaling molecule.
- Eg. Insulin, estrogen

23. What are antibiotics?

The medicines that have the ability to kill the pathogenic bacteria are grouped as antibiotics. Example: (i) Penicillins (ii) amoxicillin

24. What happens when increase the surface area of the reactant?

- Increase in surface area of reactant leads to, more collisions per litre per second, and hence rate of reaction is increased.
- For example, powdered calcium carbonate reacts much faster with dilute HCl than with the same mass of $CaCO_3$ as marble

PART - III

III ANSWER ANY 6 QUESTIONS (Q.NO:33 IS COMPULSORY).

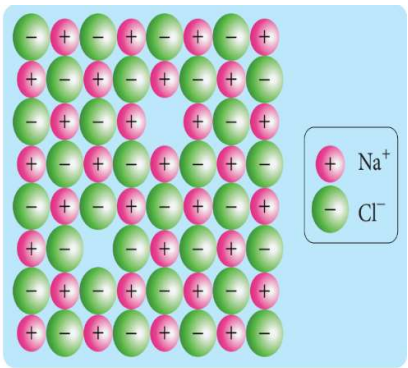
25. Give the uses of helium.

- Helium and oxygen mixture is used by divers in place of air oxygen mixture. This Prevents the painful dangerous condition called bends.
- Helium is used to provide inert atmosphere in electric arc welding of metals.
- Helium has lowest boiling point hence used in cryogenics.
- Helium is much less dense than air and hence used for filling air balloons.

26. Out of $Lu(OH)_3$, and $La(OH)_3$, which is more basic and why?

- Due to lanthanide contraction the size of lanthanide ions decreases from La^{3+} toLu^{3+}
- The covalent character of the hydroxides increases and the basic strength decreases.
- $La(OH)_3$ is most basic and $Lu(OH)_3$ is least basic.

27. Explain Schotky defect.



Schottky Defect

- Arises due to the missing of equal number of cations and anions.
- Does not change the stoichiometry of the crystal.
- Ionic solids in which the cation and anion are of almost of similar size show schottky defect.
- Example: NaCl.
- Lowers its density
- Presence of Schottky defect in the crystal provides a simple way by which atoms or ions can move within the crystal lattice

28. Give the differences between order and molecularity of a reaction.

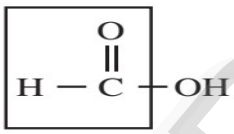
Order of a reaction	Molecularity of a reaction
It is the sum of the powers of concentration terms involved in the experimentally determined rate law.	It is the total number of reactant species that are involved in an elementary step.
It can be zero (or) fractional (or)integer.	It always a whole number, cannot be zero or fractional.
It is assigned for an overall reaction.	It is assigned for each elementary step of mechanism

29. Write short notes on Tyndall effect.

- When beam of light is passed through colloidal solution, the path of light is illuminated by the scattering of light by colloidal particles.
- The phenomenon of scattering of light by the solution particles is called Tyndall effect

30. Explain reducing nature of formic acid.

Formic acid contains both an aldehyde as well as an acid group. Hence, like other aldehydes, formic acid can easily be oxidised and therefore acts as a strong reducing agent.



Aldehyde group

Carboxylic acid group

i) Formic acid reduces Tollens reagent (ammonical silver nitrate solution) to metallic silver.

$$HCOO^- + 2Ag^+ + 3OH^- \longrightarrow 2\,Ag + CO_3^{2-} + 2H_2O$$

(Tollens reagent) Silver mirror

ii) Formic acid reduces Fehling's solution. It reduces blue coloured cupric ions to red coloured cuprous ions.

$$HCOO^- + 2Cu^{2+} + 5\,OH^- \longrightarrow Cu_2O + CO_3^{2-} + 3\,H_2O$$

(Fehlings solution) red precipitate

31. $C_6H_5 - \overset{+}{N}_2\overset{-}{Cl} \xrightarrow{Cu\ /\ HCl}$ A

$C_6H_5 - \overset{+}{N}_2\overset{-}{Cl} + HBF_4 \longrightarrow$ B

Identify A & B and write the reaction.

i) Conversion of benzene diazonium chloride into chloro / bromo arenes can also be effected using hydrochloric / hydrobromic acid and copper powder. This reaction is called Gattermann reaction.

$$C_6H_5 - \overset{+}{N}_2\overset{-}{Cl} \xrightarrow{Cu\ /\ HCl} C_6H_5 - Cl + N_2$$

Chlorobenzene

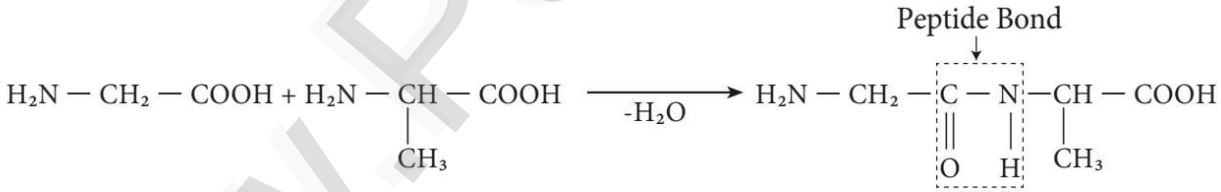
ii) When benzene diazonium chloride is treated with fluoroboric acid, benezene diazonium tetra fluoroborate is precipitated which on heating decomposes to give fluorobenzene.

$$C_6H_5 - \overset{+}{N}_2\overset{-}{Cl} + HBF_4 \longrightarrow C_6H_5 - \overset{+}{N}_2BF_4^- \xrightarrow{\triangle} C_6H_5 - F + BF_3 + N_2$$

Fluoroboric acid — Benzenediazonium fluoroborate — Fluorobenzene

32. Witte a short note on peptide bond.

The amino acids are linked covalently by peptide bonds. The carboxyl group of the first amino acid react 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.



Glycine — Alanine — Glycyl alanine - Dipeptide

33. $[Ti(H_2O)_6]^{3+}$ is coloured, while $[Sc(H_2O)_6]^{3+}$ is colourless – Explain.

$[Ti(H_2O)_6]^{3+}$:

- The central metal ion of $[Ti(H_2O)_6]^{3+}$ is Ti^{3+}
- Ti^{3+}ion has one unpaired electron for d-d transition, hence it is coloured

$[Sc(H_2O)_6]^{3+}$:

- The central metal ion of $[Sc(H_2O)_6]^{3+}$ is Sc^{3+}

- ❖ Have vacant d^0 orbitals
- ❖ No unpaired electrons
- ❖ No d-d displacement therefore colourless

PART-IV

V ANSWER ALL THE QUESTIONS.

34. a) i) Explain gravity Separation. (3)

- ❖ The ore is finely powdered and washed with a current of water.
- ❖ The lighter gangue particles are washed away by water.
- ❖ Example: Oxides ores like Tin Stone.

ii) Write the Imitations of Ellingham diagram. (2)

- ✓ It does not explains the rate of the reaction.
- ✓ It does not explain the possibility of other reactions taking place.
- ✓ When the reactants and the products are in equilibrium, the value of ΔG is not true value.

(OR)

34. b) i) Write the uses of Boric acid. (2)

- Boric acid is used in the manufacture of pottery glases, enamels and pigments.
- It is used as an antiseptic and as an eye lotion.
- It is also used as a food preservative.

ii) How will you prepare chlorine from Deacon process. (3)

In this process a mixture of air and hydrochloric acid is passed up a chamber containing a number of shelves, pumice stones soaked in cuprous chloride are placed. Hot gases at about 723K are passed through a jacket that surrounds the chamber.

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

35. a) i) Why transition elements form interstitial compounds. (2)

Small size of interstitial atoms:

- Interstitial compounds are formed when small atoms, such as hydrogen, carbon, or nitrogen, occupy the interstitial spaces in the lattice of a transition metal.

- These small atoms can fit into the voids (interstices) of the metal lattice without significantly disturbing its structure.

1. High metallic bonding
2. Variable oxidation states
3. Hardness and stability
4. High melting

These unique properties make interstitial compounds highly useful in industrial applications.

ii) Compare Lanthanoids and actinoids. (3)

Lanthanoids	Actinoids
Differentiating electrons enters in 4f orbital.	Differentiating electrons enters in 5f orbital.
Binding energy of 4f orbitals are higher.	Binding energy of 5f orbitals are lower
They show less tendency to form Complexes.	They show greater tendency to form complexes.
Most of the lanthanoids are colourless	Most of the actinoids are coloured. For Eg. U^{3+} (Red), U^{4+}(Green),UO_2 (Yellow)
They do not form oxocations	They do not form oxocations

(OR)

35. b) i) Write a short note on double salts and co-ordination compounds. (3)

Doublesalt	Co-ordination compound
Dissociating into ions their constituent simple ions in solutions.	Never dissociates to give simple ions in Solutions.
Lose their identity	Does not lose its identity
Positive and negative ions are present	Simple and complex ions are present
Example: Potash alum $K_2SO_4.Al_2(SO_4)_3.24H_2O$	Example: $K_4[Fe(CN)_6]$

ii) What is crystal field stabilization energy (CFSE)? (2)

It is the energy associated with the absorbed wavelength of light is called crystal field splitting energy.

$\Delta = hc\nu$

Δ - crystal field splitting energy ; h – Plank's constant ;

c – velocity of light & ν - wavelength

36. a) What are difference between crystalline and amorphous solids. (5)

Crystalline Solid	Amorphous Solid
Long range orderly arrangement of constituents.	Short range (or) random arrangement of Constituents.
Definite Shape.	Irregular Shape.
Anisotropic Nature.	Isotropic Nature.
True Solids.	Pseudo Solids (or) Super cooled liquids.
Definite Heat of fusion.	Heat of fusion not definite.
Have Sharp Melting Point.	No Sharp Melting Point.
Ex. NaCl, Diamond.	Ex. Rubber, Plastic

b) Derive Henderson Hasselbalch equation. (5)

1. The concentration of hydronium ion in acidic buffer solution depends on the ratio of concentration of the weak acid to the concentration of its conjugate base present in the solution. i.e., $[H_3O^+] = K_a \frac{[acid]_{eq}}{[base]_{eq}}$

2. The weak acid is dissociated only to a small extent. Moreover due to common ion effect, the dissociation is further suppressed and hence the equilibrium concentration of the acid is nearly equal to the initial concentration of the unionised acid. Similarly the concentration of the conjugate base is nearly equal to the initial concentration of the added salt. $[H_3O^+] = K_a \frac{[acid]}{[salt]}$

3. [Acid] and [Salt] represent the initial concentration of the acid and salt, respectively used to prepare the buffer solution.

4. Taking logarithm on both sides

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

5. Reverse the sign on both sides

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

We know that

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

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

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

37 a) i) State Kohlrausch law. (3)

At infinite dilution, the limiting molar conductivity of an electrolyte is equal to the sum of the limiting molar conductance of it constitute ions.

For a uni – univalent electrolyte such as NaCl, the Kohlraush's law is expressed as

$$\left(\Lambda_m^0\right)_{NaCl} = \left(\lambda_m^0\right)_{Na^+} + \left(\lambda_m^0\right)_{Cl^-}$$

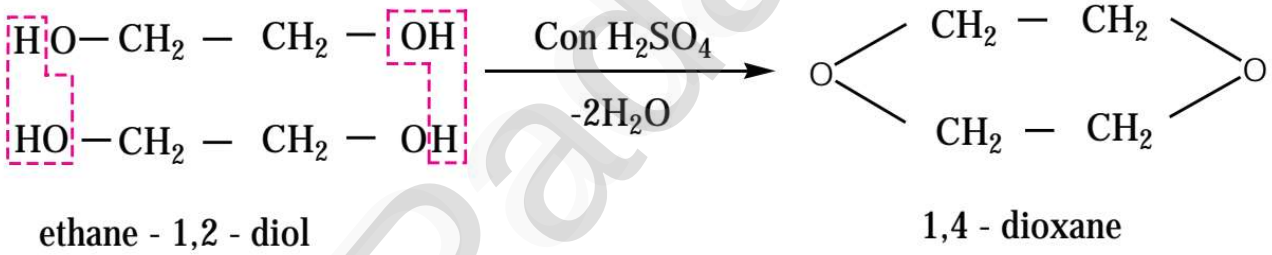
ii) Write note on catalytic poison. (2)

- Certain substances when added to a catalysed reaction decreases or completely destroys the activity of catalyst and they are often known as catalytic poisons.
- Ex: In the reaction, $2SO_2 + O_2 \rightarrow 2SO_3$ with a Pt catalyst, the poison is As_2O_3
- i.e., As_2O_3 destroys the activity of Pt .
- As_2O_3 blocks the activity of the catalyst. So, the activity is lost.

(OR)

b) i) How will you convert Glycol in to 1,4-dioxane. (3)

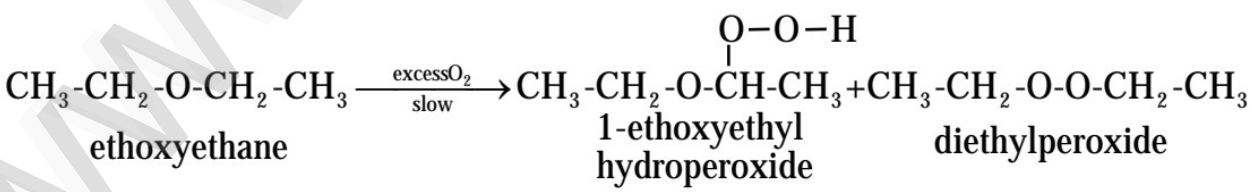
When distilled with Conc. H SO 2 4 , glycol forms dioxane.



ethane - 1,2 - diol 1,4 - dioxane

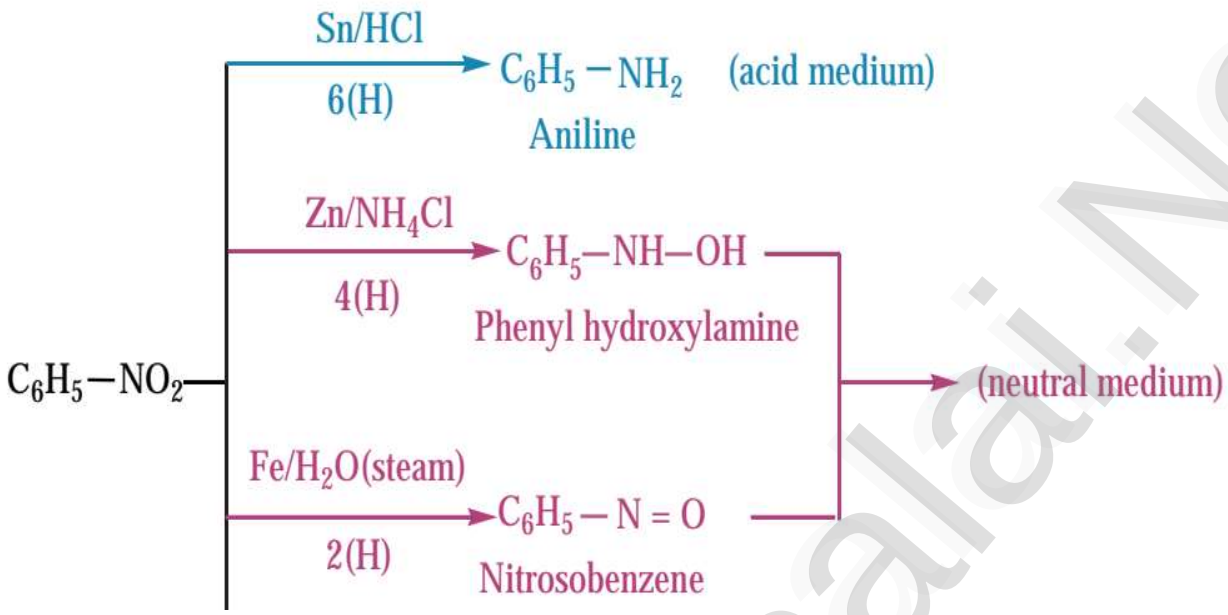
ii) What happens when oxygen react with di-ethyl ether? (2)

When ethers are stored in the presence of atmospheric oxygen, they slowly oxidise to form hydroperoxides and dialkylperoxides. These are explosive in nature. Such a spontaneous oxidation by atmospheric oxygen is called autooxidation.



ethoxyethane 1-ethoxyethyl hydroperoxide diethylperoxide

38. a) i) Wite the equation for reduction of Nitrobenzene in acidic and neutral Medium. (3)



ii) Write short note on carbylamine reaction. (2)

Aliphatic (or) aromatic primary amines react with chloroform and alcoholic KOH to give isocyanides (carbylamines), which has an unpleasant smell. This reaction is known as carbylamine test. This test used to identify the primary amines.

$$\underset{\text{Ethylamine}}{C_2H_5 - NH_2} + \underset{\text{Chloroform}}{CHCl_3} + 3KOH \longrightarrow \underset{\text{Ethylisocyanide}}{C_2H_5 - NC} + 3KCl + 3H_2O$$

(OR)

38. b) i) What is epimersation? Give example. (3)

- Sugar differing in configuration at an asymmetric centre is known as epimers.
- The process by which one epimer is converted into other is called epimerisation and it requires the enzymes epimerase.
- Galactose is converted to glucose by this manner in our body.

ii) What are bio-degradable polymers? (2)

❖ The materials that are readily decomposed by microorganisms in the environment are called biodegradable.

- Natural polymers degrade on their own after certain period of time but the synthetic polymers do not.
- Examples: Poly hydroxy butyrate (PHB), Polyglycolic acid (PGA), Polylactic acid (PLA)
- Uses: In medical field such as i) Surgical sutures ii) Plasma substitute
- These polymers are decomposed by enzyme action and are either metabolized or excreted from the body.

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