XIITH CHEMISTRY PUBLIC EXAM
ANSWER KEY - 2025

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PART -A

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

1. During the decomposition of H_2O_2 to give dioxygen, 48g O_2 is formed per minute at certain point of time. The rate of formation of water at this point is

a) 2.25 mol $^{-1}$min b) 0.75 mol $^{-1}$min

c) 3.0 mol $^{-1}$min d)1.5 mol $^{-1}$min

2. How many moles of I_2 are liberated when 1 mole of potassium dichromate react with potassium iodide? **a) 3** b) 1 **c) 4** d)2

3. Non stick cook wares generally have a coating of a polymer, whose monomer is

a) chloroethene b) ethane

c) 1,1,2,2-tetrafluoroethane d) prop-2-enenitrile

4. The compound that reacts with nitrous acid to give yellow oily liquid is

_____

a) N-methylaniline **b) Nitro benzene**

c) N,N-dimethyl aniline **d) Aniline**

5. Boric acid is an acid because its molecule

a) combines with proton to form water molecule

b) contains replaceable H+ ion

c) accepts OH- from water ,releasing proton

d). gives up a proton

6. In an electrical field, the particles of a colloidal system move towards cathode. The coagulation of the same sol is studied using K_2SO_4 (i), Na_3PO_4 (ii),$K_4[Fe(CN)_6]$ (iii) and NaCl (iv) Their coagulating power should be

a) III > II > I > IV b) I > II > III > IV c) II > I>IV > III d) none of these

7. Bond dissociation energy of fluorine is greater than chlorine gas

Reason : chlorine has more electronic repulsion than flourine

a) Assertion is true but reason is false

b) Both assertion and reason are true but reason is not the correct explanation of assertion

c) Both assertion and reason are false

d) Both assertion and reason are true and reason is the correct explanation of assertion.

8. In calcium fluoride, having the flurite structure the coordination number of Ca^{2+} ion and F- Ion are

a) **8 and 4** b) 4 and 2 **c)** 4 and 8 d) 6 and 6

9. The secondary structure of a protein refers to

a) sequence of a-amino acids

b) fixed configuration of the polypeptide backbone

c) α -the helical backbone

d) hydrophobic interaction

10. At 25°C, ionic product constant Kw of water is 1.00×10^{-14}. Its value at 40°C is _____

a) 1.00×10^{-14} b) 1.14×10^{-14} c) 2.71×10^{-14} d) 2.95×10^{-14}

11. What is the oxidation state of the central metal ion in the complex, $[Pt(NO_2)(H_2O)(NH_3)_2]Br$?

a) +4 b) +2 c) +6 d) +3

12. The number of electrons that have a total charge of 9650 coulombs is ……..

(a) 6.022×10^{22} (b) 6.22×10^{23} (c) 6.022×10^{-34} (d) 6.022×10^{24}

13. Which one of the following is the strongest acid

(a) 4 – nitrophenol b) 2 – nitrophenol

(c) 3 – nitrophenol (d) 4 – chlorophenol

14. $CH_3Br \xrightarrow{KCN} (A) \xrightarrow{H_3O^+} (B) \xrightarrow{PCl_5} (C)$ product (C) is

a) chloro acetic acid

b) α- chlorocyano ethanoic acid

c) acetylchloride

d) none of these

15. Extraction of gold and silver involves leaching with cyanide ion. silver is later recovered by

a) Displacement with zinc b) Distillation

c) liquation d) Zone refining

PART-II

II. ANSWER ANY 6 QUESTIONS (Q.NO:24 IS COMPULSORY). (6 X 2 = 12)

16. Which type of ores can be concentrated by froth flotation method? Give two examples for such ores.

- ***Sulphide ores*** can be concentrated by froth flotation method.
- Eg. Galena(PbS) and zinc blend (ZnS).

17. What happens when PCl5 is heated?

On heating phosphorous pentachloride, it decomposes into phosphorus trichloride and chlorine.

$$PCl_5(g) \longrightarrow PCl_3(g) + \underset{(Excess)}{Cl_2(g)}.$$

18. Why do Zirconium and Hafnium exhibit similar properties?

- Zirconium and Hafnium exhibit similar properties due to lanthanoid contraction.
- Similar ionic radius and hence exhibits similar properties.

Series	Element	Atomic radius
4d series	Zr	145 pm
5d Series	Hf	144 pm

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. Define Equivalent Conductance.

The conductance of one gram equivalent of an electrolytic solution is called Equivalent conductance.

$$\lambda_c = \frac{\kappa \times 10^{-3}}{C} \qquad \text{Unit} \Rightarrow S.m^2 gram.eq^{-1}$$

21. Peptising agent is added to convert precipitate into colloidal solution. Explain with an example.

1. Ions either positive or negative of peptizing agent (electrolyte) are adsorbed on the particles of precipitate. They repel and hit each other and break the particles of the precipitate into colloidal size.

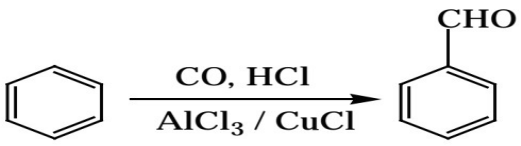
2. For example, when we add a small volume of very dilute hydrochloric acid solution peptising agent to a fresh precipitate of a silver chloride, it leads to formation of silver chloride colloidal solution,

Ex: $\underset{\text{Precipitate}}{AgCl} \xrightarrow{HCl} \underset{\text{colloid}}{AgCl}$

22. Write Gattermann- Koch reaction.

This reaction is a variant of Friedel – Crafts acylation reaction.

Reaction of carbon monoxide and HCl generate an intermediate which reacts like formyl chloride.



23. How drugs are classified?

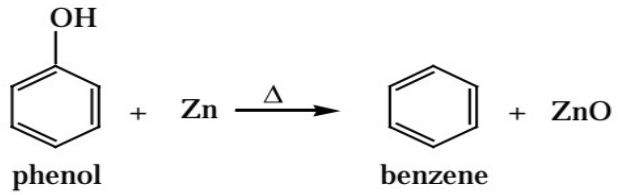
Classification based on i. The chemical structure

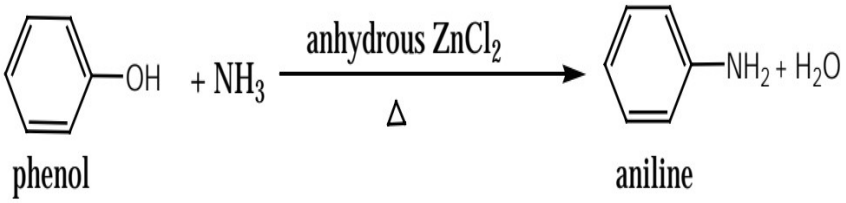
ii. Pharmacological effect

iii. Target system (drug action)

iv. Site of action (molecular target)

24. Find the products X and Y in the following reactions.





PART - III

III ANSWER ANY 6 QUESTIONS (Q.NO:33 IS COMPULSORY). (6 X 3 = 18)

25. Describe a method for refining nickel.

The impure nickel is heated in a stream of carbon monoxide at around 350K. The nickel reacts with the CO to form a highly volatile nickel tetracarbonyl. The solid impurities are left behind.

$$Ni\ (s) + 4\ CO\ (g) \rightarrow Ni(CO)_4(g)$$

On heating the nickel tetracarbonyl around 460 K, the complex decomposes to give pure metal.

$$Ni(CO)_4\ (g) \rightarrow Ni\ (s) + 4\ CO\ (g)$$

26. Write about the bleaching action of sulphur dioxide.

In presence of water, sulphurdioxide bleaches coloured wool, silk, sponges and straw into colourless due to its reducing property.

$$SO_2 + 2H_2O \longrightarrow H_2SO_4 + 2[H]$$
$$X + 2[H] \longrightarrow XH_2$$

Coloured colourless

27. What are hydrate isomer?

When solvent molecules like water are exchange by the ligands in the crystal lattice of the coordination compounds is called solvate isomerism.

Eg : -

$[Cr(H_2O)_6]Cl_3$	Violet colour
$[Cr(H_2O)_5\ Cl]Cl2.H_2O$	Pale green colour
$[Cr(H_2O)_4\ Cl_2]Cl.2H_2O$	Dark green colour

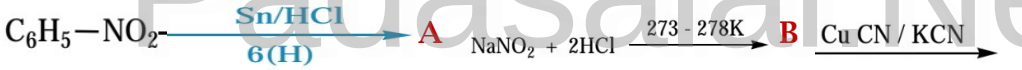
28. Distinguish between Tetrahedral and Octahedral voids

Tetrahedral voids	Octahedral voids
When the spheres of the second layer is above the voids of the first layer is called as Tetrahedral voids	When the spheres of the second layer partially covers the voids of the first layer is called as Octahedral voids
The number of Tetrahedral voids is given by '2n'. where 'n' is the closed packed sphere.	The number of Octahedral voids is given by 'n'. where 'n' is the closed packed spheres.
There are 3 spheres in the lower layer and one in the upper layer. Total 4 spheres.	There are 3 lspheres in the power layer and 3 in the upper layer. Total 6 spheres.
When the 4 spheres are joined the center gives a Tetrahedron.	When the 6 spheres are joined the center gives a Octahedron

29. What are the limitations of Freundlich adsorption isotherm?

- Freundlich equation is purely empirical and valid over a limited pressure range.
- The values of constants 'k' and 'n' also found vary with temperature.
- No theoretical explanations were given.

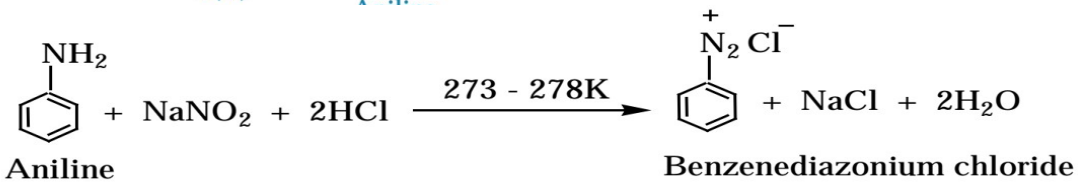
30. Identify compounds A,B and C in the following sequence of reaction.



Answer:

i) $C_6H_5-NO_2 \xrightarrow[6(H)]{Sn/HCl} C_6H_5-NH_2$ (acid medium) A – Aniline

ii)



(B)

iii) $C_6H_5 - \overset{+}{N}_2\overset{-}{Cl} \xrightarrow{Cu\ CN\ /\ KCN} C_6H_5 - CN + N_2$

Cyanobenzene

(C)

31. What is Condensation Polymer?

Condensation polymers are formed by the reaction between functional groups an adjacent monomer with the elimination of simple molecules like H_2O, NH_3 etc….

Each monomer must undergo at least two substitution reactions to continue to grow the polymer chain i.e., the monomer must be at least bi functional.

Examples : Nylon– 6,6, terylene

32. Mention any three functions of lipids in living organism.

- Lipids are the integral component of cell membrane.
- The main function of triglycerides(lipids)in animals is as an energy reserve.
- They act as protective coating in aquatic organisms.
- Lipids of connective tissues give protection to internal organs

33. The rate constant for a first order reaction is 1.54 x 10^{-3} s^{-1}. Calculate its half life time.

We know that, $t_{1/2} = 0.693/ k$

$t_{1/2} = 0.693/1.54x\ 10^{-3}\ s^{-1} =$ **450 s**

PART-IV

IV ANSWER ALL THE QUESTIONS. **(5 X 5 =25)**

34. a) i)Describe the role of the following in the process mentioned.

(1) Cryolite inthe extraction of aluminium

(2) Iodine in the refining of zirconium.

(1) Cryolite in the extraction of aluminium	As $Al_2O_3$is a poor conductor Cryolite improves the electrical conductivity. Cryolite lowers the melting point and acts as solvent
(2) Iodine in the refining of zirconium	To form of volatile compound so as to give pure metal on decomposition

ii) State any three properties of inter halogen compounds.

- The central atom will be the larger one
- It can be formed only between two halogen and not more than two halogens.
- Fluorine can't act as a central metal atom being the smallest one
- They can undergo the auto ionization.
- They are strong oxidizing agent

(OR)

34. b) i) How will you identify borate radical?

When boric acid or borate salt is heated with ethyl alcohol in presence of conc. sulphuric acid, an ester, triethylborate is formed. The vapour of this ester burns with a green edged flame and this reaction is used to identify the presence of borate.

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

ii) **Give uses of Borax.**

1. Borax is used for the identification of coloured metal ions
2. In the manufacture optical and borosilicate glass, enamels and glazes for pottery
3. It is also used as a flux in metallurgy and also acts as a preservative

35. a) Describe the preparation of potassium dichromate.

Potassium dichromate is prepared from chromite ore. The ore is concentrated by gravity separation. It is then mixed with excess sodium carbonate and lime and roasted in a reverberatory furnace.

$$4\,FeCr_2O_4 + 8\,Na_2CO_3 + 7\,O_2 \xrightarrow{900 - 1000^0C} 8\,Na_2CrO_4 + 2\,Fe_2O_3 + 8\,CO_2 \uparrow$$

The roasted mass is treated with water to separate soluble sodium chromate from insoluble iron oxide. The yellow solution of sodium chromate is treated with concentrated sulphuric acid which converts sodium chromate into sodium dichromate.

$$\underset{\substack{\text{sodium chromate}\\(\text{yellow})}}{2\,Na_2CrO_4} + H_2SO_4 \longrightarrow \underset{\substack{\text{sodium dichromate}\\(\text{orange red})}}{Na_2Cr_2O_7} + Na_2SO_4 + H_2O$$

The above solution is concentrated to remove less soluble sodium sulphate. The resulting solution is filtered and further concentrated. It is cooled to get the crystals of $Na_2SO_4.2H_2O$.

The saturated solution of sodium dichromate in water is mixed with KCl and then concentrated to get crystals of NaCl. It is filtered while hot and the filtrate is cooled to obtain $K_2Cr_2O_7$ crystals.

$$\underset{\substack{\text{sodium dichromate}\\(\text{orange red})}}{Na_2Cr_2O_7} + 2KCl \longrightarrow \underset{\substack{\text{potassium dichromate}\\(\text{orange red})}}{K_2Cr_2O_7} + 2NaCl$$

(OR)

35. b) Write the postulates of Werner's theory.

There are two type of valencies namely a) Primary and b) Secondary valency

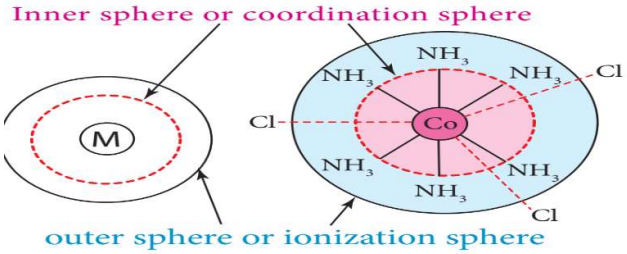
PRIMARY VALENCY	SECONDARY VALENCY
1, oxidation number of the central metal ion	1, Coordination number of the central metal ion.
2, Ionisable valency	2, Non ionisable valency

3, Always satisfied by negative ions	3, Satisfied by negative ions (or) neutral molecules (or) positive ions.
4, It is non directional	4, It is directional
Ex :- $[Ni(NH_3)_4]^{2+}$ primary valency is 2	Ex :- $[Ni(NH_3)_4]^{2+}$ secondary valency is 4 tetrahedral

❖ The inner sphere is called the coordination sphere and the groups present in this sphere are firmly attached to the central metal ion.

❖ The outer sphere is called the ionisation sphere. The groups present in this sphere are loosely attached to the central metal ion.

❖ Structure of compound $[Co(NH_3)_6]Cl_3$



36. a) i) Write a short note on metal excess defect with an example.

- ❖ Arises due to presence of more number of metal ions ascompared to anions
- ❖ For example : When NaCl crystal are heated in the presenceof sodium vapourNa+ions are formed and are deposited on thesurface of the crystal
- ❖ Chloride ions (Cl–) ions diffuse to the surface from the latticepoint and combine with Na+ ion
- ❖ The electron lost by the sodium vapour diffuse into the crystallattice and occupie the vacancy created by Cl– ions
- ❖ Such anionic Vacancies which are occupied by unpairedelectrons are called F – Centers.
- ❖ Hence the formula of NaCl which contains Na+ ions can bewritten as $Na_{1+x}Cl$.

ii) 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.

Example: Acid hydrolysis of an ester.

$$CH_3\text{-}COOCH_3 + H_2O \xrightarrow{H^+} CH_3\text{-}COOH + CH_3\text{-}OH$$

(OR)

36. b) Calculate the pH of 0.1 M CH_3COOH solution. Dissociation constant of acetic acid is 1.8×10^{-5}.

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

For weak acids,

$[H^+] = \sqrt{K_a \times C}$

$= \sqrt{1.8 \times 10^{-5} \times 0.1}$

$= 1.34 \times 10^{-3} M$ $\quad pH = -\log(1.34 \times 10^{-3})$

$= 3 - \log 1.34$

$= 3 - 0.1271$

$= 2.8729 \simeq 2.87$

37 a) Derive an expression for Nernst equation.

Let us consider an electrochemical cell for which the overall redox reaction is,

$$xA + yB \leftrightharpoons lC + mD$$

The reaction quotient Q for the above reaction is $Q = \frac{[C]^l\ [D]^m}{[A]^x\ [B]^Y}$

$$\Delta G = \Delta G^0 + RT \ln Q$$

Gibbs free energy can be related to the cell emf as follows

$$\Delta G = -nFE_{cell} \quad ; \quad \Delta G^0 = -nFE^0_{cell}$$

Substituting these values,

$$-nFE_{cell} = -nFE^0_{cell} + RT \ln \frac{[C]^l\ [D]^m}{[A]^x\ [B]^Y}$$

Dividing by – nF on both sides,

$$E_{cell} = E^0_{cell} + RT \ln \frac{[C]^l\ [D]^m}{[A]^x\ [B]^Y}$$

$\ln = 2.303 \log$

$$E_{cell} = E^0_{cell} - 2.303 \times \frac{RT}{nF} \ln \frac{[C]^l\ [D]^m}{[A]^x\ [B]^Y}$$

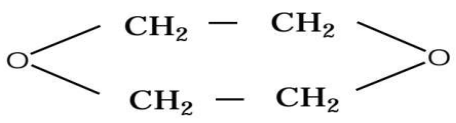
(OR)

b) How will you convert (i) Ethyl alcohol → Ethene

(ii) Ethylene glycol → 1,4-dioxane

(iii) Glycerol → Acrolein

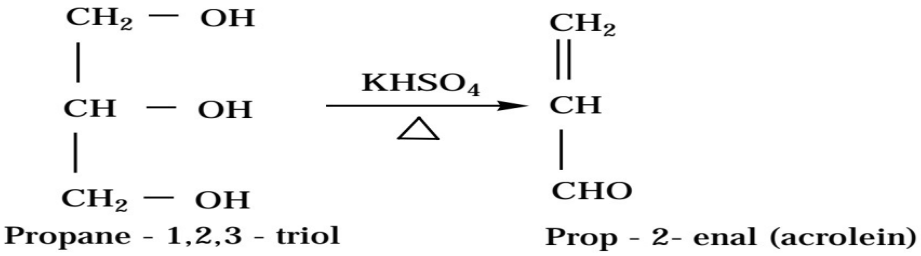
i) $CH_3 - CH_2 - OH \xrightarrow[443\ K]{H_2SO_4} CH_2 = CH_2 + H_2O$

ii) $HO - CH_2 - CH_2 - OH \xrightarrow[-2H_2O]{Con\ H_2SO_4}$ 

ethane - 1,2 - diol

1,4 - dioxane

iii)

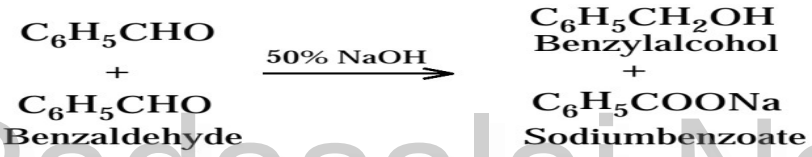


Propane - 1,2,3 - triol Prop - 2- enal (acrolein)

38. a) An organic compound with the molecular formula of C_7H_6O undergoes Cannizaro reaction. Compound (A) also reacts with chlorine in presence of concentrated ferric chloride to give compound (B). Compound (A) reacts with chlorine in the presence of absence of catalyst to give compound (C). Identify A B and C with suitable reactions.

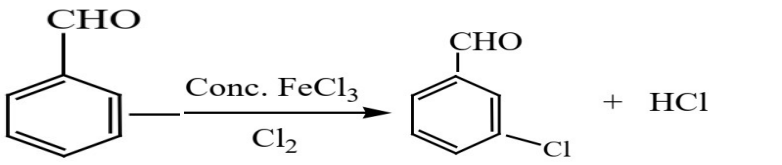
Compound (A) is C_6H_5CHO – BENZALDEHYDE

i) Benzaldehyde on treatment with concentrated NaOH (50%) gives benzyl alcohol and sodium benzoate.



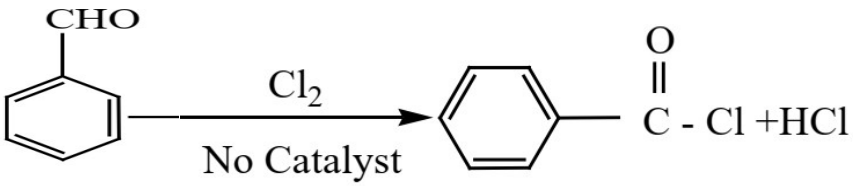
This reaction is called Cannizaro reaction.

ii) BENZALDEHYDE reacts with chlorine in presence of concentrated ferric chloride to give compound (B) (m-chlorobenzaldehyde)

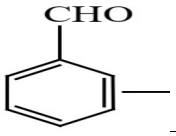
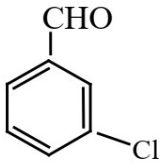
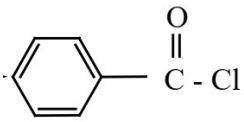


m - chlorobenzaldehyde

iii) BENZALDEHYDE reacts with chlorine in the presence of absence of catalyst to give compound (C) (Benzoyl chloride)



Benzoyl chloride

COMPOUND A	BENZALDEHYDE	
COMPOUND B	m-CHLOROBENZALDEHYDE	
COMPOUND C	BENZOYL CHLORIDE	

(OR)

38. b) i) How will you distinguish between nitro and aci form of CH_3NO_2?

Nitro form	Aci form
1. Less Acidic	1. More acidic
2. Dissolves in NaOH slowly	2. Instantly.
3. decolourless $FeCl_3$solution.	3. Gives Reddish Brown colour.
4. Electrical conductivity is low.	4. High.

ii) What are the different types of RNA which are found in cell?

RNA molecules are classified into three major types.

- ❖ Ribosomal RNA (rRNA)
- ❖ Messenger RNA (mRNA)
- ❖ Transfer RNA (tRNA)

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