PUBLIC EXAMINATION –SEPTEMBER - 2020

XII- CHEMISTRY – ANSWER KEY

PART-I

1	d	In the metallurgy of gold ,the metal is leached with dilute sodium chloride solution.
2	c	Al
3	d	$Na_2B_4O_7.10H_2O$
4	d	Phosphine
5	d	Group number 3 and period number 6
6	c	$[Co(NH_3)_3Cl_3]$
7	b	68%
8	a	First order
9	c	OH- and F- respectively
10	a	Adsorption is exothermic
11	b	SN2 Mechanism
12	a	$(CH_3)_2C(OH)C_6H_5$
13	a	Thorpe nitrile condensation
14	d	Vitamin B_2
15	a	(1)-(iii) (2)-(iv) (3)-(i) (4) - (ii)

PART-II

16 Explain the following terms with suitable example.

i) Gangue:

- The non metallic impurities, rocky materials and siliceous matter present in the ores are called gangue.
- Eg : SiO_2 is the gangue present in the iron ore Fe_2O_3 .

ii) Slag:

- Slag is a fusible chemical substance formed by the reaction of gangue with a flux.

$$\underset{\text{Flux}}{CaO_{(s)}} + \underset{\text{gangue}}{SiO_{2(s)}} \rightarrow \underset{\text{slag}}{CaSiO_{3(s)}}$$

17 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 (low temperature science).
- It is much less denser than air and hence used for filling air balloons

18 **What are interstitial compound?**

- An interstitial compound or alloy is a compound that is formed when small atoms like hydrogen, boron, carbon or nitrogen are trapped in the interstitial holes in a metal lattice. They are usually non-stoichiometric compounds.
- **Example:** TiC, ZrH , Mn_4 N

19 **Distinguish between Isotropy and Anisotropy**

Isotropy

- Isotropy means uniformity in all directions.
- In solid state isotropy means having identical values of physical properties such as refractive index, electrical conductance etc., in all directions.

Anisotropy

- Anisotropy is the property which depends on the direction of measurement.
- Crystalline solids are anisotropic and they show different values of physical properties when measured along different directions.

20 **The rate of the reaction is x + 2y →product is 4×10^{-3}mol $L^{-1}s^{-1}$, if [x] = [y] = 0.2M and rate constant at 400K is 2×10^{-2} s^{-1}, What is the overall order of the reaction.**

$$\text{Rate} = k\,[x]^n[y]^m$$

$$4 \times 10^{-3}\,\text{mol L}^{-1}\text{s}^{-1} = 2 \times 10^{-2}\,\text{s}^{-1}(0.2\,\text{mol L}^{-1})^n(0.2\,\text{mol L}^{-1})^m$$

$$\frac{4 \times 10^{-3}\,\text{mol L}^{-1}\text{s}^{-1}}{2 \times 10^{-2}\,\text{s}^{-1}} = (0.2)^{n+m}\left(\text{mol L}^{-1}\right)^{n+m}$$

$$0.2\left(\text{mol L}^{-1}\right) = (0.2)^{n+m}\left(\text{mol L}^{-1}\right)^{n+m}$$

Comparing the powers on both sides

The overall order of the reaction $n + m = 1$

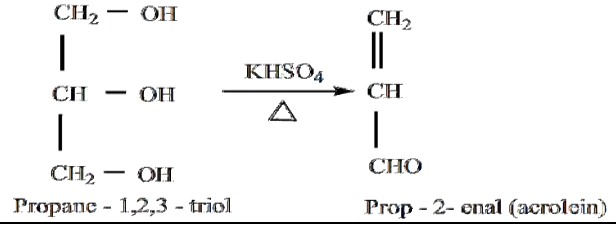
21 **Calculate the pH of 0.1M CH_3COONa Solution.**

$$pH = 7 + \frac{pK_a}{2} + \frac{\log C}{2}$$

$$= 7 + \frac{4.74}{2} + \frac{\log 0.1}{2} = 7 + 2.37 - 0.5$$

$$= 8.87$$

22 **Convert glycerol to acrolein**

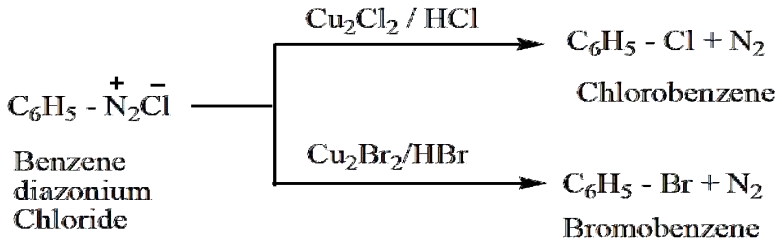


Propane - 1,2,3 - triol Prop - 2- enal (acrolein)

23 **Write a note on denaturation of protein.**

- The process of a losing its higher order structure without losing the primary structure, is called denaturation.
- When a protein denatures, its biological function is also lost.
- Example: coagulation of egg white by action of heat.

24 **How is aryl halide prepared by using Cu_2Cl_2/HCl or Cu_2Br_2/HBr**



PART-III

25 **What are the factors responsible for the anomalous behaviour of elements of the p-block ?**

- ❖ Small size of the first member
- ❖ High ionisation enthalpy and high electronegativity
- ❖ Absence of d orbitals in their valance shell.

26 **Which metal in 3d series exhibits +1 oxidation state most frenquently and why?**

- ❖ Copper exhibits +1 oxidation state in the 3d series.

Reason :

- ❖ Electronic configuration of **Cu** = $\mathbf{[Ar]3d^{10}4s^1}$
- ❖ It can easily lose 4s1 electron to give stable $\mathbf{3d^{10}}$ configuration. Hence, it exhibits +1 oxidation state.

27 **Mention the metal complexes and its metal ions are used in biological system**

COORDINATION COMPLEX	CENTRAL METAL ION	USES
RBC COMPOSED OF HEME GROUP	Fe^{2+}	Carrying oxygen from lungs to tissue, CO_2 from tissue to lungs
CHLOROPHYLL	Mg^{2+}	Photosynthesis
VITAMIN B12 (cyanocobalamine)	Co^{+}	The only vitamin consist of metal ion.
CARBOXYPEPTIDASE protease enzyme	Zinc ion	hydrolytic enzyme important in digestion,

28 **Define ionic product of water. Give its value at room temperature.**

- $H_2O + H_2O \rightleftharpoons H_3O^+ + OH^-$ $\quad K = \frac{[H_3O^+][OH^-]}{[H_2O]^2}$
- Concentration of pure liquid water is one $[H_2O]^2 = 1$,
- **Ionic product of water** $\mathbf{K_w = [H_3O^+][OH^-]}$
- Ionic product of water is defined as product of concentration of $\mathbf{[H_3O^+]}$ **and** $\mathbf{[OH^-]}$ in water at particular temperature.
- $\mathbf{K_w} = \mathbf{[H_3O^+][OH^-]} = [1 \times 10^{-7}][1 \times 10^{-7}] = [1 \times 10^{-14}]$

29 **What is inversion of phase ? Give an example**

Inversion of Phase:

- The change of W/O emulsion into O/W emulsion is called inversion of phases.

For example:

- An oil in water emulsion containing potassium soap as emulsifying agent can be converted into water in oil emulsion by adding $\mathbf{CaCl_2}$ or $AlCl_3$.

30 **Explain Benedict's solution test**

Benedict's solution Test:

- Benedicts solution is a mixture of $CuSO_4$ + sodium citrate + NaOH.
- Cu^{2+} is reduced by aldehyde to give red precipitate of cuprous oxide.

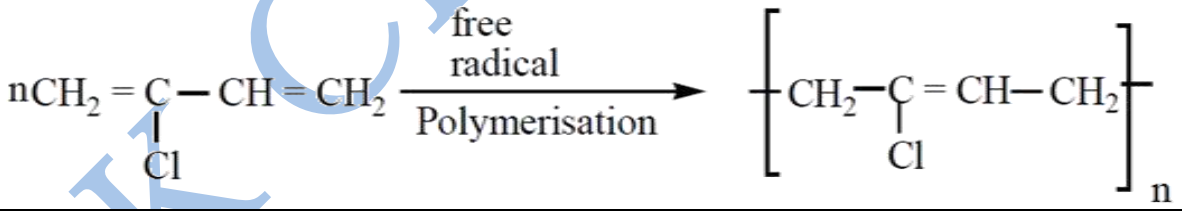
$$\mathbf{CH_3\,CHO + 2Cu^{2+} + 5OH^- \rightarrow CH_3COO^- + Cu_2O + 3H_2O}$$

31 **Write any biological importance of lipids**

* Lipids are the integral component of cell membrane. They are necessary of structural integrity of the cell.
* The main function of triglycerides in animals is as an energy reserve. They yield more energy than carbohydrates and proteins.
* They act as protective coating in aquatic organisms.
* Lipids of connective tissue give protection to internal organs.
* Lipids help in the absorption and transport of fat soluble vitamins.
* They are essential for activation of enzymes such as lipases.
* Lipids act as emulsifier in fat metabolism.

32 **How is neoprene prepared?**

❖ The free radical polymeristion of the monomer, 2-chloro buta-1,3-diene(chloroprene) gives neoprene.



33 **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 $\mathbf{Ag^+ + e^- \rightarrow Ag}$ (reduction)

$$m = ZIt$$

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

$$I = 2A$$

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

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

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

$$m = 2.68\ g.$$

PART-IV

34

a **i** **What are the differences between minerals and ores?**

Mineral	Ore
A naturally occurring substance obtained by mining which contains the metal in free state (or) in the form of compounds.	The minerals that contains a high percentage of metal from which metal can be extracted conveniently and economically.
All minerals are nor ores	All ores are minerals
e.g: Bauxite and china clay are minerals of aluminium	**e.g:** Bauxite is an ore of aluminium

ii **Give the balanced equation for the reaction between chlorine with cold NaOH and hot NaOH.**

- Chlorine reacts with cold NaOH to give sodium chloride and sodium hypochlorite.

$$Cl_2 + 2\,NaOH \rightarrow NaOCl + NaCl + H_2O$$

Sodium hypochlorite

- Chlorine reacts with hot NaOH to give sodium chloride and sodium chlorate.

$$3Cl_2 + 6NaOH \rightarrow NaClO_3 + 5\,NaCl + 3H_2O$$

Sodium chlorate

OR

b **i** **What is cetanation**

❖ Catenation is an ability of an element to form chain of atoms. The following conditions are necessary for catenation.

ii **Write a short note on Holmes signal**

In a ship, a pierced container with a mixture of calcium carbide and calcium phosphide, liberates phosphine and acetylene when thrown into 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**.

35

a **i** **Write the postulates of Werner's theory**

❖ Most of the elements exhibit, two types of valence.
- Primary valence
- Secondary valence

❖ Primary valence is referred as the oxidation state of the metal atom and the Secondary valence as the coordination number.

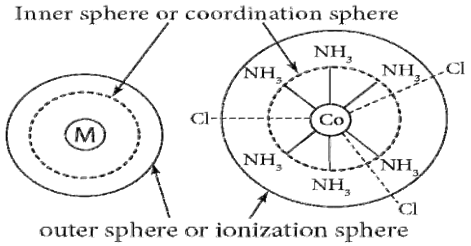
❖ The primary valence of a metal ion is positive in most of the cases and zero in certain cases. They are always satisfied by negative ions.

❖ The secondary valence is satisfied by negative ions, neutral molecules, positive ions or the combination of these.

❖ According to Werner, there are two spheres of attraction around a metal atom/ion in a complex.
- The inner sphere is known as coordination sphere.

- The outer sphere is called ionisation sphere.

❖ The primary valences - non-directional
❖ the secondary valences - directional.
❖ The geometry of the complex is determined by the spacial arrangement of the groups which satisfy the secondary valence.

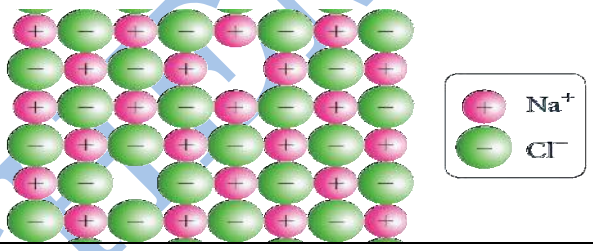


❖ Six - octahedral geometry.
❖ Four -either tetrahedral or square planar geometry.

OR

b i Explain Schottky defect.

- Schottky defect arises due to the missing of equal number of cations and anions from the crystal lattice.
- This effect 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.

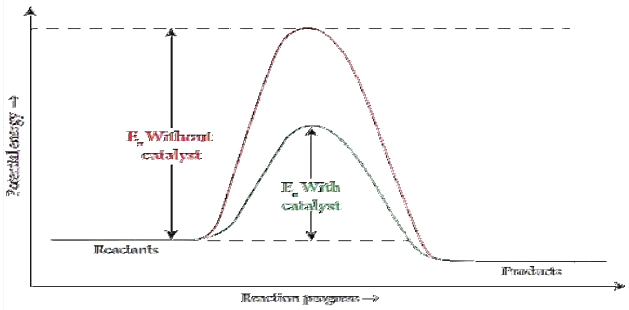


ii Identity the auto catalyst in following reaction.

Reactions	Auto catalysis
$CH_3COOC_2H_5 + H_2O \rightarrow CH_3COOH + C_2H_5OH$	Acetic acid
$2AsH_3 \rightarrow 2As + 3H_2$	Arsenic

Explain the effect of catalyst on reaction rate with an example

In the presence of a catalyst, the energy of activation is lowered and hence, greater number of molecules can cross the energy barrier and change over to products, thereby increasing the rate of the reaction.



ii Classify the following into Lewis acid and Lewis bases.

❖ Lewis acid : $\mathbf{BF_3}$, $\mathbf{CO_2}$
❖ Lewis bases : $\mathbf{MgO}$, $\mathbf{CH_3^-}$

or

b i Derive an expression for Nernst equation.

- Nernst equation is the one which relates the cell potential and the concentration of the species involved in an electrochemical reaction.
- Let us consider an electrochemical cell for which the overall redox reaction is,

$$xA + yB \rightleftharpoons lC + mD$$

The reaction quotient Q for the above reaction is given below

$$Q = \frac{[C]^l\ [D]^m}{[A]^x\ [B]^y}$$

We have already learnt that,

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

$$\Delta G = -nFE_{cell} \quad ; \Delta G^\circ = -nFE^\circ_{cell}$$

Substitute these values and Q from

$$\Rightarrow -nFE_{cell} = -nFE^\circ_{cell} + RT \ln \frac{[C]^l[D]^m}{[A]^x\ [B]^y}$$

Divide the whole equation by (-nF)

$$\Rightarrow E_{cell} = E^\circ_{cell} - \frac{RT}{nF} \ln \frac{[C]^l[D]^m}{[A]^x\ [B]^y}$$

$$\text{(or) } E_{cell} = E^\circ_{cell} - \frac{2.303RT}{nF} \log \frac{[C]^l[D]^m}{[A]^x\ [B]^y}$$

The above equation is called the Nernst equation

$$E_{cell} = E^\circ_{cell} - \frac{2.303 \times 8.314 \times 298}{n(96500)} \log \frac{[C]^l[D]^m}{[A]^x\ [B]^y}$$

$$E_{cell} = E^\circ_{cell} - \frac{0.0591}{n} \log \frac{[C]^l[D]^m}{[A]^x\ [B]^y}$$

37

a i Name the factors affecting adsorption

- ❖ Nature of adsorbent
- ❖ Nature of adsorbate
- ❖ Pressure
- ❖ Concentration at a given temperature.

ii Explain auto oxidation of ether.

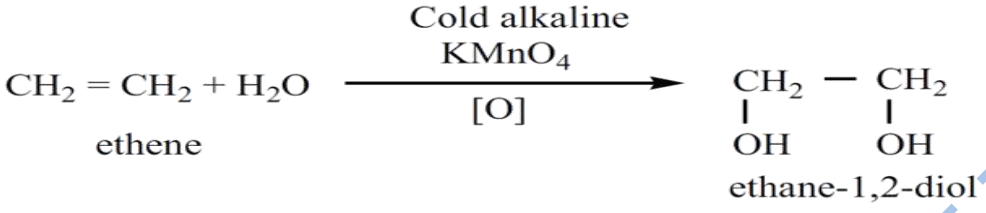
- ❖ When ethers are stored in the presence of atmospheric oxygen, they slowly oxidise to form hydroperoxides and dialkylperoxides.
- ❖ These are explosive in nature. Such a spontaneous oxidation by atmospheric oxygen is called autooxidation.

$$\underset{\text{ethoxyethane}}{CH_3\text{-}CH_2\text{-}O\text{-}CH_2\text{-}CH_3} \xrightarrow[\text{slow}]{\text{excess}O_2} \underset{\text{1-ethoxyethyl hydroperoxide}}{CH_3\text{-}CH_2\text{-}O\text{-}CH(O\text{-}O\text{-}H)\text{-}CH_3} + \underset{\text{diethylperoxide}}{CH_3\text{-}CH_2\text{-}O\text{-}O\text{-}CH_2\text{-}CH_3}$$

OR

b i What is baeyer's reagent? How its useful to convert ethen to ethane 1,2 diol.

- Cold alkaline solution of potassium permanganate called Baeyer's reagent



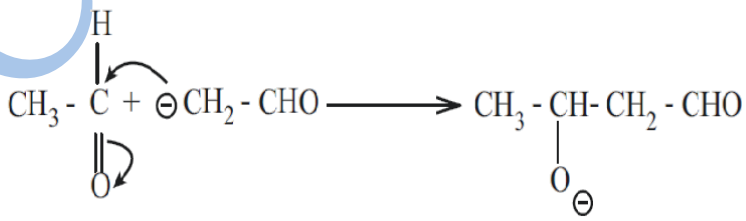
ii How do antiseptics differ from disinfectants

Antiseptics	Disinfectants
Stop or slow down the growth of micro organisms.	Stop or slow down the growth of micro organisms.
Applied to living tissue	Generally used on inanimated objects.
Example ❖ Hydrogen peroxide ❖ Povidine – Iodine ❖ (iii) Benzalkonium chloride	Example ❖ Chlorine compounds ❖ Alcohol ❖ (iii) Hydrogen peroxide

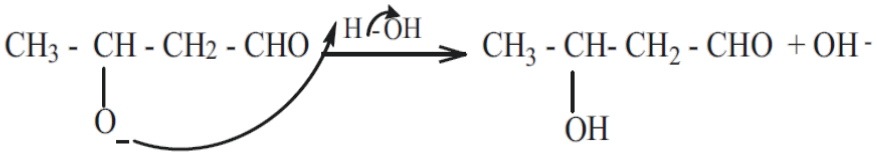
i Write the mechanism of aldol condensation reaction.

Step 1 : The carbanion is formed as the α - **hydrogen atom** is removed as a proton by the base.

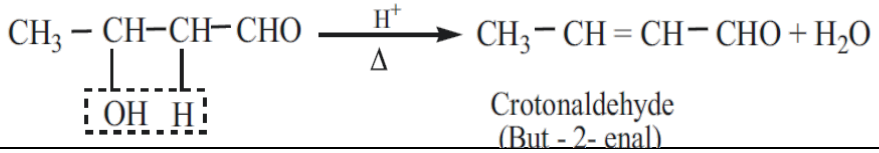
Step 2 : The carbanion attacks the carbonyl carbon of another unionized aldehyde to form an alkoxide ion.



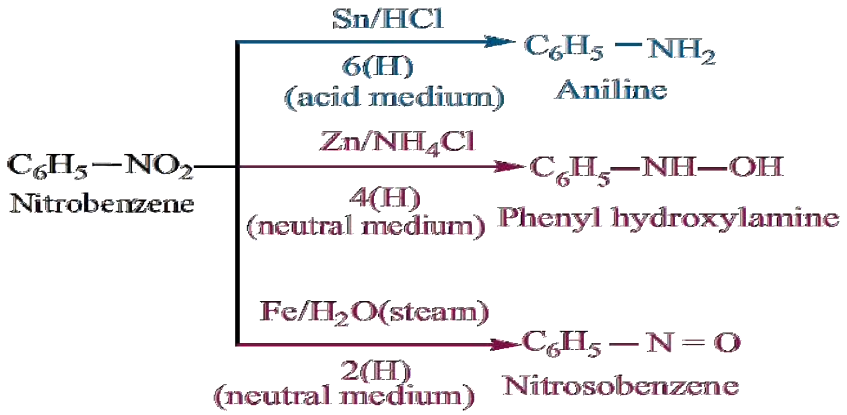
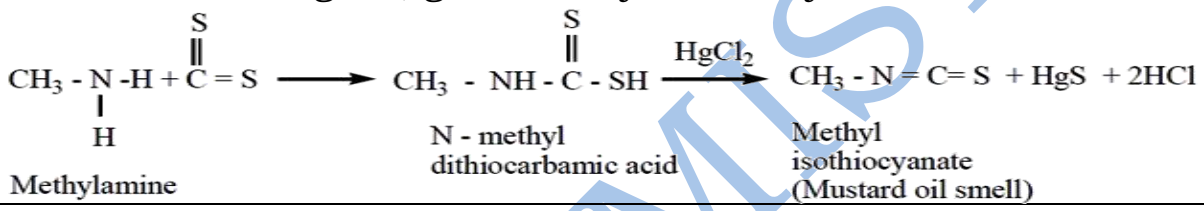
Step 3 : The alkoxide ion formed is protonated by water to form aldol.



The aldol rapidly undergoes dehydration on heating with acid to form α - β unsaturated aldehyde.



OR

b	i	**Name the reducing agent used in the reduction of nitrobenzene to the following compounds**
		
	ii	**Write mustard oil reaction**
		❖ When primary amines are treated with carbon disulphide (CS_2), N - alkyldithio carbonic acid is formed which on subsequent treatment with $HgCl_2$, give an alkyl isothiocyanate. 

*****Mark allotment may be as per GOVT answerkey**

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