PUBLIC EXAMINATION – MAY - 2022
XII- CHEMISTRY – ANSWER KEY

	PART - A	
I.	ANSWER THE FOLLOWING QUESTIONS. $[15 \times 1 = 15]$	
	TYPE - A	**TYPE - B**
1	c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$	c) Glycine
2	a) $Al_2O_3.nH_2O$	c) methanal
3	b) 30 minutes	c) basic
4	a) Sn / HCl	d) FeO
5	c) methanal	c) Hydrolysis of sucrose in presence of dil HCl
6	c) $[Fe(CO)_5]$	a) Sn / HCl
7	a) HPO_4^{2-}	d) charge carried by one mole of electrons
8	c) basic	a) $Al_2O_3.nH_2O$
9	c) Hydrolysis of sucrose in presence of dil HCl	b) 30 minutes
10	c) electrophilic addition	a) HPO_4^{2-}
11	d) +3	c) $[Fe(CO)_5]$
12	d) charge carried by one mole of electrons	d) +3
13	c) Glycine	c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$
14	d) FeO	c) liquid in gas
15	c) liquid in gas	c) electrophilic addition

PART - B

II. **ANSWER ANY SIX QUESTIONS. (Q.No : 24 is compulsory)** $[6 \times 2 = 12]$

16 **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

17 **Which is more stable? Fe^{3+} or Fe^{2+}- explain.**

	Fe^{3+}	Fe^{2+}
	Electronic configuration =[Ar] $3d^5 4s^0$	Electronic configuration =[Ar] $3d^6 4s^0$
	It consists of 5 unpaired electrons	It consists of 4 unpaired electrons.
	Hence HALF FILLED Fe^{3+} is more stable than PARTIALLY FILLED Fe^{2+}	

18 **Define coordination number.**

The number of ligand donor atoms bonded to a central metal ion in a complex is called the coordination number of the metal.

Or

The neighbouring atoms surrounded by each atom is called coordination number.

19 **Define covalent solids.**

- In covalent solids, the constituents (atoms) are bound together in a three dimensional network entirely by covalent bonds.
- Examples: Diamond, silicon carbide etc.

20 **Give examples for the first order reaction.**

Examples for the first order reaction

1) Decomposition of dinitrogen pentoxide $N_2O_{5(g)} \rightarrow 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$
2) Decomposition of thionyl chloride $SO_2Cl_{2(l)} \rightarrow SO_{2(g)} + Cl_{2(g)}$
3) Decomposition of the H_2O_2 in aqueous solution $H_2O_{2(aq)} \rightarrow H_2O_{(i)} + \frac{1}{2}O_{2(g)}$
4) Isomerisation of cyclopropane to propene.

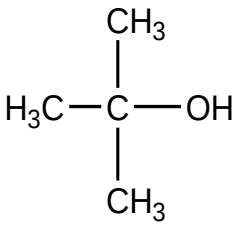
21 **What are the limitations of Arrhenius concept?**

- Arrhenius theory does not explain the behaviour of acids and bases in non-aqueous solvents such as acetone, Tetrahydrofuran etc
- This theory does not account for the basicity of the substances like ammonia (NH_3) which do not possess hydroxyl group.

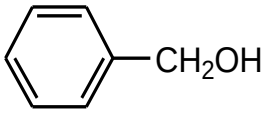
22 **Write a note on electrophoresis**

- When electric potential is applied across two platinum electrodes dipped in a hydrophilic sol, the dispersed particles move toward one or other electrode.
- This migration of sol particles under the influence of electric field is called electrophoresis or cataphoresis.

23 **Give the IUPAC names.**



2-methylpropan-2-ol



Phenyl methanol

24 **Identify A and B in the following sequence of reactions.**

$$CH_3Br \xrightarrow{NaN_3} CH_3N_3 \xrightarrow{LiAlH_4} CH_3NH_2 + N_2$$

A – Methyl azide

B – Methylamine

PART - C

III **ANSWER ANY SIX QUESTIONS. (Q.No : 33 is compulsory)** $[6 \times 3 = 18]$

25 **What are interhalogen compounds? Give examples.**

- Each halogen combines with other halogen to form a series of compounds called interhalogen compounds
- Eg : ClF, BrCl, IF_7

26 **What are the properties of interstitial compounds?**

1) They are hard and show electrical and thermal conductivity
2) They have high melting points higher than those of pure metals
3) Transition metal hydrides are used as powerful reducing agents
4) Metallic carbides are chemically inert.

27 **Write Arrhenius equation and explains the terms involved.**

$\mathbf{k = A\ e^{\frac{-E_a}{RT}}}$

Where

A - the frequency factor,

R - the gas constant,

E_a -the activation energy of the reaction and,

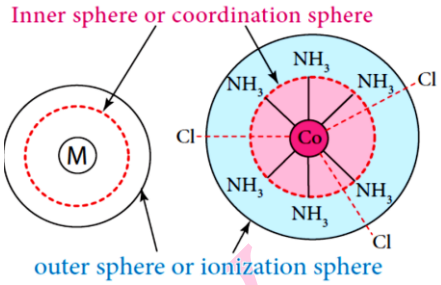
T - the absolute temperature (in K)

28	**What are the Factors affecting electrolytic conductance**
	• If the interionic attraction between the oppositely charged ions of solutes increases, the conductance will decrease. • Solvent of higher dielectric constant show high conductance in solution. • Conductance is inversely proportional to the Viscosity of the medium. i.e., conductivity increases with the decrease in viscosity. • If the temperature of the electrolytic solution increases, conductance also increases. Increase in temperature increases the kinetic energy of the ions and decreases the attractive force between the oppositely charged ions and hence conductivity increases. • Molar conductance of a solution increases with increase in dilution. This is because, for a strong electrolyte, interionic forces of attraction decrease with dilution. For a weak electrolyte, degree of dissociation increases with dilution.
29	**What is homogeneous catalysis? Give example.**
	In a homogeneous catalysed reaction, the reactants, products and catalyst are present in the same phase. $$\mathbf{2SO_{2(g)} + O_{2(g)} + [NO]_{(g)} \rightarrow 2SO_{3\,(g)} + [NO]_{(g)}}$$
30	**Write any one method of preparation for diethyl ether.**
	When ethanol is treated with con. H_2SO_4 at 413K, substitution competes over elimination to form ethers. $$\mathbf{2CH_3 - CH_2 - OH \xrightarrow{Conc\ H_2SO_4} CH_3 - CH_2 - O - CH_2 - CH_3}$$
31	**Write haloform reaction.**
	$$CH_3{-}\overset{\overset{O}{\|}}{C}{-}CH_3 \xrightarrow[NaOH]{3Cl_2} CCl_3{-}\overset{\overset{O}{\|}}{C}{-}CH_3 \xrightarrow{NaOH} CHCl_3 + CH_3{-}\overset{\overset{O}{\|}}{C}{-}ONa$$
32	**What are epimers ? give example**
	• Sugar differing in configuration at an asymmetric centre is known as epimers. **Example:** • glucose and mannose are epimers at C2 carbon • glucose and galactose are epimers at C4 carbon
33	**Write the following for the complex $[Ag(NH_3)_2]^+$**
	(a) Ligand - ammine (Neutral ligand) **(b) central metal ion** - silver(I) ion (Ag^+) **(c) IUPAC name** -diamminesilver(I) ion

PART - D		
34	**i.**	**Write a note on gravity separation**
		• The ore having high specific gravity is separated from the gangue that has low specific gravity by simply washing with running water. • Ore is crushed to a finely powdered form and treated with rapidly flowing current of water. • During this process the lighter gangue particles are washed away by the running water. • This method is generally applied to concentrate the native ore such as gold and oxide ores such as haematite (Fe_2O_3), tin stone (SnO_2) etc.
a)	**ii.**	**Explain the Mond's process of refining nickel**
		• The impure nickel is heated in a stream of carbon monoxide at around 350 K. The nickel reacts with the CO to form a highly volatile nickel tetracarbonyl. The solid impurities are left behind. $$Ni_{(s)} + 4\,CO_{(g)} \xrightarrow{350\ K} [Ni(CO)_4]_{(g)}$$ • On heating the nickel tetracarbonyl around 460 K, the complex decomposes to give pure metal. $$[Ni(CO)_4]_{(g)} \xrightarrow{460\ K} Ni_{(s)} + 4\,CO_{(g)}$$
		OR
b)	**i.**	**What is inert pair effect?**
		• The heavier post transition metals, the outer s electrons (ns) have a tendency to remain inert and show reluctance to take part in the bonding, which is known as inert pair effect.
	ii.	**What are the uses of boric acid?**
		• 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.
35	**i.**	**What are the uses of oxygen?**
		1. Oxygen is one of the essential component for the survival of living organisms. 2. It is used in welding (oxyacetylene welding) 3. Liquid oxygen is used as fuel in rockets etc...
a)	**ii.**	**How will you prepare bleaching powder?**
		Bleaching powder is produced by passing chlorine gas through dry slaked lime (calcium hydroxide). $$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$$

		OR
b)		**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** -tetrahedral or square planar geometry.

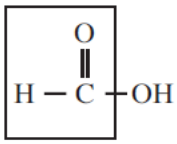
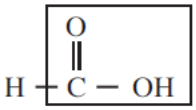


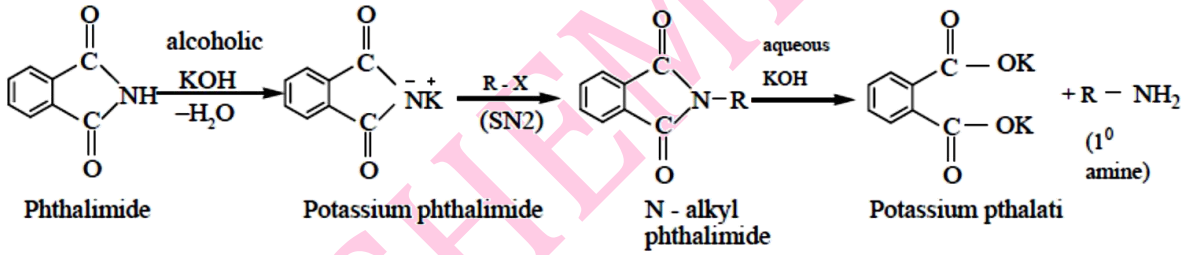
36 **Differentiate crystalline solids and amorphous solids.**

a)		**Crystalline solids**	**Amorphous solids**
1	Long range orderly arrangement of constituents.	Short range, random arrangement of constituents.
2	Definite shape	Irregular shape
3	Generally crystalline solids are anisotropic in nature	They are isotropic like liquids
4	They are true solids	They are considered as pseudo solids (or) super cooled liquids
5	Definite Heat of fusion	Heat of fusion is not definite
6	They have sharp melting points.	Gradually soften over a range of temperature and so can be moulded.
7	Examples: NaCl , diamond etc.,	Examples: Rubber , plastics, glass etc

b)	**i.**	**Define pH**
		• pH of a solution is defined as the negative logarithm of base 10 of the molar concentration of the hydronium ions present in the solution. • $\mathbf{pH = -\log [H_3O^+]}$

	ii.	**Explain common ion effect with an example.**
		• The dissociation of a weak acid (CH_3COOH) is suppressed in the presence of a salt (CH_3COONa) containing an ion common to the weak electrolyte. It is called the common ion effect. • For example, the addition of sodium acetate to acetic acid solution leads to the suppression in the dissociation of acetic acid which is already weakly dissociated. • In this case, CH_3COOH and CH_3COONa have the common ion , CH_3COO^- • Acetic acid(CH_3COOH) is a weak acid. Hence it is not completely dissociated in aqueous solution. $$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$$ The added salt ,sodium acetate (CH_3COONa) completely dissociates to produce Na^+ and CH_3COO^-
37	**i.**	**Derive an expression for Nernst equation.**
a)		Nernst equation is the one which relates the cell potential and the concentration of the species involved in an electrochemical reaction. $$xA + yB \rightarrow lC + mD$$ The reaction quotient $Q = \frac{[C]^l[D]^m}{[A]^x[B]^y}$ _____(1) $\Delta G = \Delta G^\circ + RT \ln Q$ _____(2) The Gibbs free energy can be related to the cell emf as follows $\Delta G = -nFE$ _____(3) $\Delta G^\circ = -nFE^\circ_{cell}$ _____(4) Substitute these values and Q from (1) in the equation (2) $-nFE = -nFE^\circ_{cell} + RT \ln \frac{[C]^l[D]^m}{[A]^x[B]^y}$ _____(5) Divide the whole equation (5) by (-nF) $\mathbf{E = E^\circ_{cell} - \frac{2.303\,RT}{nF} \log \frac{[C]^l[D]^m}{[A]^x[B]^y}}$ _____**(6)** The above equation (6) is called the Nernst equation At 25°C (298K), $\mathbf{E = E^\circ_{cell} - \frac{0.0591}{n} \log \frac{[C]^l[D]^m}{[A]^x[B]^y}}$
		OR

b)	**i.**	**What are the characteristics of catalyst ?**
		• For a chemical reaction, catalyst is needed in very small quantity. Generally, a pinch of catalyst is enough for a reaction in bulk. • There may be some physical changes, but the catalyst remains unchanged in mass and • chemical composition in a chemical reaction. • A catalyst itself cannot initiate a reaction. It means it cannot start a reaction which is not taking place. But, if the reaction is taking place in a slow rate it can increase its rate. • A solid catalyst will be more effective if it is taken in a finely divided form. • A catalyst can catalyse a particular type of reaction, hence they are said to be specific in nature. • In an equilibrium reaction, presence of catalyst reduces the time for attainment of equilibrium and hence it does not affect the position of equilibrium and the value of equilibrium constant. • A catalyst is highly effective at a particular temperature called as optimum temperature. • Presence of a catalyst generally does not change the nature of products For example. $2SO_2 + O_2 \rightarrow 2SO_3$ This reaction is slow in the absence of a catalyst, but fast in the presence of Pt catalyst
38	**i)**	**Explain the reducing action of formic acid with example.**
a)		**<u>Reducing action of Formic acid</u>** • 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 • Formic acid reduces ammoniacal silver nitrate solution (Tollen's reagent) to metallic silver. $HCOO^- + 2Ag^+ + 3OH^- \rightarrow 2Ag + 2H_2O + CO_3^{2-}$ (Tollen's reagent) (silver mirror) • Formic acid reduces Fehling's solution. It reduces blue coloured cupric ions to red coloured cuprous ions. $HCOO^- + 2Cu^{2+} + 5OH^- \rightarrow Cu_2O + 3H_2O + CO_3^{2-}$ Fehling's reagent (blue) (red precipitate)

		OR
b)		**Write a note on:** **Carbylamine reaction** 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. $$C_2H_5NH_2 + CHCl_3 + 3KOH \rightarrow C_2H_5 - NC + 3KCl + 3H_2O$$ **Gabriel phthalimide synthesis** Gabriel synthesis is used for the preparation of Aliphatic primary amines. Phthalimide on treatment with ethanolic KOH forms potassium salt of phthalimide which on heating with alkyl halide followed by alkaline hydrolysis gives primary amine. 

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