DEPARTMENT OF GOVERNMENT EXAMINATIONS

HIGHER SECONDARY SECOND YEAR EXAMINATION MAY- 2022

KEY ANSWER FOR CHEMISTRY – ENGLISH MEDIUM

Maximum Marks - 70

Answer all the Questions   **Part -I**   **15 x 1 = 15**

Q.NO	Option	A Type	Q.NO	Option	B Type
1	c)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$	1	c)	Glycine
2	a)	$Al_2O_3\ nH_2O$	2	a)	Methanal
3	d)	30 minutes	3	a)	basic
4	c)	Sn / HCl	4	d)	FeO
5	a)	Methanal	5	c)	Hydrolysis of sucrose in presence of dil.HCl
6	c)	$[Fe\ (CO)_5]$	6	c)	Sn / HCl
7	a)	HPO_4^{2-}	7	d)	Charge carried by one mole of electrons
8	a)	basic	8	a)	$Al_2O_3\ nH_2O$
9	c)	Hydrolysis of sucrose in presence of dil.HCl	9	d)	30 minutes
10	c)	Nucleophilic addition	10	a)	HPO_4^{2-}
11	c)	+3	11	c)	$[Fe\ (CO)_5]$
12	d)	Charge carried by one mole of electrons	12	c)	+3
13	c)	Glycine	13	c)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$
14	d)	FeO	14	a)	Liquid in gas
15	a)	Liquid in gas	15	c)	Nucleophilic addition

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Part – II

Answer any SIX Questions and Questions No.24 is Compulsory.   6 X 2 =12

16				
	Ores	**Minerals**		
	All ores are minerals	All minerals are not ores	½ +½	2
	The minerals that ontains a high percentage of metal, from which it can be extracted conveniently and economically are called **ores**.	A naturally occurring substance obtained by mining which contains the metal in free state or in the form of compounds like oxides, sulphides etc... is called a **mineral**.	½ +½	
	Ex: Bauxite ($Al_2O_3.2H_2O$)	Ex: China lay($Al_2O_3.2SiO_2.2H_2O$)		

17	Fe^{3+} ion is more stable due to its **half-filled 3d^5** electron configuration. As half-filled and completely filled shells are more stable Fe^{3+} ion is more stable. While Fe^{2+} ion **is partially filled** d sub shell ($3d^6$) in not stable. Hence, Fe^{3+} is more stable than Fe^{2+}.	1 1	2

18	**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) In other words, the coordination number is equal to the number of σ-bonds between ligands and the central atom.	2	2

19	**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	1 1	2

20	**Examples for the first order reaction** (i) Decomposition of dinitrogen pentoxide (ii) Decomposition of sulphuryl chloride (iii) Decomposition of the H_2O_2 in aqueous solution (iv) Isomerisation of cyclopropane to propene. (any two correct example)	1 + 1	2

21	**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. (Correct two points)	1 + 1	2

22	This migration of sol particles under the influence of electric field is called **electrophoresis or cataphoresis** Correct definition ------	2	2
23	**IUPAC Name** a) 2-methylpropan-2-ol …………………………………………………… b) Phenyl methanol ……………………………………………………....	1 1	2
24	**Compulsory Questions** A - Methyl azide (or) $CH_3 - N_3$ ……………………………………………… B) – Methylamine (or) $CH_3 - NH_2$……………………………………………	1 1	2

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Part – III

Answer any SIX Questions and Questions No.33 is Compulsory.   6 X 3 =18

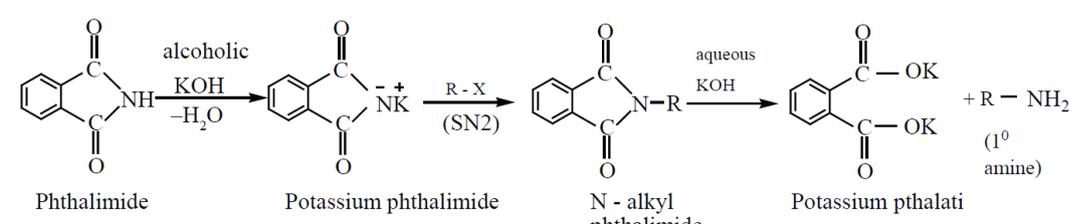| 25	**Inter halogen compounds:**
	
	Each halogen combines with other halogens to form a series of compounds called interhalogen compounds.
	
	Example : AB - type ClF, BrF , BrCl, IF
	            AB_3 - type ClF_3, BrF_3
	            AB_5 - type IF_5
	            AB_7 - type IF_7
	                    (Correct definition with any one example)
		2 +1	3

26	**Properties interstitial compounds** (i) They are hard and show electrical and thermal conductivity (ii) They have high melting points higher than those of pure metals (iii) Transition metal hydrides are used as powerful reducing agents (iv) Metallic carbides are chemically inert. **(any three correct point)**	1+1+1	3
27	$$k = Ae^{-Ea/RT} \text{ (correct equation)}$$ Where, A the frequency factor,………………………………………………………… R the gas constant,……………………………………………………….. E_a the activation energy of the reaction…………………………………… T the absolute temperature (in K)………………………………………………	1 ½ ½ ½ ½	3
28	**Factors affecting electrolytic conductance** 1) Solvent of higher dielectric constant show high conductance in solution. 2) Conductance is inversely proportional to the Viscosity of the medium. i.e., conductivity increases with the decrease in viscosity.		

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	3) 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.	1+1+1	3
	4) 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 **(any three correct point)**		
29	**Homogeneous catalysis**		
	In a homogeneous catalysed reaction, the reactants, products and catalyst are present in the same phase………………………………………………………	2	3
	$2SO_{2(g)}+O_{2(g)}+[NO]_{(g)} \rightarrow 2SO_{3(g)} + [NO]_{(g)}$……………………………………………	1	
	(or)		
	$C_6H_{12}O_{6(l)} +H_2O_{(l)} +H_2SO_{4(l)} \rightarrow C_6H_{12}O_{6(l)}+ C_6H_{12}O_{6(l)}$		
	(Mere attempt)		
30	**Inter molecular dehydration of alcohol**		
	(**with definition only**) ………………………………………………………………	2 M	3
	$2CH_3 -CH_2 -OH$ (**H₂SO₄ / 413 K**) $\rightarrow CH_3 -CH_2 -O - CH_2 -CH_3$		
	Diethyl ether		
	(correct equation) ……………………………………………………………..	3	
	(or)		
	Williamsons synthesis:		3
	When an alkyl halide is heated with an alcoholic solution of sodium alkoxide, the corresponding ethers are obtained. The reaction involves S_N2 mechanism.		
	$C_2H_5 -ONa + Br- C_2H_5 + heat \rightarrow C_2H_5- O- C_2H_5 + NaBr$		
	(any one correct equation)		
31	**Haloform reaction**		
	Acetaldehyde and methyl ketones, containing $CH_3CO -$ group, when treated with halogen and alkali give the corresponding haloform. This is known as Haloform reaction. (Correct definition) …………………………	3	3
	(or)		
	$CH_3 -CO-CH_3 + 3Cl_2 \rightarrow CCl_3 -CO-CH_3 + NaOH \rightarrow CHCl_3 + CH_3COONa$		
32	**Epimers**		
	Sugar differing in configuration at an asymmetric centre is known as epimers	2	
			3

	Example : glucose and mannose are epimers at C_2 carbon and glucose and galactose are epimers at C_4 carbon	1	
33	**Compulsory Questions** $[Ag(NH_3)_2]^+$ a) Ligand : NH_3 (ammine) …………………………….. b) Central metal ion : Ag^+ (Silver) ……………………………….. c) IUPAC Name : Diamminesilver(I) ion …………………………..	1 1 1	3

Part – IV

Answer all the Questions   **5 x 5 = 25**

34	**a) i) Gravity separation or Hydraulic wash** In this method, 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. **ii) Mond process for 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. $$Ni(s) + 4CO(g) \rightarrow [Ni(CO)_4]_{(g)}$$ On heating the nickel tetracarbonyl around 460 K, the complex decomposes to give pure metal. $$[Ni(CO)_4 \rightarrow Ni(s) + 4CO(g)]$$	2 3	5
	(OR)		
	b) i) 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. This effect is also observed in groups 14, 15 and 16. **ii) Uses of boric acid:** 1. Boric acid is used in the manufacture of pottery glases, enamels and pigments. 2. It is used as an antiseptic and as an eye lotion. 3. It is also used as a food preservative.	2 3	5

35	**a) i) Uses of Oxygen:** 1. Oxygen is one of the essential components for the survival of living organisms. 2. It is used in welding (oxyacetylene welding) 3. Liquid oxygen is used as fuel in rockets etc... **(three correct point)**	3	5
	ii) Preparation of bleaching powder: Bleaching powder is produced by passing chlorine gas through dry slaked lime (calcium hydroxide). $$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$$	2	
	(OR)		
	b) Werner postulated his theory as follows 1. Most of the elements exhibit, **two types of valence namely primary valence and secondary valence and each element tend to satisfy both the valences.In modern terminology**, the primary valence is referred as the oxidation state of the metal atom and the secondary valence as the coordination number.	1	
	2. **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**.	1	
	3. The secondary valence is satisfied by negative ions, neutral molecules, positive ions or the combination of these.	1	5
	4. 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 and the groups present in this sphere are firmly attached to the metal. The outer sphere is called ionisation sphere. The groups present in this sphere are loosely bound to the central metal ion and hence can be separated into ions upon dissolving the complex in a suitable solvent.	1	
	5. **The primary valences are non-directional while the secondary valences are directional**. The geometry of the complex is determined by the spacial arrangement of the groups which satisfy the secondary valence	1	
36	**a) Differences between crystalline and amorphous solids**		

S.No	Crystalline	Amorphous solids	
1	Long range orderly arrangement of constituents	Short range, random arrangement of constituents.	1

	2	Definite shape	Irregular shape	1	
	3	Generally crystalline solids are anisotropic in nature	They are isotropic* like liquids	1	
	4	They are true solids	They are considered as pseudo solids (or) super cooled liquids	1	5
	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.	1	
	7	Examples: NaCl , diamond etc.,	Examples: Rubber , plastics, glass etc		

<div align="center">(OR)</div>

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.

<div align="center">(or)</div>

<div align="center">$pH = - \log_{10} [H_3O^+]$</div>

Margin marks: 2

ii) Common Ion Effect

When a salt of a weak acid is added to the acid itself, the dissociation of the weak acid is suppressed further

Margin marks: 2 | 5

Example:

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^-

Margin mark: 1

37

a) Nernst equation

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

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

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

Margin marks: ½, ½, ½, ½, 1

Divide the whole equation by (-nF)

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

1

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

1

The above equation is called the Nernst equation

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

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

$$\begin{bmatrix} \therefore\ R = 8.314\ JK^{-1}\ mol^{-1} \\ T = 298\ K. \\ 1\ F = 96500\ C\ mol^{-1} \end{bmatrix}$$

5

(OR)

b) Characteristics of catalysts

1. For a chemical reaction, catalyst is needed in very small quantity. Generally, a pinch of catalyst is enough for a reaction in bulk.

2. There may be some physical changes, but the catalyst remains unchanged in mass and chemical composition in a chemical reaction.

3. A catalyst itself cannot initiate a reaction. It means it can not start a reaction which is not taking place. But, if the reaction is taking place in a slow rate it can increase its rate.

4. A solid catalyst will be more effective if it is taken in a finely divided form.

5. A catalyst can catalyse a particular type of reaction, hence they are said to be specific in nature.

6. 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.

7. A catalyst is highly effective at a particular temperature called as optimum temperature.

8. Presence of a catalyst generally does not change the nature of products

(any correct five points)

5

| 38 | a) **Reducing action of Formic acid** | | |

i) 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

2

Aldehyde group $\boxed{\begin{matrix} O \\ \| \\ H-C \end{matrix}}$ OH $H \boxed{\begin{matrix} O \\ \| \\ C - OH \end{matrix}}$ Carboxylic acid group

1½   5

ii) Formic acid reduces Tollens reagent (ammonical silver nitrate solution) to metallic silver. $$HCOO^- + 2Ag^+ + 3OH^- \rightarrow 2Ag + CO_3^{2-} + 2H_2O$$ iii) ii) Formic acid reduces Fehlings solution. It reduces blue coloured cupric ions to red coloured cuprous ions. $$HCOO^- + 2Cu^{2+} + 5OH^- \rightarrow Cu_2O + CO_3^{2-} + 3H_2O$$	1½

<div align="center">(OR)</div>

b) i) **Carbylamine reaction** Aliphatic (or) aromatic primary amines react with chloroform and alcoholic KOH to give isocyanides (carbylamine), which has an unpleasant smell. This reaction is known as carbylamine test. This test used to identify the primary amines. $$C_2H_5 - NH_2 + CHCl_3 + 3KOH \rightarrow C_2H_5 - NC + 3KCl + 3H_2O$$	2
ii) **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. Aniline cannot be prepared by this method because the aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide	5
	3

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