HSC SECOND YEAR HALF - YEARLY EXAMINATION – 2024

SUB: CHEMISTRY **THOOTHUKUDI DISTRICT** **MARKS: 70**

ANSWER KEY

Part - I

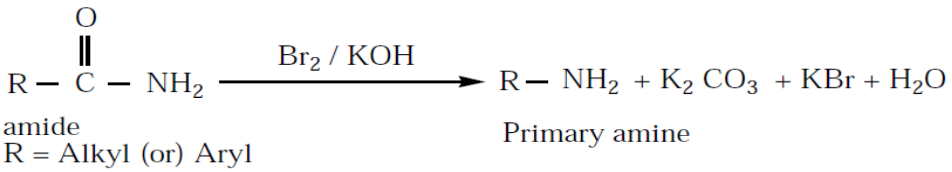
I. CHOOSE THE CORRECT ANSWER: **(15 X 1 = 15)**

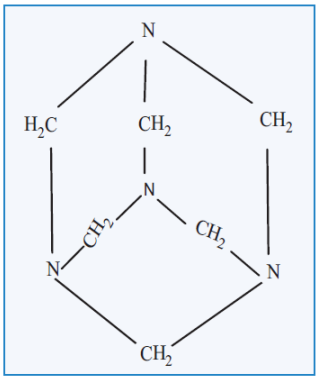
Q.no	options	ANSWERS
1.	A	Al
2.	C	$B_3N_3H_6$
3.	C / D	He / Kr
4.	B	+3
5.	C	Crystal Field Theory
6.	C	6
7.	C	10 $t_{1/2}$
8.	A	0.5 X 10^{-15}
9.	B	0.002 N
10.	B	Mechanical Dispersion
11.	C	4 – nitro phenol
12.	A / D	but – 3 – enoic acid / but – 3 – ene-1-oic acid
13.	D	triethyl amine
14.	D	Vitamin – B_2
15.	B	PAN

Part – II

Note: Answer any six questions. Q.No: 24 is compulsory **(6 X 2 = 12)**

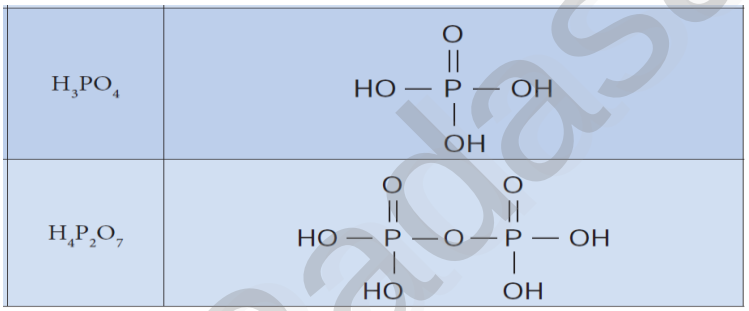
16.	**Uses of Potash Alum** ▪ Potash alum is used for purification of water ▪ It is used for water proofing and textiles ▪ It is used in dyeing and paper industries ▪ It is used as a styptic agent to arrest bleeding.	**2**	**2**
17.	▪ Small size and High electronegativity ▪ Absence of d-orbitals	**1** **1**	**2**
18.	It is the energy difference between the electronic configuration of the ligand field and the isotropic field. $CFSE \ (\Delta E_O) = (E_{LF}) - (E_{ISO})$	**2**	**2**

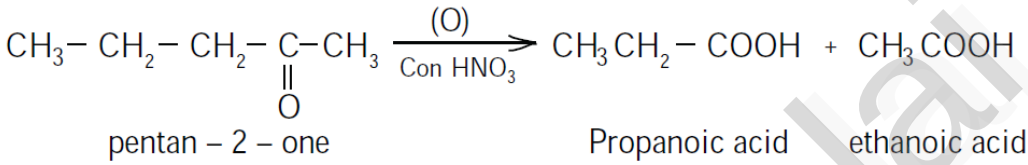
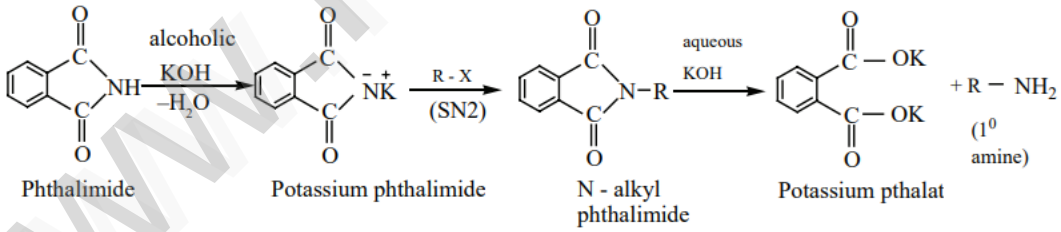
19.	**$n\lambda = 2d \sin \Theta$** ❖ n - order of diffraction ❖ λ - wavelength of X-ray ❖ d - inter planar distance between two successive planes ❖ Θ- angle of diffraction	**2**	**2**
20.	<table><tr><th>Lewis acids</th><th>Lewis bases</th></tr><tr><td>Electron deficient molecules such as BF_3,$AlCl_3$,BeF_2 etc...</td><td>Molecules with one (or) more lone pairs of electrons. NH_3,H_2O,R-O-H,R-O-R, R - NH_2</td></tr><tr><td>All metal ions Examples: Fe^{2+},Fe^{3+},Cr^{3+},Cu^{2+} etc...</td><td>All anions F^-,Cl^-,CN^-,SCN^-,SO_4^{2-} etc...</td></tr><tr><td>Molecules that contain a polar double bond Examples : SO_2,CO_2,SO_3 etc...</td><td>Molecules that contain carbon – carbon multiple bond Examples: $CH_2=CH_2$, CH ≡ CH etc...</td></tr><tr><td>Molecules in which the central atom can expand its octet due to the availability of empty d – orbitals Example: SiF_4,SF_4,$FeCl_3$ etc..</td><td>All metal oxides CaO,MgO,Na_2O etc...</td></tr><tr><td>Carbonium ion $(CH_3)_3C^+$</td><td>Carbanion CH_3^-</td></tr></table> **any two points – 2 M**	**2**	**2**
21.	The flocculation and settling down of the sol particles is called coagulation	**2**	**2**
22.	**Uses of Diethyl ether:** ❖ Diethyl ether is used as a surgical anaesthetic agent in surgery. ❖ It is a good solvent for organic reactions and extraction ❖ It is used as a volatile starting fluid for diesel and gasoline engine. ❖ It is used as a refrigerant.	**2**	**2**
23.	**Hoffmann's degradation reaction** When Amides are treated with bromine in the presence of aqueous or ethanolic solution of KOH, primary amines with one carbon atom less than the parent amides are obtained.  amide R = Alkyl (or) Aryl Primary amine **Correct Equation – 2 M ; Explanation only – 1 M**	**2**	**2**

24.	**Structure of Urotropine:** 	**2**	**2**

Part – III

Note: Answer any six questions. Q.No: 33 is compulsory **(6 X 3 = 18)**

25.	<table><tr><th></th><th>Minerals</th><th>Ores</th></tr><tr><td>1.</td><td>Naturally occuring substances obtained by mining which contain the metals in free state or in the form of compounds</td><td>Minerals that contain high percentage of metal</td></tr><tr><td>2.</td><td>Metal can not be extracted easily from minerals</td><td>Metal can be extracted easily from ores</td></tr><tr><td>3.</td><td>All the minerals are not ores</td><td>All the ores are minerals</td></tr><tr><td>4.</td><td>Mineral of Al is Bauxite and Clay</td><td>Ore of Al is Bauxite</td></tr></table>	**3**	**3**
26.		**1 ½** **1 ½**	**3**
27.	• E^0 value for Cr^{2+} is -0.91 V, E^0 Value for Mn^{3+} is +1.51V • If E^0 of a metal is large and negative, the metal is a powerful reducing agent. • Hence Cr^{2+} is strongly reducing agent.	**1** **1** **1**	**3**
28	<table><tr><th></th><th>Rate of a reaction</th><th>Rate constant of a reaction</th></tr><tr><td>1</td><td>It is measured as decrease in the conc. of the reactants or increase in the conc. of products.</td><td>It is equal to the rate of reaction, when the conc. of each of the reactants in unity.</td></tr><tr><td>2</td><td>It depends on the initial concentration of reactants</td><td>It does not depend on the initial concentration of reactants</td></tr><tr><td>3</td><td>It represents the speed at which the reactants are converted into products at any instant</td><td>It is a proportional constant</td></tr></table>	**1** **1** **1**	**3**

29.	Concentration of HNO_3 = 0.04M $[H_3O^+]$=0.04 mol dm^{-3} $pH=-\log[H_3O^+]$ $=-\log(0.04)$ $=-\log(4\times10^{-2})$ $=2-\log4$ $=2-0.6021$ $=1.3979 = 1.40$	1 1 1	3
30.	At infinite dilution, the limiting molar conductivity of an electrolyte is equal to the sum of the limiting molar conductivities of its constituent ions.	3	3
31.	**Popoff's rule** states that during the oxidation of an unsymmetrical ketone, a (C–CO) bond is cleaved in such a way that the keto group stays with the smaller alkyl group.  pentan – 2 – one Propanoic acid ethanoic acid **Equation only – 3 M ; Conc. HNO_3 is not mentioned – 2 M ; Statement only – 1 M**	3	3
32.	Hormone is an organic substance that is secreted by one tissue. It limits the blood stream and induces a physiological response. Eg. insulin, epinephrine	2 1	3
33.	**Gabriel Phthalimide synthesis:** Gabriel synthesis is used for the preparation of Aliphatic primary amines. Phthalimide on treatment with alcoholic KOH forms potassium salt of phthalimide which on heating with alkyl halide followed by alkaline hydrolysis gives primary amine.  Phthalimide Potassium phthalimide N - alkyl phthalimide Potassium pthalat **Correct Equation – 3 marks; Explanation only – 2 marks; Alcoholic KOH (or) R – X is not mentioned – 2 marks.**	3	3

Part – IV

Note: Answer all the questions: **(5 X 5 = 25)**

34. a

(i) Roasting of some ores give the metal even in the absence of a reducing agent.

$$HgS\,(s) + O_2\,(g) \longrightarrow Hg\,(l) + SO_2\uparrow$$ **2**

(ii)

Ortho silicates	SiO_4^{4-}	Phenacite, Olivine	Simple tetrahedral silicate units. No sharing of oxygen atom
Pyro silicates	$Si_2O_7^{6-}$	Thortvetite	They are formed by joining two $[SiO_4]^{4-}$ tetrahedral units by sharing one oxygen atom at one corner

1 ½ **1 ½** **5**

34. b

(i) Chlorine with Cold dilute NaOH:

$$Cl_2 + 2NaOH \longrightarrow \underset{\text{sodium hypo chlorite}}{NaOCl} + NaCl + H_2O$$ **1 ½**

Chlorine with Hot Conc. NaOH:

$$Cl_2 + 2NaOH \longrightarrow \underset{\text{sodium hypo chlorite}}{NaOCl} + NaCl + H_2O$$ **1 ½** **5**

(ii) Transition metal has energetically available d orbitals that can accept electrons from reactant molecule or metal can form bond with reactant molecule using its d electrons. **2**

35. a

$[Ni(H_2O)_6]^{2+}$	$[Ni(CN)_4]^{2-}$
• Ni – $3d^8 4s^2$ • Ni^{2+} - $3d^8$ • H_2O is a weak field ligand • d electrons is not paired. • presence of unpaired electrons • d - d transition occurs • Hence, it is green colour	• Ni – $3d^8 4s^2$ • Ni^{2+} - $3d^8$ • CN^- is a strong field ligand • d electrons pairs up. • no unpaired electrons present. • no d - d transition takes place • Hence, it is colourless

2 ½ + 2 ½ **5**

35. b

(i)

Schottky Defect	Frenkel Defect	
Arises due to the missing of equal number of cations and anions from the crystal lattice.	Arises due to dislocation of ions from its crystal lattice. The ion which is missing from the lattice point occupies an interstitial position	1
Size of anion and cation similar	Size of anion and cation differ	1
Lowers its density	Does not affect the density of crystal	1
Ex. NaCl	Ex. AgBr	

(ii) The colliding molecules must possess a minimum energy called activation energy — **2**

5

36. a

Nernst Equation:

$xA + yB \rightleftharpoons lC + mD$ — ½

$Q = \frac{[C]^l [D]^m}{[A]^x [B]^y}$ — ½

$\Delta G = \Delta G^\circ + RT \ln Q$ — 1

$\Delta G = -nFE_{cell}$; $\Delta G^\circ = -nFE^\circ_{cell}$ — ½ + ½

$-nFE_{cell} = -nFE^\circ_{cell} + RT \ln \frac{[C]^l[D]^m}{[A]^x [B]^y}$ — 1

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

$E_{cell} = E^\circ_{cell} - \frac{2.303RT}{nF} \log \frac{[C]^l[D]^m}{[A]^x [B]^y}$ (or) — 1

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

5

36. b

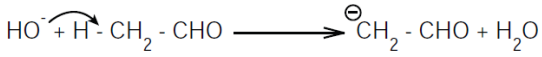
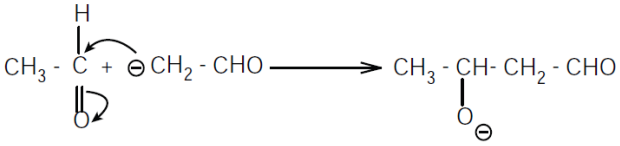
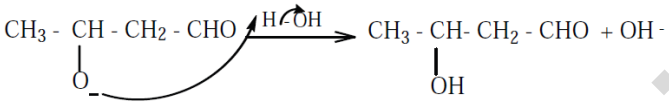
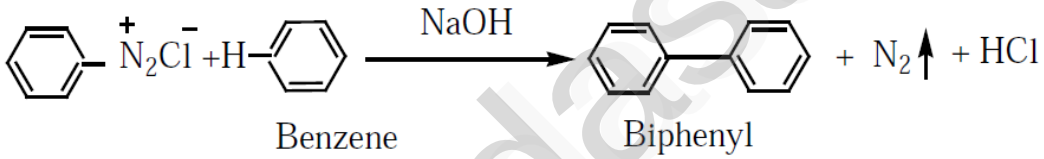
Catalyst is defined as a substance which alters the rate of chemical reaction without itself undergoing chemical change. — **1**

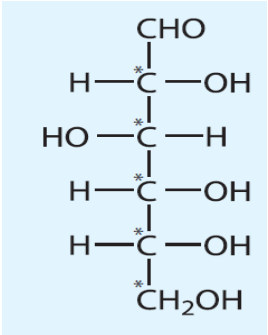
Characteristics:

- Specific in nature
- Alters the speed of chemical reaction
- Needed in very small quantity.
- Does not change the nature of products.
- Does not affect the position of equilibrium

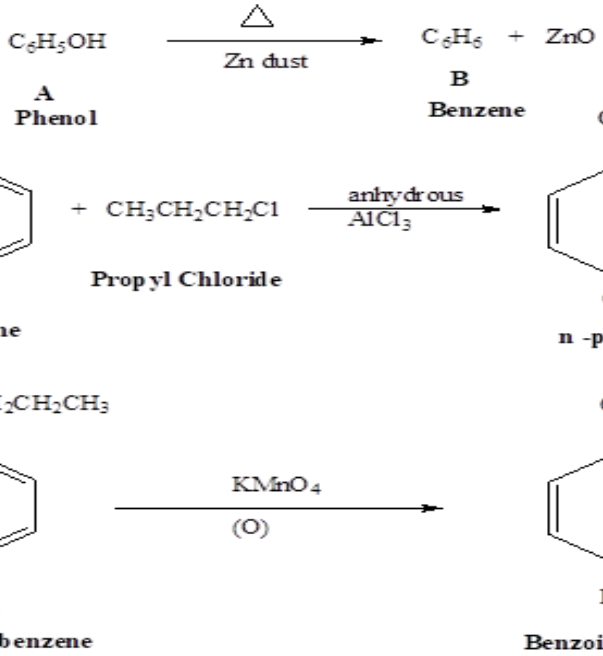
4

5

37. a	**(i)** **Mechanism** The mechanism of aldol condensation of acetaldehyde takes place in three steps. **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.  3-Hydroxy butanal **(ii)** Benzene diazonium chloride reacts with benzene in the presence of sodium hydroxide to give biphenyl. This reaction in known as the **Gomberg reaction**.  Benzene Biphenyl **Correct Equation only – 2 M ; NaOH is not mentioned – 1 ½ ; Explanation only – 1 M**	**1** **1** **1** **2**	**5**
37 b.	• Elemental analysis and molecular weight determination show that the molecular formula of glucose is $C_6H_{12}O_6$ • **Glucose on reduction with P/HI it gives n-hexane. It indicates the presence of six carbon atoms are bonded linearly.** • Glucose forms neutral solution with water. It indicate the absence of –COOH group • **Glucose reacts with acetic anhydride in the presence of pyridine to give penta acetate. It indicates the presence of 5-OH groups.**	**1** **1**	

	• Glucose reacts with hydroxylamine to form oxime and with HCN to form cyanohydrin. It indicates the presence of carbonyl group. • Glucose is reduced with Tollens Reagent and Fehlings solution. It indicates the presence of an aldehyde (-CHO) group • Glucose gets oxidized to gluconic acid with bromine water. It indicates the – CHO group occupies one end of the carbon chain. • Glucose gets oxidised to saccharic acid with conc. nitric acid. It indicates the other end is occupied by a **primary alcohol group.** 	**1** **1** **1**	**5**
38. a	• Structure of **palmitate ion exhibit dual property** **Polar -** Carboxyl portion (hydrophilic). It is **soluble in water.** **Non polar** - Hydrocarbon portion (hydrophobic). It is **soluble in oils and greases**  • When the soap is added to a grease part of the cloth. The hydrocarbon part dissolve in the grease, leaving the **carboxylate** end exposed on the grease surface. • At the same time **the carboxylate groups are strongly attracted by water**, thus leading to the formation of small droplets called **micelles** • When the water is rinsed away the grease goes with it. • As a result, the cloth gets free from dirt and the droplets are washed away with water.	½ **1** **1** ½ **1** **1**	**5**

38. b

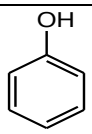
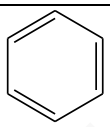
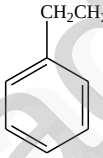
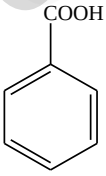


1

1

1

5

Compound	Molecular Formula / Structure	Name
A	C_6H_5OH / 	**Phenol**
B	C_6H_6 / 	**Benzene**
C	$C_6H_5CH_2CH_2CH_3$ / 	**n – Propyl benzene**
D	C_6H_5COOH / 	**Benzoic acid**

½

½

½

½