HIGHER SECONDARY SECOND YEAR EXAMINATION MAY- 2024

KEY ANSWER FOR CHEMISTRY – ENGLISH MEDIUM

Maximum Marks – 70

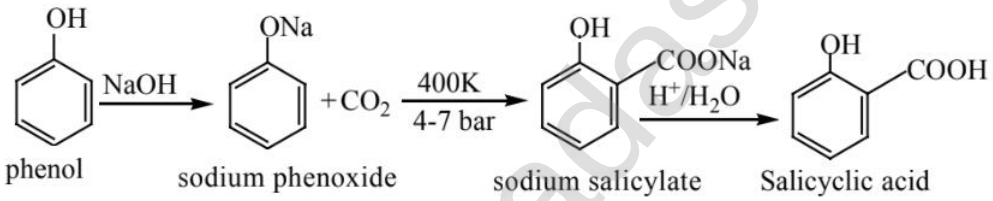
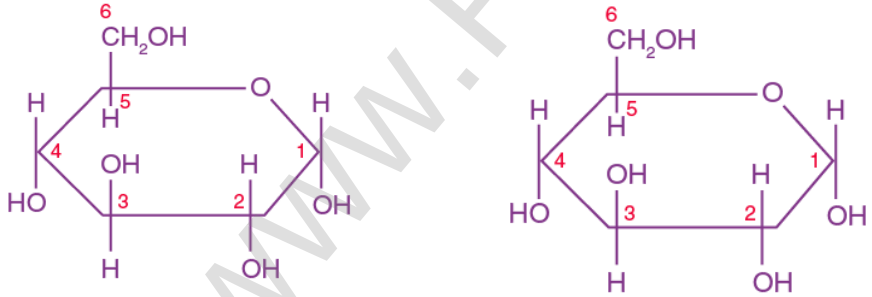
Answer all the Questions **Part -I** **15 x 1 = 15**

Q.No	Option	A Type	Q.No	Option	B - Type
1	b)	Both assertion and reason are true but reason is not the correct explanation of	1	b)	First order
2	c)	potassiumtrioxalatoalumina te(III)	2	b)	Acetyl salicylic acid
3	b)	HI	3	d)	Carbon-di-oxide
4	c)	dry ice	4	c)	potassiumtrioxalatoaluminate(III)
5	c)	Cytosine and Uracil	5	a)	Sodium chloride
6	b)	Acetyl salicylic acid	6	b)	(i) and (iv)
7	d)	Carbon-di-oxide	7	d)	Impure Copper
8	c)	Acetanilide	8	b)	Both assertion and reason are true but reason is not the correct
9	a)	Sodium chloride	9	c)	Nucleophilic addition
10	b)	(i) and (iv)	10	c)	dry ice
11	c)	Nucleophilic addition	11	d)	PCC
12	b)	First order	12	b)	HI
13	d)	Impure Copper	13	c)	Acetanilide
14	c)	Al_2O_3	14	c)	Cytosine and Uracil
15	d)	PCC	15	c)	Al_2O_3

Part – II

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

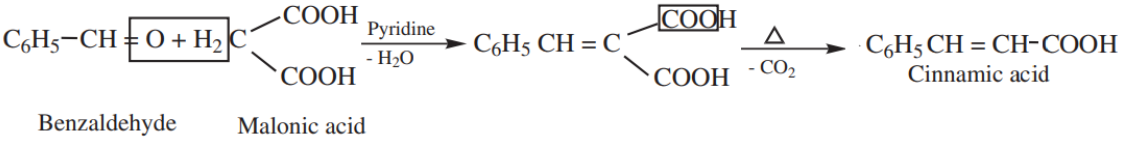
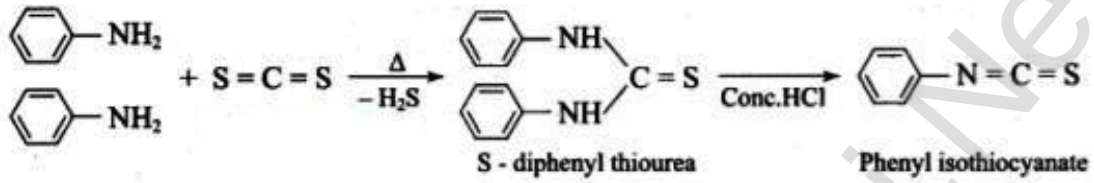
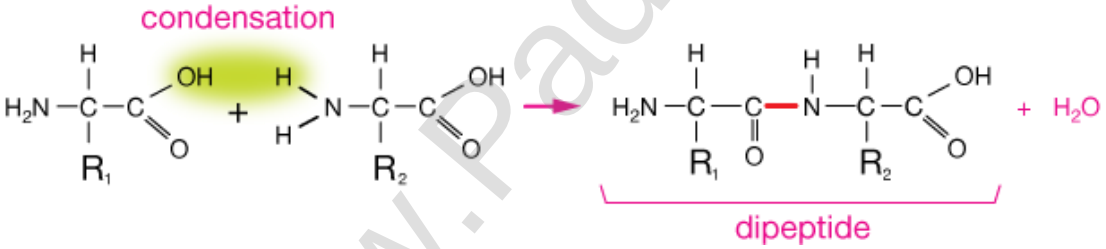
Q.No	Answer		
16	Calcination : Calcination is the process in which the concentrated ore is strongly heated in the absence of air. $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$	1 + 1	2
17	Acton of ammonia Fusion of urea with $B(OH)_3$, in an atmosphere of ammonia at 800 - 1200 K gives boron nitride. $B(OH)_3 + NH_3 \xrightarrow{\Delta} BN + 3H_2O$	1 + 1	2
18	The dehydrating property can also be illustrated by its reaction with organic compounds such as sugar, oxalic acid and formic acid. $C_6H_{12}O_6 + H_2SO_4 \xrightarrow{\Delta} 12C + H_2SO_4.11H_2O$	1 + 1	2

19	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. 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^-	1 +1	2
20	$E^o_{cell} = (E^o_{ox}) + (E^o_{red}) = -1.09 + 0.771 = -0.319V$ $\Delta G^\circ = -nFE^o_{cell}$, If E^ocell is -ve; i) ΔG is +ve and the cell reaction is **non spontaneous**. **ii) Hence, Fe^{3+} cannot oxidize Bromide to Bromine.**	1 ½ ½	2
21	Kolbe's (or) Kolbe's Schmit reaction: In this reaction, phenol is first converted into sodium phenoxide which is more reactive than phenol towards electrophilic substitution reaction with CO_2 . Treatment of sodium phenoxide with CO_2 at 400K, 4-7 bar pressure followed by acid hydrolysis gives salicylic acid. **(OR)**  	2	2
22	i) alpha-D-glucopyranose ii) beta-D-glucopyranose 	1 + 1	2
23	The drugs are grouped based on their biological effect that they Produce on the recipient. For example, the medicines that have the ability to kill the pathogenic bacteria are grouped as antibiotics. Examples: Antibiotic drugs: amoxicillin, ampicillin, cefixime, cefpodoxime, erythromycin, Tetracycline etc..(Any one Example)	1 1	2
24	It is the sum of the powers of concentration terms involved in the experimentally determined rate law.	2	2

Part – III

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

Q.No	Answer		
25	**Helium:** 1. Helium and oxygen mixture is used by divers in place of air oxygen mixture. This prevents the painful dangerous condition called bends. 2. Helium is used to provide inert atmosphere in electric arc welding of metals 3. Helium has lowest boiling point hence used in cryogenics (low temperature science). 4. It is much less denser than air and hence used for filling air balloons **(Any three correct point)**	1 +1+1	3
26	**Fe (Z = 26)** **$Fe \rightarrow Fe^{2+} + 2e^{-}$** **$Fe \rightarrow Fe^{3+} + 3e^{-}$** Fe^{2+} [Number of electrons 24] Electronic configuration = $[Ar]3d^6$ Fe^{3+} [Number of electrons 23] Electronic configuration = $[Ar]3d^5$ Among Fe^{3+} and Fe^{2+}, Fe^{3+} is more stable due to half filled d-orbital. So Fe^{3+} is more stable than Fe^{2+}	½ ½ 1 1	3
27	Given, Radius (r) = 125 pm Edge length of unit cell (a) =? Since aluminum crystallizes in Face centered $a = 2\sqrt{2}r$ ---------- Formula (1 M) a = 2 x1.414 x 125 pm	**1** **2**	**3**
28	**$k = Ae^{-(Ea/RT)}$** Where, A the frequency factor, R the gas constant, E_a the activation energy of the reaction and, T the absolute temperature (in K)	1 ½ + ½ + ½ + ½	3
29	**i) Effect of temperature** : When temperature is raised chemisorption first increases and then decreases. Where as physisorption decreases with increase in temperature. **ii) Effect of pressure:** Chemical adsorption is fast with increase in pressure, it can not alter the amount of adsorption. In Physisorption the extent of adsorption increases with increase in pressure.	1 ½ 1 ½	3

30	**Knoevenagal reaction** Benzaldehyde condenses with malonic acid in presence of pyridine forming cinnamic acid, Pyridine act as the basic catalyst. **(correct explanation -……,,,,,,,,,,,,,,,,,,,,,,……(2M)** (or)  **(correct equation -……(3M)**		3
31	These reactions are known as **Hofmann – Mustard oil reaction**. This test is used to identify the primary amines.  Explanation only ----------1M Correct equation ----------3M		3
32	**The amino acids are linked covalently by peptide bonds.** The carboxyl group of the first amino acid react with the amino group of the second amino acid to give an amide linkage between these amino acids. This amide linkage is called peptide bond  	**2** **1**	**3**
33	**Correct Complex is [$Co(en)_2Cl_2$]Cl** Name : Dichloridobis(ethane-1,2-diamine)cobalt(III) chloride Central metal ion : Cobalt (III) Coordination Number : 6 **(mere attempt Q.S) ---------- 3M**	1 1 1	3

Answer all the Questions 5 x 5 = 25

<table>
<tr><th>Q.No</th><th colspan="2">Answer</th><th></th><th></th></tr>
<tr><td>34</td><td>a)</td><td>i)
<table>
<tr><th>S.No</th><th>Minerals</th><th>Ore</th></tr>
<tr><td>1</td><td>All minerals are not ores.</td><td>All ores are minerals.</td></tr>
<tr><td>2</td><td>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.</td><td>Such mineral that contains a high percentage of metal, from which it can be extracted conveniently and economically are called ores.</td></tr>
<tr><td>3</td><td>Example: Clay is the mineral of Aluminum</td><td>Example: Bauxite and Cryolite are the ores of Aluminum</td></tr>
</table>
ii) The ferrous oxide formed due to melting is basic in nature and it combines with silica to form ferrous silicate (slag).
$FeO_{(s)} + SiO_{2(s)} \longrightarrow FeSiO_{3(s)}$
Gangue Flux Slag</td><td>3

2</td><td>5</td></tr>
<tr><td></td><td>b)</td><td>i) Uses of boric acid:
1. Boric acid is used in the manufacture of pottery glasses, enamels and pigments.
2. It is used as an antiseptic and as an eye lotion.
3. It is also used as a food preservative.
ii) Silicates :
The mineral which contains silicon and oxygen <u>in tetrahedral $[SiO_4]^{4-}$ units</u> linked together in different patterns are called silicates. Nearly 95 % of the earth crust is composed of silicate minerals and silica. The glass and ceramic industries are based on the chemistry silicates.</td><td>3

2</td><td>5</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>35</td><td>a)</td><td>lanthanoid contraction:
As we move across 4f series, the atomic and ionic radii of lanthanoids show gradual decrease with increase in atomic number. This decrease in ionic size is called lanthanoid contraction.</td><td>2</td><td></td></tr>
</table>

Consequences of lanthanoid contraction:

1. Basicity differences As we from Ce^{3+} to Lu^{3+} , the basic character of Ln^{3+} ions decrease. Due to the decrease in the size of Ln^{3+} ions, the ionic character of Ln-OH − bond decreases (covalent character increases) which results in the **decrease in the basicity.**

For example,

i) 4d series – Zr – Atomic radius 145 pm

ii) 5d series – Hf – Atomic radius 144 pm

3

5

OR

b) i)

S.No	double salts	Coordination compounds
1	When two or more stable compounds in solution are mixed together and allowed to evaporate, in certain cases there is a possibility for the formation of double salts	Let us recall the blood red colour formation in the inorganic qualitative analysis of ferric ion, the reaction between ferric chloride and potassium thiocyanate solution gives a blood red coloured coordination compound,
2	From this we can infer that the double salts lose their identity and dissociates into their constituent simple ions in solutions ,	whereas the complex ion in coordination compound, does not loose its identity and never dissociate to give simple ions
	Example : Mohr's salt	Example: K_4 [Fe(CN)$_6$].

3

5

ii) Many complexes are used as medicines for the treatment of various diseases. For example,

(1) **Ca-EDTA chelate** is used in the treatment of lead and radioactive poisoning. That is for removing lead and radioactive metal ions from the body.

(2) **Cis-platin** is used as an antitumor drug in cancer treatment.

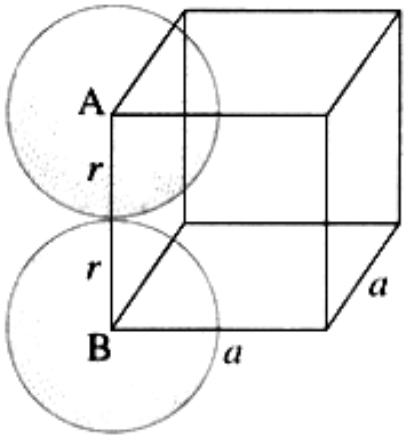
2

OR

36 a)

$$\text{Packing fraction} = \frac{\text{Total volume occupied by spheres in a unit cell}}{\text{Volume of the unit cell}} \times 100$$ **1**

Edge length a is = ax a x a = a^3 ½



½

½ 5

From the figure, $a=2r \Rightarrow r=\frac{a}{2}$

∴ Volume of the sphere with radius 'r **1**

$$= \frac{4}{3}\pi r^3 \quad = \frac{4}{3}\pi\left(\frac{a}{2}\right)^3$$

$$= \frac{4}{3}\pi\left(\frac{a^3}{8}\right) = \frac{\pi a^3}{6} \quad \ldots (1)$$

In a simple cubic arrangement, number of spheres belongs to a unit cell is equal to one ∴ ½

Total volume occupied by the spheres in sc unit cell

$$= 1 \times \left(\frac{\pi a^3}{6}\right) \quad \ldots (2)$$ **1**

Dividing (2) by (3)

Packing fraction :

$$= \frac{\left(\frac{\pi a^3}{6}\right)}{\left(a^3\right)} \times 100 = \frac{100\,\pi}{6} = 52.38\%$$

b) i) Integrated rate law for a **zero order reaction**: A reaction in which the rate is independent of the concentration of the reactant over a wide range of concentrations is called as zero order reactions.

A → product ½

The rate law can be written as, Rate = k $[A]^0$

$$\frac{-d[A]}{dt} = k\,(1) \quad (\because [A]^0 = 1) \qquad \text{½}$$

$$\Rightarrow -d[A] = k\,dt$$

$$-\int_{[A_0]}^{[A]} d[A] = k\int_0^t dt \qquad \text{½}$$

$$-([A])_{[A_0]}^{[A]} = k\,(t)_0^t \qquad \text{½}$$

$$[A_0] - [A] = kt$$

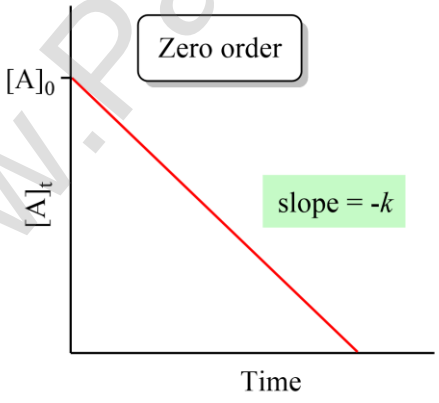
$$k = \frac{[A_0] - [A]}{t}$$

Equation (2) is in the form of a straight line y = mx + c

i.e., [A] = - kt [A_0] ½

y = c + mx

A plot of [A] Vs time gives a straight line with a slope of −k and y - intercept of [A_0] .



½

ii) Buffer capacity and buffer index The buffering ability of a solution can be measured in terms of buffer capacity. **Vanslyke** introduced a quantity called buffer index, **β = dB /d(pH)** 2

5

37 a) **Galvanic cell notation**

The galvanic cell is represented by a cell diagram, for example,

Daniel cell is represented as

$$Zn_{(s)} \mid Zn^{2+}_{(aq)} \parallel Cu^{2+}_{(aq)} \mid Cu_{(s)}$$

(|) represents a phase boundary

(||) double vertical bar represents the salt bridge.

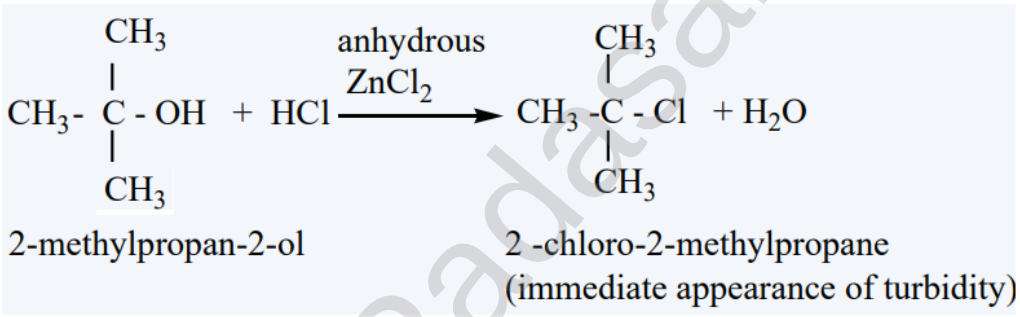
The anode half cell is written on the left side of the salt bridge and the cathode half cell on the right side. — 3

ii) Gold number is defined as the number of milligrams of hydrophilic colloid that will just prevent the precipitation of 10ml of gold sol on the addition of 1ml of 10% NaCl solution. Smaller the gold number greater the protective power — 2

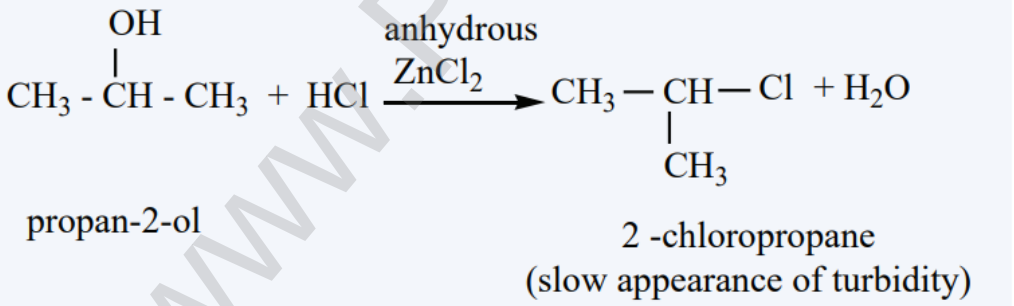
5

b) Lucas test:

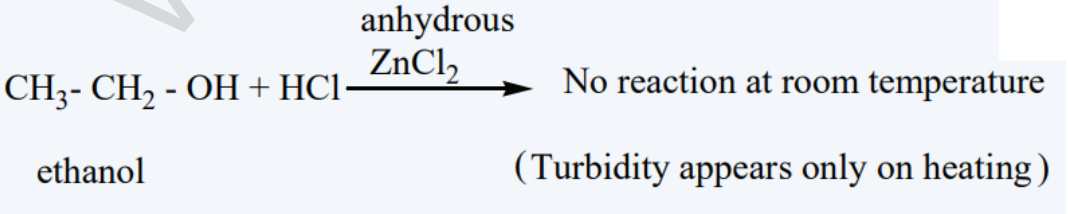
When alcohols are treated with Lucas agent **(a mixture of concentrated HCl and anhydrous $ZnCl_2$)** at room temperature — ½



1½



1½



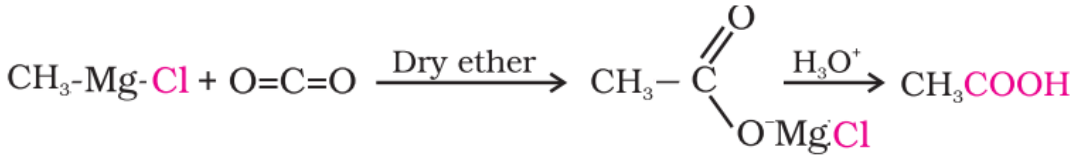
1½

5

OR

38 a)

i) From Grignard reagent Grignard reagent reacts with carbon-di-oxide (dry ice) to form salts of carboxylic acid which in turn give corresponding carboxylic acid after acidification with mineral acid. **3**



5

ii) Biodegradable Polymers The materials that are readily decomposed by microorganisms in the environment are called biodegradable. **1**

Examples: (any one Example)

Polyhydroxy butyrate (PHB)

Polyhydroxy butyrate-co-A- hydroxyl valerate (PHBV) **1**

Polyglycolic acid (PGA),Polylactic acid (PLA) Poly (∈caprolactone) (PCL)

b) Compound (A) - C_2H_4O (Aliphatic aldehyde)

Clemmensen reduction: Compound (A) gives Compound (B) 1

$$CH_3CHO + 4(H) \xrightarrow{Zn/Hg.Conc\ HCl} CH_3 - CH_3$$

Compound (B) give Compound (C) and (D)

$$CH_3 - CH_3 + HNO_3 \xrightarrow{673K} CH_3CH_2\text{-}NO_2\ (73\%) + CH_3\text{-}NO_2\ (27\%)$$

Compound (C) give Compound (E) table vinegar 1

$$\underset{\text{Nitroethane}}{CH_3CH_2 - NO_2} \xrightarrow[\text{Boil}]{HCl\ /\ H_2O} CH_3 - COOH + NH_2OH$$ ½

5

Compound	Formula	Name
A	CH_3CHO	Acetaldehyde
B	$CH_3 - CH_3$	Ethane
C	$CH_3CH_2\text{-}NO_2$	Nitro ethane
D	$CH_3\text{-}NO_2$	Nitromethanbe
E	CH_3COOH	Acetic acid

½ ½ ½ ½ ½