

**Time allowed: 3 Hours****Max. Marks: 70****Section-A (1 mark each)****Q1.** Define organometallic compounds.

Ans. Compounds containing metal-carbon bond are known as organometallic compounds.

**OR**

Reagents used for Clemmensen's reduction.

Ans. Zinc amalgam and HCl.

**Q2.** What is invert sugar?

Ans. An equimolar mixture of glucose and fructose.

**Q3.** Write the composition of a composite rocket propellant.

Ans. A mixture of polyurethane or polybutadiene as fuel and Ammonium perchlorate as the oxidizer.

**OR**

Define ferromagnetic substances.

Ans. Ferromagnetic substances are those substances which are strongly attracted by the magnetic field. For example: iron.

**Q4.** How osmotic pressure depend upon the temperature?

Ans. Osmotic pressure increases with the increase in temperature.

$$\text{As, } \pi = CRT$$

**Q5.** How half-life period of any first order reaction depends on concentration?

Ans. The half-life period of any first order reaction is independent of initial concentration

**Section-B (2 marks each)****Q6.** State the Faraday's Laws of Electrochemistry.

Ans. Faraday's Laws of Electrochemistry:

- (i) First law of electrolysis: the amount of any substance liberated/deposited at the electrode is directly proportional to the quantity of electricity passed through the electrolytic solution.
- (ii) Second law of electrolysis: when the same quantity of electricity is passed through different electrolytic solutions connected in a series, the amounts of substances deposited at the electrodes are directly proportional to their equivalent weights.

**OR**

Give 2 differences between Absorption and Adsorption.

Ans.

Absorption	Adsorption
It is a bulk phenomenon as the particles of adsorbate are uniformly distributed throughout the body of the solid.	It is surface phenomenon as the particles of the adsorbate are in higher concentration on the surface than in the bulk of the solid adsorbent.
Endothermic process	Exothermic process

**Q7.** Give reason for each of the following.

- (i) Why methyl amine is stronger base than ammonia?
- (ii) Why boiling point of ethanamine is more than N-Methylmethanamine?

Ans. (i) In case of methyl amine, the methyl group has +I effect, it is an electron donating group, so the electron density on nitrogen atom increases. Hence methyl amine can donate the lone pair of electron easily. In ammonia no electron releasing group is attached.  
(ii) In ethanamine there are 2 hydrogen atoms are bonded to nitrogen whereas in N-Methylmethanamine only one hydrogen is bonded to nitrogen. Therefore hydrogen bonding is more in ethanamine so it has higher boiling point than N-Methylmethanamine.

**OR**

Define following: (i) Micelle and (ii) Critical micellization concentration (CMC)

Ans. (i) Micelle: It is defined as the cluster of particles formed by aggregating in colloidal solution.

(ii) Critical micellization concentration (CMC): Concentration above which the micelle formation occurs is known as Critical micellization concentration.

**Q8.** Give an ore of Sn and Pb.

Ans. Sn- Cassiterite ( $\text{SnO}_2$ )

Pb- Galena ( $\text{PbS}$ )

**Q9.** What is Flux and its role in metallurgy?

Ans. Flux: The chemical substance which is added to the ore of the metal during extraction process to remove impurities in the form of slag. It converts the non-fusible impurities to fusible impurities and can be removed as slag.

**Q10.** (a) What is the coordination number of Fe in  $[\text{Fe}(\text{EDTA})]$ ?

(b) Give the IUPAC name of  $[\text{Pt}(\text{NH}_3)\text{Cl}_2]\text{Cl}_2$ .

Ans. (a) Coordination number of Fe in  $[\text{Fe}(\text{EDTA})]$  is Six.

(b) The IUPAC name of  $[\text{Pt}(\text{NH}_3)\text{Cl}_2]\text{Cl}_2$  is Diamminedichloroplatinum (IV) chloride

**Q11.** (a) Which order does radioactive decay follow?

(b) What is the end product of natural radioactive series?

Ans. (a) Radioactive decay follow first order kinetics.

(b) An isotope of lead is the end product of natural radioactive series.

**Q12.** (a) What is the reason of geometrical isomerism in case of alkenes?

(b) Give the total number of stereoisomers for a compound having 4 chiral carbon atoms.

Ans. (a) Hindered rotation around  $\text{C}=\text{C}$  (double bond).

(b)  $2^4 = 16$

### Section-C (3 marks each)

**Q13.** What is racemisation? Give the methods to convert optically active compound into a racemic mixture.

Ans. The process used to convert an optically active enantiomer (d or l form) into a racemic mixture is called Racemisation.

Methods to convert optically active compound into a racemic mixture are:

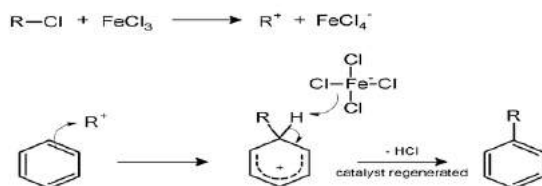
- (i) By rotating  $\text{C}-\text{C}$  single bond.
- (ii) By enolization.
- (iii)

**Q14.** Give reaction for each:

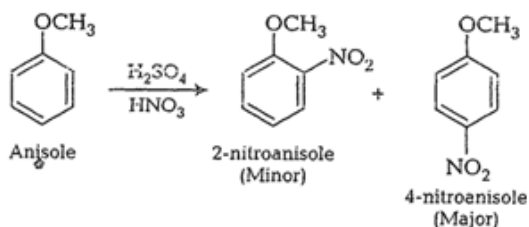
- (a) Friedel Crafts alkylation reaction
- (b) Nitration of anisole
- (c) Chlorination of anisole

Ans.

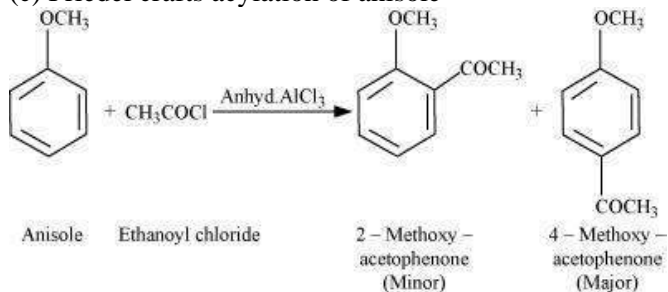
(a) Friedel Crafts reaction



(b) Nitration of anisole

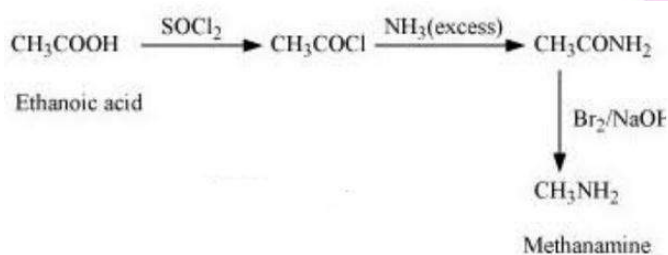


(c) Friedel crafts acylation of anisole

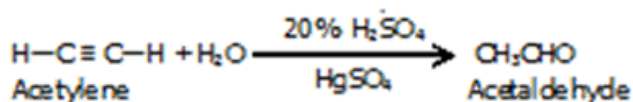


**Q15.** Complete following conversions:

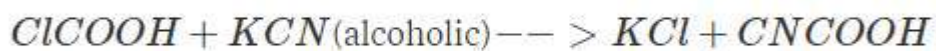
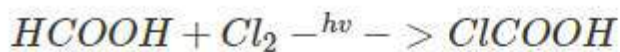
(a) Acetic acid to methylamine



(b) Acetylene to aldehyde

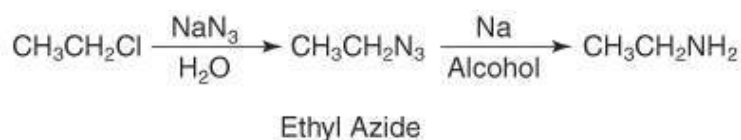


(c)

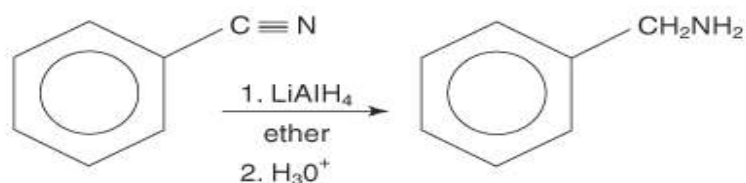


**Q16.** Give three methods for the preparation of Amines.

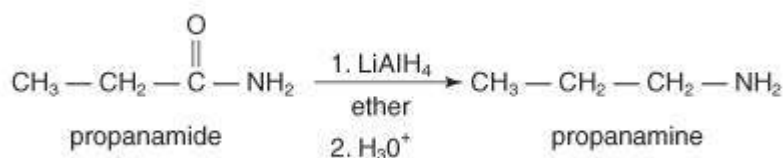
Ans. (i) Reduction of alkylazides:



(ii) Reduction of nitriles:



(iii) Reduction of amides:



**OR**

Give the monomers and uses of Nylon 66.

Ans. Monomers of Nylon 66 are: Hexamethylenediamine and adipic acid.

Uses are: (i) For making brush bristles  
(ii) In textiles  
(iii) In making sheets

**Q17.** (a) What does PMMA stand for?  
(b) Name a synthetic polymer which is an ester.  
(c) Give a natural elastomer.

Ans. (a) Polymethylmethacrylate (Acrylic)  
(b) Dacron  
(c) Natural rubber

**Q18.** Give three differences between enzymes and catalysts.

Ans.

Enzymes	Catalysts
These are globular proteins	These are not proteins
Need optimum pH (around 7) and temperature (around 31°C)	Need high temperature and pH
They form enzyme-substrate complex by either H-bonding or van der waal interactions	They form chemical bonds

**Q19.** Name three nucleic acids which are used in protein synthesis.

Ans. (i) m RNA

- (ii) r RNA
- (iii) t RNA

**OR**

What is ATP? Give two enzymes which are required in the digestion of proteins.

Ans. ATP – Adenosine triphosphate. It is an energy rich molecule; it provides energy to sustain life.

Two enzymes which are required in the digestion of proteins are Pepsin and trypsin.

**Q20.** Write the deficiency of vitamin A, C and D.

Ans. Vitamin A- Xerophthalmia (night blindness)

Vitamin C – Scurvy and Pyorrhea

Vitamin D – Rickets, deformation of bones and teeth

**Q21.** Define medicine. Give two types of medicines with examples.

Ans. The chemicals used for treating a disease is known as medicine.

Two examples of medicines are:

(i) Antipyretics: these are used to lower down the body temperature. For example: Aspirin, Paracetamol

(ii) Analgesics: these are used to decrease the pain. For example: Ibuprofen, Novalgin

**Q22. (a) What are dyes?**

(b) Give an example of sulpha drug.

(c) Give one use of equanil.

Ans. (a) chemical substances which are coloured and imparts colour to the wool, silk, textiles food items etc.

(b) Sulphadiazine

(c) Tranquilizer

**OR**

(a) Give example of Vat dye.

(b) Give use of Morphine.

(c) Name of liquid which is used both as fuel and an oxidiser.

Ans. (a) Example of Vat dye is Indigo.

(b) Morphine is used as an analgesic.

(c) Methyl nitrate.

**Q23.** Write the units of enthalpy, entropy and free energy.

Ans. Enthalpy:  $\text{KJ K}^{-1} \text{mol}^{-1}$

Entropy:  $\text{JK}^{-1} \text{mol}^{-1}$

Free energy:  $\text{KJ mol}^{-1}$

**Q24.** Mention three colligative properties.

Ans. (i) Relative lowering of vapour pressure

(ii) Elevation in boiling points

(iii) Depression in freezing point

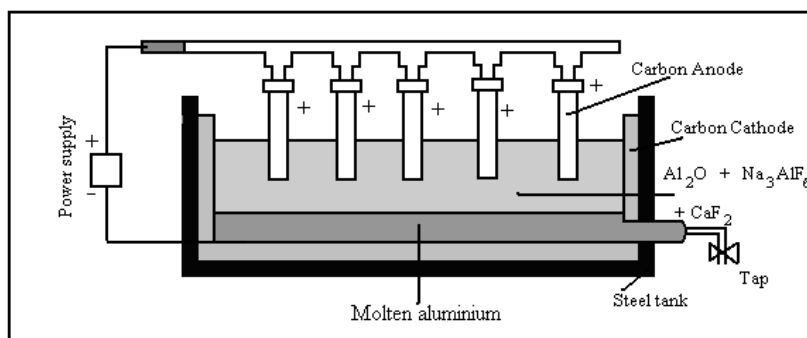
## Section-D (5 marks each)

**Q25.** Discuss the extraction of Aluminium.

Ans. The ore of aluminium is bauxite  $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$

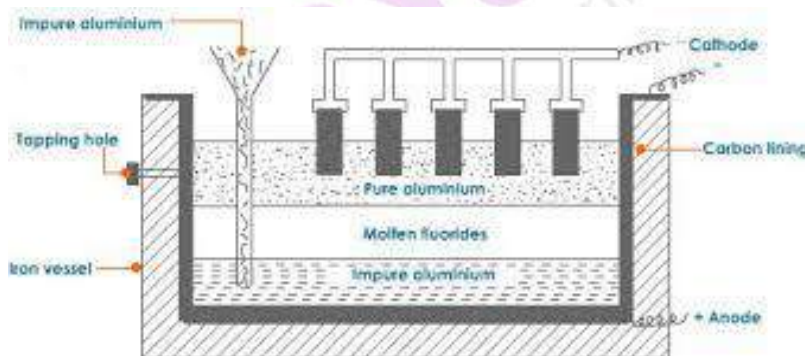
Steps for the extraction of Aluminium:

1. Preparation of Alumina
  - (a) Baeyer's process
  - (b) Serpeck's process
2. Electrolysis of fused Alumina



Electrolytic reduction of alumina

3. Refining of Aluminium (Hoope's Process)



OR

Discuss allotropic forms of Sulphur.

Ans. Allotropes of Sulphur are divided into two categories:

(a) Crystalline:

(i) Rhombic/Octahedral/ $\alpha$ -Sulphur: These are translucent yellow crystal. Melting point is 387 K. It is stable below 369 K. Density is  $2.06 \text{ g cm}^{-3}$ .

(iii) Monoclinic/Prismatic/ $\beta$ -Sulphur: these are transparent crystals with a melting point of 392 K. It is unstable at 369 K. Density is  $1.96 \text{ g cm}^{-3}$ .

(b) Amorphous:

(i) Plastic/ $\gamma$ -Sulphur: This is formed by pouring boiling sulphur in cold water, a rubber like solid is obtained which is known as plastic sulphur. It is dark coloured solid with a density of  $1.95 \text{ g cm}^{-3}$ .



(ii) Milk of Sulphur: This is formed by the action of weak HCl on  $(\text{NH}_4)_2\text{S}$ . Also by boiling sulphur with aqueous solution of  $\text{Ca}(\text{OH})_2$ , it is then filtered and HCl is added and finally milk of sulphur is obtained.

**Q26.** Discuss the difference between Physisorption and Chemisorption

Ans.

Physisorption	Chemisorption
Enthalpy of adsorption is $10\text{--}40 \text{ KJ mol}^{-1}$	Enthalpy of adsorption is $20\text{--}400 \text{ KJ mol}^{-1}$
Van der waals forces of attraction present	Chemical bond present
Less specific	Highly specific
Multimolecular layers are formed	Mono molecular layer is formed
Occurs at low temperature	Occurs at relatively high temperature

**OR**

Discuss characteristics of d-block elements:

Ans.

- (a) Metallic character: All elements are metals because they have low ionisation energy values. These elements are hard, malleable and ductile.
- (b) Variable oxidation states: these elements have variable oxidation states because the energies of  $(n-1) d$  orbitals are comparable to  $ns$  orbitals, therefore the electrons from  $(n-1) d$  and  $ns$  orbitals can be used for the formation of compound.
- (c) Coloured compounds: Compounds of d-block elements are coloured. This happens due to d-d transition.
- (d) Magnetic properties: d-block elements and their compounds are paramagnetic (unpaired electrons) in nature, hence they are attracted by magnetic field.
- (e) Alloy formation: These elements have a tendency to mix with each other freely in the molten state. For example: Cr mixes with Ni to form Cr-Ni alloy.

**Q27.** What are carbohydrates? Discuss the classification of carbohydrates with examples.

Ans. Carbohydrates are biomolecules which are polyhydroxy aldehydes or ketones, they are metabolised in the animal body to get energy.

Carbohydrates are classified as:

- (i) Monosaccharides:
  - (a) These cannot be hydrolysed further.
  - (b) Either aldehyde or ketone group may be present.
  - (c) Depending on the number of carbon atoms, they may further be classified as:
    - Trioses (e.g., Glyceraldehyde)
    - Tetroses (e.g., Erythrose)
    - Pentoses (e.g., Ribose, Xylulose)
    - Hexoses (e.g., Glucose, Fructose)
    - Heptoses (eg., Sedoheptulose)
- (ii) Oligosaccharides: it may further be classified as:
  - (a) Disaccharides: these hydrolyse to give two monosaccharide units. Examples are Sucrose, Maltose.



- (b) Trisaccharides: these on hydrolysis give three monosaccharide units.  
Examples are Raffinose, Maltotriose.
- (iii) Polysaccharides: these are further classified into:
- (a) Structural Polysaccharides: these contain a large number of monosaccharide units linked to each other by oxygen bridges. Linkage is known as glycosidic linkage. It forms the structural part of the plant. Example of such polysaccharide is Cellulose.
- (b) Storage Polysaccharides: these also contain a large number of monosaccharide units linked to each other by oxygen bridges. Linkage is known as glycosidic linkage. It forms the storage part. Example of such polysaccharide is starch.

**OR**

Discuss cannizzaro reaction.

Ans. Cannizzaro reaction is given by the aldehydic compounds which are devoid of  $\alpha$ -hydrogen.

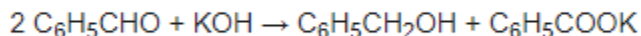
Requirements for the Cannizzaro Reaction:

- Aromatic aldehydes which **do not contain  $\alpha$ -hydrogen**, for example  $\text{C}_6\text{H}_5\text{CHO}$  (benzaldehyde)
- Aliphatic aldehydes which do not contain  $\alpha$ -hydrogen, for example  $\text{HCHO}$ ,  $(\text{CH}_3)_3\text{CCHO}$
- Presence of **concentrated aqueous alkali** ( $\text{KOH}$ ,  $\text{NaOH}$ )

Products formed are:

- Reactants undergo self-oxidation and reduction to give alcohol and the salt of the corresponding carboxylic acid.

Reaction involved:



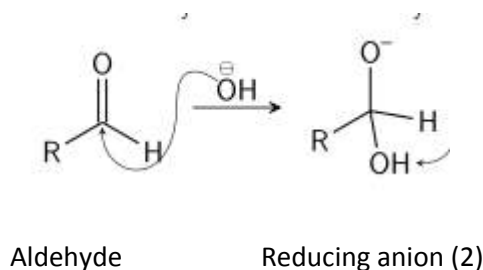
Benzaldehyde                  Benzyl alcohol          Sodium benzoate  
(Potassium salt of benzoic acid)

This disproportionation reaction (same reactant undergoing oxidation and reduction reaction) of aldehydes without  $\alpha$ -hydrogen is known as Cannizzaro reaction.

Mechanism of the reaction:

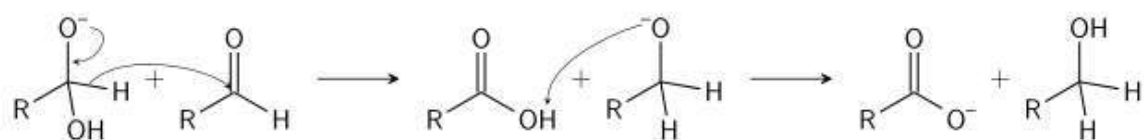
Step 1:

- In this step  $\text{OH}^-$  (hydroxide ion) attack on carbonyl carbon of aldehydic group to give reducing anion (1).



Step 2:

- The anion formed in first reaction transfers a hydride ion to carbonyl carbon of another molecule of same aldehyde as used in step 1, forming carboxylic acid and the alkoxide ion.
- The shift of proton from acid to (2) gives the final product as alcohol.



(1) Aldehyde

reducing anion (2)

Salt of Carboxylic acid

Alcohol

