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**DEPT- MBBS**

**MATRIC NO- 19/MHS01/345**

**COURSE- CHM102**

**(1) Give the IUPAC names of the following compounds**

1. HCOOH - Methanoic acid
2. HOOCCH2CH2CH2COOH - Penatn-1,5-dioic acid
3. CH3CH2CH2COOH – Butanoic acid
4. HO2C-CO2H- Ethane-dioic acid
5. CH3(CH2)4COOH – Hexanoic acid
6. CH3CH=CHCH2CH2COOH – Hex-4-eneoic acid

**(2) Discuss briefly the physical properties of carboxylic acids under the following headings**

1. Physical appearance –

All simple aliphatic carboxylic acids up to C10 are liquids at room temperature. Most other carboxylic acids are solid at room temperature although anhydrous carboxylic acid (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

1. Boiling point –

Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.

1. Solubility-

Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water; this largely due to their ability to form hydrogen bonds with water molecules. The water solubility of the acids decreases as the relative molecules mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent.

**(3) Write two industrial preparations of carboxylic acids**

1. From Carbon(II) oxide

Methanoic acid (formic acid) is manufactured by adding carbon(II) oxide under pressure to hot aqueous solution of sodium hydroxide. The free carboxylic acid is liberated by careful reaction with tetraoxosulphate (vi) acid (H2SO4)

**CO -------------- HCONa ---------> HCOOH + NaHSO4**

1. From petroleum

Liquid phase air oxidation of C5-C7 carboxylic acids with methanoic, propanoic and butanedioic acids as by- products.

 **C5-C7 ------------------------------------------------> C5 -C7 carboxylic acids**

**(4) With equations and brief explanation discuss the synthetic preparation of carboxylic acid**

1. Oxidation of primary alcohols and aldehydes-

Can be used to prepare carboxylic acids using oxidizing agents ( i.e K2Cr2o7 or KMnO4) in acidic solution.

 RCH2OH --------------------------- -> RCHO -------> RCOOH

1. Carbonation of Grignard reagent

Aliphatic carboxylic acids are obtained by budding carbon (iv) oxide into the Grignard reagent and then hydrolyzed with dilute acid

 RMgBr + CO2 -----------> RCOOMgBr ----------> RCOOH + MgBrOH

1. Hydrolysis of nitriles (cyanides) or esters

RCN + 2H2O ----------> RCOOH + NH4+

(R= alkyl or aryl radical)

(**5) with chemical equation only, outline the reduction, decarboxylation and esterification of carboxylic Acid.**

1. **Reduction to primary alcohol-**

4RCOOH + 3LIALH4 -------------> (RCH2O)4AILi + 2 LiAlO2 + 4H2

 | 4H2O

 4RCH2O+ Al(OH)3 + LiOH

CH3CH2CH2COOH ---------------> CH3CH2CH2CH2OH

Butanoic acid Butanol

1. **Decarboxylation -**

CH3CH2CH2COONa + NaOH ---------------------> CH3CH2CH3 + Na2CO3

1. **Esterification-**

CH3CH2CH2COOH + CH3CH2CH2OH <--------> CH3CH2CH2COO CHO2CH2CH3 + H2O