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MATRIC NUMBER: 19/MHS01/029

DEPT: MBBS COURSE: CHM102

CARBOXYLIC ACIDS ASSIGNMENT

1 Give the IUPAC names of the following compounds

i) $\text{HCOOH} \rightarrow$ Methanoic acid

ii) $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ Pentan-1,5-dioic acid

iii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ Butanoic acid

iv) $\text{CH}_3(\text{CH}_2)_4\text{COOH} \rightarrow$ Hexanoic acid

v) $\text{HO}_2\text{C}-\text{CO}_2\text{H} \rightarrow$ Ethanedioic acid

vi) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \rightarrow$ Hex-4-enoic acid

2. Discuss briefly the physical properties of carboxylic acids under the following headings

i) Physical appearance (ii) Boiling Point (iii) Solubility.

i) Physical appearance: All simple aliphatic carboxylic acids up to C_{10} are liquids at room temperature. Most others are solid at this temperature although anhydrous carboxylic acid (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below room temperature.

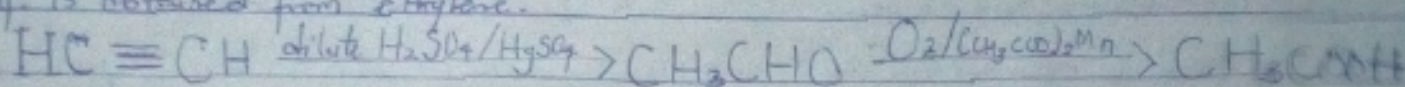
ii) Boiling points: their boiling points increase with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.

(iii) Solubility: lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in H_2O , this is largely due to their ability to form hydrogen bonds with water molecules. Their water solubility decreases as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent. All carboxylic acids are soluble in organic solvents.

3. Write two industrial preparations of carboxylic acids. 19/MH501/029

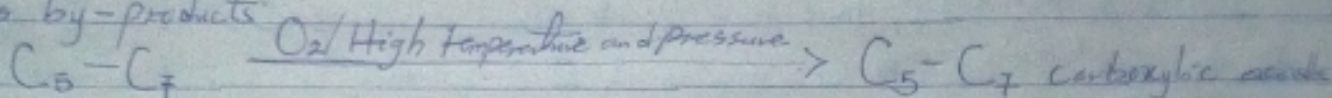
a) From ethanal

Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganese(IV) ethanoate catalyst. Ethanal itself is obtained from ethylene.



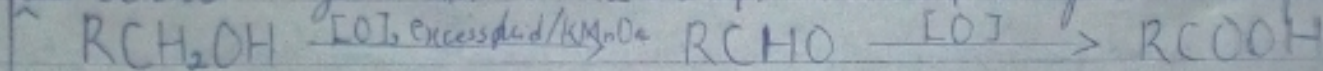
b) From Petroleum

Liquid phase air oxidation of C₅-C₇ alkanes, obtainable from petroleum at high temperature and pressure will give C₅-C₇ carboxylic acids with methanoic, propanoic and butanoic acids as by-products.



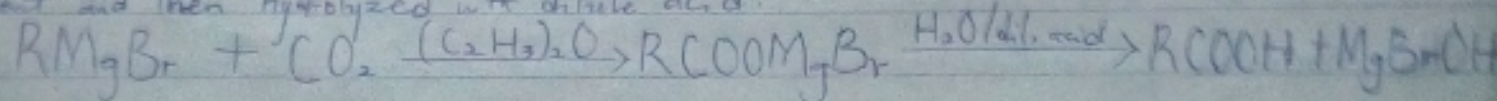
4) With equations and brief explanation discuss the synthetic preparation of carboxylic acid

a) Oxidation of primary alcohols and aldehydes: The oxidation of primary alcohols and aldehydes with oxidizing agents such as K₂Cr₂O₇/KMnO₄ will give carboxylic acids



b) Carbonation of Grignard reagent

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



ai) Hydrolysis of nitriles (cyanides) or esters

