NAME: IBEM BLESSING ONYEKACHI

MATRIC NUMBER: 19/MHS02/062

DEPARTMENT: NURSING

COURSE CODE: CHM 102

1) Give the IUPAC names of the following compounds;
   - HCOOH- Methanoic acid
   - HOOCCH2CH2CH2COOH- Pentan-1,5-dioc acid
   - CH3CH2CH2COOH- Butanoic acid
   - HO2C-CO2H- Ethanedioic acid
   - CH3(CH2)4COOH- Hexanoic acid
   - CH3CH=CHCH2CH2COOH- Hex-4-eneoic acid

2) Discuss briefly the physical properties of carboxylic acids under the following headings:
   - **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.
   - **Boiling point:**
     The boiling point increases with increasing relative molecular mass. Aromatic carboxylic acids and crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.
   - **Solubility:**
     Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water. This is largely due to their ability to form hydrogen bonds with water molecules. All carboxylic acids are soluble in organic solvents.
3) Write two industrial preparations of carboxylic acid:
   - **From ethanol:**

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

$$HC{\equiv}CH \xrightarrow{\text{Dil. } H_2SO_4/HgSO_4} CH_3CHO \xrightarrow{O_2/(CH_3COO)_2Mn} CH_3COOH$$

- **From petroleum:**
  Liquid phase air oxidation of C3-C7 alkanes, obtainable from petroleum at high temperature and pressure will give C3-C7 carboxylic acid with methanoic, propanoic and butanedioic acids as by-products.

$$\text{C5-C7} \xrightarrow{O_2/\text{ high temperature and pressure}} \text{C5-C7 carboxylic acids}$$

4) **Hydrolysis of acid:**
   All acids derivatives can be hydrolyzed to yield carboxylic acids; the conditions required range from mild to severe, depending on the compound involved. The easiest acid derivatives t hydrolyze are acyl chlorides, which require only the addition of water. Carboxylic acid salts are converted to the corresponding acids instantaneously at room temperature simply on treatment with water and a strong acid such as hydrochloric acid, carboxylic esters, nitriles, and amides are less reactive and typically must be heated with water and a strong acid or base to give the corresponding carboxylic acid.

5) **Decarboxylation of carboxylic acid:**
   Both cyclic and open chain ketones are formed by pyrolysis of carboxylic acid and calcium or thorium salts of dibasic acids or monobasic acids.