

The study of organic compounds starts with the characterisation of the compound and the determination of its molecular structure. The procedure generally employed for this purpose consists of the following steps :

- (1) Purification of organic compounds
- (2) Qualitative analysis of organic compounds
- (3) Quantitative analysis of organic compounds
- (4) Determination of molecular mass of organic compounds
- (5) Calculation of Empirical formula and Molecular formula of organic compounds
- (6) Determination of structure of organic compounds by spectroscopic and diffraction methods

(1) **Purification of organic compounds :** A large number of methods are available for the purification of substances. The choice of method, however, depends upon the nature of substance (whether solid or liquid) and the type of impurities present in it. Following methods are commonly used for this purpose,

- (i) Simple crystallisation
- (ii) Fractional crystallisation,
- (iii) Sublimation
- (iv) Simple distillation
- (v) Fractional distillation
- (vi) Distillation under reduced pressure
- (vii) Steam distillation
- (viii) Azeotropic distillation
- (ix) Chromatography
- (x) Differential extraction
- (xi) Chemical methods

(i) **Simple crystallisation :** This is the most common method used to purify organic solids. It is based upon the fact that whenever a crystal is formed, it tends to leave out the impurities. For crystallisation, a suitable solvent is one (a) which dissolves more of the substance at higher temperature than at room temperature (b) in which impurities are either insoluble or dissolve to an extent that they remain in solution (in the mother liquor) upon crystallisation, (c) which is not highly inflammable and (d) which does not react chemically with the compound to be crystallized. The most commonly used solvents for crystallisation are : water, alcohol, ether, chloroform, carbon-tetrachloride, acetone, benzene, petroleum ether etc.

Examples : (a) Sugar having an impurity of common salt can be crystallized from hot ethanol since sugar dissolves in hot ethanol but common salt does not.

(b) A mixture of benzoic acid and naphthalene can be separated from hot water in which benzoic acid dissolves but naphthalene does not.

(ii) **Fractional crystallisation :** The process of separation of different components of a mixture by repeated crystallisations is called fractional crystallisation. The mixture is dissolved in a solvent in which the two components have different solubilities. When a hot saturated solution of this mixture is allowed to cool, the less soluble component crystallises out first while the more soluble substance remains in solution. The mother liquor left after crystallisation of the less soluble component is again concentrated and then allowed to cool when the crystals of the more soluble component are obtained. The two components thus separated are recrystallized from the same or different solvent to yield both the components of the mixture in pure form.

Fractional crystallisation can be used to separate a mixture of $KClO_3$ (less soluble) and KCl (more soluble).

