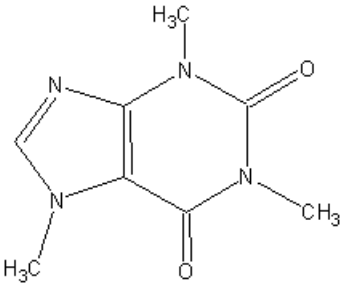
Extraction of Caffeine

Lab No. 1

Caffeine is a naturally occurring xanthine alkaloid found in coffee, tea and Cocoa. The leaves may be fermented or left unfermented. **Fermented teas** are referred to as black tea, **unfermented teas** as green tea, and **partially fermented teas** as oolong tea.



Caffeine

The chemical formula of caffeine is 1,3,7-trimethylxanthine ($C_8H_{10}N_4O_2$). It acts as a stimulant, where it stimulates the heart, respiration and the central nervous system, in addition, caffeine is a vasodilator (relaxes the blood vessels) as well as a diuretic (increases urination)

Principle of the experiment:

- The technique used to separate an organic compound from a mixture of compounds is called Extraction. The solution of these dissolved compounds is referred as the Extract.
- Tea leaves consist mostly of cellulose, caffeine, tannins and a small amount of chlorophyll. Here the organic solvent chloroform is used to extract caffeine from aqueous extract of tea leaves because caffeine is more soluble in chloroform (140 mg/ml) than it is in water (22 mg/ml). However, the tannins that are slightly soluble in the chloroform can be eliminated by converting it to their salts (phenolic anions by adding sodium carbonate).

Procedure:

1. Place 30 g of the tea leaves or tea bags in a 500 mL beaker. Add 250mL of water and 5g of sodium carbonate, stir the contents of the beaker with a glass rod.
2. Boil the beaker over direct flame for 20 minutes.
3. Using an ordinary funnel, pour the tea into the separatory funnel (► Ensure that the separatory funnel valve is shut)
4. Extract the caffeine with four successive 25-mL portions of chloroform (► slowly pour into the separatory funnel, since chloroform and the tea mixture can form an emulsion difficult to separate if allowed to be agitated)
5. Pass the lower layer from the separatory funnel through a drying agent (such as Na_2SO_4) through a conical funnel lined with filter paper.
6. Evaporate the combined chloroformic extract to obtain a crude product (use a hot plate).
7. With a spatula, remove the solid left behind and mass it. This solid is principally caffeine.