ANALYSIS OF ASPIRIN TABLETS

For a long time the bark of the willow tree (salix alba) was used as a traditional medicine to relieve the fever symptoms of malaria. In the 1860's chemists showed that the active ingredient in willow bark is salicylic acid (2-hydroxybenzoic acid) and by 1870 salicylic acid was in wide use as a pain killer (analgesic) and fever depressant (antipyretic). However, because it is a relatively strong acid, salicylic acid has the undesirable side effect of irritating and damaging the mouth, esophagus and stomach membranes. In 1899 the Bayer Company of Germany introduced the ethanoate ester of salicylic acid, naming it 'Aspirin'. Since that time mild analgesics containing aspirin have appeared under many different brand names. The aim of this experiment is to determine the percentage of aspirin present in different commercial preparations and to find which is the best value for money.

The analysis makes use of the fact that aspirin is a monoprotic (monobasic) acid and therefore reacts with sodium hydroxide according to the equation:

\[ \text{C}_6\text{H}_4(\text{OCOCH}_3)\text{COOH} + \text{NaOH} \rightarrow \text{C}_6\text{H}_4(\text{OCOCH}_3)\text{COONa}^+ + \text{H}_2\text{O} \]

ENVIRONMENTAL CARE:
None of the reactants or products is particularly harmful to the environment and the waste can be safely disposed of down the sink.

SAFETY:
No special precautions are necessary. You might like to consider why many doctors now recommend that you take paracetamol rather than aspirin for a headache even though aspirin is an effective mild analgesic.

PROCEDURE:
Note the brand name and the price of the aspirin tablets you are using. Weigh out accurately one tablet (about 0.4 - 0.5 g) into a 50 cm³ conical flask and dissolve it in 10 cm³ of 95% alcohol. Titrate with 0.100 mol dm⁻³ sodium hydroxide solution using two drops of phenolphthalein solution as an indicator.

CALCULATIONS:
1. What amount (in mol) of sodium hydroxide was required to react exactly with the aspirin?
2. What amount (in mol) of aspirin was present in your weighed-out tablet?
3. What is the mass of one mole of aspirin?
4. What is the percentage of aspirin in your sample?
5. Compare the mass of aspirin in the tablet that you have obtained with the value claimed by the manufacturer on the side of the box. What assumptions have you made that might not be true?
6. Pool your results with others and draw out a table for the different sources of aspirin showing their percentage purity and the cost per gram of pure aspirin. Which is the best buy?