Topic 8

Chemical analysis

1

- Chemical apparatus - you must be familiar with the use(s) of the following types of apparatus:
  - conical flask;
  - beaker;
  - measuring cylinder;
  - delivery tube;
  - dropper;
  - test tubes;
  - boiling tubes;
  - funnel;
  - filter paper;
  - evaporating basin;
  - pipette with safety filler;
  - burette;
  - thermometer;
  - volumetric flask.

2

- Practical techniques - you must be familiar with the following practical techniques:
  - simple filtration using filter paper and a funnel to separate the residue from the filtrate;
  - evaporation to separate a soluble sale from a solution;
  - use of a balance;
  - methods for the collection of gases including:
    - collection over water (for relatively insoluble gases);
    - downward displacement of air (for soluble gases that are less dense than air);
    - upward displacement of air (for soluble gases that are more dense than air).
  - methods of heating using Bunsen burners and electric hotplates;
  - preparation of soluble salts by the reaction of acids with metals, metal oxides, metal hydroxides and metal carbonates;
  - preparation of insoluble salts by precipitation:
    - precipitation is the reaction of two solutions to form an insoluble salt called a precipitate;
    - information on the solubility of compounds can be used to predict when a precipitate will form;
    - the formation of a precipitate can be used to identify the presence of a particular ion.
  - testing the electrical conductivity of solids and solutions;

- setting up an electrochemical cell using a salt bridge and either metal or carbon electrodes;
- electrolysis of solutions using a DC supply;
- determination of E_h

3

- Analytical methods:
  - titration is used to determine, accurately, the volumes of solution required to reach the end-point of a chemical reaction;
  - an indicator is normally used to show when the end-point is reached;
  - titre volumes within 0·2 cm^3 are considered concordant;
  - solutions of accurately known concentration are known as standard solutions;
  - flame tests can identify metals present in a sample;
  - it is possible to distinguish an unsaturated compound from a saturated compound using bromine solution;
  - unsaturated compounds quickly decolourise bromine solution;
  - simple tests can be used to identify oxygen, hydrogen and carbon dioxide gases;
  - the type of bonding and structure of a substance can be identified by its properties.

4

- Reporting experimental work:
  - labelled, sectional diagrams can be drawn for common chemical apparatus;
  - data can be presented in tabular form with appropriate headings and units of measurement;
  - data can be presented as a bar, line or scatter graph with suitable scale(s) and labels;
  - a line of best fit (straight or curved) can be used to represent the trend observed in experimental data;
  - average (mean) values can be calculated from data;
  - given a description of an experimental procedure and/or experimental results, an improvement to the experimental method can be suggested and justified.