CIE Chemistry IGCSE

AO3 Practical Skills 2: Plan experiments and investigations

Notes

Planning an experiment

Devising a hypothesis

Before you can start to devise an experimental method, you must devise a **hypothesis**. A hypothesis is a **prediction** made before conducting an experiment about the results you expect to collect. A hypothesis is often written as an if/then statement. For example:

- 'If I drink more water, then I will lose weight faster.'
- 'If you drink coffee before bed, then you will take longer to get to sleep.'

A hypothesis states a relationship between two variables - the **independent** and **dependent** variables. The hypothesis **cannot be proven as true** but it can be supported by scientific data.

Devising a method

When devising a method you must include:

- What your **independent, dependent** and **control variables** are
- How to **control** the **control variables** to ensure the test is valid
- The **range** and **intervals** of your independent variable you will test
- If the experiment should be **repeated**
- Whether a **control experiment** is possible for comparison
- The required **apparatus** and how to **set up** the apparatus **safely**
- The **techniques** required
- A method that enables you to **test the predictions** you have made

Ultimately, the method must be **clear, easy to follow** and enable you to collect **precise and accurate data.**

Risk assessment

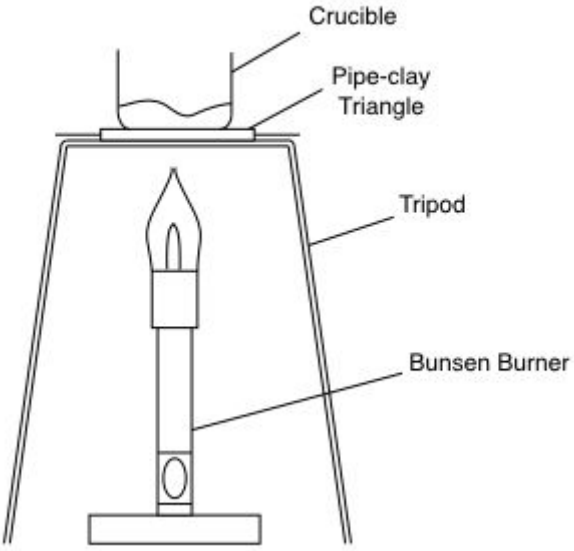
It is important to carry out a **risk assessment** before you start the experiment. This must consider all the **chemicals**, **conditions** and **apparatus** being used. The assessment must evaluate the risk and put in place safety precautions. An action should be in place which can be carried out if the hazard arises.

Common risks in the laboratory:

- **Glassware** - Glassware is fragile so must be handled carefully. Sweep up any broken glass immediately.
- **Bunsen burners** - Bunsen burners could cause flammable chemicals to ignite. Keep windows open and flammable substances away from the Bunsen burner when in use.
- **Corrosive chemicals** - Corrosive chemicals can burn the skin so wear safety glasses and handle with care. Wipe up any spilled chemicals immediately and wash your hands immediately if you come into contact.
- **Toxic chemicals** - Chemicals like ammonia and chlorine have toxic vapours. Handle them in a fume cupboard. Keep the laboratory well ventilated.

Suggesting suitable apparatus

When deciding what apparatus to use the **precision** and **practicality** of using a piece of apparatus for a given task should be considered. A **diagram** is a useful way to show the initial setting up of apparatus. An example is shown:



Example of apparatus suitability for measuring volume:

Various apparatuses are suitable for different uses. To measure liquid volume there are several options, each with a different use:

- **Dropping pipette** - Suitable for very small quantities of solutions, used to add drops to a mixture. Not the most accurate.
- **Measuring cylinder** - Less accurate than a burette but simpler and quicker to use.
- **Beaker** - Low accuracy, often used to hold liquid but can be used to measure approximate volumes.
- **Volumetric pipette** - Measures extremely accurate volumes. Often can only measure one volume accurately. E.g. 25cm^3 volumetric pipette.
- **Burette** - Measures extremely accurate volumes. It can measure a range of volumes.