

CIE Chemistry IGCSE

AO3 Practical Skills 1: Demonstrate
knowledge of how to safely use
techniques, apparatus and materials

Notes



Techniques, Apparatus and Materials

The safe use of techniques, apparatus and materials is crucial to devising a **safe and reproducible** experiment. If an experiment is not safe then it usually means it is **not being carried out correctly**, and therefore the **data collected is not valid**.

Safe use of Techniques

Techniques used in an experiment must be carried out safely. If practical techniques are not executed properly, the person conducting the experiment is at risk and the data from the experiment must be discarded as being **invalid**.

A wide **range of experimental techniques** are carried out in experimental procedures:

- Measurements
- Purification
- Synthesis
- Observation
- Analysis

For the techniques to be carried out safely, it is important that you have a **solid understanding of the method** and what is actually **occurring chemically** in the reaction:

For example, for the experiment to measure the **rate of reaction between sodium thiosulfate solution and hydrochloric acid**, a precipitate is produced so a black cross is observed under the beaker until it disappears. For this observation technique, it is important that you are aware of the reaction going on in the beaker because **sulfur dioxide is produced** which causes irritation to the eyes and lungs. Therefore, to be safe during the observation, you must not breathe in too deeply when looking down the beaker to observe the cross.

Safe use of Apparatus

There are a lot of **hazards** related to experimental apparatus. These must be considered and recorded in a risk assessment when devising an experimental procedure. Apparatus must be used carefully and treated well to **prevent damage**. As well as damaged apparatus causing an expense, it also **corrupts data**. If damaged apparatus is used for an experiment then the data produced must be discarded as **invalid** because it is unknown if the **equipment has affected the results**.

Examples of where the safe use of apparatus needs to be considered:

- **Bunsen burners** - these must be left on the orange safety flame when not in use and the gas tap must be turned off when the flame is not lit. All hair must be tied back and safety goggles must be worn. Flammable substances must be kept away from the flame and the room should be kept well ventilated to encourage complete combustion.
- **Glassware** - fragile glassware is used in the laboratory. This must be handled carefully to prevent it smashing. If the glass smashes it can propose two possible dangers because as well as producing broken glass, the chemical contents of the glassware will also be spilled.
- **Collecting volumes** - if a gas or liquid is produced as a product, it is important that the container used for collection has been calculated to be big enough for the amount of product that will be produced. For example, if a gas syringe is collecting a gaseous product, ensure the syringe is big enough, otherwise the syringe stopper can get rapidly pushed out which could damage the equipment.



Safe use of Materials

Materials used in experiments often have a **hazard symbol** to indicate what precautions must be taken. Common hazards seen in the laboratory are '**irritant**', '**corrosive**' and '**hazardous to the environment**'. The hazard symbols are often on the chemical bottle in a red diamond, similar to the two below. It is important that the hazards of the materials are included in a **risk assessment** when devising an experiment and within this, there should be a record of suitable actions to take.



For example:

Corrosive and/or irritant - these chemicals must be handled carefully to avoid contact with the skin. Safety glasses must be worn and the skin should be washed immediately if it comes into contact.

