Assessing hazards and risks

Chemistry laboratories are usually safe places. This is because knowledge of hazardous chemicals has been carefully documented. In any laboratory there are guidelines for most operations, such as mixing or heating chemicals, the use of fume cupboards, the precautions when using electrical equipment and the disposal of wastes.

Most accidents arise from human error. People in laboratories should take time to think about what they are doing before they start, and pay attention to what they are doing while they work.

**TIP**

The key to health and safety is: STOP – THINK – DO

Always minimise your exposure to risk. Always wear eye protection and whatever other protective clothing is recommended. Follow instructions carefully and take note of safety advice.

Hazards and risks

Anything that can cause harm or injury if things go wrong is a hazard. The chance of harm or injury actually occurring is the risk. The risk depends on the likelihood of something going wrong and on the seriousness of any possible injury. There is little risk from sulfuric acid when it is properly stored in a locked cupboard. The risk increases when someone carries a bottle of the acid into a laboratory for use.

Figure 1 shows the hazard symbols which you are likely to see on bottles, jars and packets during an advanced chemistry course.

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| **Toxic** – chemicals that may involve serious health risks and even cause death if breathed in, swallowed or absorbed through the skin. | **Corrosive** – chemicals that destroy living tissues on contact. | **Flammable** – chemicals which easily catch fire, including solids which may catch fire after brief contact with a flame or which give off flammable gases in contact with water. | **Oxidising** – chemicals which produce a heating effect large enough for flammable substances to ignite when they come in contact with and react with other substances. | **Caution** – chemicals with less serious effects such as skin or eye irritation. |

**Figure 1** Hazard symbols for chemicals.

Working safely

Your teachers and their employers are responsible for carrying out risk assessments for all of your practical work. You will, however, be expected to work safely and correctly as you carry out any practical work.

When you prepare for any experiment, you should look carefully at the procedure and consider where you will be working. You should check on the chemicals you are going to use, and in what quantities and concentrations (if they are solutions) – taking into account any warnings that appear in the instructions.

Try to anticipate the hazards. These might include:

* chemicals that can be splashed into your eyes, absorbed through your skin or inhaled
* chemicals that may spit or splash on heating
* chemicals that may catch fire
* reactions that are highly exothermic or may become violent
* hot apparatus which might cause burns
* glassware that could lead to hazards if it blocks or cracks
* chemicals that need special arrangements for disposal at the end of a practical procedure.

You should take careful note of the precautions that you need to take to control and minimise risks. If you have been asked to plan your own experiment or investigation, this might include:

* working on a smaller scale
* substituting a less hazardous chemical
* using a less hazardous form of the same chemical (for example hydrated crystals instead of an anhydrous powder or a more dilute solution)
* modifying a procedure or using alternative techniques to make it less risky (for example, by working in a fume cupboard to remove harmful vapours, cooling a reaction mixture that might be too violent, or wearing gloves to protect your hands)
* heating liquids with a water bath or electric heating mantle, instead of heating directly with a flame.

**TIP**

If you are asked to devise an experiment or investigation, always make sure that your teacher checks your plans before you start any practical work.