

Safety in the school laboratory

HSA – Health and Safety Authority

To develop an understanding of science it is necessary to explore science by learning through investigation and discovery. Learning by doing motivates and develops curiosity about the world around us. Practical work in science may involve exposure to something that may have the potential to cause harm or injury i.e. a **hazard**. In particular, it may involve exposure to any of the following hazards:

- Chemical e.g. solvents, paints, solvent vapours, waste
- Biological e.g. medical waste or samples of a micro-organism, virus or toxin (from a biological source)
- Physical e.g. slips, trips or falls or sources of energy (noise, extremes in temperature or pressure)



Fig. 1 Scientist working safely

It is important to know the hazards, to understand the **risks** (the likelihood of causing harm and the severity of that harm if it occurs) and apply controls/manage the **risks**, for example by wearing eye **protection** in a laboratory in which **corrosive** chemicals are used.

General safety control measures in the laboratory

Safety in the school laboratory is everyone's concern and the aim is to ensure that no one gets hurt or becomes ill. The following control measures briefly outline ways of preventing accidents:

- Do not enter the laboratory or use equipment without permission.
- Do not eat or drink in the laboratory.
- Be aware of safety signs and adhere to them.
- In the event of an accident, inform the teacher immediately.
- Be aware of the location of fire extinguishers/fire blankets; first aid box and eye wash station.
- Wear eye **protection** when instructed.
- Long hair should be tied back and dangling jewellery, baggy clothing etc. secured.
- Hands should be washed after laboratory practical work.
- Do not run; pay attention to where you are going.

Safety control measures for specific hazards

Safety guidelines in chemistry

Laboratory accidents may be prevented by observing the following control measures:



- Read the **hazard label** and SDS of chemicals before you use them.
- If no label is present inform the teacher immediately.
- Remain alert when working with chemicals.
- Never taste or inhale (sniff or smell the vapours) laboratory chemicals.
- Wear eye **protection** when instructed to do so.
- Wear gloves when instructed to do so.
- Gas should be used only under the direction of a teacher.
- Always use a Bunsen burner in a controlled manner.
- If you smell gas, inform the teacher immediately and do not use gas outlets, electrical equipment or naked flames.
- Do not mix chemicals together unless you are directed to do so as part of the laboratory procedure.
- Never add water to **concentrated acids** or bases.
- Follow the SDS for disposal requirements.
- Report any chemical spills to your teacher for safe disposal.
- Do not return chemicals to stock containers unless instructed to do so.

Understanding hazardous chemicals

The containers of hazardous chemicals should show the appropriate **hazard label** which gives information about the physical, chemical, health and environmental hazards. The current European Union (EU) label shows the **hazard symbols**, the **risk phrases** (describe the hazard in detail) and **safety phrases** (give appropriate handling advice) (Fig. 2). The detail of the **hazard label** will also be listed in the **Safety Data Sheet (SDS)** for that substance. The current EU Classification and Labelling system will be eventually replaced by a globally harmonised system.



Current EU Classification and Labelling system	
Substance: Ethanol EC Number: 200-578-6	Substance: Hydrochloric acid ≥25% EC Number: 231-595-7
Symbol of Danger	Symbol of Danger
	
Indicator of Danger	Indicator of Danger
Flammable	Corrosive
Risk phrases	Risk phrases
R11 Flammable	R34 Causes burns R37 Irritating to respiratory system
Safety phrases	Safety phrases
S2 Keep out of reach of children. S7 Keep container tightly closed. S16 Keep away from sources of ignition – no smoking.	S1/2 Keep locked up and out of the reach of children. S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

Fig. 2 Examples of current EU hazard labels

Biological hazards

Biological agents are widely found in the natural environment. They include bacteria, viruses, fungi (yeasts and moulds) and **parasites**. Some of these agents are harmless to people whilst others have potential to cause ill health. Measles, mumps and **ebola** are caused by viruses.

An **allergic reaction** may occur as a result of exposure to a **biological agent** or substances such as enzymes that it produces. The most common causes of laboratory-acquired infections are:

- **oral aspiration** through contact with Petri dishes containing biological agents
- contact with infectious plant or animal material.

Other common causes of infection include cuts or scratches from contaminated glassware, cuts from dissecting instruments, spilling or dropping bacterial cultures, and airborne **contaminants** entering the body through the **respiratory tract**.

Safety guidelines in biology

The following control measures briefly outline ways of preventing accidents when exposed to potentially infectious biological materials:



Fig. 4 Pipetting safely

- Inform the teacher if you have particular allergies.
- Do not swallow any biological material – inform your teacher if you think you have ingested any biological material.
- Do not place a pipette in your mouth.
- Wear gloves when directed.
- Disinfect the worktop/bench before and after working with **microorganisms**.

- Ensure dissection specimens are properly secured to the worktop while dissecting.
- Disposal of potentially infectious biological material (plant or animal material or micro-organisms) is the responsibility of the teacher.
- Wash, dry and **sterilise** (if appropriate) equipment after use in the biology laboratory or when directed.

Physical hazards

A physical **hazard** is a **hazard** that may have the potential to cause physical harm or physical injury e.g. fire, gas cylinders, lifting/pulling/ holding a heavy load or exposure to sources of energy (noise, vibration, radiation from welding, and extremes in temperature and pressure).

Safety guidelines for physical hazards

The following control measures are ways of preventing accidents:

- Wear eye **protection** when instructed especially whilst working with **compressed gases**.
- Broken glass can cause serious injury; secure all glassware with clamps under direction of a teacher and do not over-tighten.
- Always use the appropriate size of **bung** for the glassware you are using.
- Always handle hot test tubes or glassware with tongs.
- If you are heating something at your bench, do not leave it unsupervised.