



**Chemical Safety**

**Module 2**

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Health & Safety  
**Essentials**

Registered charity number 207890

# Labelling & safe processing

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This section is about chemicals and chemical safety in the laboratory environment. We will look at the classification of chemicals<sup>7</sup> and the meaning of the term dangerous substance. We will look at hazardous substances and properties, incompatibilities and a brief overview of safe processing issues.

## Classification and labelling of chemicals<sup>7</sup>

This is an identification system that allows you to understand how the chemicals that you are using can cause harm to yourself, others or the environment and is covered by the **Classification (Hazard, Information for Packaging) Regulations 2009<sup>7</sup>**.

Classification is a way to determine whether the chemicals supplied are 'hazardous' according to an agreed set of criteria for:

- Physical hazards (e.g. explosive, highly flammable)
- Health hazards (e.g. corrosive, carcinogenic, irritant)
- Environmental hazards (e.g. causes harm to the aquatic environment)

The supplier of the chemical is required to consider what sort of harm a substance can cause, the likelihood and severity of that harm, and how hazardous the substance is.

The orange and black hazard symbols that appear on chemical products, with the warning and safety phrases are familiar to all. Illustrated below are those for explosive, flammable, and oxidising:



## The classification of chemicals<sup>7</sup> according to CHIP:

Properties	Category	Symbol
Physico-chemical	Explosive	E
	Oxidising	O
	Extremely Flammable	F+
	Highly Flammable	F
	Flammable	F
Health	Very Toxic, Toxic	T+, T
	Harmful	Xn
	Corrosive	C
	Irritant (Inhalation), (Skin)	Xn, Xi
	Carcinogen (Cat 1, Cat 2, Cat 3)	T, T, Xn
	Mutagen (Cat 1, Cat 2, Cat 3)	T, T, Xn
	Toxic for reproduction (Cat 1, Cat 2, Cat 3)	T, T, Xn
Environmental	Dangerous for the Environment	N

Classification and labelling laws in the EU and the UK are sophisticated and have a technical system of criteria but there has been much work to establish one system for classification and labelling for chemical producers world-wide.

Regulation (EC) No 1272/2008 - classification, labelling and packaging of substances and mixtures 2008 (CLP) adopts the globally harmonised system (GHS) of classification and labelling of chemicals. The GHS is an agreement rather than law, but the EU Regulation comes fully into force for all EU member states over a transition period up to 2015.

It has a set of recognisable pictograms and illustrated below are those for explosive, compressed gases and flammables:



These will be replacing the **Classification (Hazard, Information for Packaging) Regulations 2009** in 2015, and a transition period is in operation until then.

## Dangerous substances

Dangerous substances<sup>3</sup> are substances or mixtures of substances (preparations), which could create a risk to people's safety from fires, explosions or similar events, such as a thermal runaway from chemical reactions. Materials in the form of liquids, gases, vapours, solids and dusts can all be dangerous substances.

These substances also include any kind of dust that can explode when spread into air to form a cloud (i.e. form an explosive atmosphere), or substances or mixtures of substances that because of their physical properties and the way that they are present create a risk to safety from fires and explosions (which may not be covered by CHIP) e.g. high flashpoint liquids present at elevated temperatures in a process.

Dangerous substances are those that are classified under the Classification (Hazard, Information and Packaging for Supply) Regulations ('CHIP') as explosive, oxidising, extremely flammable, highly flammable, or flammable. Hazardous substances are also classified to the new Regulation (EC) No 1272/2008 - classification, labeling and packaging of substances and mixtures (known as the 'CLP Regs'), which replace the Approved Supply List that is to be discontinued.

Many substances that are also classified as toxic, harmful, irritant or that create another risk to health are covered by the Control of Substances Hazardous to Health Regulations 2002 (COSHH). The requirements for risks to health are covered in more detail within the **Health & Safety Resource Online Module – COSHH**.

## Safe chemical processing

Look at your process and see how the process pathway, substances used, handling practices, sampling strategies, monitoring and control systems can all be reviewed, amended or controlled to give the lowest risk.

An inherently safe process will involve the use of smaller quantities of hazardous materials, the use of a less hazardous material, alternative reaction routes and process conditions that reduce the risk of runaway exothermic reactions, fires, explosions and the release or generation of toxic materials.

You are required to eliminate or reduce the risk from events such as fire, explosions, thermal run-away and release of chemicals. This is a requirement for considerations to be made during the risk assessment for the process.

Careful consideration should be made of incompatibilities, potential releases, by products, and this should include ignition potential, protection from heat, sunlight, moisture and anything that would escalate an incident.

You will find the materials physico-chemical hazards listed on the suppliers Safety Data Sheet, which will give advice on its handling, special storage conditions, temperature limitations, and health issues.

Additionally, you could check compatibilities in the reference book '**Handbook of Reactive Chemical Hazards**' by **Bretherick**.

In general you should also use good laboratory practice techniques such as minimising spillages, use of spill trays or other liquid retaining methods to minimise liquid spread, use of containment, extraction and ventilation. Ensure your work area is in good order, use proper supports for glass equipment, and place electrical equipment out of any enclosures wherever possible, so they are removed from the flammable area, and can be isolated easily. Think about what could go wrong in the process, the likelihood of this occurring, and have controls in place to minimise the risk.



# Learning assessment 1

Match the hazard to the pictogram.

- a. Flammable
- b. Damaging to the environment
- c. Compressed gas
- d. Toxic
- e. Corrosive
- f. Irritant
- g. Explosive
- h. Oxidising
- i. Health hazard

	Answer
	
	
	
	
	
	
	
	
	