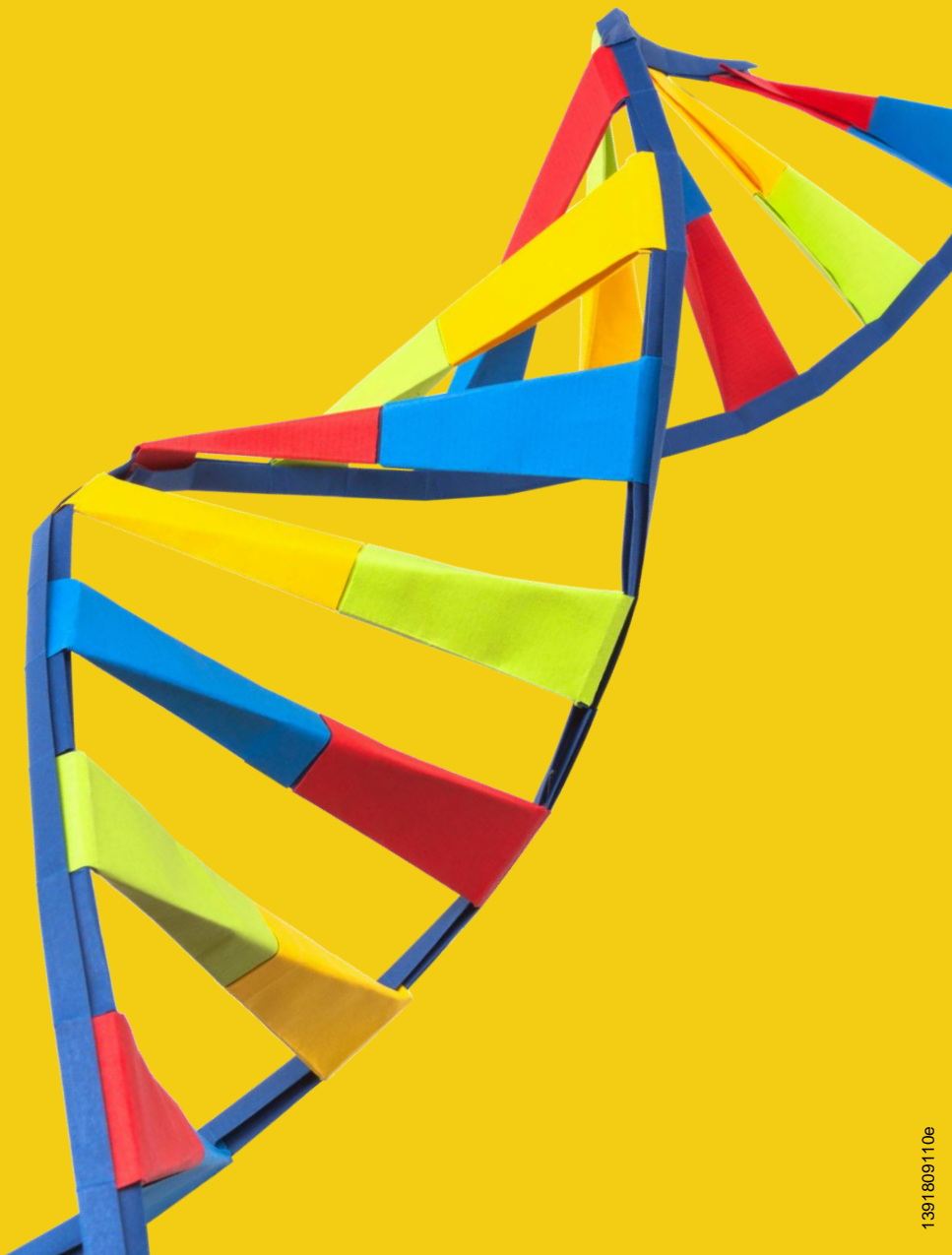


GCSE Science

Practical Booklet:
Safety in the Lab





Introduction








This is a guide to simple terms related to hazards and to health and safety considerations that you will meet in GCSE science lessons or exams. When carrying out any experiment, you are expected to pay due attention to your own safety and to that of other people. You need to be able to describe how hazard symbols are used on containers to show what dangers are presented by the contents and to be able to say how you might manage those risks when using handling hazardous substances.

Exam questions related to experiments that you have already done or that you might carry out in a science laboratory will sometimes ask what precautions you might take to make the experiment safer. Students often lose marks by being too general in their answers to these questions – by referring to things which would be common safety precautions (such as wearing safety glasses, or tying back long hair, perhaps) but which take no account of the particular dangers in the experiment being asked about and how those risks can be managed more safely.

There are common safety symbols that are used in places where you might come across substances that can cause harm to you, others around you and to other living things. You might see these symbols on bottles or storage cupboards in a science lab, but equally you might see them on buildings or on the side of tankers or other vehicles carrying hazardous chemicals on the road. We'll start with a few of the more common hazard symbols you might see being used and what they mean and then we'll look at some questions based on that information, before we go on to some more general safety considerations.



Hazard Symbols

	<p>Irritant</p> <p>This symbol warns that a chemical may harm your health if you do not use it properly. The chemical may give you a rash if you get it on you or make you choke if you breathe it in. Examples include detergents, acetone, chlorine.</p>
	<p>Corrosive</p> <p>This symbol tells you that a chemical is corrosive. It will attack your skin if you get it on you. Examples include sulfuric acid, sodium hydroxide.</p>
	<p>Flammable</p> <p>This symbol tells you that a chemical is flammable. It catches fire easily. Examples include alcohols, methylated spirits, petrol.</p>
	<p>Oxidising</p> <p>This symbol warns you that a chemical is oxidising. This means that it can provide a source of oxygen for a fire and make the fire worse. Examples include oxygen, hydrogen peroxide, potassium permanganate.</p>
	<p>Toxic</p> <p>This symbol means that a chemical is poisonous (toxic). Poisons can kill. Examples include pesticides, mercury, lead.</p>
	<p>Harmful to the water environment</p> <p>This symbol warns you that a chemical is very poisonous to water organisms. Chemicals like this should not be released into the environment. Examples include nitrates and phosphates, oil spills and industrial waste.</p>
	<p>Some symbols tell you to do things so that you stay safe:</p> <p>This symbol reminds you to wear safety glasses or goggles when working in a certain area or using particular pieces of equipment or chemicals.</p>



This symbol reminds you to wash your hands after you have done an experiment.

Exemplar exam questions

Q4c i and ii, 1CH0_2F, 2019

(c) Calcium chloride is hazardous to health.

(i) Which hazard symbol would be expected to be seen on a container of calcium chloride?

(1)

☐ A



☐ B



☐ C



☐ D



(ii) Give a safety precaution that the student should take during the experiment.

(1)



Examiner's report

Calcium chloride is an irritant, so the correct answer to part (i) is C

The second part of this question (4c ii) was very well answered with a significant majority of responses scoring the 1 mark available. Most correct responses referred to the use of goggles or gloves. In many responses where glasses were referred to, candidates specified 'safety' glasses to score the mark.

Reference to 'glasses' alone did not score. Commonly seen incorrect answers included: wear an apron, tie long hair back, washing hands, use a blast shield, being careful or wearing a mask.

Q8c I and ii, 1CH0_2F, 2022



Figure 15

(i) What is the meaning of the hazard symbol in Figure 15?

- ☐ A flammable
- ☐ B health hazard
- ☐ C oxidising
- ☐ D toxic

(1)

(ii) Barium hydroxide is also corrosive.

Give **one** precaution that the student should take when using barium hydroxide.

(1)

Examiner's report

The correct answer to part (i) is B. It was pleasing to see that the majority of candidates were able to give a suitable precaution when using corrosive barium hydroxide. However, some of the weaker responses gave unsuitable answers, such as wearing PPE or washing hands.



wearing goggles



ResultsPlus
Examiner Comments

This is a response that was awarded the mark.

The student should wear safety equipment
to ensure they don't harm themselves when using it.



ResultsPlus
Examiner Comments

The candidate's reference to safety equipment is too vague and does not score.



ResultsPlus
Examiner Tip

When asked for precautions, be specific with your answer and ensure that the precaution you state is relevant to the practical being discussed.

Q8b ii, 1BI0_2F, 2018

- (ii) Give **one** safety precaution you need to take when handling animal tissue such as blood vessels.

(1)

Examiner's report

Safety precautions must be appropriate to the practical task being assessed: in this case dealing with animal tissue so gloves, washing hands and sterilising equipment were the relevant precautions. General lab practice will not be awarded marks on this style of question as safety precautions have to be specific to the task.

- (ii) Give **one** safety precaution you need to take when handling animal tissue such as blood vessels.

(1)

gloves, be careful of your
surrounding, gloves.



'Gloves' was the most common answer seen. Gloves on its own was credited in this item as it was thought that the only thing to do with them would be to wear them.

Avoid vague answers like 'be careful of your surroundings' as this is true for all practicals. For credit in the safety precaution questions they must be specific to the practical in the question and not a general laboratory rule.

Exam Style Questions

- **Q1** A teacher takes precautions to protect her students from the radiation emitted by the radioactive sources. State **two** suitable precautions that protect the students. **(2)**
- **Q2** State one safety precaution that should be taken when storing cobalt-60. **(1)**
- **Q3** HIV is diagnosed by blood tests. State two safety precautions that need to be taken when handling blood samples. **(2)**
- **Q4** State a problem caused by the disposal of poly(propene) ropes in landfill sites. **(1)**
- **Q5** A titration is to be carried out to find the concentration of a solution of sodium hydroxide. State one safety precaution that must be taken when using sodium hydroxide solution and dilute sulfuric acid **(1)**



Mark schemes

Question Number	Answer	Acceptable answers	Mark
Q1	Any two relevant precautions	<p>Distance (between students and source); no touching; no eating; short exposure time;(use of) film badge/detector ;</p> <p>Protective clothing; Use of <u>lead</u> (lined) box /keep box shut/sources in box (when not in use);</p> <p>(stand behind/use of) a screen; Do not point (source) at students; Show video/dvd of demo;</p> <p>Ignore goggles, gloves, lab coats,;</p> <p>Answers referring to the safety of teacher can score a maximum of one of the 2 marks eg use of tongs</p>	(2)

Question Number	Answer	Acceptable answers	Mark
Q2	<p>any one from:</p> <ul style="list-style-type: none"> • use a lead (-lined) box (1) • warning signs (1) • restricted access owtte (1) • locked room/cupboard (1) 	<p>ignore references to temperature/safety goggles/gloves/don't touch it/keep it at a distance/protective clothing/(face) mask</p> <p>sealed/secure container eg metal-lined box or in concrete (block) or behind lead (walls)</p> <p>keep people away / keep away from people</p>	(1)



Question Number	Answer	Additional guidance	Mark
Q3	Any two from: <ul style="list-style-type: none"> • wear gloves/ goggles/cover wounds/cover cuts (1) • clean up spills/use tongs to handle sample (tubes) (1) • store samples in sealed containers (1) • dispose of samples safely (1) 	accept store in fridge/cooler accept burn/incinerate/sterilise(1)	(2) AO 2 1

Question Number	Answer	Acceptable answers	Mark
Q4	not biodegradable / persist in landfill sites / does not decompose	ignore answers in terms of burning / allow takes a long time to rot / decompose / takes up space in landfill	(1)

Question number	Answer	Mark
Q5	any one precaution from: <ul style="list-style-type: none"> • wear gloves to prevent contact with skin/safety (1) • spectacles to prevent contact with eyes (1) 	(1)