Chlorine

including **chlorine water**

Substance	Hazard	Comment
Chlorine *Gas*	 **OXIDISING** **TOXIC** **ENVIRONMENTAL HAZARD**	DANGER: may cause or intensify fire; causes skin and serious eye irritation; toxic if inhaled; may cause respiratory irritation; very toxic to aquatic organisms. Effects of exposure by inhalation may or may not be immediately apparent and can develop or increase over time. Inhalation by those with known breathing difficulties (eg asthma) may exacerbate such pre-existing conditions. For a 15-minute exposure, the concentration of the gas in the atmosphere should not exceed 1.5 mg m^{-3}. It is used to kill microbes in public water supplies, at a concentration between about 0.1 and 1.0 mg per litre. It is also used to treat swimming pool water at a concentration between about 1.4 and 4.0 mg per litre. It may be formed in the laboratory by electrolysis and the oxidation of some chlorides. It may be formed in the laboratory, in the home or at work by the action of acid on bleaches; see CLEAPSS *Student Safety Sheet 41*.
Chlorine water *Solution in water*	**Currently not classified as hazardous** (but beware of **TOXIC** gas given off)	It can be made in a fume cupboard by diluting a saturated solution with a little more than its own volume of water. Chlorine gas escapes easily from the solution, especially if it is warmed. For a 15-minute exposure, the concentration of chlorine gas in the atmosphere should not exceed 1.5 mg m^{-3} and this could easily be approached in localised situations, eg just above open test tubes or bottles.

Typical control measures to reduce risk

- If preparing the gas in test-tube reactions, use the smallest possible amounts; where possible, absorb excess gas with a soda lime tube.
- Wear eye protection.
- Use a fume cupboard for anything larger than test tube amounts of gas; ensure good laboratory ventilation.
- If testing for the gas by its smell, follow the safe technique for sniffing gases: use your hand to waft the gas towards your nose.
- Do not expose asthmatics to the gas; even with chlorine water, take care not to breathe in chlorine.

Assessing the risks

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
- How serious would it be if something did go wrong?
  Note: there are occasional reports of pupils being taken to hospital as a result of breathing in chlorine.
- How can the risk(s) be controlled for this activity?
  eg can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

In all emergency situations, alert the responsible adult immediately. Be aware that actions may include the following:

- In the eye — Irrigate the eye with gently-running tap water for at least 20 minutes. Call 999/111.
- Vapour breathed in — Remove the casualty to fresh air. Call 999/111 if breathing is even slightly affected.
- In the mouth/swallowed — Do no more than rinse and spit with drinking water. Do **not** induce vomiting. Call 999/111.
- Spilt on the skin or clothing — Remove contaminated clothing. Irrigate the affected area with gently-running tap water for at least 20 minutes. Call 999/111 as appropriate. Rinse clothing.
- Spilt on the floor, bench, etc — Open all windows. For a release of more than 1 litre of chlorine gas, evacuate the laboratory. Mop up chlorine water and rinse with plenty of water.
- Gas escape in a laboratory — Open all windows. If over 1 litre of gas is released, evacuate the laboratory.

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