



Substance	Hazard	Comment
Hydrogen Gas	 FLAMMABLE  GAS CYLINDER	<p>DANGER: extremely flammable gas; contains gas under pressure, may explode if heated (cylinders & canisters).</p> <p>It forms explosive mixtures with air and oxygen. Mixtures with air between 4% and 74% hydrogen by volume are explosive.</p> <p>Explosive mixtures will ignite below 500 °C and well below this temperature in the presence of catalysts such as transition metals and their oxides.</p> <p>The explosion with oxygen produces a very loud noise which can damage hearing.</p> <p>Mixtures of hydrogen and oxygen can arise when recharging a car battery (or model cells in schools); ensure good ventilation, avoid sparks and naked flames.</p>

Typical control measures to reduce risk

- If preparing the gas in test-tube reactions, use the smallest possible amounts.
- Wear eye protection and stand well back.
- Use safety screens for all but test-tube amounts of the gas; ensure good laboratory ventilation.
- If preparing the gas on anything larger than a test-tube scale, make sure the apparatus has the smallest possible volume, so that only a little air has to be flushed out. If lighting the gas at a jet, test a sample to make sure that all the air has been flushed out and light from a distance.
- If possible, use a gas cylinder rather than generate your own hydrogen, because the cylinder produces a more-rapid flow which flushes air more quickly from the apparatus.
- When reducing, eg, metal oxides, consider alternative reducing agents such as methane or ammonia gas.

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?**
eg, could the hydrogen be ignited accidentally? How easy is it to make sure that all the air has been flushed out?
- **How serious would it be if something did go wrong?**
NB There are occasional reports of pupils being taken to hospital (for treatment to cuts or for splashes of chemicals) as a result of damage to apparatus in hydrogen explosions.
- **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

- **Gas escape** Open all the windows. Make sure there are no naked flames.
- **Explosion** If there are cuts from flying glass, apply pressure using a clean pad of cloth. Do **not** attempt to remove large pieces of embedded glass, etc. If there is arterial bleeding, the casualty should be laid down and the injured limb raised up. Consult a medic.