






Oxygen and ozone

Substance	Hazard	Comment
<b>Oxygen (O<sub>2</sub>)</b> Gas	 OXIDISING   GAS UNDER PRESSURE	DANGER: may cause or intensify fire; contains gas under pressure, may explode if heated (cylinders).  Air contains about 21% oxygen.  Combustible substances burn much more fiercely in air which has been only slightly enriched with oxygen (eg, 25%).  Products of combustion are often strongly acidic or basic (alkaline) oxides.  If the amount of oxygen in the air becomes too low, headaches, unconsciousness and death may result. First effects may be noticed when the percentage drops to 18%. Similar effects may be observed on high mountains due to lower air pressure.
<b>Ozone (O<sub>3</sub>)</b> Gas	 OXIDISING   TOXIC   IRRITANT	DANGER: may cause or intensify fire; causes serious eye irritation; fatal if inhaled. For a 15-minute exposure, the concentration in the atmosphere should not exceed 0.4 mg m <sup>-3</sup> . It is not normally made or used in school science.  In the presence of sunlight, traces of hydrocarbons in the air react with nitrogen oxides (see <i>CLEAPSS Student Safety Sheet 53</i> ), eg from car exhausts, to form ozone. This causes photochemical smog in certain hot weather conditions. Small amounts of ozone are also formed in some photocopiers but this is only likely to be a problem in a small room with poor ventilation.  Although dangerous if breathed in, ozone in the upper atmosphere performs a very important role, where it absorbs much of the ultraviolet radiation reaching the Earth, thus preventing dangerous exposures (see <i>CLEAPSS Student Safety Sheet 12</i> ). Certain chlorinated hydrocarbons (see <i>CLEAPSS Student Safety Sheet 62</i> ) have a role in damaging the ozone layer.

Typical control measures to reduce risk

- Wear eye protection when preparing oxygen or burning substances in oxygen.
- Never look directly at the very bright light from magnesium burning in oxygen. Wear eye protection and view through a passive welding filter lens, shade 9. Note: viewing through fingers, sunglasses, smoked glass, blue glass or polaroid filter is **no longer recommended**.
- Avoid inhaling products when non-metals or metals are burning in oxygen.
- Use safety screens when burning substances in oxygen on anything larger than a test tube scale.
- If using cylinders of oxygen, do not lubricate controls with oil or grease as this might catch fire.

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 substances burn much more fiercely than expected?*
- How serious would it be if something did go wrong?  
*eg would there be widespread health effects if the ozone layer is damaged by pollution?*
- 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:

- Gas escape                                      Open all the windows. Extinguish all naked flames.
- Clothing catches fire                         Smother flames on clothing or the skin with a fire blanket or other material. Cool any burnt skin with gently-running tap water for 20 minutes. Call 999/111 if the area of burn is larger than a small coin.
- Other fires                                        Allow fires in sinks etc to burn out. Fires at the top of test tubes, beakers etc should be smothered with a damp cloth or heat resistant mat.