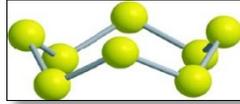


AS90933 Properties and uses of non-metals and selected compounds

	Carbon	Nitrogen	Oxygen	Sulfur	Chlorine
Allotropes and element stuff	<p>Buckminsterfullerene, C₆₀, covalent molecular.</p> <p>Diamond, covalent network, very hard, no delocalised electrons.</p> <p>Graphite, covalent network, delocalised electrons within sheets, weak (but many) attractive forces between sheets. A good high-melting point conducting lubricant.</p>	<p>N₂(g), molecular covalent.</p> <p>Strong covalent triple bond, very unreactive.</p> <p style="text-align: center;">⋮N ≡ N⋮</p>	<p>O₂ and O₃.</p> <p>Ozone layer at high altitude protects us from UV rays. It is toxic as highly oxidizing. Can be used to disinfect water with only oxygen as a by-product.</p>	<p>S₈ rings.</p>  <p>Monoclinic (needle-like) reverts to rhombic (plate-like).</p> <p>Plastic sulfur forms when liquid sulfur is cooled quickly.</p>	<p>Cl₂(g), molecular covalent. Dense poisonous pale green gas.</p> <p>Turns damp blue litmus red then bleaches it.</p> 
Ion	None.	N ³⁻ , nitride	O ²⁻ , oxide	S ²⁻ , sulfide	Cl ⁻ , chloride
Oxyanions	CO ₃ ²⁻ , carbonate	NO ₃ ⁻ , nitrate, NO ₂ ⁻ , nitrite		SO ₄ ²⁻ , sulfate, SO ₃ ²⁻ , sulfite	OCl ⁻ , hypochlorite
Industrial processes		<p>Nitrogen is a raw material in the Haber Process which makes ammonia (see <i>compounds</i>). Catalyst, lumps of iron. High pressure and moderate temperatures needed.</p> <p>$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$</p>		<p>Sulfur is a raw material in the Contact Process which makes sulfuric acid (see <i>compounds</i>). Catalyst, vanadium pentoxide makes SO₃(g) which is dissolved in concentrated H₂SO₄ to make oleum, H₂S₂O₇.</p>	
Compounds	<p>CH₄, methane.</p> <p>CO₂, carbon dioxide, is a dense gas which doesn't support combustion. Turns limewater from clear to cloudy. Produced by reacting carbonates with acids or by respiration (aerobic and anaerobic).</p>	<p>NH₃, ammonia. Very soluble, basic gas. Turns damp red litmus blue.</p>  <p>Used to make nitric acid, some plastics and fertilisers, as well as being used as a refrigerant.</p>	<p>Metal oxides are generally basic.</p> <p>Non-metal oxides are acidic.</p>	<p>SO₂(g), sulfur dioxide. Produced when sulfur burns with a pale blue flame.</p> <p>$S(s) + O_2(g) \rightarrow SO_2(g)$</p> <p>Very soluble and strongly acidic. Used as a bleach and a preservative. H₂SO₄, sulfuric acid. Very widely used in many industrial processes <i>e.g.</i> drugs, explosives, detergents, dyes and pigments. Makes superphosphate (soluble) out of phosphate (insoluble).</p>	<p>Chlorine reacts with water producing HCl and HOCl.</p> <p>$Cl_2 + H_2O \rightarrow HCl + HOCl$</p> <p>Hypochlorous acid, HOCl is a bleach and anti-bacterial compound. Household bleach is a solution of sodium hypochlorite.</p>