Sources of sulfur

• In it's elemental form underground in USA, Mexico and Poland

• Can be made from Sulfides ores

• Bi-product of from removal of sulfur from petroleum and natural gas

Uses of sulfur

• Making of sulphuric acid (important chemical used in many industries)

• Used extensively in making rubber tyres more flexible- vulcanising (rubber tyre is heated with sulfur)

Sulfur dioxide

• Made by the direct combination of sulfur with oxygen

→ This method is the first stage of manufacture of sulphuric acid

$S + O_2 \rightarrow SO_2$

Uses of sulfur dioxide

• As a bleach in the manufacture of wood pulp for paper

• Preservative for foods and drinks by killing bacteria

• Sulfites are added to foods and these release sulfur dioxide in acidic conditions

Manufacture of sulphuric acid

• Synthesized by the contact process

→ Uses sulfur and oxygen from air

→ Is done in three distinct conditions

Stage 1) Oxidation of sulfur

$S + O_2 \rightarrow SO_2$

Stage 2) Oxidation of SO_2 to sulfur trioxide

Catalyst used: V_2O_5

$2SO_2 + O_2 \rightleftharpoons 2SO_3$

Conditions during stage 2

Temperature 450°C

→ Reaction is exo so increasing temperature shits equilibrium position to the left therefore, higher the temperature, lower the yield.

Pressure 2 atm

→ Increase in pressure shifts equilibrium position to the right (direction of a smaller number of gaseous moles)

Stage 3) Sulfur trioxide is absorbed into solution of sulfuric acid to produce oleum

$SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

Manufacture of sulphuric acid (cont)

→ Trioxide isn't absorbed into water because a fine mist of sulfuric acid will be produced and this would be difficult to produce and thus, highly dangerous

→ Oleum is added to water to form concentrated sulfuric acid

$H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

Properties of sulfuric acid

•It is a strong dibasic acid (two of its hydrogen atoms can be replaced by a metal)

•Reacts in a similar way to other acids with metal carbonates, oxides, hydroxides and metals (and ammonia)

•Concentrated sulfuric acid is corrosive and a powerful oxidizing agent

•A very powerful dehydrating agent (very good at removing water from other substances

Uses of sulfuric acid

DIlute

•Used as a catalyst in many organic reactions

•To clean the surface of metals

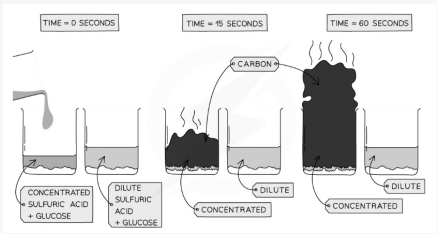
Concentrated

•Used in car batteries, making phosphate fertilizers, soaps and detergents

•Used to make acid drain cleaners

•Used in production of paints and dyes

Sugar and sulfuric acid



When mixed with sugar, ($C_6H_{12}O_6$), concentrated H_2SO_4 will remove water molecules and leave behind carbon, producing a tower of pure carbon