Classification of Substances

Atoms

- **Atoms** are the smallest particles found on Earth

- Everything is made up of atoms

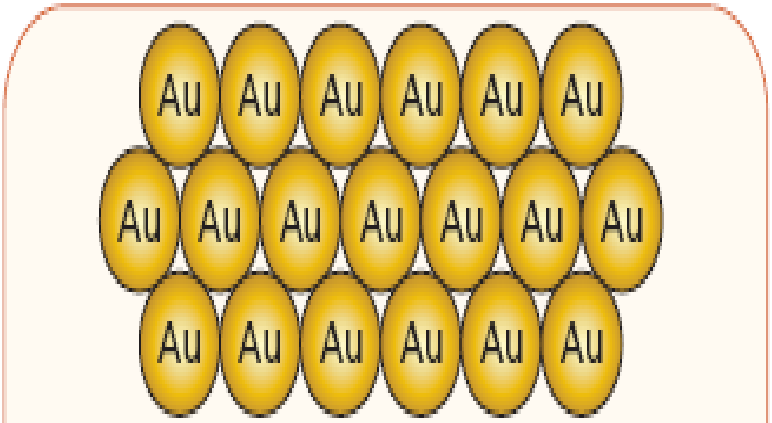


Fig 19.1 Gold (symbol Au) is an element. Note how tightly the atoms are packed together. This is why gold is a solid

Molecules

- Molecules are substances made two or more atoms are chemically combined, e.g. 0_2

Molecules

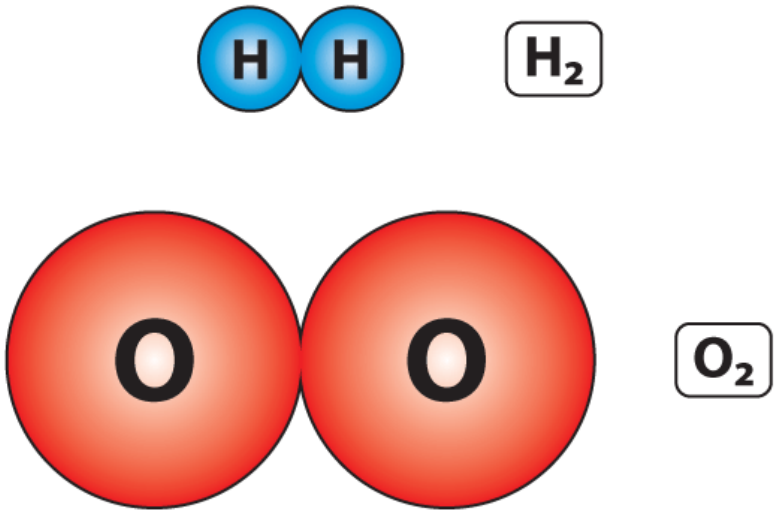


Fig 20.8 Hydrogen molecules (above) and oxygen molecules

Elements

- **An Element** is something that can't be broken down into something simpler
- Elements are found naturally on Earth e.g. Oxygen, Carbon, Silver
- A list of all the Elements can be found in the Periodic table

Elements

- An Element of Oxygen will only have atoms of Oxygen in it
- An Element of Hydrogen will only have atoms of Hydrogen in it

Compounds

- **Compounds** are 2 or more elements combined together

- **Example:** Water H2O

  Water is made up of the element Hydrogen and the Element Oxygen combined together

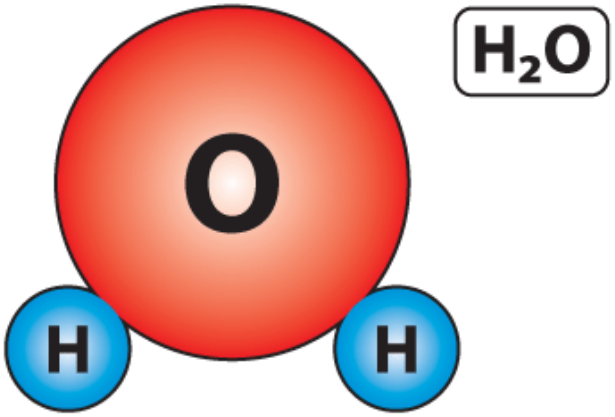


Fig 20.5 Water molecule

Compounds

- **Example:** Table salt NaCl

  Table salt is made up of the element _____ and the Element _____ combined together

Look up the Periodic Table!

Mixtures

- **Mixtures** have 2 or more different substances mixed together but not chemically combined

- This means the 2 substances can be separated from each other easily

Mixtures

- **Example:** Sea salt

Sea salt is a mixture of salt and water

- *Can you remember how to separate salt from water?*

Mixtures

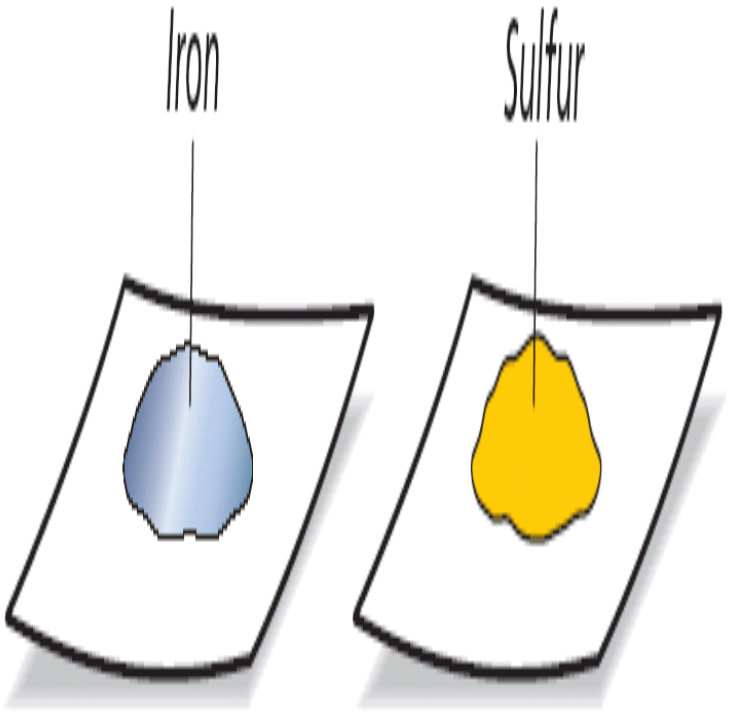
- **Example:** Air

  Air is a mixture of different gases including Oxygen, Nitrogen, Carbon Dioxide and other gases

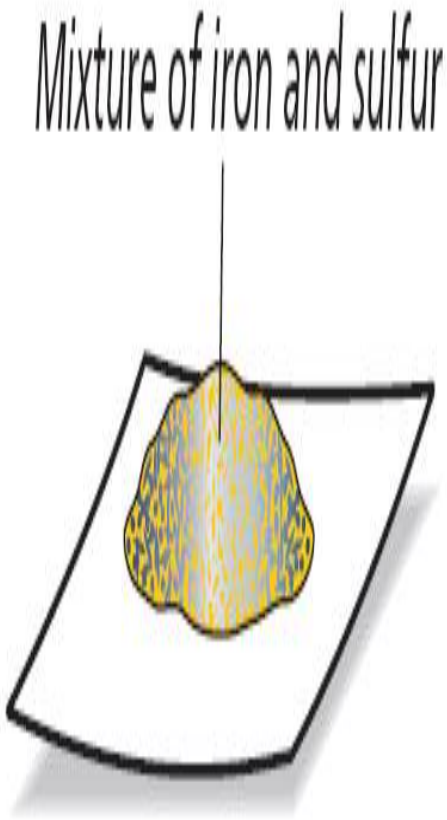
A Demonstration to compare a mixture of Iron and Sulphur to the Iron Sulphide (FeS)

- Firstly recall the difference between a Mixture and a Compound
- A mixture is ?
- A compound is ?

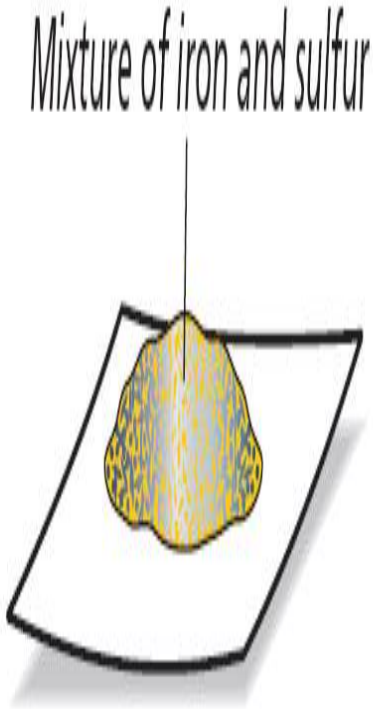
- Weigh out 2g of Iron and 4 g of Sulphur on a piece of paper



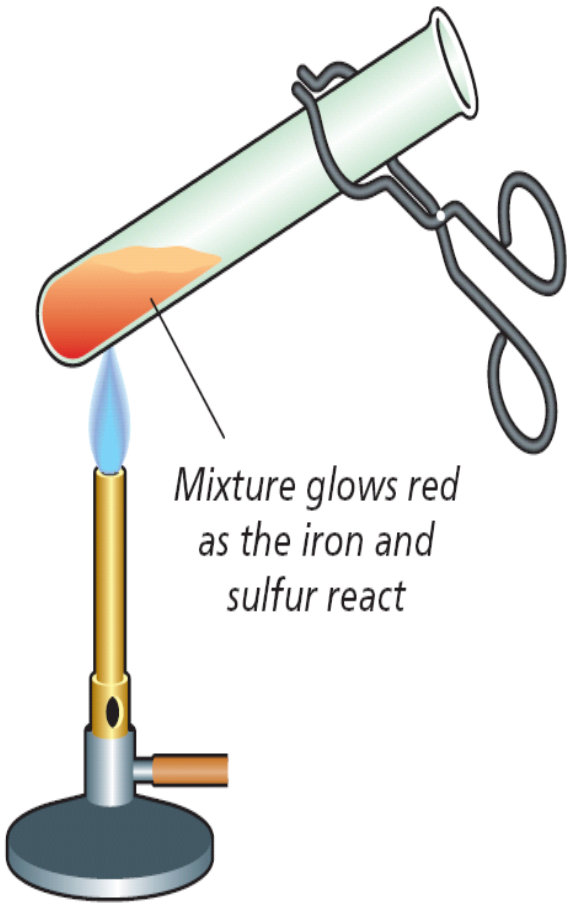
- Mix the Iron and the Sulphur together



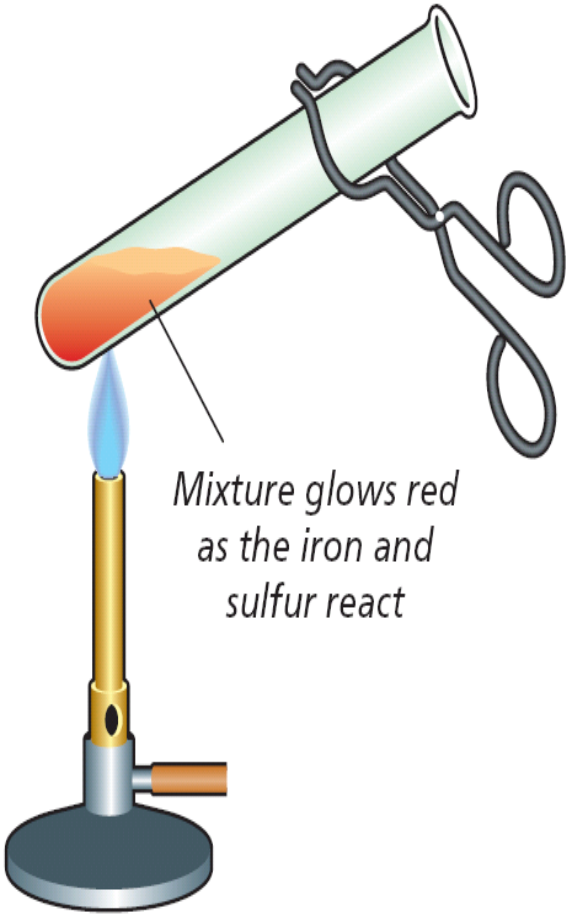
- You can separate the Iron from the Sulphur by placing a magnet above the mixture
- The Iron will stick to the magnet and the Sulphur will stay on the paper



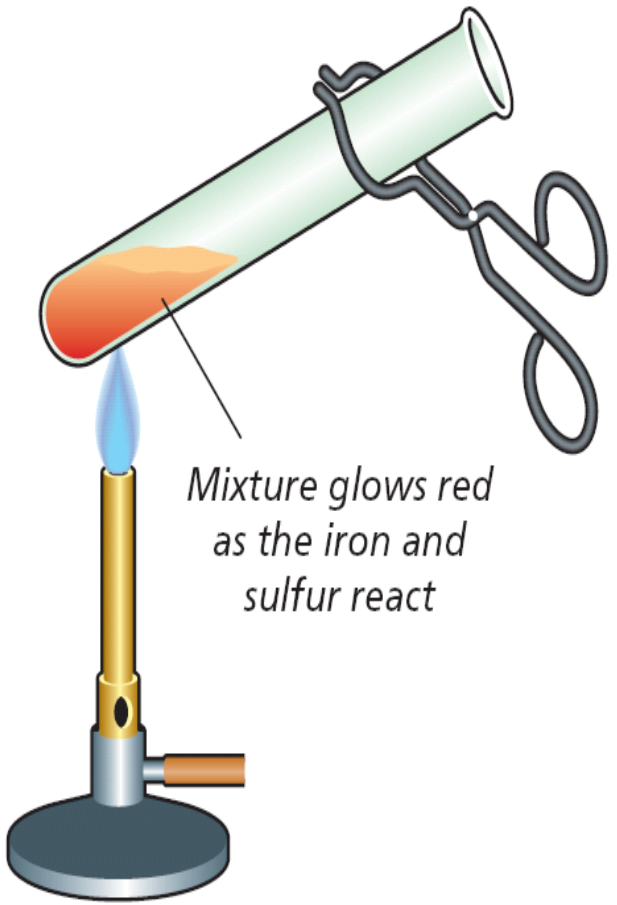
- Place the Iron back onto the paper with the Sulphur
- Place this mixture into a test tube
- Heat it strongly in a fume cupboard



- Why in a fume cupboard? Sulphur dioxide gas is given off which is poisonous
- The mixture has turned into the red compound Iron Sulphide



- Place the magnet over the compound
- The Iron is not attracted and the compound can't be separated



Elements can lose their properties in chemical reactions

- The above demonstration is an example of a chemical reaction (Heating)
- Before heating the Element Iron was grey and the Element Sulphur was yellow
- After heating (or after the chemical reaction) both Iron and Sulphur lost their original colours and turned to red
- The Elements lost their properties in the chemical reaction

Properties of Elements v Compounds

- Elements can have different properties when they are on their own compared to when they are together in Compounds

Properties of Elements v Compounds

- **Example:** Carbon Dioxide (CO2)
- Carbon (C) is black and a solid
- Oxygen (O) is colourless and a gas

- Carbon Dioxide (CO2) is a colourless gas with no smell or taste

Properties of Elements v Compounds

- **Example:** MgO
- Magnesium (Mg) is silver and a solid
- Oxygen (O) is colourless and a gas

- MgO is a solid, white powder

Compounds	Mixtures
Made up of a single substance	Made up of two or more substances
Elements in a compound are always in a fixed ratio	Amounts of substances in a mixture can vary
Difficult to separate the elements of a compound	Usually easy to separate the substances in a mixture
Properties of a compound are different to those of the elements it contains	Properties of a mixture are similar to those of the substances in the mixture
There is usually a heat change when a compound is formed	Very little heat change when a mixture is made

▲ Fig 20.11 The differences between compounds and mixtures

Physical Reaction

- A physical change or reaction is when nothing new is formed

- Ice melting
- Blowing up a balloon

Chemical Reaction

- A chemical change or reaction is when a new substance is formed

- A banana ripening
- Acid and Base together will give a salt and water