

# Elements and compounds

If *everything* is made up of **atoms**, how many different types do you think there are? A million, a hundred thousand or ten thousand? In fact, there are only 92 that occur naturally on Earth. There are also at least 23 that have been made by scientists. The good news is that this small number of atoms can join together in many ways to make the millions of different substances that are all around us.

## Elements

All atoms are made of **protons**, **neutrons** and **electrons**. But there are different types of atom. Every type of atom has a different number of protons. For example, carbon has six protons, but hydrogen has only one proton in the **nucleus**. All of these atoms are arranged in a chart called the **periodic table** of the **elements**. Each element has its own symbol — for example, the element carbon has the symbol 'C'.

An element is a substance that contains only one type of atom. Gold is the only metal that occurs in large amounts as an element. Most other atoms found in nature are joined to other types of atoms.

## Compounds

In a **compound**, the atoms of one element are joined tightly to the atom or atoms of another element. This means that a compound is made up of different types of atoms **bonded** together. A compound has very different properties compared with the elements from which it is made. For example, the compound sodium chloride (table salt) is very different from the elements sodium and chlorine.



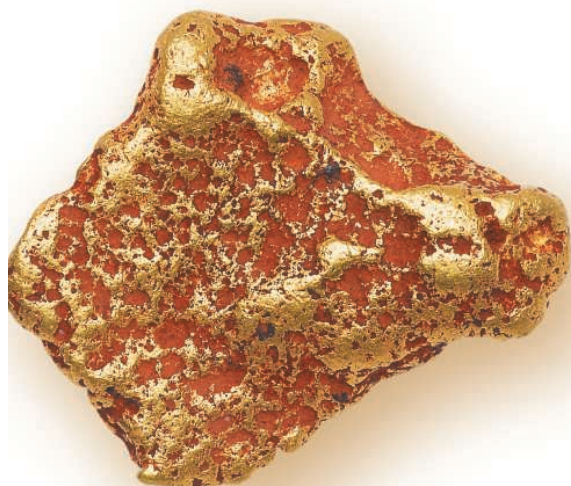
The elements sodium and chlorine bond to make the compound sodium chloride.

## In a mix

**Mixtures** can be made up of:

- two or more elements
- two or more compounds
- a combination of elements and compounds.

In a mixture, the elements or compounds are not bonded together. The **particles** of one type just get in between particles of another type. This means that mixtures can be separated.



Pure gold is an element made up of only gold atoms.



### Examples of elements, compounds and mixtures

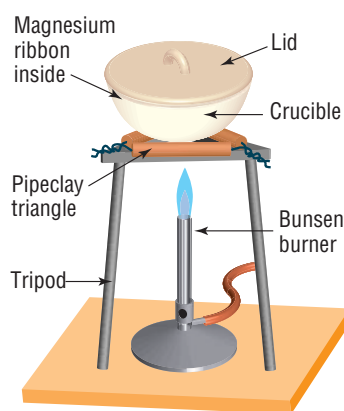
Common name	Scientific name	Type of substance	Made up of
Helium	Helium	Element	Helium
Sulfur	Sulfur	Element	Sulfur
Graphite	Carbon	Element	Carbon
Carbon dioxide	Carbon dioxide	Compound	Carbon and oxygen
Water	Dihydrogen oxide	Compound	Oxygen and hydrogen
Marble	Calcium carbonate	Compound	Calcium, carbon, oxygen
Sugar	Glucose	Compound	Carbon, hydrogen, oxygen
Air	—	Mixture	Oxygen, nitrogen, carbon dioxide and other gases
Sea water	—	Mixture	Water, sodium chloride and other compounds



## From elements to compounds

You will need:  
clean, shiny magnesium ribbon (5 cm long)  
crucible with lid  
clay triangle  
Bunsen burner, tripod, heatproof mat  
tongs  
blue glass.

1. Examine the magnesium ribbon and record its appearance.
  2. Is magnesium an element or a compound? (*Hint: Does it appear in the periodic table?*)
- Set up the equipment as shown.
  - Heat the crucible on a blue flame. Use tongs to lift the lid occasionally to see what is happening.



**!CAUTION:** Never look directly at burning magnesium. Instead, look through the blue glass and only for a very brief time.

- When all the magnesium is burnt, turn off the flame and leave to cool.
3. How has the appearance of the magnesium changed?
  4. The burnt magnesium is a compound. Where did the other element come from to join with the magnesium? (*Hint: What does a fire need in order to burn?*)

## Activities

### REMEMBER

1. Explain the following terms carefully.
  - (a) Element
  - (b) Compound
  - (c) Mixture
2. Give two examples of each type of substance in question 1.
3. If atoms are 'bonded' together, what does this mean?
4. How many elements are there in total?
5. What elements are present in carbon dioxide?

### THINK

6. How can only 92 different elements make millions of different compounds?
7. Draw a diagram to show a mixture of water and carbon dioxide **molecules**.

### CREATE

8. Build models of some compounds. You may have to work out how many of each type of atom there are in a compound and in what shape they are joined together.

### INVESTIGATE

9. Each element has a symbol. Describe what this means, and identify the symbols of the first ten elements in the periodic table.

### ICT

10. Find out more about the elements by studying an interactive periodic table. Go to [www.jaconline.com.au/sciencealivevic/salevel5](http://www.jaconline.com.au/sciencealivevic/salevel5) and click on the Periodic Table link for information.

### learning I CAN:

- describe the difference between elements, compounds and mixtures
- give examples of elements, compounds and mixtures.