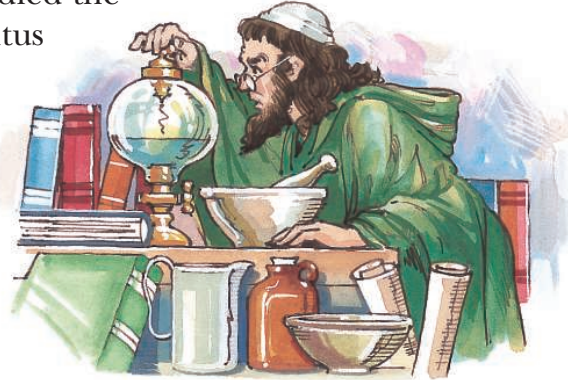


What's in an atom?

About 2000 years ago, an alchemist named Democritus lived in Greece. Alchemists were important scientists who studied the stars, made metals and performed spells. Democritus was also a teacher. He suggested that everything was made up of tiny **particles** that he could not see. He called these particles 'atomos' meaning 'unable to be divided'. Scientists have now proved that Democritus was correct, although other teachers disagreed with him at the time. Now we have the technology to see these tiny **atoms** using powerful microscopes.



Atoms

The particles that make up all matter are called atoms. It's almost impossible to imagine how small an atom is. A hundred million atoms side by side would be only 1 cm long! A sheet of paper like this page is about a million atoms thick! There are over 100 different types of atom, including oxygen, hydrogen, zinc and gold. Although we think of atoms as the smallest particles, scientists now know that atoms are made up of even smaller parts.

Structure of an atom — summary

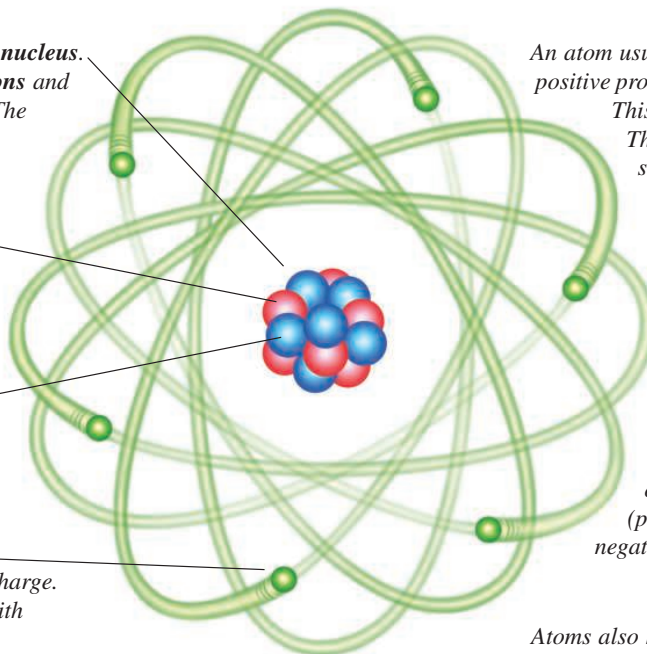
Part of atom	Where found	Relative weight	Charge
Proton	Nucleus	Heavy	Positive
Neutron	Nucleus	Heavy	Neutral (no charge)
Electron	Around nucleus	Light	Negative

In the middle of the atom is the **nucleus**. The nucleus is made up of **protons** and **neutrons** held tightly together. The nucleus has a positive charge because it contains protons.

Protons are found in the nucleus. They have a positive charge and are heavy when compared with electrons.

Neutrons are found in the nucleus and have no charge (neutral). They are also heavy when compared with electrons.

Electrons move around the nucleus. They have a negative charge. They are very light compared with protons and neutrons.



An atom usually has equal numbers of positive protons and negative electrons. This makes the atom neutral. This atom has six protons and six electrons.

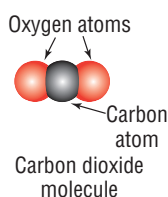
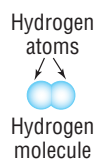
The electrons whiz around the nucleus in different levels. The electrons do not fly off the atom because they are attracted to the protons in the nucleus. This is because opposite charges attract (positive protons attract negative electrons).

Atoms also have a lot of empty space.



Atoms and molecules

There are many different types of atom. Some atoms are found on their own, such as argon and neon. But most are found joined in groups with other atoms. When atoms join, or **bond**, together, they can form a **molecule**. For example, a hydrogen molecule consists of two hydrogen atoms bonded together. A molecule of carbon dioxide has one carbon atom and two oxygen atoms.



Molecules consist of two or more atoms joined together.



Flaming atoms!

Different atoms have different properties. If we place samples of some atoms in a flame they will burn with different colours.

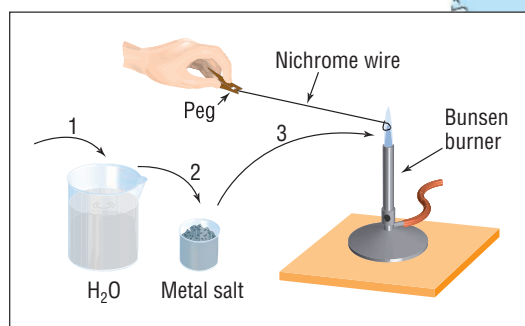
You will need:
wire loop (nichrome)
wooden peg or test-tube holder
Bunsen burner
beaker with water
chloride salts of various metals, including barium, strontium, sodium, potassium, copper and nickel.

- Bend the nichrome wire so that it has a tiny loop on the end. Grip the other end with the peg.
- Light the Bunsen and turn it to a blue flame.
- Dip the wire loop into the water and then into one of the salts.
- Hold the wire in the flame.

1. Record the colour in a table like the one below.

Metal of salt tested	Flame colour
Barium	

- Test all the metal salts supplied, thoroughly rinsing the wire loop between each test.
 - Your teacher may supply you with some unlabelled metal salts. You must work out what each salt is, using a flame test.
2. Each of the substances you have tested is made up of a metal and chloride. How do we know that it is the different metals that produce a different colour and not the chloride?
3. How can a flame test be used to identify atoms?
4. Why do you need to clean the wire loop between each test?



Activities

REMEMBER

1. What does the word 'atomos' mean?
2. What is an atom?
3. Name the three parts of an atom and explain where they would be found.
4. Why do electrons not fly off an atom?
5. What mostly makes up an atom?
6. What is a molecule?
7. Give two examples of molecules.

THINK

8. If a neutral atom has 12 protons, how many electrons will it have?
9. Draw a diagram of a water molecule made of one oxygen atom and two hydrogen atoms.
10. What is the difference between an atom and a molecule?

CREATE

11. Construct a model of an atom. It should have at least six protons, six neutrons and six electrons. Use any materials that you like. Perhaps try using a bowl of jelly with lollies in it to represent the parts of the atom! Your model should have a key.

INVESTIGATE

12. What is **nanotechnology** and what connection does it have with atoms?



I CAN:

- describe what is in an atom
- describe and give examples of molecules
- describe the difference between atoms and molecules.