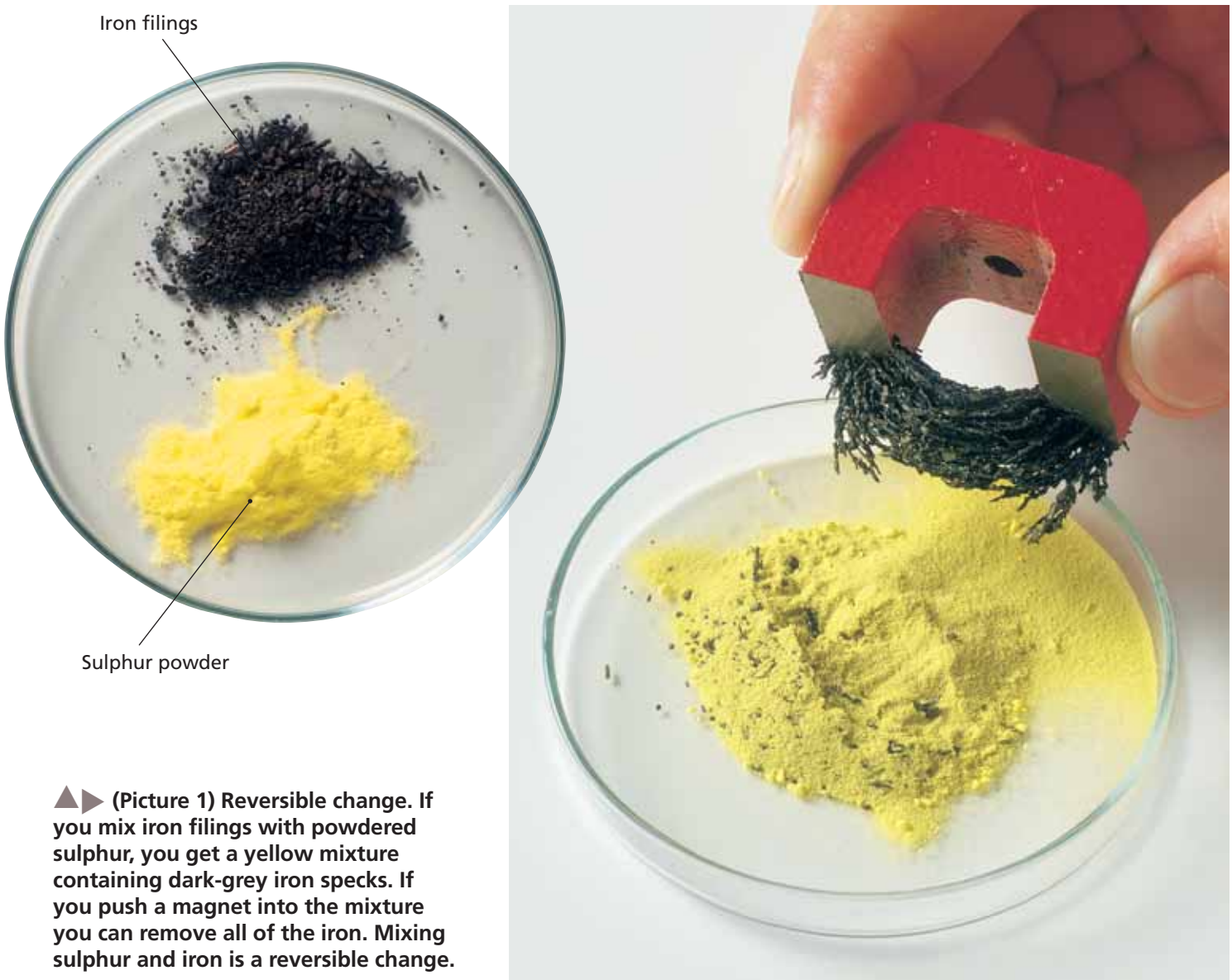
1 How do substances change?

Substances can be changed in many ways. Some changes can be reversed, while others cannot.

We are always changing the **MATERIALS** around us. For example, every time we eat some food, switch on a light or go on a bus, materials are being changed.

If you look around the room you are sitting in, you will see many more examples of change. The chairs may be covered in **MAN-MADE FIBRES**; the computer will have a **PLASTIC** case; the desk lamp may have a **METAL** base. None of these things occurs naturally – all have to be made by changing or combining different materials.



(Picture 1) Reversible change. If you mix iron filings with powdered sulphur, you get a yellow mixture containing dark-grey iron specks. If you push a magnet into the mixture you can remove all of the iron. Mixing sulphur and iron is a reversible change.

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▲▶ **(Picture 2) Permanent change. If you mix iron filings with powdered sulphur, and then heat them with a very high heat, the sulphur and iron combine. A new substance has been made. You cannot separate the iron and sulphur in this new substance. This is an example of an irreversible change.**

There are two very different ways we change materials. One is reversible and the other is permanent, or irreversible.

Reversible changes

In the case of reversible changes, the material is not permanently altered.

For example, when you boil water you make **WATER VAPOUR**. But when you cool the vapour down again, the **LIQUID** water reappears. So although you have changed the water from liquid to **GAS**, it is still water.

Similarly, when you mix some solids together, for example, powdered **SULPHUR** and **IRON**, you can separate them again by using a magnet (Picture 1).

Permanent, irreversible changes

Many changes cannot be reversed. If you heat the mixture of sulphur and iron, for example, a new material will be formed. A magnet could not separate iron from sulphur in this new material (Picture 2).

The importance of change

Here are some of the common ways of changing substances permanently:

- ▶ They can be heated.
- ▶ They can have electricity passed through them.
- ▶ They can be added to a liquid or to other substances.

Using methods like these, iron is removed from rock, petrol is separated from oil, coloured **DYES** are made from coal and grapes are turned into wine. The possibilities for making new substances are endless and are part of the excitement of science.

Summary

- **Some changes to materials can be reversed.**
- **Often, when materials are combined, a new material is produced.**
- **Many of our most useful materials are made by permanently changing other substances.**