



# Extracting iron from breakfast cereal

## Learning objectives

- 1 Extract iron from different breakfast cereals.
- 2 Compare the amounts of iron in different breakfast cereals.
- 3 Explain the importance of iron in our diets.

## Introduction

Many breakfast cereals – and other food products such as flour – contain iron as a mineral supplement. Cereals containing added iron are often known as fortified breakfast cereals. The iron is added in the form of a food-grade iron powder because this does not produce any taste or react with any other ingredients within the product. The iron is believed to react with our stomach acid before passing into the small intestine. Our bodies contain roughly the same amount of iron as two small nails!

In this experiment, you will extract the metallic iron from a mixture of crushed cereal in water using a strong magnet.

## Equipment

### Apparatus

- Safety glasses
- Pestle and mortar
- Sealable plastic sandwich bag
- A strong magnet

### Chemicals

- Distilled water
- Breakfast cereals to be tested



## Method

1. Place a few flakes of cereal in the mortar. Hold the magnet close to the flakes to see if they stick to the magnet or are moved by it.
2. Crush the dry flakes into a fine powder with the pestle.
3. Transfer the powder into the sandwich bag. Add enough distilled water to cover the powder. Carefully seal the bag.
4. Allow the cereal to soften and gently shake the contents for a few minutes. If the mixture has absorbed too much water and appears too dry, add some more distilled water.
5. Place the magnet on the outside of the bag. Move the magnet backwards and forwards over the mixture.
6. Carefully turn the bag over, keeping the magnet touching the bag. Squeeze the bag slightly to lift the magnet above the cereal mixture to see what has been collected. You should see tiny iron particles.
7. Compare the amount of iron you have collected with groups who used a different cereal brand.

## Questions

1.

(a) Estimate which of the cereals tested contained the most iron.

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(b) Compare your answer to (a) with the nutritional information on the cereal boxes.

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(c) Suggest a reason why your answer to (a) and (b) may not be the same.

*Hint:* Consider possible sources of error or variation in the practical.

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2. The iron collected from the cereal is in its **elemental** form.

(a) Fill in the gaps below to define the term **element**.

Elements are the \_\_\_\_\_ form of a substance. Elements are made up of the same type of \_\_\_\_\_.

(b) State which **physical property** of the element iron allowed it to be collected during this practical.

*Hint:* think of the equipment the iron was attracted to.

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(c) Which of the following are properties of metals? Circle **two** correct answers.

- A Electrical insulators
- B Shiny
- C Brittle
- D Thermal (heat) conductors

3. Fortified cereals have powdered iron added to them. You should be able to get all the iron you need from your daily diet.

Kellogg's 'Special K'<sup>®</sup>, which contains around 14 mg of iron per 100 g of cereal, contains a higher proportion of iron than many other breakfast cereals.

(a) State whether the iron in fortified breakfast cereals is part of a mixture or a compound. Explain your answer.

The iron in fortified breakfast cereal is part of a \_\_\_\_\_. The method of separating the iron from the cereal did not need a \_\_\_\_\_ change to take place.

(b) According to the NHS, an adult woman between the ages of 19-49 needs a recommended daily intake of 14.8 mg of iron. A portion of Special K<sup>®</sup> is 30 g.

i. Calculate the amount of iron in one portion of Special K<sup>®</sup>.

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- ii. Calculate the number of portions of Special K<sup>®</sup> an adult woman would need to eat to consume an equivalent to their daily iron intake.

- (c) Suggest a reason why you should not eat more than one portion of fortified cereal.

*Hint:* Look at the nutritional information for the breakfast cereal.

- (d) List as many other foods that can provide dietary sources of iron as you can.

4. Iron is essential in our bodies for producing **haemoglobin**. Thalassaemia is a group of inherited conditions that affect haemoglobin production. People with thalassaemia produce no (or too little) haemoglobin. This causes severe anaemia and patients with this condition require frequent blood transfusions.

- (a) What is the role of **haemoglobin** in our blood? Circle the correct answer.

- A Digests food
- B Helps us to breathe
- C Allows oxygen to bind to red blood cells
- D Helps us to fight infections

- (b) Explain why taking an iron supplement does **not** help someone with thalassaemia.



(c) Regular blood transfusions can lead to **excess iron** in the body – a condition called iron overload. Medicines such as Exjade<sup>®</sup> and Desferal<sup>®</sup> treat iron overload by binding excess iron in the body and facilitating its release through the urine.

**Iron deficiency** and **iron overload** have many common symptoms. With a partner, research these symptoms and use this to explain why monitoring of iron levels is particularly important for patients with thalassaemia.

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