



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 into 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.

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

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



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

(a) Define the term **element**.

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

(c) State two other properties of metallic elements.

1. _____
2. _____

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

Kellogg's 'Special K'[®], 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.

According to the NHS, an adult woman between the ages of 19-49 needs a recommended daily intake of 14.8 mg of iron.

(b) Calculate the number of portions of Special K[®] an adult woman would need to eat to consume an equivalent to their daily iron intake. A portion of Special K[®] is 30 g.



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

(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) State the role of **haemoglobin** in our blood.

(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® and Desferal® treat iron overload by binding excess iron in the body and facilitating its release through the urine.

With your partner, research the symptoms of **iron deficiency** and **iron overload**. Use your research to explain why monitoring of iron levels is particularly important for patients with thalassaemia.
