11–14 years

Extraction of iron on a match head

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Learning objectives

1. Safely investigate heating iron oxide on a match head to reduce iron.
2. Explain why metals need to be extracted from their ores.
3. State that the method of extraction depends on the reactivity of the metal being extracted.

The experiment

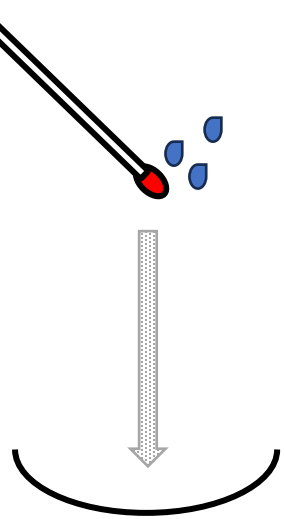
In this experiment, you will reduce iron(III) oxide with carbon on a match head to produce iron.



Method

1. Dip the head of a match in water to moisten it.
2. Roll the damp match head first in sodium carbonate powder, then in iron(III) oxide powder.
3. Hold the match in a pair of tongs. Put the head of the match into a blue Bunsen flame (air-hole open). The match will flare and burn. Do not allow the match to burn more than halfway along its length.
4. Allow the match to cool for about 30 seconds.
5. Use a spatula to crush the charred part of the match into a small plastic weighing boat.
6. Move a magnet around under the weighing boat – some of the small particles will move around in the weighing boat following the track of the magnet. Do not dip the magnet into the particles directly.

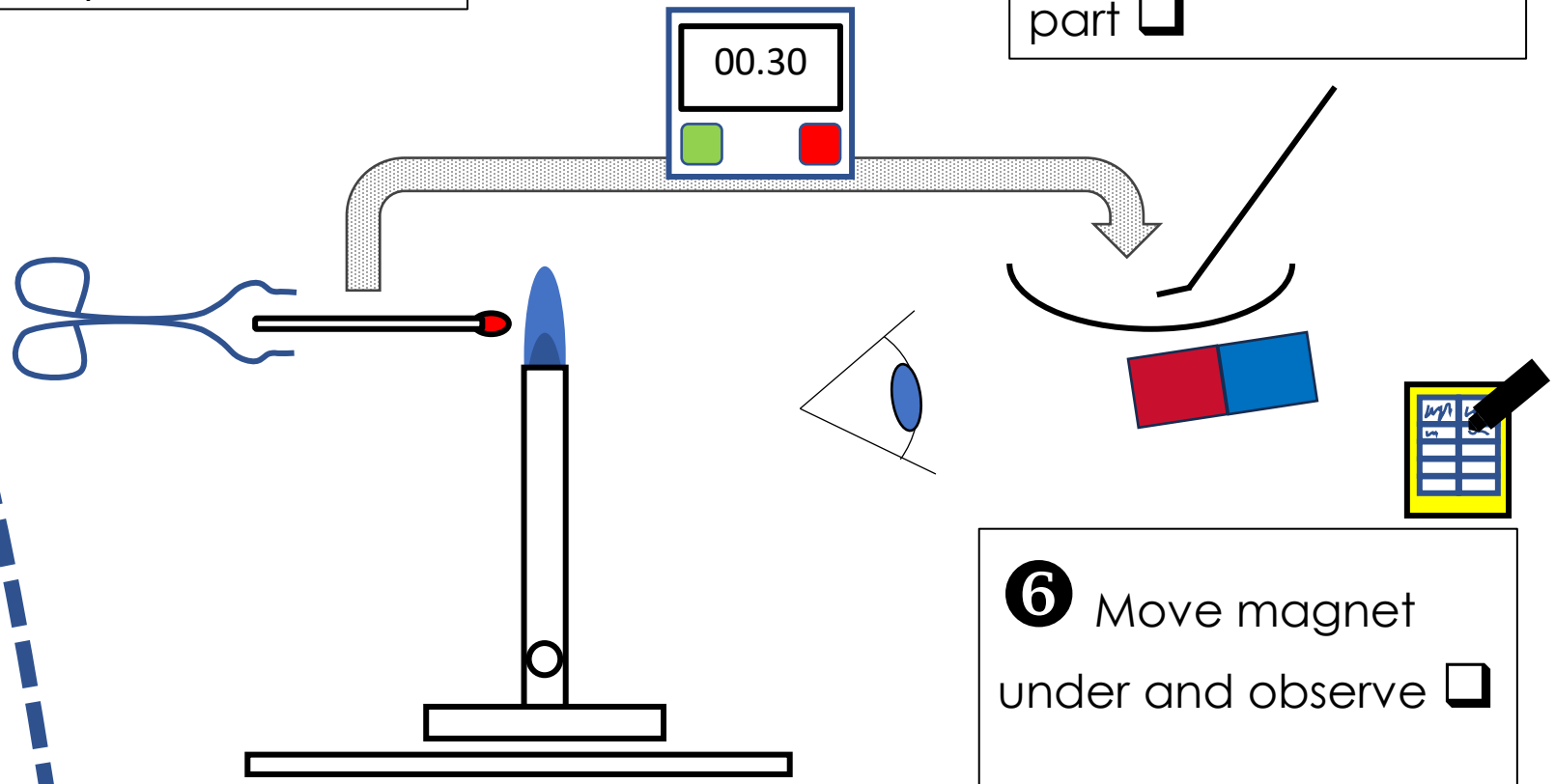
1. Moisten match ❑



2. Roll head in:
   - sodium carbonate ❑
   - iron(III) oxide ❑

3. Burn no more than halfway ❑

4. Cool for 30 seconds ❑



5. Crush charred part ❑

6. Move magnet under and observe ❑

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Extraction of iron on a match head
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Follow-up questions (unscaffolded)

1. In this experiment, iron was produced by reacting the iron oxide with carbon from the matchstick. Carbon dioxide was also produced.

   a) State what elements are present in iron oxide.
   b) Using the information in the question, write a word equation for this reaction.

2. Using the reactivity series, state the name of another metal that is likely to be extracted in the same way as iron.

Follow-up questions (unscaffolded)

3. Some metals can be found uncombined in the earth's crust. However, lead is often extracted from its main ore, galena, which mostly contains lead sulfide.

   a) State the name of a metal that can be found uncombined in the earth's crust.

   b) Define the term 'ore'.

   c) The first stage of the process involves reacting lead sulfide with oxygen to produce lead oxide. Sulfur dioxide is also produced.

   Write a word equation for this reaction.

   d) The lead oxide can then be reacted with carbon to produce lead and carbon dioxide.

   Write a word equation for this reaction.

Follow-up questions (scaffolded)

1. In this experiment, iron was produced by reacting the iron oxide with carbon from the matchstick. Carbon dioxide was also produced.

   a) State what elements are present in iron oxide.

   b) Using the information in the question, write a word equation for this reaction.

_____ + _____ → _____ + _____

Follow-up questions (scaffolded)

2. Using the reactivity series, circle another metal that is likely to be extracted in the same way as iron.

zinc sodium silver

Follow-up questions (scaffolded)

3. Some metals can be found uncombined in the earth's crust. However, lead is often extracted from its main ore, galena, which mostly contains lead sulfide.

   a) Circle the name of a metal that can be found uncombined in the earth's crust.

   copper aluminium gold

   b) Define the term 'ore' by selecting the correct words in the sentences below.

Ores are rocks that are found naturally in the Earth's **atmosphere/crust**. They contain enough **metal/oxygen** to make it **expensive/profitable** to extract.

Follow-up questions (scaffolded)

c) The first stage of the process involves reacting lead sulfide with oxygen to produce lead oxide. Sulfur dioxide is also produced.

Write a word equation for this reaction.

_____ + _____ → _____ + _____

d) The lead oxide can then be reacted with carbon to produce lead and carbon dioxide.

Write a word equation for this reaction.

_____ + _____ → _____ + _____