5 - CHEMISTRY - CHEMICALS REACTING

What I already know

Groups: **1 ▸ 2 ▸ 4**

About chemical reactions

Chemical reactions are going on around you all the time. Any time that two or more substances are mixed and a new substance is formed, a chemical reaction has occurred. A log burning in a fireplace, gas burning in the stove, a car body rusting at a dump and a cake rising in the oven are all examples of chemical reactions from everyday life. In the chemical lab, the same is true.

A teacher exploring the term 'chemical reaction' asked the students to watch carefully as she mixed two liquids.

She then wrote on the board, shown at the right.

What do you understand by the term chemical reaction?

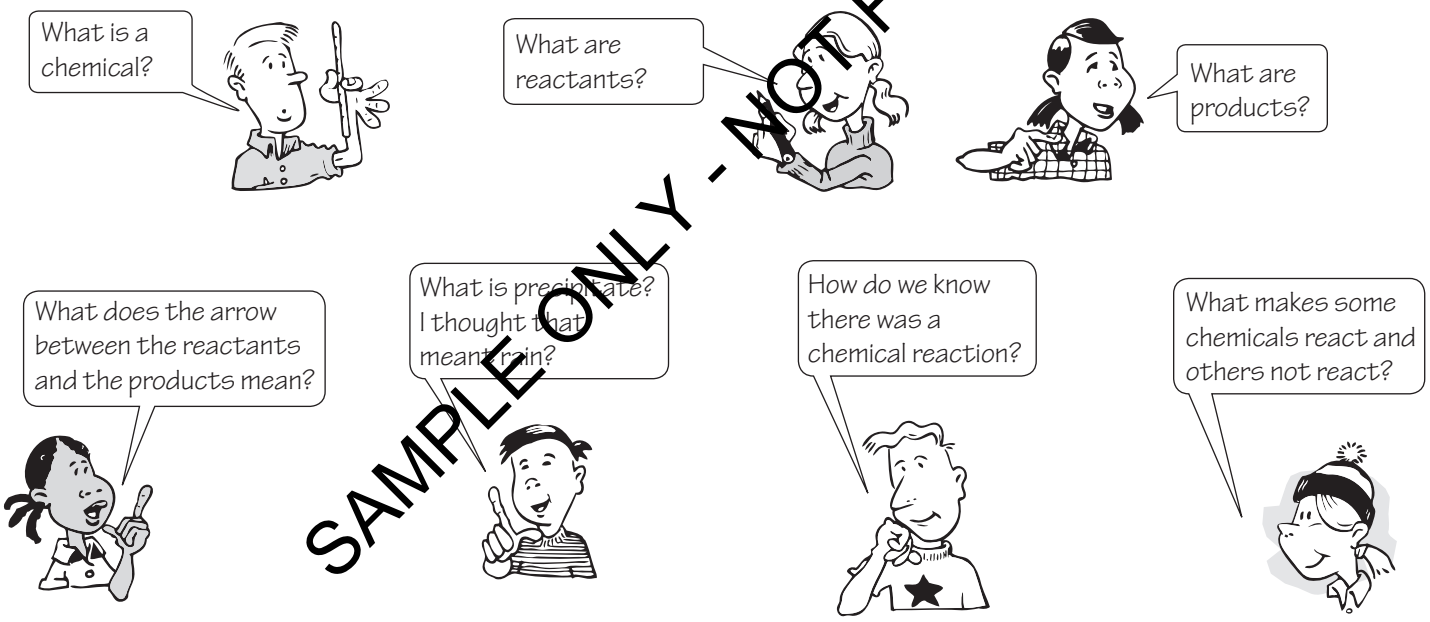
When sodium carbonate reacts with silver nitrate the products are silver carbonate and sodium nitrate.

REACTANTS: **sodium carbonate + silver nitrate**
↓
PRODUCTS: **silver carbonate + sodium nitrate**

The silver nitrate precipitates out of solution.

Working by yourself

1 Some students had questions about what they had observed and the terms used.
Answer their questions to help you identify what you understand by chemicals reacting.



Working with a partner

2 Compare your answers to the questions above. Using a different coloured pen, make any changes to your answers, based on your discussion.

3 Write two questions you have about any of the terms used in the students' questions.

4 Write a sentence defining 'chemical reaction' in your own words.

Working in a group of four

5 Discuss the statement: *Chemicals are made up of particles that we call atoms.*
What do you picture in your head when you think of atoms? Record your ideas.

6 What do you imagine happens to atoms when chemicals react? Without looking up any reference books, draw diagrams to show your ideas.

7 Create a roleplay of chemicals reacting, playing the parts of atoms. Record the details and rehearse it to perform for your class.

Extension: Atoms in chemical reactions. Use references to help you draw a diagram representing the atoms in the chemical reaction shown on the teacher's board above.

6 - EARTH SCIENCE - THE EARTH'S TOP LAYER

How I know

Groups: **1 › 2**

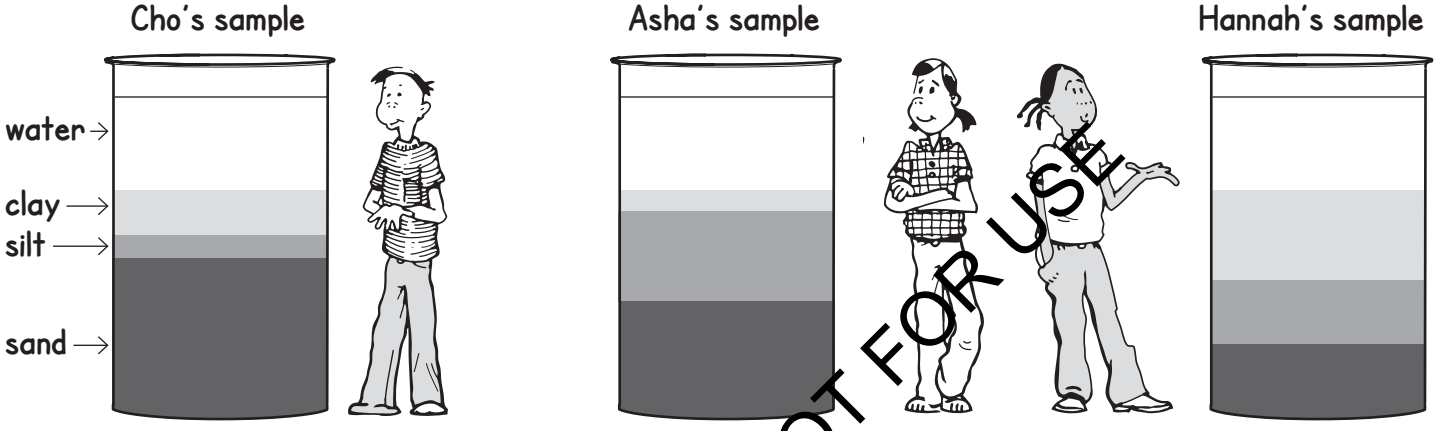
Grains in soils

Soil textures are sorted according to the grain sizes of the soil. The different grain sizes are grouped as clay, sand or silt.

Some students were investigating local soils.
They took soil samples from areas that looked different.
They shook a sample of their soil with water and waited for it to settle.

Grain size key

Grain	Description	Average grain size (mm)
Sand	Coarse grains	0.05–2
Silt	Medium-fine grains	0.002–0.05
Clay	Fine grains	less than 0.002



Working by yourself

1 Use the diagrams above to estimate the percentage of each grain size in the students' samples.

Student's sample	% clay	% silt	% sand
Cho's sample			
Asha's sample			
Hannah's sample			

The next day, the teacher gave them a soil texture triangle to classify their soils.

2 What do you think the dotted lines on the triangle mean?

3 What do you think the students would find the percentages of clay, sand and silt to be in:

- a loamy sand?
- b silt?
- c silty clay?

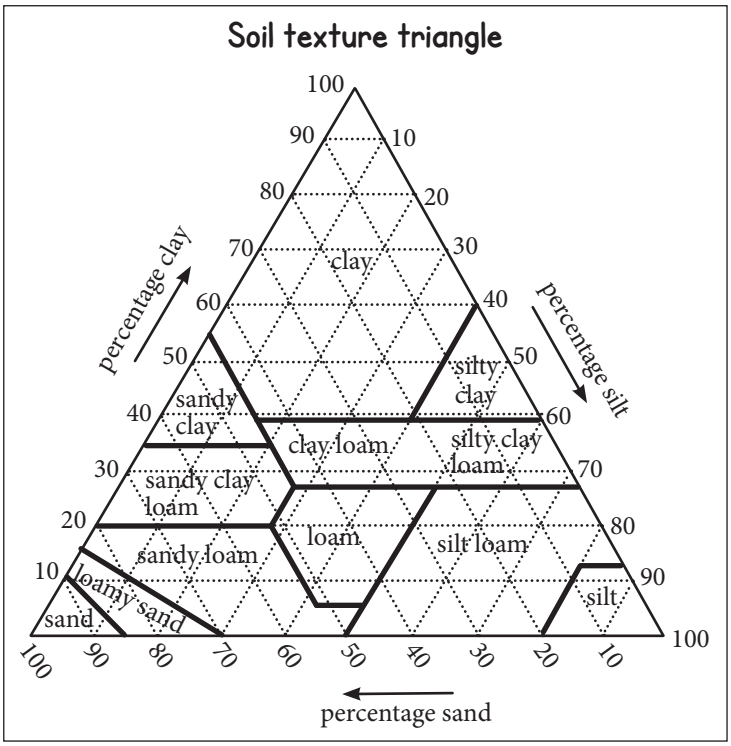
Working with a partner

4 Using the information in the triangle, classify each of the soils in the table in question 1.

5 What else is important in the quality of soils?

6 What do you think causes soils to have different grain sizes?

7 Explain what you understand the term 'good soil' to mean. List the characteristics you think good soils have.



Extension: Different types of rocks, made up of different minerals, break down into different grain sizes.

Research the different minerals (chemicals) in sand, silt and clay and the types of rocks they come from.

7 - PHYSICS - ABOUT HEAT

How I know

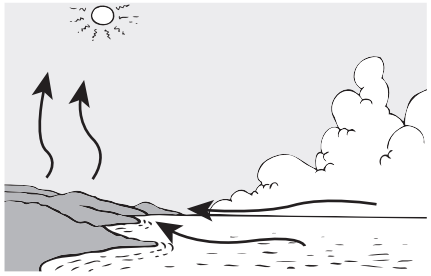
Groups: **1 ▸ 2 ▸ 4**

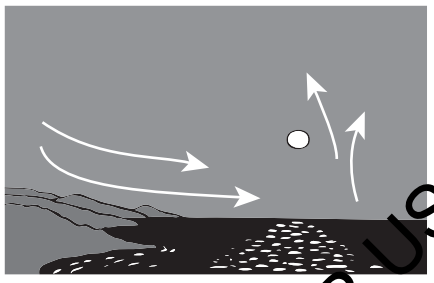
Explaining heat transfer

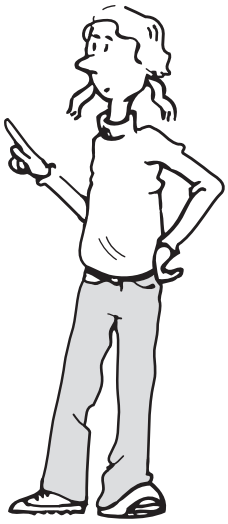
Some students were applying ideas to different real-life situations to explain heat transfer.

SEA BREEZES by Jamie

Sea breezes are convection currents in the air caused by differences in the temperature of air over land and sea. During the day, sunlight warms the land more quickly than it warms the sea. Warm air rises from the land in the daytime and cool air from the sea rushes in to take its place. The opposite occurs at night, with the land cooling down more quickly than the sea.







Working by yourself

1 Write the answers Jamie could give to these questions asked by her classmates.

- **a** How does the heat of the Sun get to the Earth when it is so far away in empty space?
- **b** What makes the air rise from the land in the daytime?
- **c** If we were standing on a beach in the daytime, in which direction would you feel the air moving?
- **d** What is a convection current?
- **e** How do sea breezes change direction at night?

Working with a partner

2 Paulo's report on body temperature included the following information.

> Humans are described as warm-blooded. This means that the inside of the human body has a constant temperature of about 38°C, even though the outside temperature may be warmer or cooler than that.

- **a** How would you know if Paulo's information was true?
- **b** What evidence can you give to support the idea?
- **c** Is your skin always at this temperature?
- **d** When people are ill, what happens to their body temperature?
- **e** How do you think the body temperature is kept constant?

3 Briefly list the evidence you could collect to support your ideas about how the human body is kept at a constant temperature.

4 Other investigations carried out by students included the following. For each one, write a sentence that you think helps answer the question.

- **a** How does a thermos flask work to keep food either hot or cold?
- **b** How does insulation in the roof help reduce fuel bills?
- **c** How does a jacket keep me warm on a cold day?
- **d** How does keeping the fridge door closed help the food stay cool?

Working in a group of four

5 Choose one of the questions above. Write an explanation of the process, using ideas of heat transfer. Use Jamie's explanation of sea breezes as a model. Include diagrams with labels to help your explanation.

Extension: Some animals are called warm-blooded and others cold-blooded.

Write a definition of warm-blooded and cold-blooded.

What evidence would you need to collect to find out if an animal was warm- or cold-blooded?

8 - PHYSICS - USING MACHINES

What will I do to find out about ...?

Groups: **2 ▸ 4**

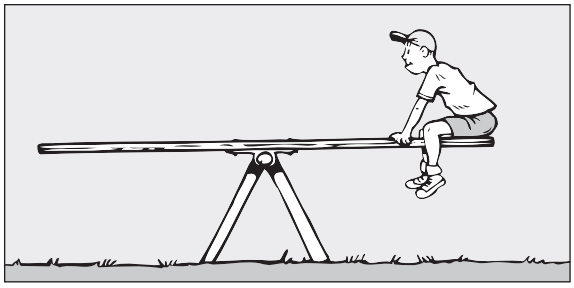
Balancing forces

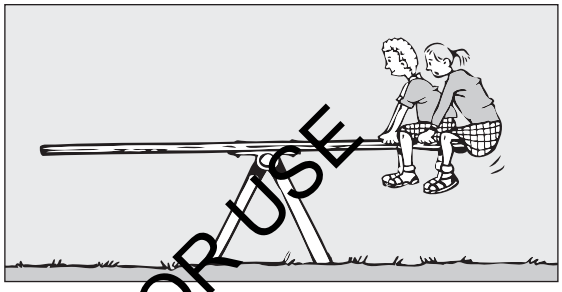
Mobiles, see-saws and many other items are actually simple levers that are used by balancing the forces. Mobiles and see-saws balance when they have equal turning forces on each side of the pivot point or fulcrum. The turning force can be calculated by multiplying the weight by its distance from the fulcrum.

Turning force = weight × distance from fulcrum

Working with a partner

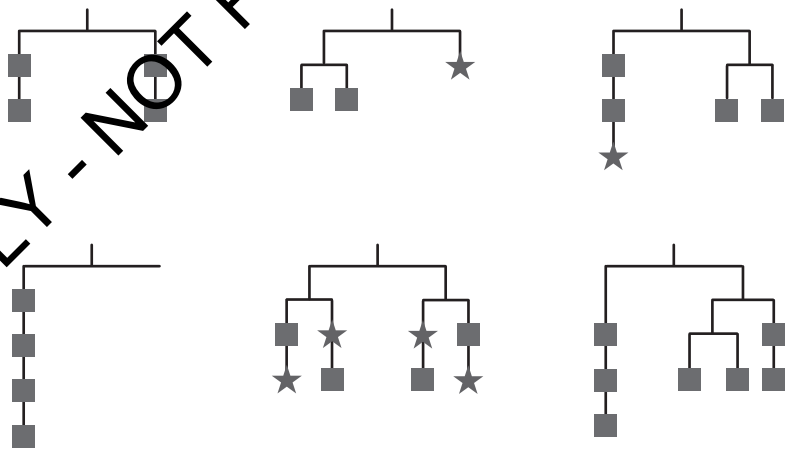
1 Imagine some children in a playground. Balance their see-saws by drawing one child on the empty side of the see-saw. Explain for each drawing how you found the balance.





2 You do not have to make a set of mobiles to work out which ones will balance. You can decide which one will balance by thinking about the forces involved in each level of the mobile.

- a Circle the mobile designs at the right that you think might balance.
- b For those that do not balance, change the set-up so that they will. Redraw each one adding more weights, taking some weights away or moving them to make it balance.



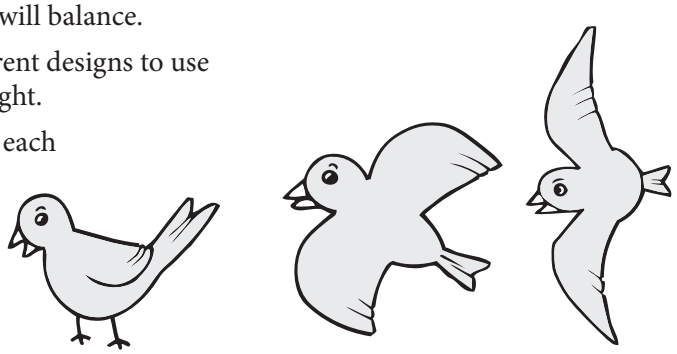
3 Imagine you are designing a balancing mobile with three different objects. Their compared weights are:

● = 1, ▲ = 2, ♦ = 3

- a Draw a design of a balancing mobile with at least four levels. Include at least one of each shape.
- b Explain how you came up with a design that you think will balance.

4 Some students decorated a set of bird shapes in three different designs to use to make a mobile for a young child, as you can see at the right.

- a Design a balanced mobile that includes at least three of each bird shape and at least three levels.
- b Explain how you can work out how to balance this mobile without knowing how much each bird shape actually weighs.



Working in a group of four

5 Real versus ideal – Though the idea is simple in principle, many people say that mobiles are hard to make. Why do you think it may be harder to actually get mobiles to balance than it seems in theory, even when you are following a design that you know should work? List three ideas.

Extension: High-wire acts and tightrope walkers in the circus often use a long pole to help them balance. Use references to investigate how lowering of the centre of gravity makes balancing easier. Write a short class talk to explain how this works. Use labelled diagrams to help your explanation.