



Preview


GetScience is based on research into learning from text and pictures. Here are some key features your students will benefit from...

Concrete & familiar


Abstract ideas and processes are presented in more familiar ways that students can picture, and make sense of.

Dynamic Earth
... Understand

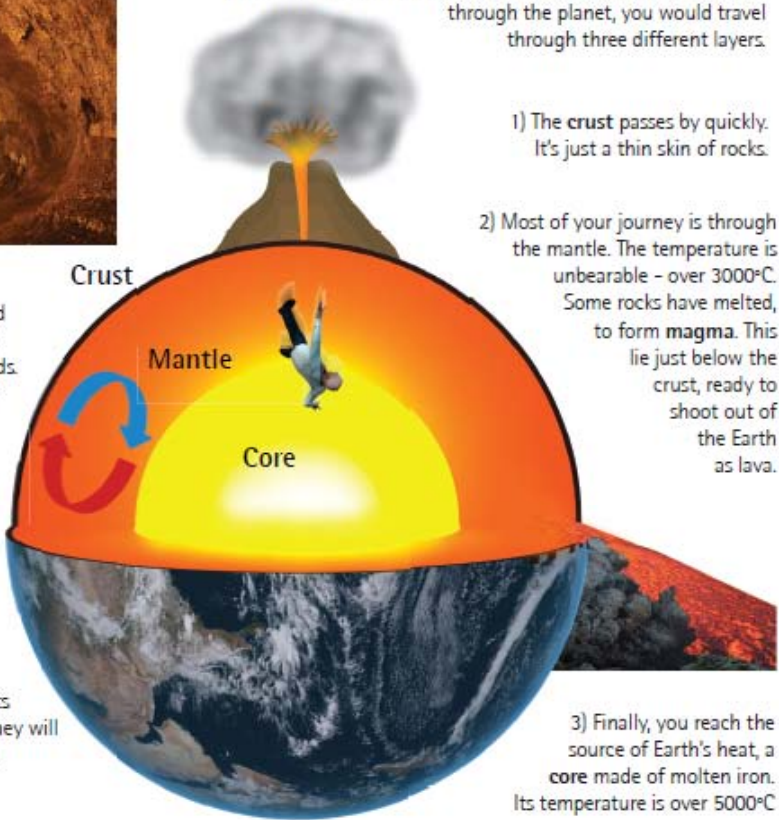
Journey to the centre of the Earth



► High temperatures and huge pressures make the solid rocks flow like liquids. They carry heat upwards by **convection** and make volcanoes possible.



► A volcanologist predicts eruptions and whether they will send out lava, gas or ash.



Crust

Mantle

Core

◀ In a famous story, a scientist falls down a volcanic pipe, and finds prehistoric life. In reality, the Earth is solid. But if you could fall through the planet, you would travel through three different layers.

- 1) The **crust** passes by quickly. It's just a thin skin of rocks.
- 2) Most of your journey is through the mantle. The temperature is unbearable – over 3000°C. Some rocks have melted, to form **magma**. This lie just below the crust, ready to shoot out of the Earth as lava.
- 3) Finally, you reach the source of Earth's heat, a **core** made of molten iron. Its temperature is over 5000°C

Got it?

1. **Summarise:**

Earth has 3 layers: the ____, ____ and ____.

The core is hot. Convection carries ____ up through the ____ towards the crust.

In places, the mantle melts to form ____.

If this breaks through the crust, it becomes ____.
2. **Compare:**
 - a Which is hottest, the core or mantle? (L4)
 - b How do magma and lava differ? (L4)
 - c How do ash, gas and lava differ? (L4)

3. **Deduce:**
 - a Why does magma solidify faster if it flows into a lake? (L5) Hint?
 - b No-one can stop a volcano erupting. How do volcanologists reduce the number of deaths volcanoes cause? (L5) Hint?
 - c A volcanic eruption often affects more than one country. Suggest why. (L5) Hint?
 - d Food crops grow well in soil that contains volcanic ash. Suggest a possible problem that could cause. (L5) Hint?

upd8 Link Catastrophe > Etna
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Visible thinking

For How Science Works, the mental processes you want students to engage in are broken down into easy to follow steps.

Models
...understand

Using models

► Why does a runny egg turn solid when you cook it?



→


To explain something using a model, follow these 3 steps:


1. Choose **characters** to represent the real thing and **actions** to show what they do.

2. Decide what happens next by playing the model in your mind, like a movie.


3. Match the model to the real thing and use it to explain what happens.




◀ Characters:
"Let's use balls of string to represent egg particles."




◀ Action:
"When they get hot, the string unwinds."



◀ Explanation:
"Eggs turn solid as they cook because their particles unwind and tangle."



◀ What happens next?
"The particles tangle up into a solid lump."



Got it?

1. **Summarise:**
Models use ___ to represent real things and ___ to show what they do.
To use a model, choose the characters and ___. Play the model in your ___, like a ___, and ___ what happens next. Then match the model to the ___ thing and use it to ___ what happens.

2. **Use:**
Pancakes contain egg, flour and milk.

a Why are egg particles like balls of string? (L4) *Hint?*
b Eggs go solid when heated. How does the model make this easier to understand? (L5) *Hint?*
c If you don't add the egg, pancakes fall apart. Use the model to explain how egg particles hold flour and milk particles together. (L5) *Hint?*

3. **Explain:**
Ben's dentist showed a model to explain how cola harms teeth. He dropped acid onto a piece of marble. The solid dissolved.

a List the characters and actions in the dentist's model. (L4) *Hint?*
b Suggest why the dentist chose acid to represent cola. (L4) *Hint?*
c What makes marble a good model for a tooth? (L4) *Hint?*
d How does the model make tooth decay easier to explain? (L5) *Hint?*
e Sugar has no effect on marble but it causes severe tooth decay. Use the model to suggest what happens to sugar in your mouth. (L5) *Hint?*

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Multimedia effect

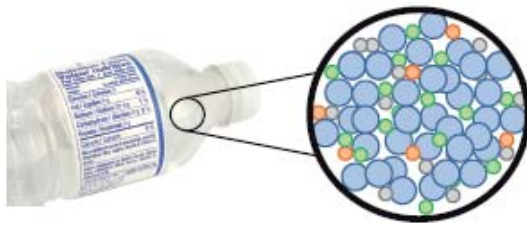
Theory says students learn more from text + pictures, only if they are carefully combined to reinforce each other's meaning.

Particles 1

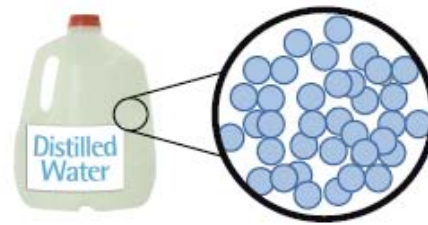
...understand

Separating mixtures

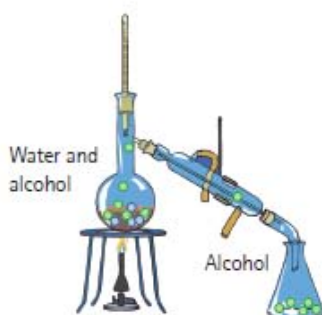
► Pure water, or is it? Bottled water contains dissolved substances. It is a **mixture**.



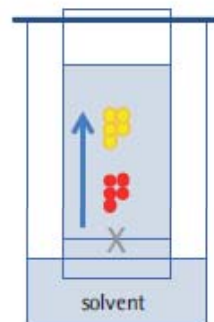
▼ There are only water particles in distilled water, so it is **pure**.



▼ We can separate substances if they have different properties:

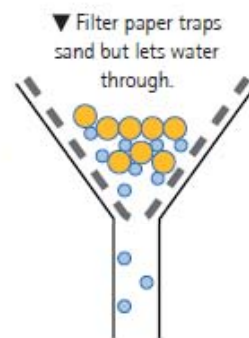


▲ **Distillation** works because the particles with the lowest **boiling point** leave the mixture first.



▲ **Chromatography** works because the most **soluble** particles move further.

◀ The particles in red and yellow ink separate as the solvent moves them upwards.



▲ **Filtration** separates liquid particles from large insoluble ones.

Got it?

1. **Summarise:**

You can separate the substances in a mixture if they have different properties. If their boiling points differ use _____. If they have different solubilities use _____. If one substance has large, insoluble particles, use _____.

2. **Use:**

Name the methods that could be used to separate each of these mixtures:

- a tea leaves from tea.
- b water from ink.
- c the food colourings in a sweet.
- d water from salty water (L5).

3. **Explain:**

Salt is often found mixed with sand.

- a Explain how you could use water to separate sand from salt. (L5) *Hint?*
- b What difference between sand and salt makes this possible? (L5) *Hint?*
- c Draw particle pictures to show the sand and salt at each step in your method. (L5) *Hint?*
- d Explain how you could separate water from a mixture of salt and water. (L5)
- e What difference between water and salt makes this possible? (L5) *Hint?*

Bare essentials

The research also says students learn 'more from less' - so only the text relevant to the desired outcome is included.

Forces

...understand

What can forces do?



◀ Venus Williams is one of the fastest servers in history. The strings of her racket push the ball with great force. It speeds up to an amazing 128mph (206km/hr).



▶ Forces can slow things down too. The arms of the tackler pull backwards to stop the player in his tracks.



▼ Instead of changing speed, a force from the side makes the female skater change direction and move in a circle.




▼ Not all forces rely on contact. The invisible pull of **gravity** is what makes the moon circle the Earth.



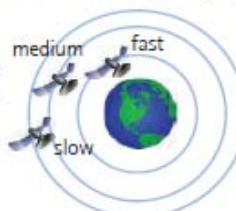
◀ Gravity keeps any satellite in a circular orbit, if its speed and distance are right.

Got it?

- Summarise:**
Forces can make an object change its shape, ___ or ___. We use ___ to show their ___.
- Use:**
A skateboard is sliding down hill. You try to stop it. Sketch the skateboard and add an arrow to show the force you applied. (L4)
- Predict:**
Suppose Venus hit the ball even harder. What difference would that make to the racket and the ball? (L4) Hint?

- Deduce:**
When this carriage got to the bend it changed direction. 
A force from the track made it turn. Which arrow shows the force correctly? (L4)

- Compare:**
How does the distance from Earth affect a satellite's speed? (L5)



Depth processing

To remember, students must process the ideas. 'Got it' starts with recognition and recall, and simple explanation... (L3-5)

Changing Atmosphere 1		...understand
Got it?		
1 Summarise: The climate is the usual pattern of ___ and rainfall. When the climate changes, living things can find it harder to ___.	4 Explain: a Some people think mammoths went extinct because their woolly coats made them too hot. Explain another reason why a warm, wet climate could have made them die out. (L4)	
2 Exemplify: a Name an animal that has been made extinct by climate change recently. (L3) b Why did the climate change make it harder for the animal to survive? (L3)	b Sabre-toothed tigers were fierce predators. They also became extinct at the end of an Ice Age. Using the ideas about climate change to suggest why they did not survive. (L5) Hint?	
3 Recall: The temperature is different everywhere, so scientists work out an average. How has Earth's temperature changed in the past? (L3)	c Earth has been hotter in the past than it is today. Explain why scientists worry about rising temperatures. (L5) Hint?	

'Master' pages challenge students to do more with the knowledge, like deducing or explaining in depth.

Changing Atmosphere 2		...understand
Got it?		
1 Summarise: To stay at the same temperature, Earth must emit as much energy as it ____. Solar ____ can get through the ____, but some of the ____ Earth emits is absorbed by ____ gases.	3 Explain: a Explain why Earth's temperature doesn't usually change much. (L5) Hint? b Use a model to explain how CO ₂ can make Earth's temperature rise. (L6) Hint? c The amount of CO ₂ we release is rising faster than ever. Explain why. (L6) Hint? d Roger doesn't understand how a little bit of extra CO ₂ could warm the Earth. Write a step by step explanation that he can't fail to understand. (L7) Hint?	
2 Deduce: Sam beamed infra-red radiation into a jar of air and a jar of carbon dioxide. An hour later the carbon dioxide jar was much warmer. Explain why. (L5) Hint?		