Modelling Earth's structure

Setting the scene

The Earth contains different layers that all behave in different ways. Because it is impossible to see the different layers, models are an excellent way to show people what the inside of the Earth looks like.

Aims

In this activity you will:

- evaluate a simple model of the Earth
- design your own model of the Earth that can be used in a science exhibition for students and their parents.

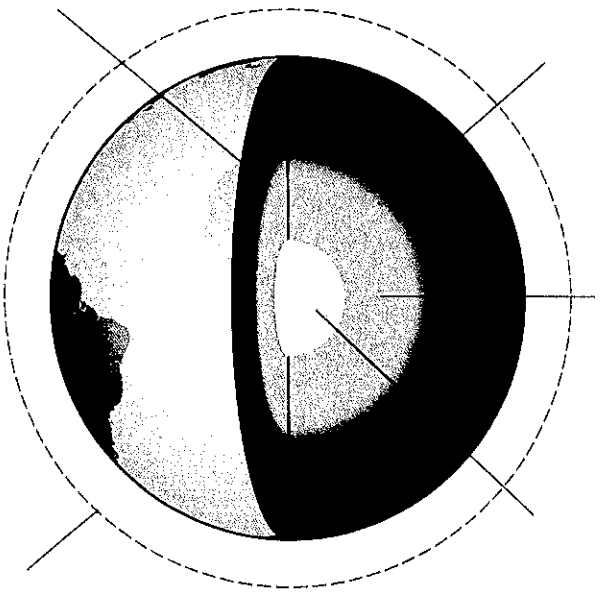
You will be **working scientifically** to:

- present explanations
- interpret observations.

Task

Ben has made a model of the Earth by cutting a tennis ball in half and filling the middle with scrunched-up red tissue paper. Answer the questions below.

1 Label the following diagram of the structure of the Earth. Include a brief description of each layer that must include its state and one other property (e.g., thickness).



6 Imagine you are to make you own model to show the structure of the Earth. Draw a plan of your model below. Remember to take into account the improvements suggested in Question 4.

In your diagram you should describe the materials you would use to make the model Earth to make it as realistic as possible and explain your choices.

B1 1.1 WebQuest Writing frame

Activate

You will produce a presentation describing the main stages in the development of the light microscope.

Slide 1

Put the title of your WebQuest on this slide and introduce your presentation.

Slide 2

Slide title:

Key developments:

Slide 3

Slide title:

Key developments:

Slide 4

Slide title:

Key developments:

Slide 5

Slide title:

Key developments:

Slide 6

Slide title:

Key developments:

Slide 7 (extension)

Slide title:

Key differences:

Important points

- Each slide (2–6) should state the key developments, explain why they are important and how they improved the microscope, and state the types of structure that could now be seen.
- Where possible, state the scientist responsible for the change.
- Include a labelled image on each slide to show the components of the microscope.
- Remember to use appropriate scientific language and explain any key words.

Using distance–time graphs

Setting the scene

In this activity you will find out how to represent a journey using a distance–time graph, and present your information to the class.

Aims

In this activity you will:

- draw and interpret distance–time graphs
- show how to use a distance–time graph to calculate speed.

You will be **working scientifically** to:

- present data using a distance–time graph.

Task

The following table gives information about journeys travelled by different moving objects. Choose one of these journeys to concentrate on for this activity.

Moving object	Distance travelled (km)	Time taken for the journey (days)	Stops	Other information
migrating bird	3000	15	The birds stop each day for about 12 hours to rest.	The birds travel further at the start of the journey when they are less tired.
cycle race (Tour de France)	4000	20	The cyclists only cycle for 4–6 hours each day.	Some days, if they are cycling up mountains, the cyclists travel much less than on other days.
Iditarod trail sled dog race	1800	10	The dogs must rest for at least 8 hours each day.	Some parts of the route are on flatter land where dogs travel further each day.

3 Plot a distance–time graph using the data in Question 2.
Make sure you show stationary periods in your graph and choose an appropriate scale. Include units.

4 Use your graph to calculate the speeds travelled by the moving object at two different sections of the graph.
Use the equation: speed = distance ÷ time.

5 Write extra information about your graph so that you can explain it to your class.

Extension

Write a short story about a character of your choice, and what they do on a typical day. Draw a distance–time graph to show their movements on that day. Be as creative as possible.

Squashing and stretching

Aims

In this lesson you are given a question to answer. You will find the answer to this question by testing how much a piece of elastic stretches when weights are applied. You will then write your answer to the question.

Big Question

An organiser of a bungee jumping competition changes the length of the bungee rope so different people can use the rope safely. Use your idea of forces to describe how the size of a person affects the rope when they jump.

Extra information: The rope is 15 m long and it extends by 3 m when an adult jumps. An adult weighs twice as much as a child. (6 marks QWC)

What I need to know

Before answering a 6-mark question you should always think about the information you need to know to answer it.

The table below states the things you need to be able to do to answer the question. You might not know how to answer all of them yet. Tick the box for the answers you know, and write your answer in the answer box.

Learning objective	✓	Answer
Describe how the length of elastic rope changes when a force is applied		
State Hooke's Law		
State that extension is found by taking the original length away from the new length		

Key words

Add all the key words you need to answer the Big Question in this box.

The composition of inhaled and exhaled air

Setting the scene

There are different amounts of gases in the air we breathe in (inhaled air) and the air we breathe out (exhaled air).

Aims

In this activity, you will be:

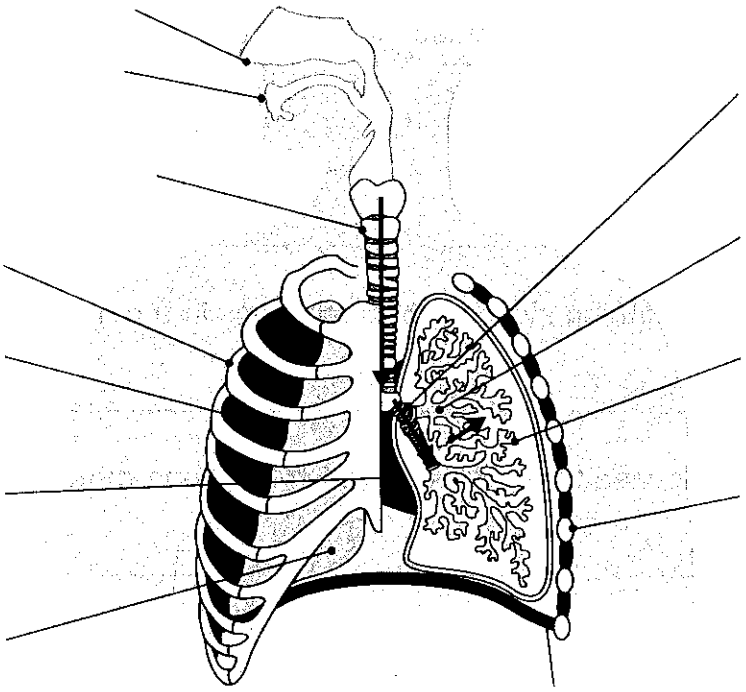
- analysing data obtained on the composition of inhaled and exhaled air.

You will be **working scientifically** to:

- present data using a graph
- identify patterns in data to draw conclusions.

Task

1 Label the diagram of our breathing system.



7 Explain why scientists use graphs or charts for their data.

Extension

1 Explain why you chose the graph or chart you did to show the data. Why would other types of chart be less useful or incorrect?

2 The data does not show any values for water vapour, which is present in the air we breathe in and out. Suggest whether water vapour levels would increase or decrease in exhaled air. Explain why this would happen.

Introducing the particle model

Setting the scene

All substances are made of particles, from the top you are wearing to the water you had in your drink this morning. But what are particles and are all particles the same?

Aims

In this activity you will:

- describe what particles are and use a particle model to explain how particles make up substances.

You will be **working scientifically** to:

- present explanations of data.

Task

Complete the following passage by choosing from the words below.

solid **particles** **individual** **iron** **substances** **water** **properties**

All substances are made up of tiny parts called _____. Different _____ contain different particles. For example, a piece of iron contains particles of _____ and a glass of _____ contains thousands and thousands of water particles. Particles can have certain _____ when they are all together in a substance but when they are on their own they don't have these properties. A gold ring has a yellow colour and is _____ at room temperature but an _____ particle of gold isn't yellow and isn't a solid. It can only have these properties when it is with other gold particles.

5 Imagine that the black bricks represent oxygen and white bricks represent carbon.

Carbon dioxide is made from carbon and oxygen.

Describe what a particle of carbon dioxide would look like if the bricks were used to model this.

(Again just describe colours, don't worry about how many bricks are needed.)

Extension

1 Using toy building bricks is a simple way of showing how individual particles build up to form substances. Can you suggest another model, perhaps using an everyday situation, which you think may be a good way of modelling how individual particles build up into substances?

2 Applying your knowledge of the particle model, identify a strength and a weakness of your suggested model.