Dear Colleague

We've made major changes to our Science Homework books for Years 9, 10 and 11 over the last 2 years, so we hope you'll take the opportunity to look at these sample pages, and perhaps use some of the exercises or experiments with your classes this year.

Each book, now called a *Workbook*, contains written theory activities and write-on practicals in the printed book, plus interactive computer activities on the CD and a password-protected Quiz file for teachers. The Quizzes parallel the computer activities, allowing you to set specific activities for homework and then test the material covered with a Quiz the next day. The student CD also contains password-protected Answers to the theory exercises, and Answers to the practicals, an electronic version of the printed workbook, a Technician's guide for the practicals, and the Workbook Map showing exactly how all the material fits together and including student learning objectives for all topics.

In addition to the resources listed above, the CD for the *New Directions in Science Workbook* (for Year 11 NCEA Science) also includes: the NCEA exam papers for Level 1 Science for 2005–2007 plus fully-worked answers to all questions and judgement statements; a printable booklet of Key Facts for Year 11 Science; electronic flash cards and audio files of the key facts suitable for uploading onto MP3 players, mini photo frames or cell phones; and a full-colour pdf file of the 326 page *New Directions in Science* text book.

This printed sample booklet shows you pages from the student books for *Science 9 Workbook*, *Science 10 Workbook* and the *New Directions in Science Workbook*. The accompanying CD contains the complete Maps for all three books, selected Revision activities and Quizzes, and the Answer files for all three books. These allow you to try out some of the theory activities in class and mark them according to the marking schedules in the book.

Topic division between *Science 9* and *Science 10* was made by surveying a number of schools from throughout New Zealand to see which topics were done in which year. There is general agreement about many topics, but disagreement on others. Selected portions of *Science 9* are included on the *Science 10* CD, and vice versa, to meet the needs of those schools whose topic division does not perfectly match the printed books.

Raising student achievement

We believe that to succeed in NCEA Science, students need a thorough knowledge of the basic facts and vocabulary for each topic, and they need to be able to write quality sentences and paragraphs to demonstrate their understanding of each topic.

It is a perennial complaint of teachers that their students won't learn their work. Most students have no particular objection to learning; it's just that they don't know how to learn. The computer activities on the CD are specifically intended to solve this problem. The wide variety of activities maintains student interest, while the repetition within the tasks means that students learn the key facts easily. When combined with the in-class Quizzes, you should find that your students master the basics with little difficulty.

Writing answers that link ideas is a skill that takes time to develop. We need to give students in Year 9 and 10 the opportunity to answer questions with sentences and paragraphs so that by Year 11 they are capable of writing Merit and Excellence responses when required. About half the theory activities in *Science 9* and *Science 10* include Merit or Excellence style questions. Even the less able students should be encouraged to write something for these questions so that they learn that *E* questions can still win them an *A* or *M*. In NCEA Mathematics, students aiming for Achievement are taught to skip the *E* questions,

but in NCEA Science, students who do not attempt the more difficult questions cannot gain sufficient *A* grades to Achieve the standard.

The theory activities in *New Directions in Science Workbook* are similar in style to examination questions, however each activity focuses on a discrete section of work (often that covered in a single lesson), whereas exam questions usually include ideas taught over a month or two within the one question. Thus the theory activities are suitable for formative work within a topic, whereas the examination questions are better saved for revision once the topic has been completed.

Practical work is essential if students are to understand, and not just memorise, the principles taught. Each *Workbook* contains a set of core practicals, suitable for all classes. The write-on format means that at the end of each topic students have clear records of their work to study for the test.

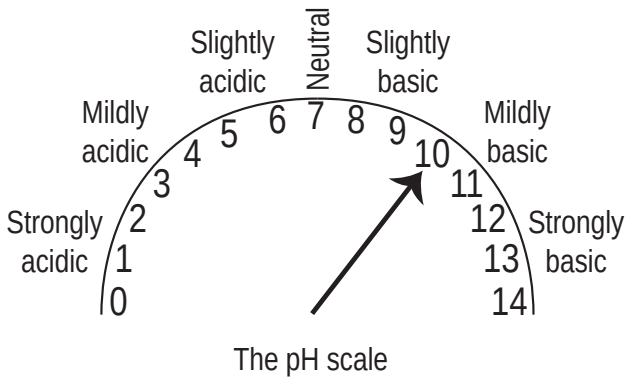
Students and teachers do better when they have a clear understanding what it is they are meant to achieve. We have written Student Learning Objectives for each topic in the *Workbooks*, and we encourage teachers in charge of each year level to go through these objectives, making whatever changes are required to fit your school scheme, and then distribute them to both staff and students. The list of objectives also makes it simple for teachers to see exactly what is covered in each unit, so that you can decide whether each book will meet your needs.

If you like what you see in this package, we hope that you will order sample books from Pearson Education.

Anne, Terry, Wendy and Janet

15.02 Understanding pH

The pH scale measures the concentration of hydrogen ions in solution. Solutions with a high concentration of hydrogen ions (H^+)are acidic. They have pH values between 0 (strongly acidic) and 6 (very weakly acidic). Basic solutions have high concentrations of hydroxide ions (OH^-) and very low concentrations of hydrogen ions. They have pH values between 8 (very weakly basic) and 14 (strongly basic). Solutions that are neither acid nor base are neutral and have pH values of around 7. In these solutions the concentrations of H^+ and OH^- are equal.



The pH scale

1 **a** Acidic solutions have a high concentration of _____ ions. Their pHs range from ____ to ___. A

b Basic solutions have a high concentration of _____ ions. Their pHs range from ____ to ___. A

c In neutral solutions the concentration of ___ ions and ___ ions is equal and the pH is ___ . A

2 Classify the substances below as strongly acidic, mildly acidic, slightly acidic, strongly basic, mildly basic, slightly basic or neutral. M

a black coffee, pH = 5.5_____

b lemon juice, pH = 2.0_____

c seawater, pH = 8.0_____

d laundry soaker, pH = 12.5_____

e pure water, pH = 7 _____

f milk of magnesia (for indigestion), pH = 10.7_____

g human tears, pH = 7.4_____

h tomato juice, pH = 4.3_____

i gastric juice (in the stomach), pH = 1.4_____

j bath salts in water, pH = 7.9_____

3 Acid-base indicators change colour at different pHs.

a What colour is litmus below a pH of 7? A_____

b What colour is phenolphthalein above a pH of 9? A_____

c What colour is bromothymol blue at a pH of 7? A_____

d What colour is universal indicator solution at a pH of 10? A

____

d Draw up a results table for this experiment, including the stretch for each band. *M*

16.07 A better cooker

About half the people living on Earth cook using wood or other plant fuel (biomass). The majority cook over a small, open fire, located on the dirt floor of their home. Much of the heat from the fire goes into the room, rather than into the food being cooked. Smoke from the fire also fills the room, repelling insects but affecting the health of the occupants.

In recent years, many groups of scientists and engineers have designed a wide variety of stoves that can burn biomass in a raised, enclosed container. These fires burn hotter than an open fire, which means combustion is more efficient, with very little waste or smoke. Most stoves are insulated, meaning that most energy goes into the food, rather than into the room. The result is that far less fuel is required to cook each meal.

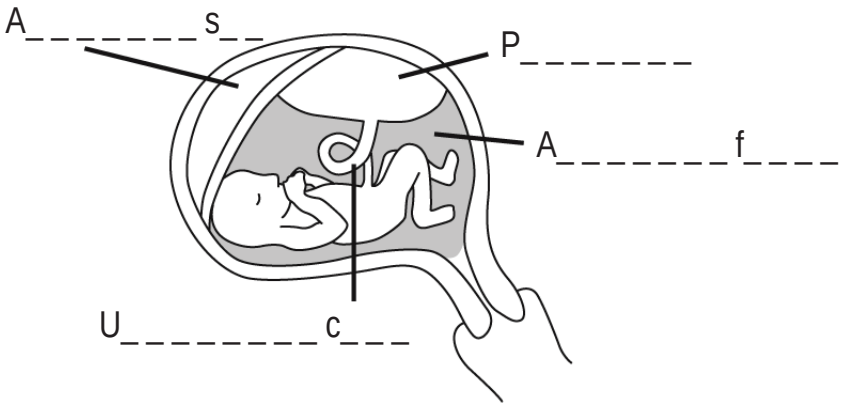
1 What advantages do the enclosed stoves have over an open fire? *A*

2 What advantages does an open fire have over the enclosed stove? *A*

3 Your village is rapidly running out of firewood and as one of the village leaders you need to decide whether it would be sensible to encourage your people to change to one of the new stoves. You have three different stoves to test. Describe a fair test to determine which stove uses the least amount of food to cook a meal, and whether any of the stoves uses less fuel than the open fires your villagers are currently using. *E*

17.05 Growing babies

1 Label this diagram showing a baby in the womb. **A**



2 Identify the part from the diagram that: **A**

a allows nutrients to flow from the mother's blood to the baby's blood.

_____

b cushions the baby from knocks.

_____

c transports waste from the baby to the mother._____

3 What would happen to the baby if the placenta pulls away from the womb during pregnancy? Why? **M**

_____

_____

_____

4 The baby grows inside a fluid-filled bag, yet every cell in its body needs oxygen for respiration. Explain how oxygen gets to the baby's cells. **M**

_____

_____

_____

_____

_____

5 Explain why women are strongly advised not to smoke while pregnant. **M**

_____

_____

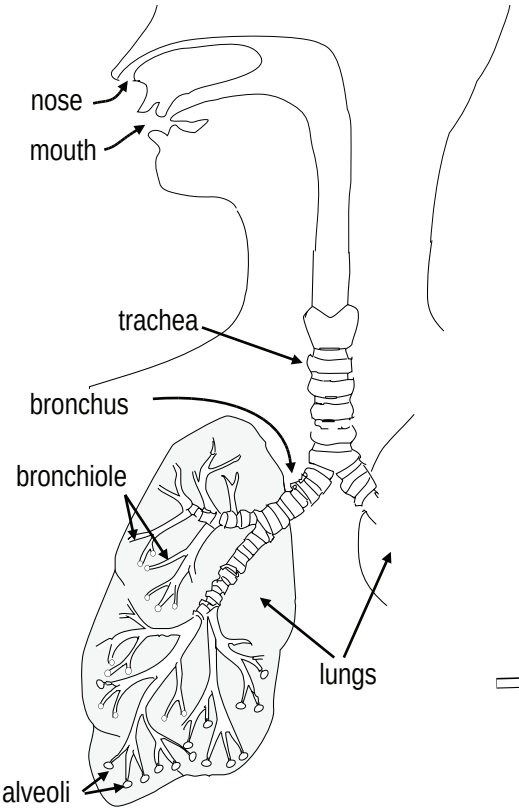
_____

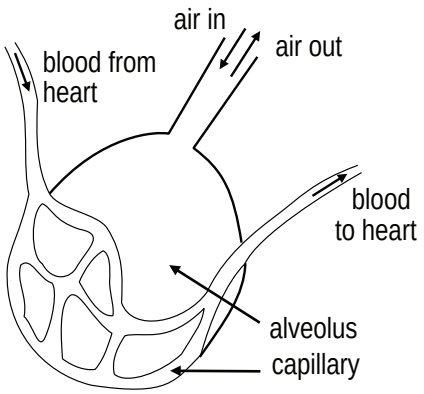
_____

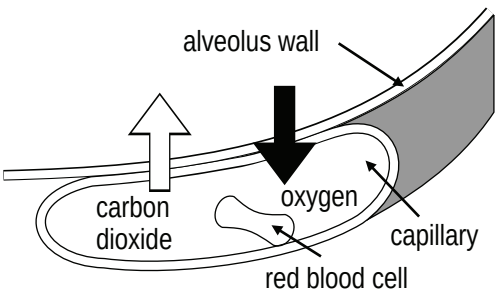
_____

18.07 The respiratory system

The diagrams on the right show the structure of the respiratory system. Use them to help you to answer the questions below.







1 Decide whether you have one, two, or many of each of these structures. **A**

- **a** bronchiole _____
- **b** lung _____
- **c** trachea _____
- **d** alveolus _____
- **e** bronchus _____

2 An alveolus can be likened to a tiny balloon. **A**

- **a** What is found on the inside of this 'balloon'? _____
- **b** What is wrapped around the outside of the 'balloon'? _____
- **c** What substance passes from the inside to the outside? _____
- **d** What substance passes from the outside to the inside? _____

3 What is the function of red blood cells? **A** _____

_____

4 Students often confuse the ideas of breathing, respiration and gas exchange.

- **a** What is the purpose of breathing? **A** _____

  _____
- **b** What is respiration? **A** _____
- **c** Where does respiration occur? **A** _____
- **d** Where does gas exchange occur? **A** _____
- **e** Can a paralysed or dead person be made to breath artificially? **A** _____
- **f** Can a dead or paralysed person be made to respire artificially? **A** _____

19.06 Tsunami warning

A tsunami is a large water wave, generated by a large undersea earthquake or an underwater landslide. Although relatively rare, tsunami can be very destructive, as was demonstrated by the 2004 Boxing Day tsunami in the Indian Ocean, which killed around 225 000 people and left almost 2 million homeless in 11 countries.

New Zealand's large coastline and its location in the middle of the Pacific Ocean makes it vulnerable to tsunami generated anywhere on the Pacific rim, as well as those that may be created by seismic events around New Zealand itself. In the centuries before Europeans arrived here, a number of coastal Maori settlements were destroyed by tsunami, and later settlements were sited inland or on hilltops in recognition of this danger.

Tsunami facts

- Tsunami move between 500 and 1000 km h^{-1} — that's faster than domestic aeroplanes.
- In the ocean, tsunami are barely detectable, but when they reach shallow waters the wave height can rise to 5 m, 10 m or even 30 m.
- Tsunami have long wavelengths, which mean there may be more than an hour between waves. In the 2004 tsunami many people had gone down to the beach to help when the second wave hit.
- The first sign that a tsunami is coming may be the water receding to expose the ocean floor. If you ever see that happen, move away from the coast as fast as you can!
- The greatest destruction occurs within a few hundred metres of the coast, but the water can also move up rivers and valleys. You should be safe 1.5 km inland or on a hill higher than 35 m.
- Damage is caused by the energy of the water itself, but also by the thousands of objects caught up in the water.

One reason so many people died in the 2004 tsunami was that they had no warning that it would strike. New Zealanders will receive warning of some tsunami from the Pacific Tsunami Warning Center which uses sensitive instruments to monitor waves in the Pacific ocean. In 2004 the Indian Ocean had no similar warning system

1 Why is it necessary to use special instruments to detect tsunami in the oceans instead of just people on boats? *M*

2 What kinds of tsunami will affect New Zealand before a warning from the Pacific Tsunami Warning Centre can be issued? *A*

3 Suggest what you should do if you can see the large wave from a tsunami. Give a reason for your answer. *M*

4 What should someone on a boat in deep water out at sea do if they hear a tsunami warning on the radio?

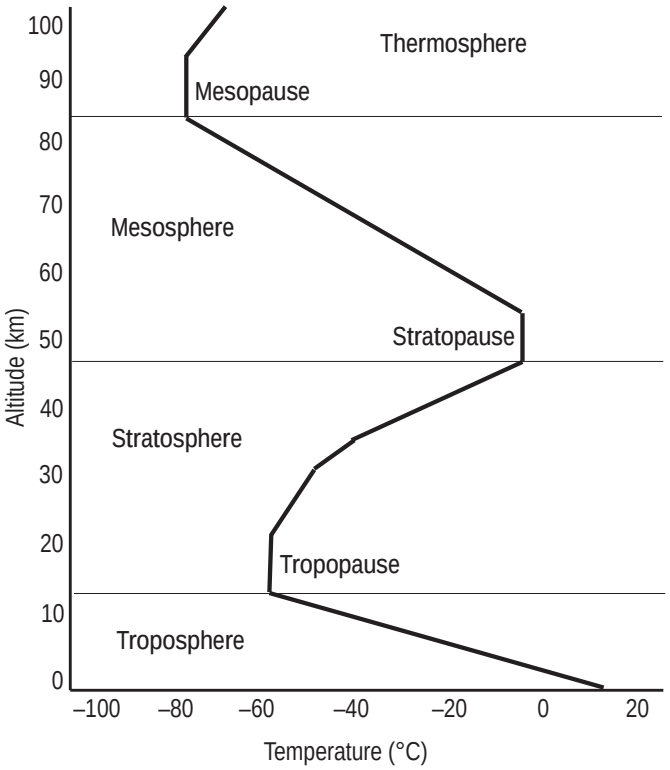
M

5 Not long after the 2004 tsunami, the coastal city of Gisborne was struck by a moderate earthquake in the early hours of the morning. Quite a lot of people immediately got in their cars and headed inland, without even checking with the radio to hear if a tsunami was coming. Were they wise or foolish? Why?

e

20.09 Temperature changes in the atmosphere

The different layers of our atmosphere are created by the way the temperature changes with altitude. The graph on the right shows how the temperature changes in the different regions. Use it to answer the questions below.



1 What happens to the temperature in the troposphere as the altitude increases? **A**

2 What characteristic do the tropopause, the stratopause and the mesopause have in common?

M

3 What happens to the temperature in the stratosphere as the altitude increases? **A**

4 The change you observed in **3** is produced by ozone after it absorbs something. What? **A**

5 The word *troposphere* comes from the Greek word *tropos*, meaning to turn or mix. The troposphere is a region where air mixes as it rises and falls.

a What property of an air mass would cause it to rise? **A**

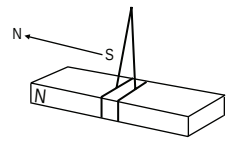
b Why would this property cause it to rise? **M**

c What property of an air mass would cause it to fall? **A**

6 Air in the stratosphere does not mix, but remains in layers (the word *strata* means layers). Use the graph to explain why air does not rise or fall in the stratosphere. **M**

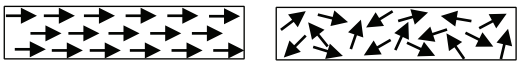
21.13 Which way is north?

A bar magnet, suspended on a hook by cotton thread, will swing around until it lines up in a north-south direction. A compass needle is just a very small bar magnet.



North-seeking pole

If a magnet is broken into many pieces, each piece acts as a tiny magnet, with its own north and south poles. Scientists say that a magnet is made up of millions of magnetic domains, all pointing the same way. An unmagnetised piece of iron is also made up of domains, but they are randomly orientated.


magnetised bar unmagnetised bar

1 If a magnet is snapped and the two broken ends held together, will they attract or repel? Explain your answer with the aid of a diagram. ***M***

2 Heating a magnet, or dropping it on the floor, may weaken or completely demagnetise it. Using the idea of domains, discuss how this happens. ***e***

3 The Earth acts as if it had a giant bar magnet inside it.

a Sketch a diagram of the Earth, showing where this imaginary bar magnet appears to be, show the field lines and label the north and south poles of this magnet. ***M***

b Explain your answer to **a** above. ***M***

2 What does the graph show about the strength of the electromagnet as the current increases? ***M***

3 State three factors that Ruth and Rowena kept constant during their investigation. ***M***

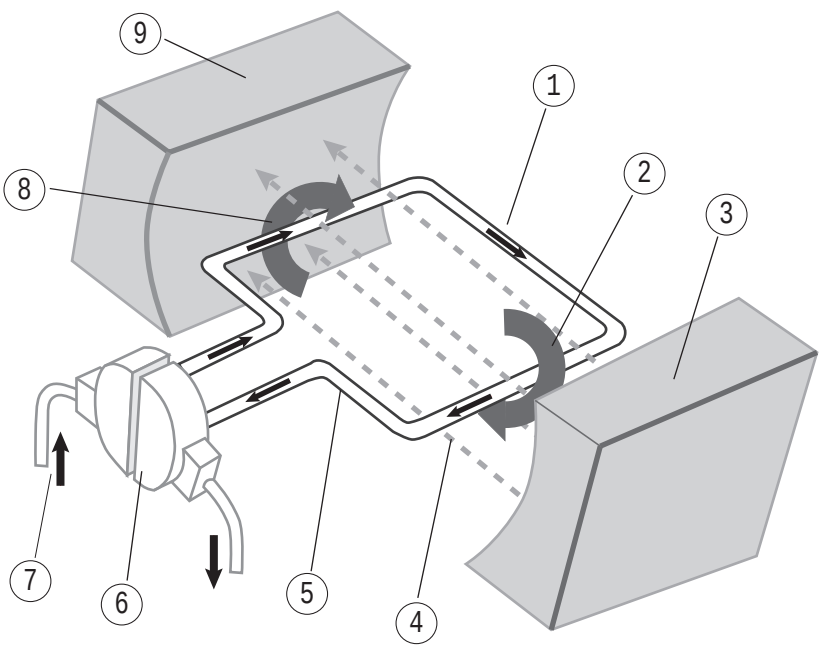
4 Suggest a way in which the girls could make a stronger electromagnet for a given current in the coil. ***M***

22.03 Electric motors

The diagram below shows how Direct Current motor converts electrical energy to kinetic energy.

1 Match the labels on the left with the numbers on the diagram. ***M***

a	When the current is cut by field lines from the left, the wire experiences a downward force.	
b	Wire coil.	
c	Magnetic field lines.	
d	North magnetic pole	
e	Electric current enters through the commutator.	
f	No force is created when the current is parallel to the magnetic field.	
g	When the current is cut by field lines from the right, the wire experiences an upward force.	
h	South magnetic pole.	
i	The split in the commutator reverses the current each half-turn, keeping the coil turning in the same direction.	



2 This diagram shows the coil as a single wire loop. Suggest a reason why but most motors contain multiple loops of wire. ***M***

22.14 Keeping safe

1 Electrical safety devices include fuses or circuit breakers, earth wires, Residual Current Devices (RCDs) and double insulation. Choose the device that: **A**

a	should be used anytime you are using a portable appliance that can cut or drill.	
b	prevents house fires caused by overheating wires.	
c	is commonly used with hand-held devices such as hair driers or portable CD players.	
d	protects the user from electrocution caused by a broken wire inside the appliance.	
e	must be replaced by a new one of the same value	
f	should be connected directly to the main power supply.	
g	requires an unbroken connection to the ground,	

2 The cable to Bethany's curling iron has got badly twisted since she was given it two years ago. When her uncle saw it, he said it was dangerous and should be replaced.

a What would you see if you cut open the thick cable that carries electricity to an appliance such as a curling iron or hair drier? **A**

b How would tightly twisting this cable cause damage? **M**

c What could happen if Bethany keeps on using her curling iron? **A**

3 We use dozens of electrical appliances every day, and those appliances start to wear out without our noticing. List three common ways in which electrical appliances in the home may have become dangerous. **A**

4 Explain how a light bulb could start a fire, even though both the bulb and the lamp are not faulty. **M**

15A Acids, bases, indicators and pH

15A1 Acids

There are many acids in our homes. Many fruits contain acids. Water in spa baths and swimming pools is checked for acidity. Farmers check the acidity of their soil.

All acids have something in common: they all contain **hydrogen.** A way of testing to see if a substance is an acid or not is to use a chemical substance which, when added to another solution, turns a characteristic colour. This chemical is called an indicator.

1 Take samples of the acids (or foods) listed in the table below and note their appearance.

2 Taste small samples of each material.

3 If the sample is a liquid use a dropper to place a drop of it onto a piece of blue litmus paper. Record the final colour of the paper on the table. Repeat with red litmus. (**Note:** If the sample is not a liquid, dissolve a rice grain sized amount in 2 mL of water and use a drop of this.)

4 Use a dropper to put about 1 mL of the material or its solution in a test tube and add a couple of drops of Universal Indicator. Note the final colour on the table.

Results

Acid (Food)	Appearance	Taste	Final colour of:		
			Blue Litmus	Red Litmus	Universal Indicator
Citric acid (lemons/ oranges)					
Malic acid (apples)					
Lactic acid (sour milk/ yoghurt)					
Tartaric acid (grapes)					
Ethanoic acid (vinegar)					
Pure water					

Thinking about it

5 Acids may be _____ or _____. They taste _____.

6 Blue litmus will turn _____ (colour) in an acid.

7 Red litmus will turn _____ (colour) in an acid.

8 Universal Indicator (U.I.) will turn _____ in an acid.

9 Pure water causes no change in the colour of an indicator. This means water is _____ an acid.

18B Lungs, heart and blood

18B 1 Observation of lungs

The lungs you will have will probably be cow, sheep or pig and come from a butcher. The butcher will have slashed open the lungs to check for disease.

1 **a** Describe the trachea, its structure and what it feels like.

_____

_____

b Why does it have this structure?_____

_____

2 Follow the windpipe down till it divides into two. Cut down the tubes to open them and describe what you see.

_____

_____

3 Find a small hole the size of a straw and push a straw (clean) into the hole then blow through it. Describe what happens and where the air is going. Remember don't share straws or blow an end that has touched the lungs.

_____

_____

Thinking about it

4 After studying hard for a science test in the library, you are attacked on the way home and stabbed. The knife passes between two ribs and enters your lung. (The attacker searches your bag and escapes with your science notes.) What affect will the knife have on your ability to breathe?

_____

_____

_____

Thinking about it

5 Hardness, colour and streak were mentioned as characteristics used to identify minerals. List 3 other characteristic properties used to identify minerals in the key.

_____

_____

19B The structure of the Earth

19B 1 A custard square Earth

The main part of this recipe should be assembled at least 3 hours ahead of the class and kept in the refrigerator. The recipe is in the technician's guide.

1 Your teacher will show you a partially completed custard square model for part of the Earth.

a What does the custard represent?

_____

b What do the biscuits represent?

_____

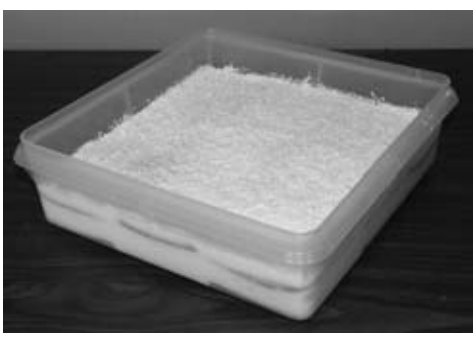
2 This custard is cold, but imagine what would happen if the custard beneath the biscuits was still being heated.

a What would happen to the hot custard if a gap formed between two of the biscuits?

_____

b Where does this happen on the Earth?_____

3 Your teacher will spread icing over the biscuit layer. The icing represents the soil or water that covers the rock layer of the Earth. If you choose, you can also sprinkle coconut on the icing (representing plants).



a Once the icing is on, the biscuit layer is no longer visible. What could you do (other than scraping off the icing!) to show where the edges of the biscuits are?

_____

_____

b How does this correspond to the real Earth?

_____

_____

21D Electrostatics

21D1 Electrostatic forces


Hold the cloth close to the charged straw.

You will be given 3 plastic straws, a pin, and a cloth by your teacher.

1 Hold two of the straws together in your hand and rub them both with the cloth for about a minute.

2 Push the pin through the centre of one of the rubbed straws, then balance it on the third (unrubbed) straw as shown in the diagram.

3 Bring the second, rubbed straw close to (without touching) the balanced straw.

What happens?_____

4 Bring the cloth close to (without touching) the balanced straw.

What happens?_____

5 Charge the straw again, then hold it over some small fragments of paper (about 3 mm in diameter).

What happens?_____

_____

6 Hold the charged cloth over the paper fragments.

What happens?_____

_____

Thinking about it

7 When an object like a straw is rubbed, it and the cloth rubbing it, become charged. Electrons are moved from one to the other by the rubbing.

a Would the two straws have the same type of charge? _____ Explain your answer._____

_____

b Would the cloth have the same type of charge as the straws?_____ Explain your answer._____

_____

8 **a** If the two objects have the same type of charge they _____

b If the two objects have a different type of charge they _____

9 Explain your the observations in **5** and **6**._____

_____

_____