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

2.8 Household cleaners

2B p 54 2C p 56 2E p 60

Household bleach reacts with acidic liquids to release poisonous chlorine gas. This is a particular hazard in the bathroom because some shower and toilet cleaners are acidic.

1 a The table below shows the pH values of certain bathroom products.

Cleaner	Foam-off	Green magic	Kleen-up	Virmic
pH	8.8	7.0	2.2	12.0

Which product is not suitable to use with bleach? **A** _____

b The bathroom cleaners listed above were tested with universal indicator paper. Complete the table showing the colour of each piece of indicator paper AFTER it had been dipped into the cleaner. **A**

Cleaner	Foam-off	Green magic	Kleen-up	Virmic
Colour of universal indicator paper				

2 Many cleaning products don't specifically state whether they contain acids or not. Identify the statements in the information on the right which strongly suggest that *Air-X 71 Foam Cleaner* contains acids. Explain your answer. **E**

AIR-X 71 FOAM CLEANER

No hard scrubbing – deodorises with AIRICIDE®

Powerful cleaning agents give this super concentrated product its great performance. Removes soap film, lime scale, rust, corrosion, hard water deposits, mildew stains, etc. from shower walls, ceramic tile floors, glass and plastic shower doors, sinks, tubs and decorative fountains. This foaming cleaner can be used on ALL bathroom surfaces because it will not damage grout, curtains, glass, chrome plating, or any other delicate surfaces or fixtures. Contains no abrasives to scratch or dull the surfaces being cleaned. Not for use on polished marble.

3 While acidic cleaners should not be used in combination with bleach, cleaners that are strongly alkaline should not be used on aluminium objects such as oven trays or muffin tins. Explain why. **M**

3.2 Scrap metal

1D p 40 1F p 44

No matter how broken and battered they are, just about all metal objects can be melted down and made into useful new items. Scrap metal merchants buy unwanted metal – often from old cars or demolished houses – sort out the different metals, and sell them. The main metals recycled in New Zealand are iron, aluminium, copper and lead.

1 When people bring their metal to the yard, the merchant has to identify each one while the customer waits for a price. While colour is a useful property of new metal samples, scrap metal is often coated in paint, plastic or simply grime, making it difficult to be certain what colour the underlying metal is. What properties of these metals would be useful in recognising them quickly in the scrap metal yard? **A**

a Lead: _____

b Iron: _____

c Aluminium: _____

d Copper: _____

2 The properties of metals determine how we use them. What properties of these metals made them useful for the purpose given? **M**

a Lead is often found wrapped around bundles of underground electricity cables.

_____

_____

b Copper is often used at the bottom of saucepans.

_____

_____

c Modern houses often have aluminium window frames.

_____

_____

3 Discuss the advantages and disadvantages of using iron in car body panels. **E**

_____

_____

_____

_____

_____

_____

5.7 Yeast trials

5D p 108

People have been using yeast to convert sugars into ethanol (alcohol) for thousands of years. Whether it is to make beer (about 5% alcohol), wine (13% alcohol) or even mead (18% alcohol), the species of yeast is the same – brewer's yeast. But just as dogs form a single species but have many different breeds with different characteristics (bloodhounds with very good noses, greyhounds for racing, pit bulls for fighting), so different strains of yeast have different characteristics. Yeasts used to make wine can tolerate a lower pH and higher alcohol concentration than those used to make beer; mead yeasts cope with higher sugar concentrations than those used to make wine or beer; and beer yeasts function better at lower temperatures than those used to make wine.

Under ideal conditions, the yeast will convert sugar into alcohol until either all the sugar has been used up, or until the alcohol concentration reaches toxic levels for that particular strain of yeast.

As a general rule, fungi are able to tolerate acid conditions better than bacteria. That's why jam and fruit are more likely to go mouldy than to be affected by bacteria. All fermentation mixtures are made slightly acidic. This is partly because yeasts are more active at a pH of 5 than 7, and also because other (undesirable) microbes are less active at lower pH. The other product of fermentation – carbon dioxide – is acidic, so as soon as fermentation begins the pH starts to fall further, to a final pH of about 4.2.

Head brewer Mark White, of Harrington's Brewery, samples his brew.

1 Complete this word equation for the fermentation of glucose. **A**

Glucose $\longrightarrow$ +

2 List the conditions, mentioned above, that must be considered when selecting the correct strain of yeast for fermentation. **A**

3 A *sweet*, 'dessert' wine contains some sugar along with alcohol, while a *dry* wine contains no sugar.

Which kind of wine could be made using a wine yeast with a relatively low tolerance for alcohol? Explain your answer. **M**

7.1 Red Rascal

7A p 126

Potato flower

Potato seeds are found in tomato-like fruit

Potato tubers form on the roots underground

Red Rascal is a new potato cultivar (variety) developed by the New Zealand Institute for Crop and Food Research at Lincoln near Christchurch. It was made by placing pollen from Desiree (a red-skinned potato with cream flesh) onto Tekau flowers. (Tekau has white skin and flesh.)

1 The table shows some characteristics of Red Rascal. Decide which characteristics are most important to the grower, and which are most important to the consumer. **A**

Characteristic	Grower	Consumer
Attractive bright red skin and white flesh		
Even, smooth, oval shape		
Resists important bacterial and fungal diseases		
No resistance to potato cyst nematode		
Suitable for harvest mid to late season		
Excellent for steaming or boiling, acceptable for home fries		
Good cropping yields		

2 Most potatoes are grown from tubers, but potato breeders plant hundreds of seeds from the same plant.

a Explain why potato *farmers* grow their plants from tubers. **M**

b Explain why potato *breeders* need to grow plants from seed. **M**

11.4 A beautiful bath

11D 11F
p 188 p 192

Free-standing, cast-iron claw-foot bath painted dark green to match the curtains.

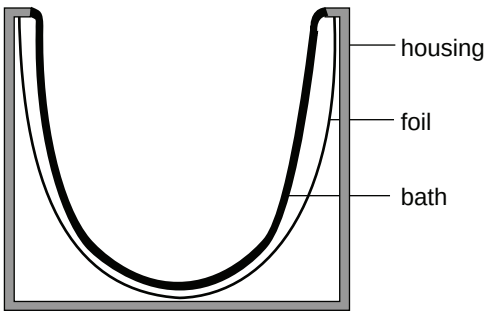
Modern white plastic bath enclosed in wooden housing.

Anne moved into a lovely 'character' home built in 1934. Along with the lead-light windows, moulded ceilings and wide wooden skirting boards was a beautifully restored, old-fashioned bathroom. When she got her book and bubble-bath ready for a long, hot soak in the claw-foot bath she discovered a big problem – the water wouldn't stay hot. A bath you can't bathe in is no use, so she had it replaced with a new one. Now she can read for an hour without having to add any more hot water.

1 Explain why the cast-iron, claw-foot bath (pictured above) lost heat so quickly. *e*

2 Explain why the new bath retained its heat well. *e*

3 The old house had not been insulated, so Anne had fibreglass insulation blankets put in the ceiling and shiny underfloor insulation paper put under the house. When the bath was installed she asked the plumber to line the wooden housing with a layer of the shiny paper before placing the bath in position. Discuss how this step helped keep the water hot. *e*

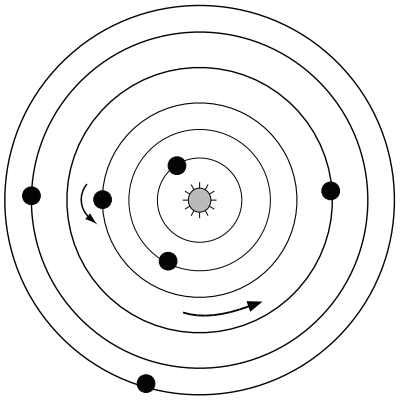


13.6 Observing the planets

13G p 228

1 Name the 5 planets visible to the naked eye in order of distance from the Sun.

2 The diagram on the right represents the positions of the first six planets in our system for a particular day. (Orbits are not to scale.) The arrow shows the direction of movement of the planets in their orbits, and also the direction of rotation of the Earth.



Use the diagram to answer the following questions.

a Which planet(s) will be visible at midnight on Earth?

b Which planet will be overhead at dawn? A

c At what time (if any) will Mercury be visible? A

d Venus is sometimes known as 'the evening star'. Why is Venus never visible at midnight? M

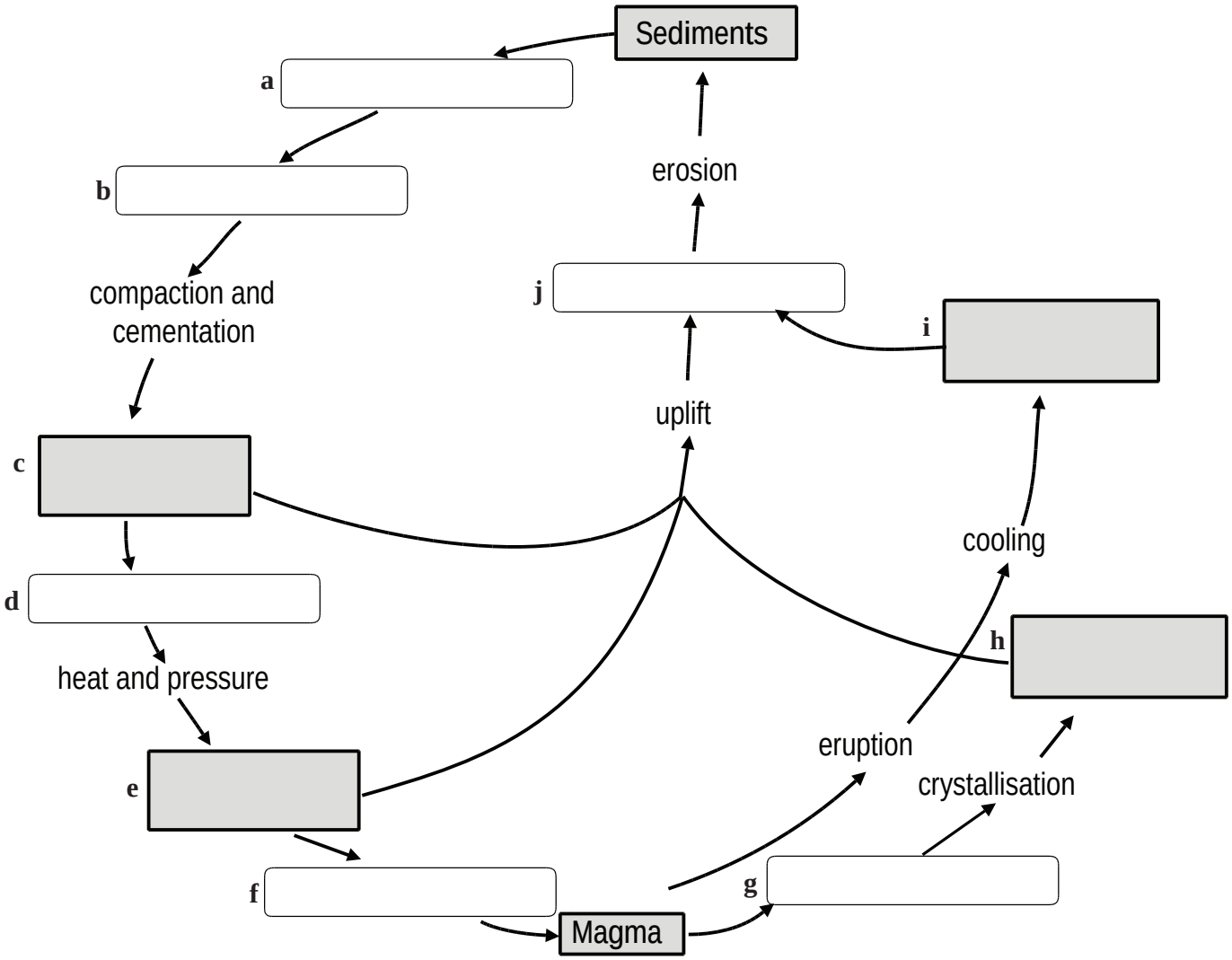
3 According to the data books, Earth is 150 million km away from the Sun, and Mars is 223 million km from the Sun. Does that mean the distance from Earth to Mars is 73 million km? Explain your answer.

M

4 There are stars all over the night sky, but the planets are always found along the strip of sky that the Sun moves along during the daytime. Use your knowledge of the structure of the solar system to discuss why the planets cannot be seen in other parts of the sky. C

15.6 The rock cycle

15D p 256



1 Complete the diagram of the rock cycle above by adding the following labels in the boxes provided. **A**

Metamorphic rock Plutonic rock Sedimentary rock Volcanic rock
cooling deep burial deposition melting transport weathering

2 Name two processes that occur at a subduction zone. **A** _____

3 Name two processes that occur inside a dyke. **A** _____

4 What type of rock forms at a mid-ocean ridge? **A** _____

5 What processes must occur before metamorphic rocks reach the Earth's surface? Explain your answer.

M _____

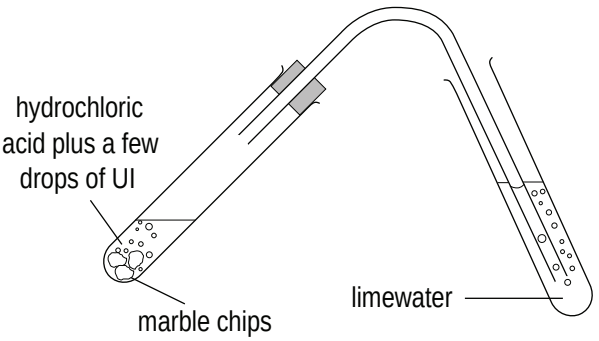
_____

_____

Inv 2.3 Acid on a carbonate

When carbonates and hydrogen carbonates react with acids, three products are formed.

1 Set up the equipment shown on the right. Use 2 mL of dilute hydrochloric acid containing a few drops of universal indicator solution. Check that the bung and delivery tube fits the test tube, put the tube in the limewater, and finally add 0.5 g of marble chips (calcium carbonate) and push the bung in.



2 **a** What colour is the indicator before the marble chips are added?_____

b What does this colour tell you?_____

3 What do you see in the acid tube when the reaction starts?

_____

4 What change occurs in the limewater tube?_____

Conclusion:_____

5 Limewater is calcium hydroxide. One product formed in the limewater test is calcium carbonate. Write word and balanced formula equations for the reaction that occurs during the limewater test.

_____

_____

6 Leave the equipment set up until no further reaction occurs in the left-hand tube.

What colour is the indicator now?_____

What does this colour tell you?_____

7 You should have some unreacted marble chips remaining in the test tube. They can be rinsed with water and returned to your teacher.

8 Write a word equation for the reaction between calcium carbonate and hydrochloric acid. Remember that there are three products.

_____

9 Now write a balanced formula equation for the reaction.

_____

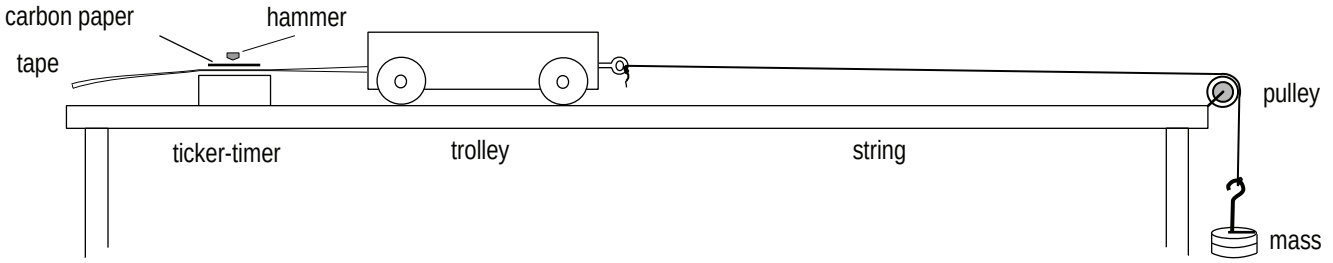
10 This experiment could have been done using lumps of washing soda (sodium carbonate) and sulfuric acid. Write word and balanced formula equations for the reaction that would have occurred.

_____

_____

Inv 9.1 Force and acceleration

In this experiment you will use different forces to accelerate an object and thus find the relationship between force and acceleration.



1 Set up the equipment shown above and tilt the table to compensate for friction (use small books). Check this by starting the ticker-timer and giving the trolley a slight push. If the table is set up correctly then the dots will be evenly spaced.

2 Attach a fresh piece of tape to the trolley. Hold the trolley in place while your partner attaches a 100 g mass to the end of the string. Start the ticker-time then let the trolley go.

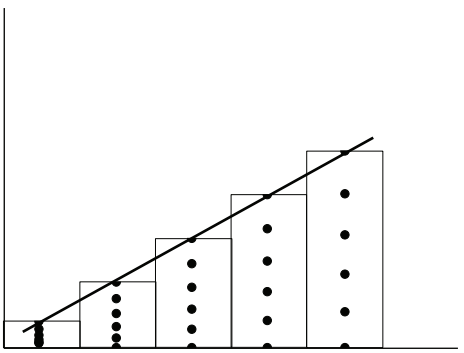
3 Calculate the force acting on the trolley (g = 10 N kg^{-1}). F = _____ Label the tape with this force.

4 Repeat the experiment twice, using 200 g and 300 g masses on the string. Label each tape with the appropriate force.

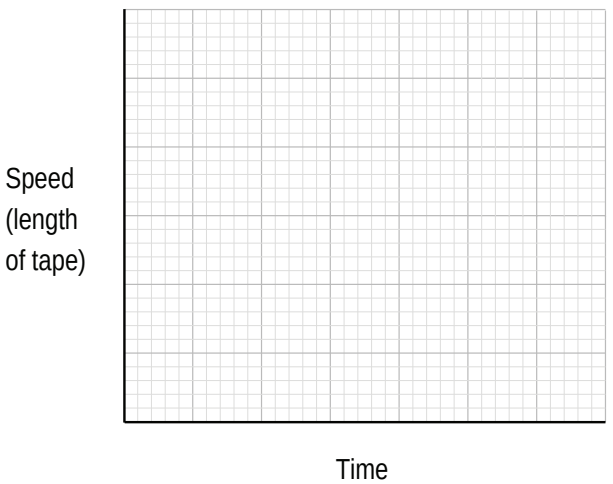
5 For each tape (on separate pieces of paper):

Rule across the tape at the first dot and then at every fifth dot then cut up the tape and stick the pieces on a sheet of paper as shown on the right.

Draw a line of best fit through each strip as shown on the right. The slope of this line is the acceleration of the trolley for that force.



6 Sketch a graph showing the slope of your tape, then add in the other two slopes. Label each one with the force that produced it.



7 What happens to the acceleration as the force increases?

_____

_____

_____

8 What factors were kept constant during this experiment?

_____

_____

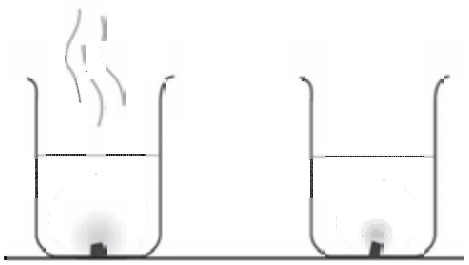
_____

Inv 11.1 Heating and cooling

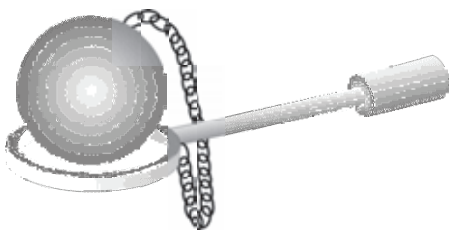
This investigation should remind you of the some of the properties of matter that you investigated in your junior science course.

1 Fill two 100 mL beakers with hot and cold water and leave them to settle for a few minutes. Then drop a couple of crystals of potassium permanganate into each one and leave them, undisturbed for as long as possible.

After you have completed the rest of the activities below, complete the diagram on the right to show the appearance of the two beakers and explain what happens.



2 When they are both cold, the ball passes through the ring. What do you think will happen when the ball is heated? Try it, then describe and explain what happens.



3 Half-fill a 2 L plastic milk bottle with hot water, shake it, then empty out the water and put the lid on. The bottle now contains a large volume of water vapour and hot air. What will happen when you cool the bottle by running cold water over the outside? Try it, draw what you see and explain what happens.

4 A bimetallic strip is made by joining strips of two different metals metals together. What will happen when the stip is heated? Try it, then describe and explain what happens.

Below the Instruments section should be a section about the power source on Cassini.

10 What is the energy source used to power the instruments on the space craft?

_____

11 Why couldn't solar power be used to power the instruments?

_____

12 What was the role of the Huygens probe?

_____

Inv 13.8 The Phoenix mission

At the time of writing, the Phoenix mission has been launched, but has yet to arrive at its destination. By the time you read this the web-sites listed here may alter slightly as they are updated, but hopefully you will still be able to find the answers to these questions, even if Phoenix has been lost.

1 Start with the Wikipedia entry on the **Phoenix (spacecraft)**: http://en.wikipedia.org.

When was Phoenix launched? _____ Where is it going?_____

When is it scheduled to arrive?_____

What is its current status?_____

2 What are its two aims?_____

_____

3 Scroll down to the Launch heading and name the launch vehicle._____

4 Click on the link for the launch vehicle, look under Vehicle description. What fuel is used in the main engine of the launch vehicle?_____

5 Go back to the Phoenix (spacecraft) page and use the section on Scientific payload to write a brief description of the functions of the following instruments.

Robotic Arm (RA)	
Surface Stereo Imager (SSI)	
Thermal and Evolved Gas Analyzer (TEGA)	
Microscopy, Electrochemistry and Conductivity Analyzer (MECA)	Performs a variety of tests on soil samples to find out whether microbes can live in it.
Meteorological Station (MET)	

Continues...