270050_KS3ScT5_7Paper2 31/3/06 8:21 pm Page 1

Sc

KEY STAGE 3

TIER 5–7

2006

Science test

Paper 2

Please read this page, but do not open the booklet until your teacher tells you to start. Write your name and the name of your school in the spaces below.

First name _____

Last name _____

School _____

Remember

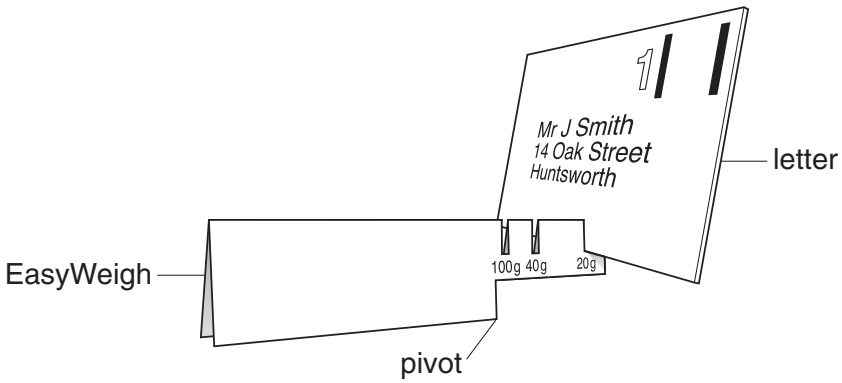
- The test is 1 hour long.
- You will need: pen, pencil, rubber, ruler, protractor and calculator.
- The test starts with easier questions.
- Try to answer all of the questions.
- The number of marks available for each question is given below the mark boxes in the margin. You should not write in this margin.
- If you are asked to plan an investigation, there will be space for you to write down your thoughts and ideas.
- Do not use any rough paper.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

For marker's use only

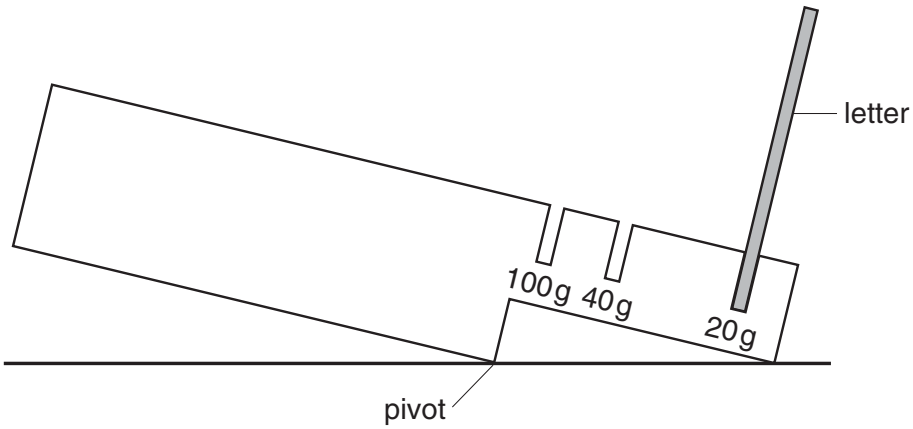
Total marks	
Borderline check	

QCA/06/1939

1. The drawing below shows a cardboard scale called an EasyWeigh.
It can be used to estimate the mass of letters.



(a) Clare put a letter in the 20 g slot. The scale tipped as shown below.



She then put the same letter in the 40 g slot. The scale did **not** tip.

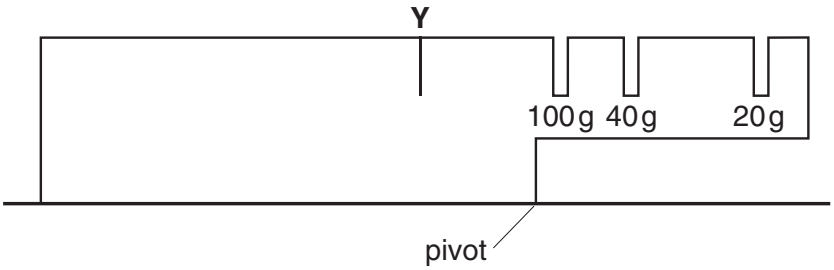
(i) What do these results tell you about the mass of Clare's letter?

1ai
1 mark

(ii) What could Clare do to this cardboard scale to weigh her letter more accurately?

1aii
1 mark

(b) (i) Clare drew a short line to show where she thought she should cut a slot to weigh a 150 g letter. She labelled the slot Y.



Why could Clare **not** use a slot at Y to weigh a 150 g letter?

_____

_____

1bi
1 mark

(ii) Clare wanted to cut a slot to weigh a 70 g letter.

On the diagram above, draw a short line to show where the slot should be cut.

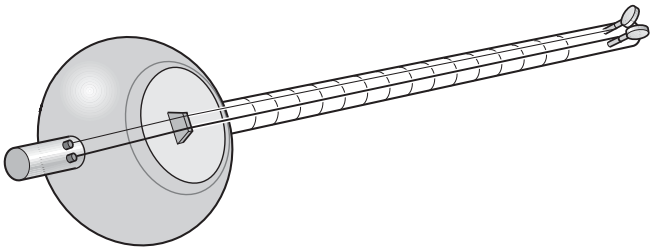
1bii
1 mark

maximum 4 marks

Total
4

 EasyWeigh™ © 2005 Innovation Affairs

2. The dotar is a musical instrument with two strings.



(a) Aftal plays the dotar very quietly.

What must he do to the strings to make a louder sound?

_____

_____

2a

1 mark

(b) Aftal makes the strings tighter so they vibrate more quickly.

How does this affect the sound produced by the strings?
Tick the correct box.

The sound has a lower pitch.	☐
The sound is louder.	☐
The sound has a higher pitch.	☐
The sound is quieter.	☐

2b

1 mark

(c) One of the strings is thicker than the other, so it vibrates more slowly.

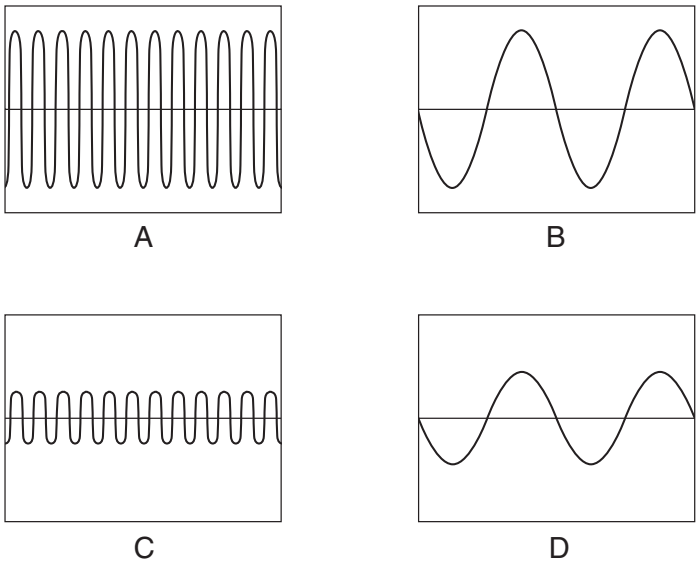
In what way is the sound made by the thicker string different from the sound made by the thinner string?

_____

2c

1 mark

(d) Aftal played the dotar near a microphone connected to an oscilloscope. The diagrams below show the patterns made by four sounds.



(i) How does the sound shown in trace A differ from the sound in trace B?

_____

_____

2di

1 mark

(ii) How does the sound shown in trace A differ from the sound in trace C?

_____

_____

2dii

1 mark

maximum 5 marks

Total

5

3. Russell investigated the relationship between mass and weight.
He weighed five different masses using a force meter.

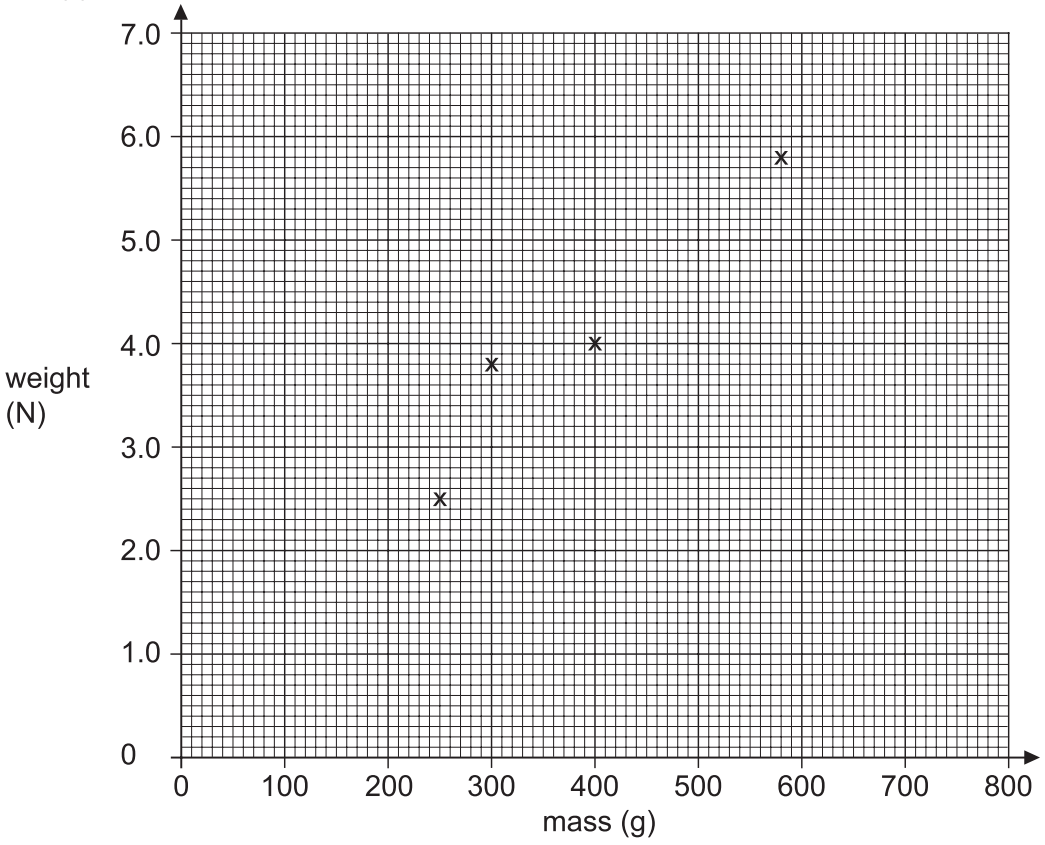
His results are shown in the table.

mass (g)	weight (N)
150	1.5
250	2.5
300	3.8
400	4.0
580	5.8

(a) He plotted four of his results on a grid as shown below.

(i) Plot the point for the 150 g mass on the graph.

(ii) Draw a line of best fit.



3ai
1 mark

3aii
1 mark

(b) One of the points Russell plotted does **not** fit the pattern.

Circle this point on the graph.

3b

1 mark

(c) Use your graph to predict:

(i) the mass of an object weighing 6.5 N;

_____ g

3ci

1 mark

(ii) the weight of an object of mass 50 g.

_____ N

3cii

1 mark

(d) Give **one** reason why it is more useful to present the results as a line graph rather than a table.

_____

_____

3d

1 mark

maximum 6 marks

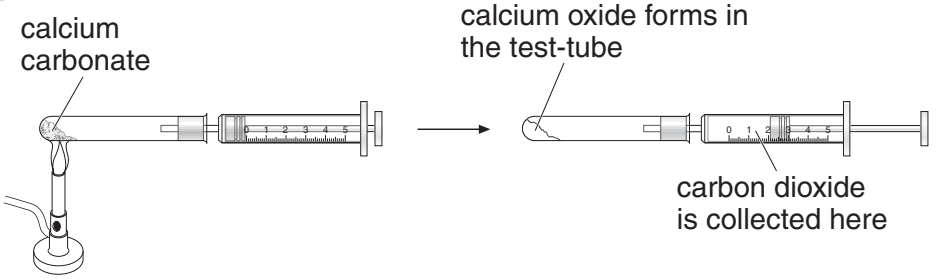
Total

6

4. A science teacher showed her class three experiments, A, B and C.
The experiments and the word equations for the reactions that took place are shown below.
All the experiments were done in a fume cupboard.

experiment A

calcium carbonate is heated



word equation calcium carbonate → calcium oxide + carbon dioxide

experiment B

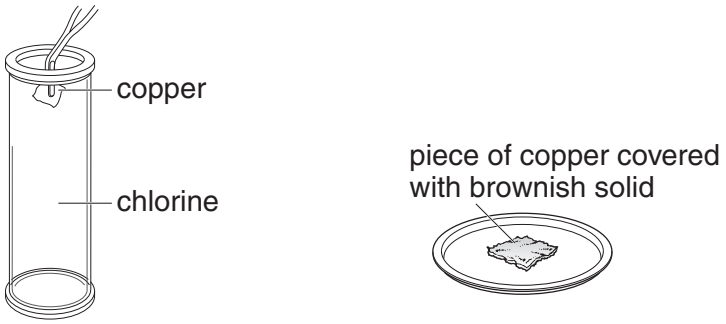
iron filings and sulphur are heated together



word equation iron + sulphur → iron sulphide

experiment C

hot copper is added to chlorine



word equation copper + chlorine → _____

(a) From the substances in experiments A, B and C, opposite, give the name of:

(i) **one** metallic element;

_____

(ii) **one** non-metallic element;

_____

(iii) **two** compounds.

_____ and _____

4ai
1 mark

4aii
1 mark

4aiii
1 mark

(b) In experiment B, the iron filings weighed 2.0 g at the beginning of the experiment and the iron sulphide produced weighed 2.8 g.

Explain this increase in mass.

_____

_____

4b
1 mark

(c) Complete the word equation for the chemical reaction in experiment C.

copper + chlorine → _____

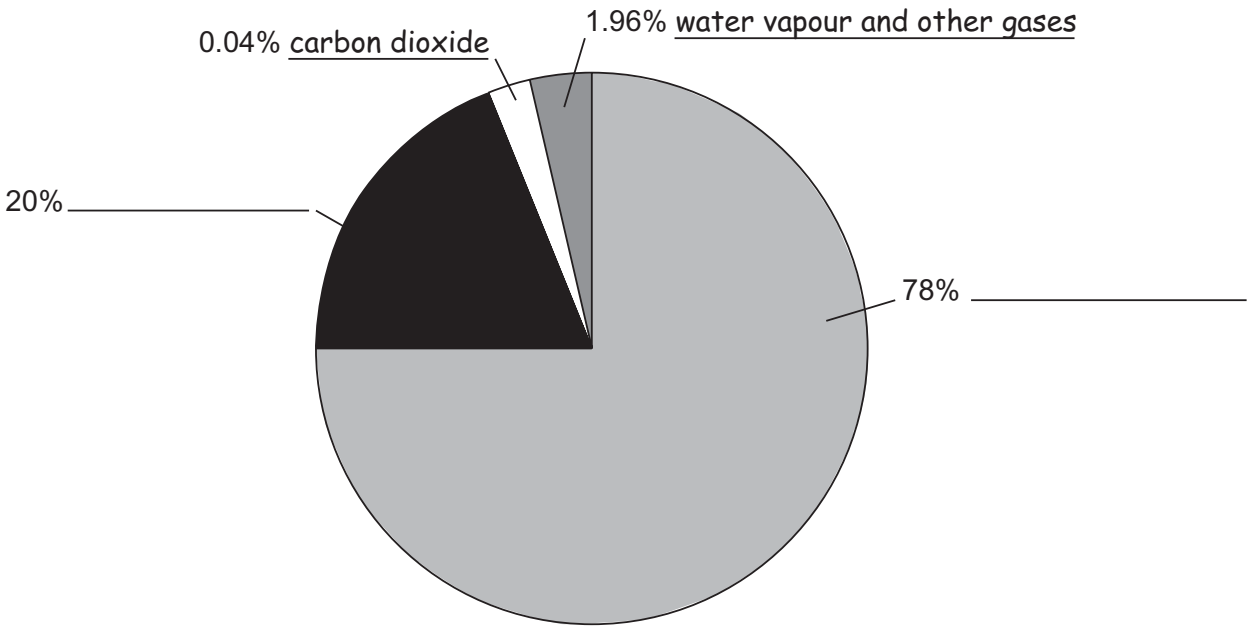
4c
1 mark

maximum 5 marks

Total
5

5. (a) Air is a mixture of gases. The pie chart represents the percentages of different gases in air.

On the line by each section of the pie chart, write the name of the correct gas.
Two have been done for you.



not to scale

5a
1 mark

5a
1 mark

(b) On a cold day, droplets of water form on a cold window.

Explain how these droplets form.

5b
1 mark

5b
1 mark

(c) The word equation below represents a process taking place in the cells of the human body.

glucose + oxygen → carbon dioxide + water

(i) What process does this word equation represent?

_____

5ci
1 mark

(ii) As a result of this process, the proportions of oxygen and carbon dioxide in air breathed in and air breathed out change.

Which **one** of the statements below is true?
Tick the correct box.

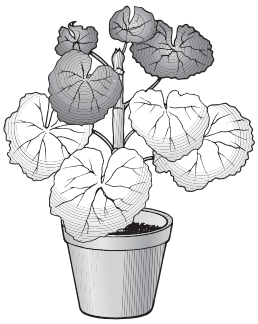
Air breathed out has less carbon dioxide and more oxygen than air breathed in.	☐
Air breathed out has less carbon dioxide and less oxygen than air breathed in.	☐
Air breathed out has more carbon dioxide and less oxygen than air breathed in.	☐
Air breathed out has more carbon dioxide and more oxygen than air breathed in.	☐

5cii
1 mark

maximum 6 marks

Total
6

6. Joe bought a potted plant. He kept it well watered but some of the leaves turned yellow.



Joe thought that the plant did **not** have enough light for photosynthesis.
He moved the plant closer to the window but more leaves turned yellow.

(a) He then thought that the plant did **not** have enough minerals.

The table below gives information about minerals.

mineral	why the mineral is needed
magnesium	to make chlorophyll
nitrogen	to make protein
phosphorus	to grow and transfer energy
potassium	to make fruit

(i) Joe's plant did **not** have enough of one of the minerals in the table.
Use the information in the table to suggest which mineral this was.

_____

6ai
1 mark

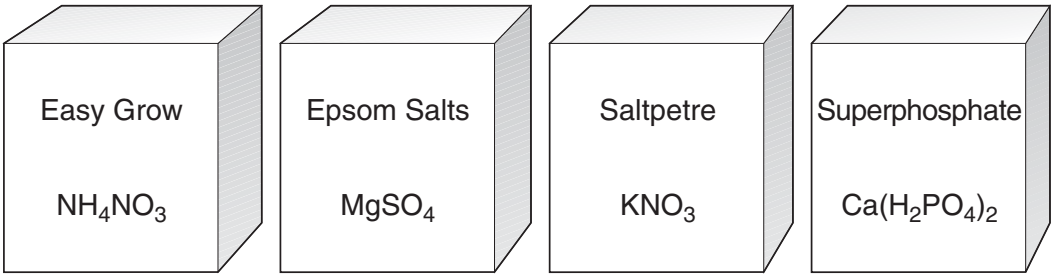
(ii) A plant growing in a pot is more likely to be affected by a shortage of minerals than a plant growing in a garden.
Give the reason for this.

_____

_____

6aii
1 mark

(b) Joe bought some fertiliser for his plant.
The names and formulae of four different fertilisers are shown below.



(i) Give the letter of **one** box of fertiliser, A, B, C or D, that would provide each of the minerals in the table below.
Write the letters in the table.

mineral	letter of fertiliser
magnesium	
nitrogen	
phosphorus	
potassium	

6bi 1 mark

6bi 1 mark

6bi 1 mark

(ii) Easy Grow is ammonium nitrate, NH_4NO_3.

How many different elements are present in ammonium nitrate?

_____

6bii 1 mark

(iii) How many atoms are present in the formula of ammonium nitrate?

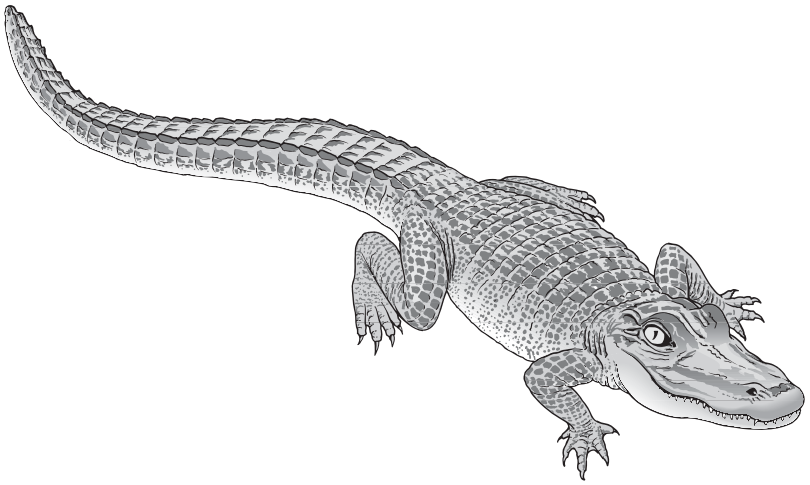
_____

6biii 1 mark

maximum 7 marks

Total 7

7. The drawing below shows an alligator.



(a) Alligators are carnivores.
What does the word carnivore mean?

_____

7a

1 mark

(b) Alligators lay eggs in nests made from plant material.
The eggs have tough shells containing calcium carbonate.

(i) How does the eggshell help the developing alligator to survive before it hatches?

_____

_____

7bi

1 mark

(ii) Rotting plant material in the nest is acidic.
When the acid comes into contact with calcium carbonate in the eggshell it makes the shell weaker.

Why does the acid weaken the eggshell?

_____

_____

7bii

1 mark

(iii) Suggest **one** reason why it is helpful to the developing alligator in the egg if the eggshell becomes weaker.

_____

_____

7biii

1 mark

(c) The table below shows the percentage of female and male alligators that hatch from the eggs when the eggs are kept at different temperatures.

temperature (°C)	% eggs hatching as females	% eggs hatching as males
26	100	0
28	100	0
30	100	0
32	86	14
34	0	100
36	0	100

(i) Use the table to suggest how a zookeeper could make sure only females hatch from the eggs.

_____

_____

7ci

1 mark

(ii) Between which **two** temperatures are 50% of the eggs likely to hatch as females?
Tick the correct box.

between 26°C and 30°C ☐

between 30°C and 32°C ☐

between 32°C and 34°C ☐

between 34°C and 36°C ☐

7cii

1 mark

maximum 6 marks

Total

6

8. Jack compared the reaction times of ten different pupils in his class.
He dropped a metre ruler between each pupil's finger and thumb.
As soon as they saw the ruler begin to move, they had to catch it as quickly as possible.



(a) Jack did **not** measure time to compare pupils' reactions.
What did Jack measure to compare pupils' reaction times?

8a

1 mark

(b) Why was it more accurate to use the ruler rather than a stopwatch in this investigation?

8b

1 mark

(c) What factor did Jack change as he carried out his investigation (the independent variable)?

_____

8c

1 mark

(d) Give **two** factors he should have kept the same to make his test fair.

1. _____

2. _____

8d

1 mark

8d

1 mark

(e) What could he do to make his results more reliable?

_____

_____

8e

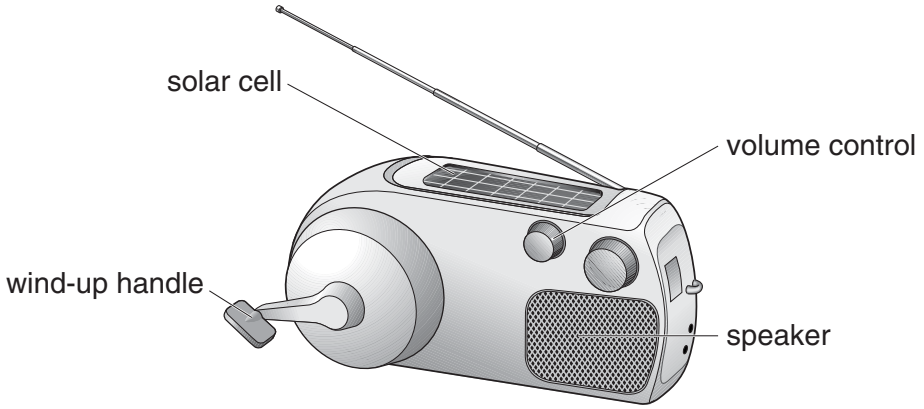
1 mark

maximum 6 marks

Total

6

9. Keith has a wind-up radio.
It does **not** use batteries. It is powered by a steel spring.



(a) Keith winds up the spring.
As the spring unwinds, potential energy in the spring is transferred to a generator, which then turns.

The generator provides electrical energy for the radio.

Fill the gaps in the sentences below to show the useful energy changes which take place in the generator and the speaker.

(i) As the generator turns, _____ energy is changed

to electrical energy.

9ai
1 mark

(ii) In the speaker, electrical energy is changed to

_____ energy.

9aii
1 mark

(b) When Keith turns the volume up so that the radio is louder, the spring unwinds more quickly.

Why does the spring unwind more quickly?

_____

_____

9b

1 mark

(c) The radio has a solar cell which can also provide electrical energy.

Keith winds up his radio and takes it outside without changing the volume. The steel spring unwinds more slowly when sunlight falls on the solar cell. Explain why.

_____

_____

9c

1 mark

(d) The wind-up radio was designed for use in poorer countries.

Suggest why wind-up radios are useful in poorer countries.

_____

_____

9d

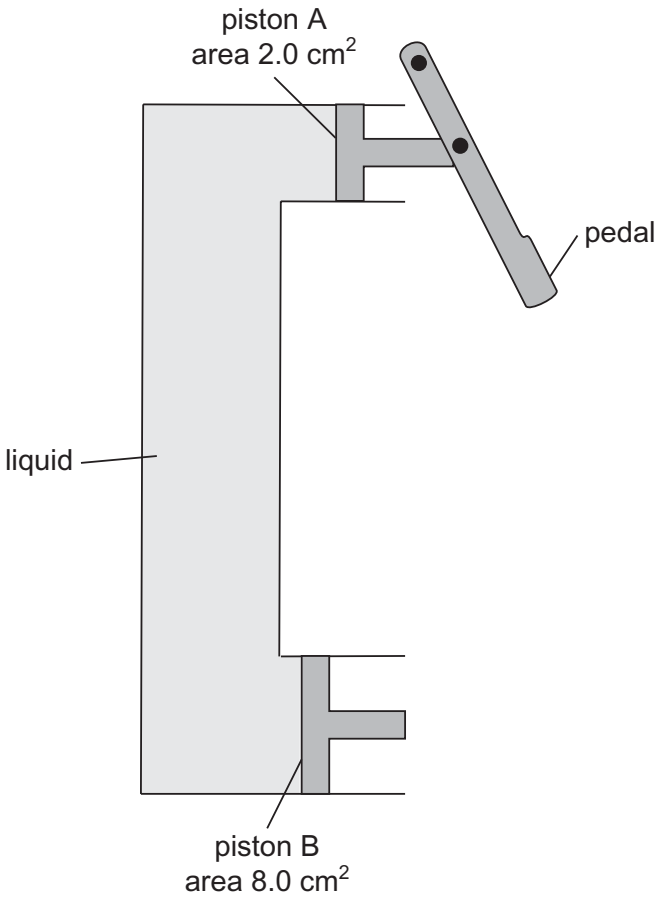
1 mark

maximum 5 marks

Total

5

10. The diagram below shows a container filled with a liquid.



At each end of the container there is a piston.
Piston A has a smaller area than piston B.

(a) (i) Rebekah pushes on the pedal. This produces a force of 200 N on piston A.

Calculate the pressure that piston A exerts on the liquid.
Give the unit.

10ai
1 mark

_____

_____

10ai
1 mark

(ii) The liquid in the container exerts the same pressure on piston B.

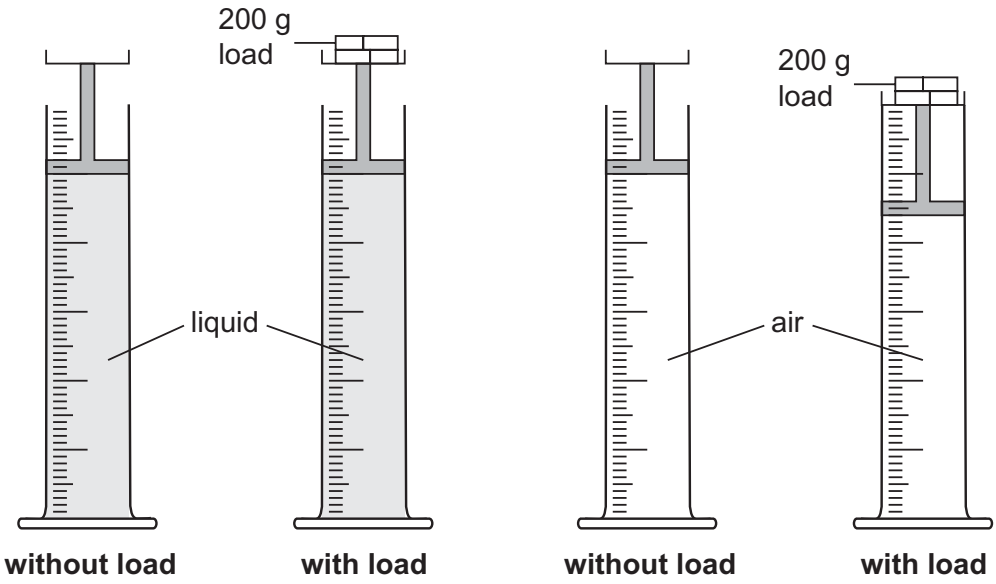
Use this pressure to calculate the force on piston B.

_____

_____ N

10aii
1 mark

(b) Rebekah set up a different experiment as shown below.
She measured the volume of the liquid and the air in the cylinders before and after a 200 g load was added to the piston.



(i) When the loads were added to the pistons, the volume of the liquid did **not** change but the volume of the air decreased.

Explain why this happened.

_____

_____

10bi
1 mark

(ii) The diagram on the opposite page represents the way the brake system of a car works.
The brake pedal pushes piston A.
Piston B pushes the brakes on.

If air bubbles get into the liquid, the brakes do **not** work properly.
Explain why.
Use the diagrams above to help you.

_____

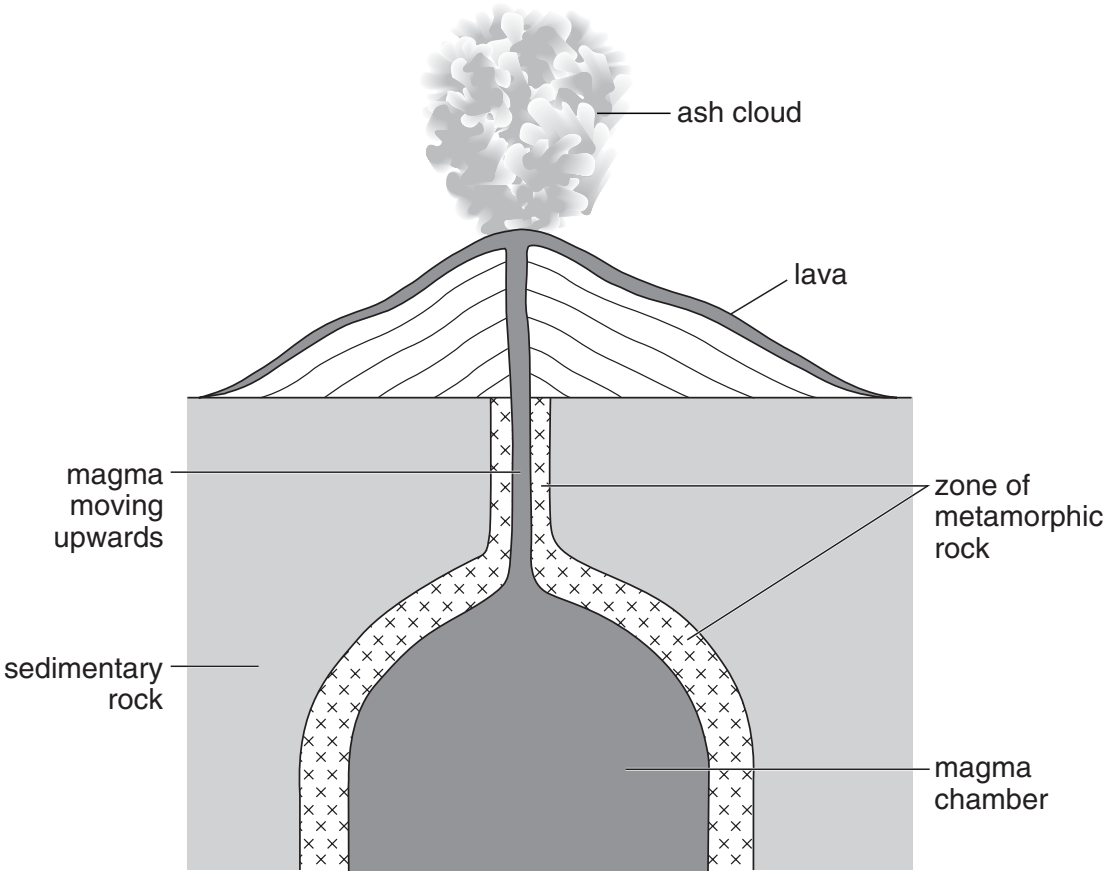
_____

10bii
1 mark

maximum 5 marks

Total
5

11. The diagram below shows a section through a volcano.
Magma is moving up from a magma chamber.
Some of the magma erupts to form lava.
The liquid lava cools and becomes solid rock.



(a) Explain why magma deep underground stays liquid longer than lava on the surface.

_____

_____

11a

1 mark

(b) As the magma cools underground, it solidifies and crystals are formed.

(i) In what way will these crystals be different from the crystals formed when lava solidifies above ground?

_____

11bi

1 mark

(ii) Give the reason for your answer.

_____

_____

11bii

1 mark

(c) A zone of rock surrounding the magma has become a metamorphic rock.

(i) What conditions would cause this to happen?

_____

_____

11ci

1 mark

(ii) Give the name of the metamorphic rock which is formed from limestone in this way.

_____

11cii

1 mark

maximum 5 marks

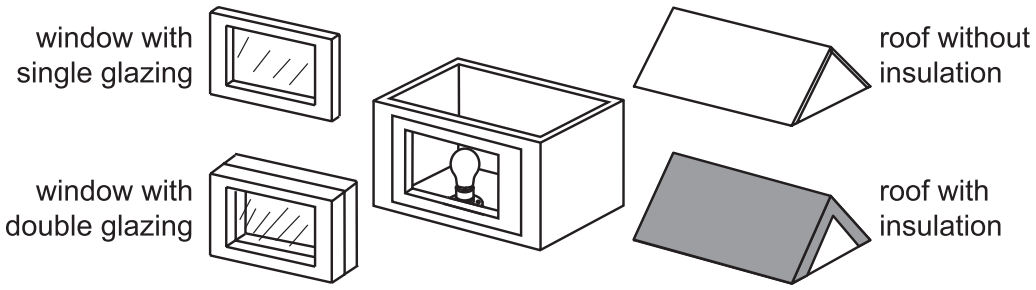
Total

5

12. Some pupils investigate whether double glazing or roof insulation is more efficient at reducing heat loss from houses.

They have a model house which can have these features:

- window with single glazing
- window with double glazing
- roof without insulation
- roof with insulation.



(a) A temperature sensor and a small lamp are placed inside the house. The lamp is used as a heat source.
When the model house reaches a given temperature, **the lamp is switched off**.
A datalogger then records temperature regularly over time.

(i) What can the combination of single glazing and **no** roof insulation tell pupils that is relevant to their investigation?

_____

_____

12ai

1 mark

(ii) Which **two** combinations **must** they use to find the more efficient way of preventing heat loss in their model house?

_____ and _____

_____ and _____

12aii

1 mark

(b) The pupils predicted that the roof insulation will be more effective than double glazing at reducing heat loss.

What evidence would support this prediction?

_____

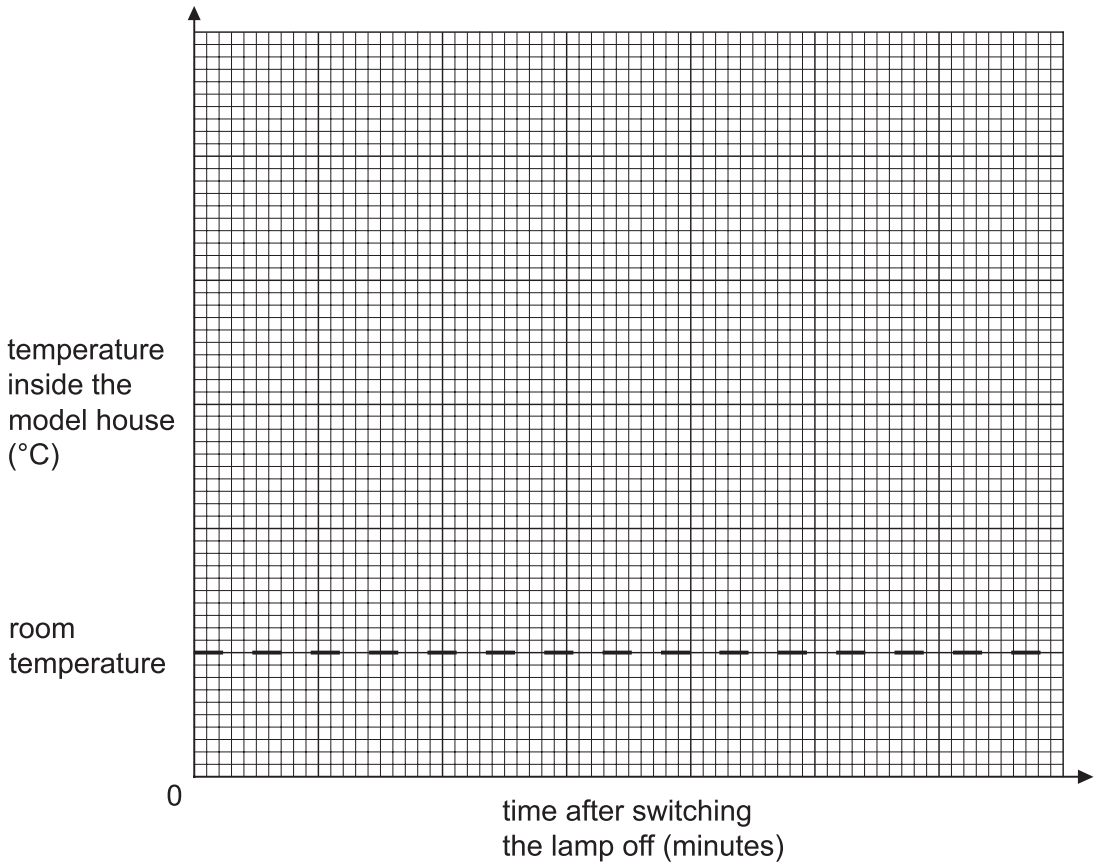
_____

_____

12b
1 mark

(c) On the grid below, sketch the shape of the two graphs you would expect to see on the datalogger if the pupils' prediction is correct.

You do **not** need to add scales to the axes.
Use a solid line (———) to show the graph for double glazed windows.
Use a dotted line (-------) to show the graph for roof insulation.



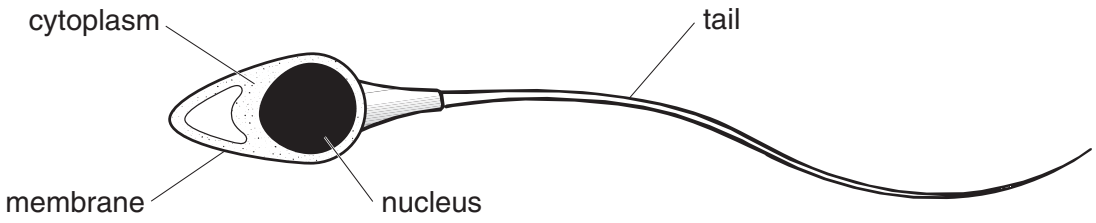
12c
1 mark

12c
1 mark

maximum 5 marks

Total
5

13. (a) The diagram shows a sperm cell. Sperm cells are adapted for fertilisation.



Sperm cells use their tails to swim towards an ovum (egg).
Give **one** other way the sperm cell is adapted for fertilisation.

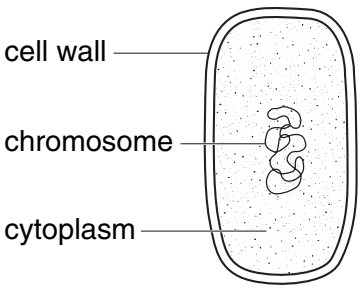
_____

_____

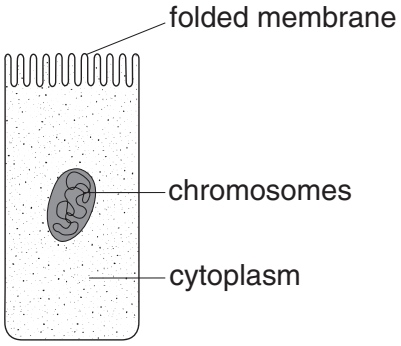
13a

1 mark

(b) The diagrams below show two other cells.



a bacterium



cell from the inner lining of the intestine

not to scale

(i) Look at the diagrams above.

What is the difference between the location of the genetic material in the bacterium and in the cell from the lining of the intestine?

_____

_____

_____

13bi

1 mark

(ii) What is the function of the genetic material in a cell?

_____

_____

13bii
1 mark

(c) Cells in the lining of the intestine are adapted to absorb digested food.

How does the folded membrane of these cells enable them to absorb the maximum amount of digested food?

_____

_____

13c
1 mark

(d) A group of cells in the lining of the intestine is a tissue.

Why is a number of sperm cells **not** a tissue?

_____

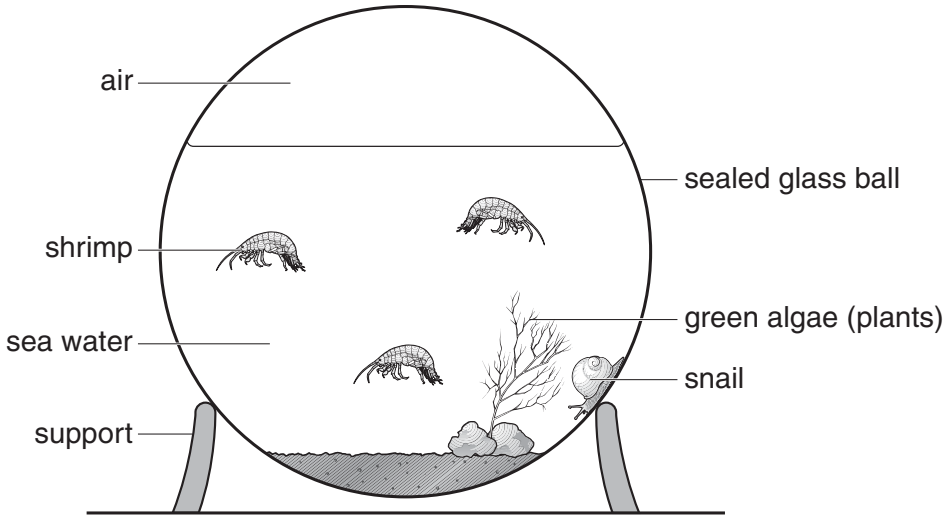
_____

13d
1 mark

maximum 5 marks

Total
5

14. An ecosphere is a model habitat that can last for many years.
The ecosphere below is a sealed glass ball containing sea water, green algae, bacteria, a snail and shrimps.



not to scale

(a) The ecosphere must receive plenty of light.

Explain why light is necessary for the survival of the green algae and the animals in the ecosphere.

14a
1 mark

14a
1 mark

14a
1 mark

(b) When organisms in the ecosphere die, they are broken down by bacteria. Nutrients, such as nitrates, are released back into the ecosphere.

Why is this necessary for the survival of the other organisms in the ecosphere?

14b
1 mark

(c) The table shows how the mass of oxygen dissolved in water changes with temperature.

temperature of the water (°C)	mass of oxygen dissolved (mg/100 cm^3)
15	10.2
17	9.7
19	9.3
21	9.0
23	8.7
25	8.4
27	8.1
29	7.9

This ecosphere was kept at a temperature between 17°C and 23°C.

In this ecosphere, respiration in the organisms is affected less if the temperature falls to 15°C than if it rises to 27°C.
Use information in the table to explain this.

14c

1 mark

maximum 5 marks

Total

5

270050_KS3ScT5_7Paper2 31/3/06 8:21 pm Page 30

END OF TEST

270050_KS3ScT5_7Paper2 31/3/06 8:21 pm Page 31

270050_KS3ScT5_7Paper2 31/3/06 8:21 pm Page 32

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