UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9662530651

COMBINED SCIENCE **0653/06**
CO-ORDINATED SCIENCES **0654/06**

Paper 6 Alternative to Practical **May/June 2008**

1 hour

Candidates answer on the Question paper

Additional Materials: No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
Total	

This document consists of **17** printed pages and **3** blank pages.

1 **(a)** A student placed a piece of celery in some coloured water so that the dye would be taken up by the stalk as shown in Fig. 1.1.

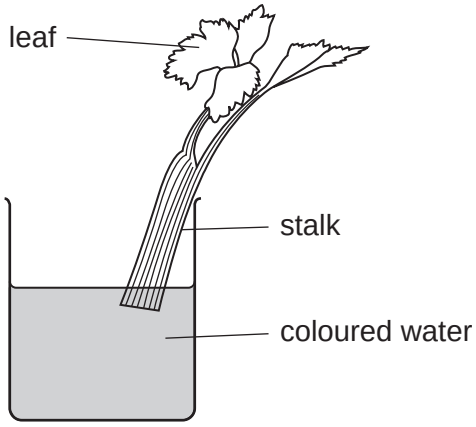

Fig. 1.1

After a few hours in a warm place he cut across the stalk to produce a thin slice that is shown in Fig. 1.2.

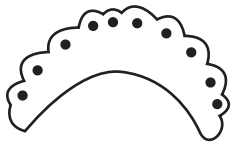

Fig. 1.2

(i) The areas where the student saw the dye are indicated on the diagram. What is the correct name for this tissue?

..... [1]

(ii) Another student placed a piece of celery in a beaker like the one in Fig. 1.1 but did not put any water in the beaker.

Draw the appearance of the celery after a few hours in a warm place and explain why this has happened.

explanation

.....

.....

..... [3]

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(b) (i) The rate of transpiration is dependent on several environmental factors, including the temperature. State **one** other environmental factor.

..... [1]

(ii) How would you investigate the transpiration rate in celery stalks at different temperatures? You may assume that a suitable coloured dye is available.

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..... [3]

2 The science class and their teacher carried out three experiments to investigate the properties of transverse waves.

In the first experiment two students investigated the speed and frequency of waves on the sea. The two students stood 60 metres apart on a pier that projected a long way into the sea. This is shown is Fig. 2.1.

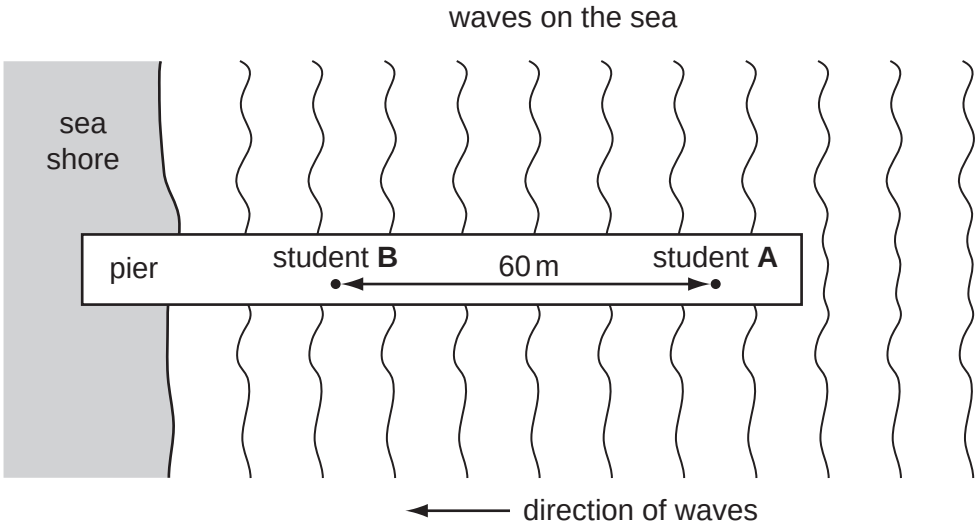

Fig. 2.1

Student **A** waved his hand when a wave passed him. At that moment, student **B** started a clock. He watched the wave as it moved towards him. When the wave reached him, he stopped the clock. The students repeated this procedure until they had four results.

(a) (i) Fig. 2.2 shows the clock dials for the four results. Read the dials and record the times in Fig. 2.3.

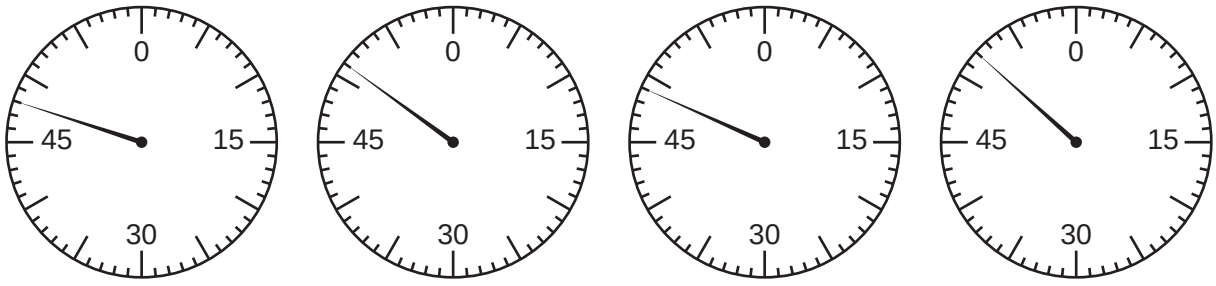

Fig. 2.2

time for a wave to travel 60 metres / s			

Fig. 2.3

[2]

For Examiner's Use

(ii) Find the average time taken for the wave to travel 60 metres.

average time taken = ... s [1]

(iii) Calculate the average speed of the waves in m / s.

average speed = ... m / s [1]

The students counted the number of waves that passed the end of the pier in 3 minutes. It was 27 waves.

(iv) Calculate the frequency of the waves in Hz (waves per second).

frequency = ... Hz [2]

In another experiment, Student **A** dropped a ball into the sea at point **S** shown in Fig. 2.4. The ball floated. There was no wind blowing.

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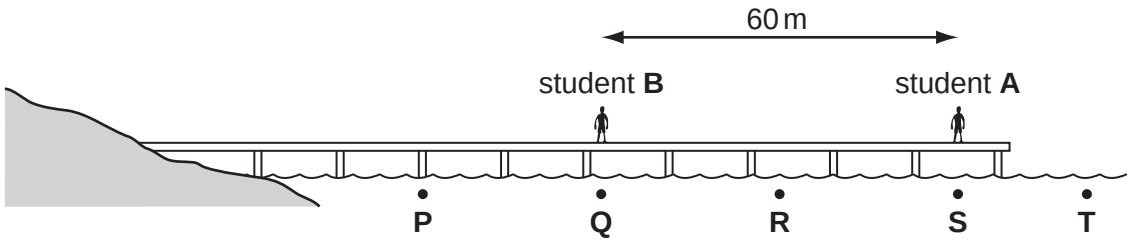

Fig. 2.4

(v) What was the position of the ball after 60 seconds? Choose from points **P, Q, R, S** and **T**.

After 60 seconds the ball was at point ..... [1]

(b) Finally the teacher gave a demonstration of waves using a long rope. A ribbon was tied about half-way along the rope. He held the rope at one end. He quickly moved his hand up and down. A wave moved along the rope. After every 1 second, he repeated this to make another wave move along the rope.

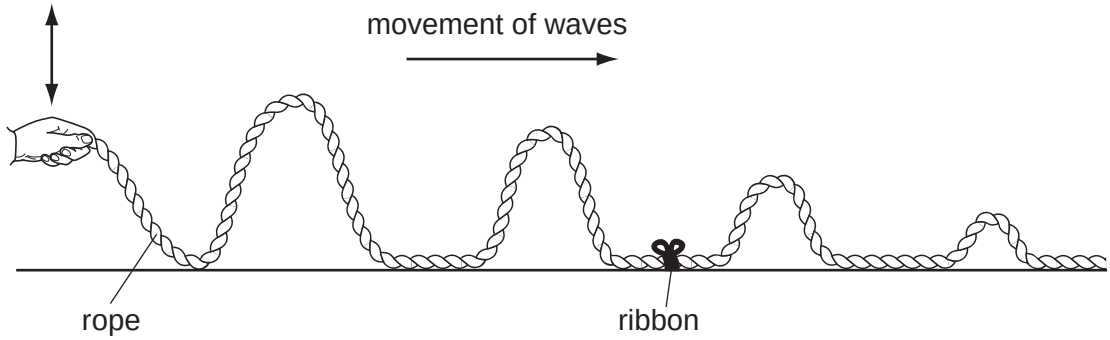

Fig. 2.5

(i) Draw an arrow on Fig. 2.5 to show the movement of the ribbon every time a wave passed along the rope.

[1]

(ii) Suggest **two** ways in which the teacher could increase the amount of energy that was transmitted along the rope.

.....

..... [2]

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3 The science class is preparing a display for the school's Open Day. They want to show the elements in the third Period of the Periodic Table. They have made cards with the symbols of the elements. A sample of the element and its description will be placed next to each card. This is shown in Fig. 3.1.

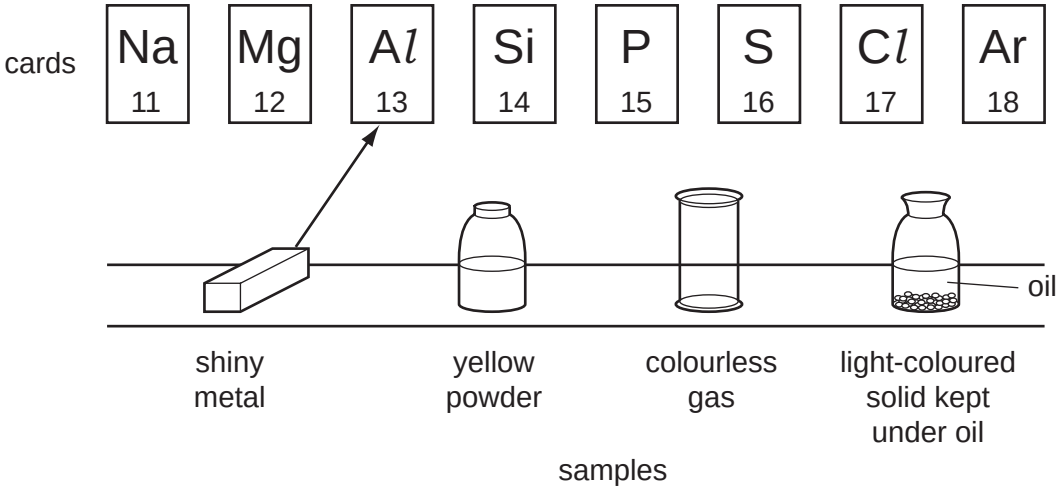

Fig. 3.1

(a) Draw a line from each of the samples to the correct symbol for the element. The first one has been done for you. [3]

One of the students wants to set up a circuit to show if an element will conduct electricity. He has placed all the components on the bench, shown in Fig. 3.2, and he has started to connect up the circuit.

(b) Draw lines to connect all the components in Fig. 3.2, so that the circuit will show that the sample conducts electricity. [2]

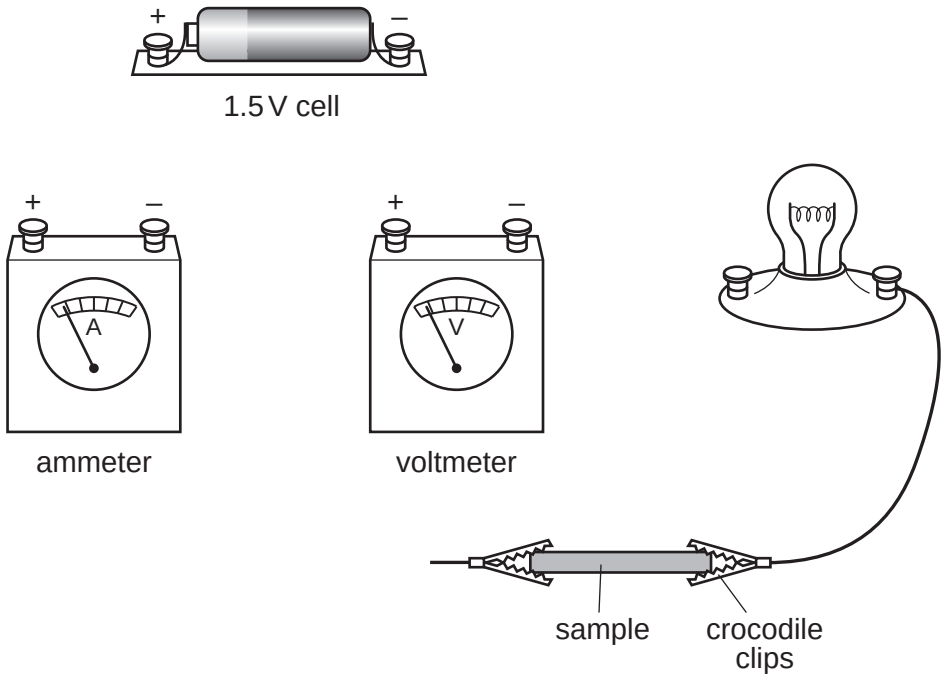

Fig. 3.2

As part of the display, another student will burn a sample of some of the elements in air.

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(c) Choose, from the list of symbols in Fig. 3.1, a solid element that will burn when it is heated in air. Before choosing, make sure that you can answer parts **(i)** to **(v)** about this reaction and its products.

(i) Name the element that you have chosen

..... [1]

(ii) State the colour of the flame when the element burns. If there is no colour, write "white".

..... [1]

(iii) Write the name of the product of burning the element in air. Give its physical state at room temperature and pressure.

name .....

physical state ..... [1]

(iv) Litmus solution is added to the product you have named in **(iii)**.

What is the colour of the litmus solution now?

..... [1]

(v) The student will wear a laboratory coat and goggles. Suggest **one** other safety precaution that the student should observe when burning the element, with a reason.

safety precaution

.....

reason

.....

..... [1]

For Examiner's Use

4 Yeast cells grow in a liquid medium using the sugar as an energy source. As they grow the yeast cells use enzymes to release energy from the sugar during respiration. Carbon dioxide is produced as a waste product. The rate of production of this gas gives an indication of the activity of the yeast.

A student did an experiment to investigate how the change of temperature affected the activity of yeast. The apparatus is shown in Fig. 4.1.

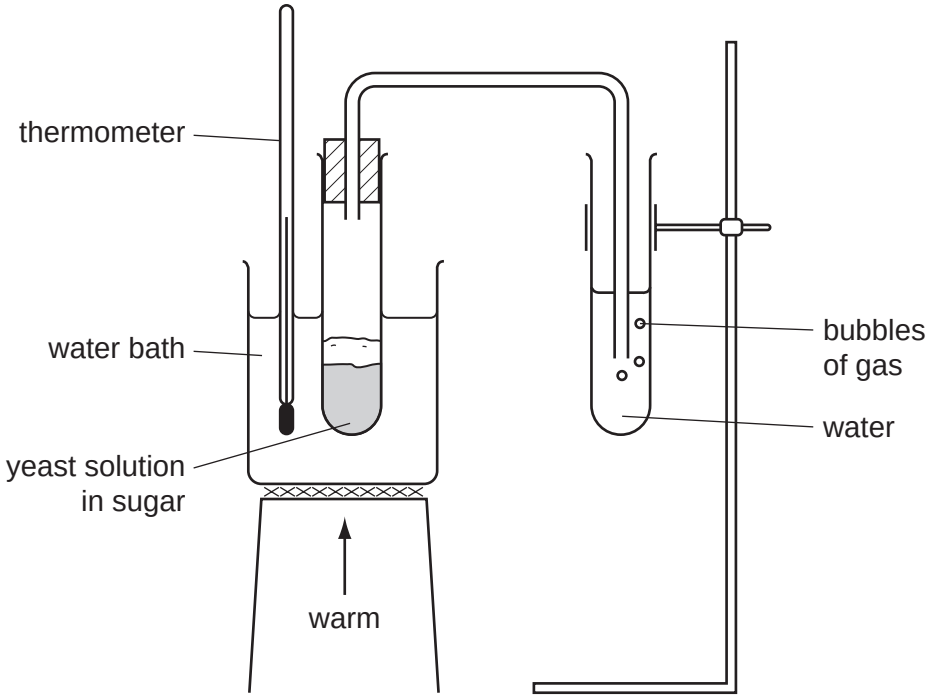


Fig. 4.1.

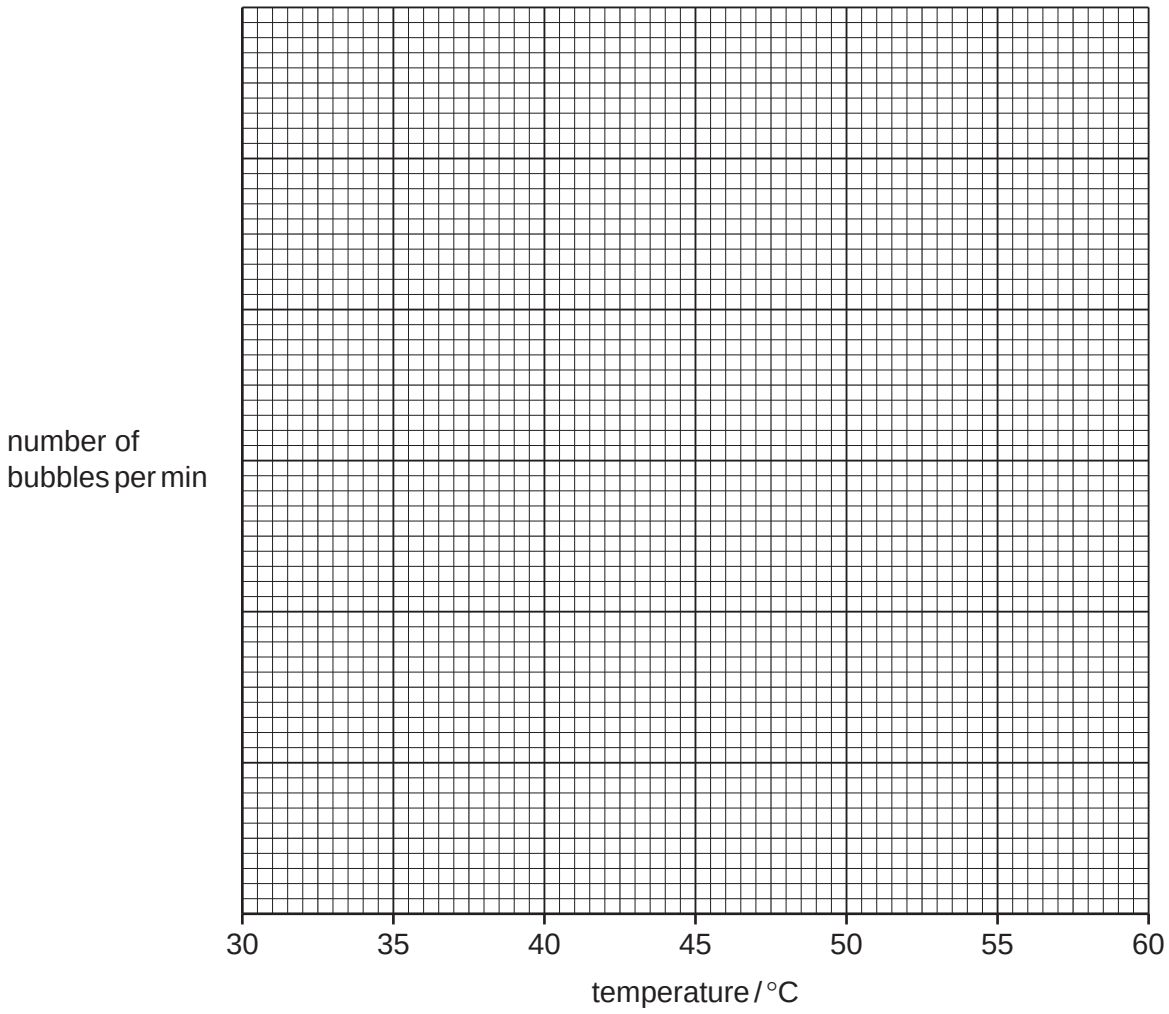
The student slowly warmed the water bath to the correct temperature, then counted the number of bubbles produced in one minute. The results are shown in Fig. 4.2.

temperature / °C	number of bubbles per minute
30	19
35	37
40	51
45	54
50	51
55	46
60	16

Fig. 4.2.

For Examiner's Use

(a) (i) Plot number of bubbles per min (vertical axis) against temperature on the grid provided. [3]



(ii) Explain as fully as possible the change in activity of the yeast between 30 °C and 45 °C,

.....

.....

.....

above 45 °C.

.....

.....

..... [4]

(b) Draw and label a modification to the apparatus that would enable the volume of gas produced to be measured more accurately.

For Examiner's Use

[2]

(c) Yeast cells can use different sugars as an energy source. Using the same apparatus, how could the student compare the activity of yeast using glucose with the activity of the yeast using sucrose used in the first experiment?

.....

.....

.....

.....

..... [3]

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5 The teacher gives a student a steel spring. He wants the student to find out whether or not the extension of the spring is directly proportional to the applied force.

The student sets up the apparatus as shown in Fig. 5.1.

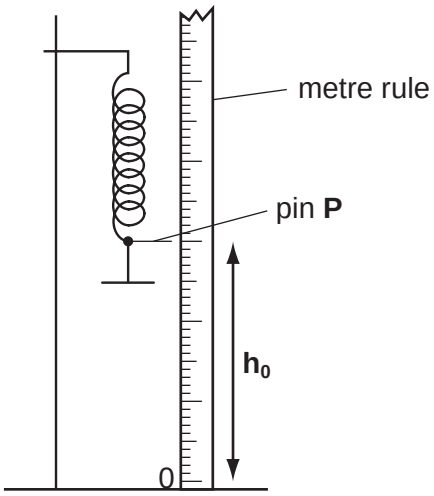

Fig. 5.1

The student sets up the apparatus as shown in Fig. 5.1.

- He attaches a weight hanger to the spring.
- He fixes a pin, **P**, to the lower end of the spring so that the pin acts as a pointer.
- He fixes a metre rule next to the spring.
- He notes the position of pin **P** with no weight added.
- Then he adds weights to the spring, each time noting the reading of the pointer, pin **P**, in Fig. 5.2.

total mass added / g	force / N	pointer reading **h** / mm	total increase in length (extension) ($\mathbf{h_0}$ - **h**) / mm
0	0	$\mathbf{h_0}$ = 304	0
50	0.5		
100			
150			
200		230	74

Fig. 5.2

(a) Convert the total mass added in grams to the force exerted in newtons and fill in the second column in Fig. 5.2. [1]

(b) Fig. 5.3 shows the position of the pointer on the metre rule for the **three** missing readings of **h**. Record the readings in the third column of Fig. 5.2. [3]

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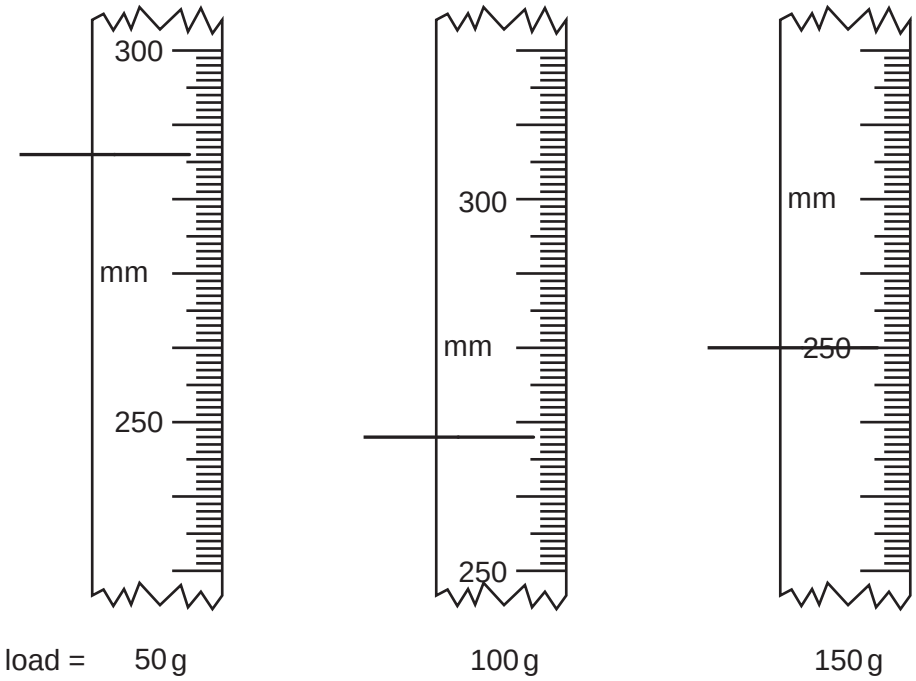
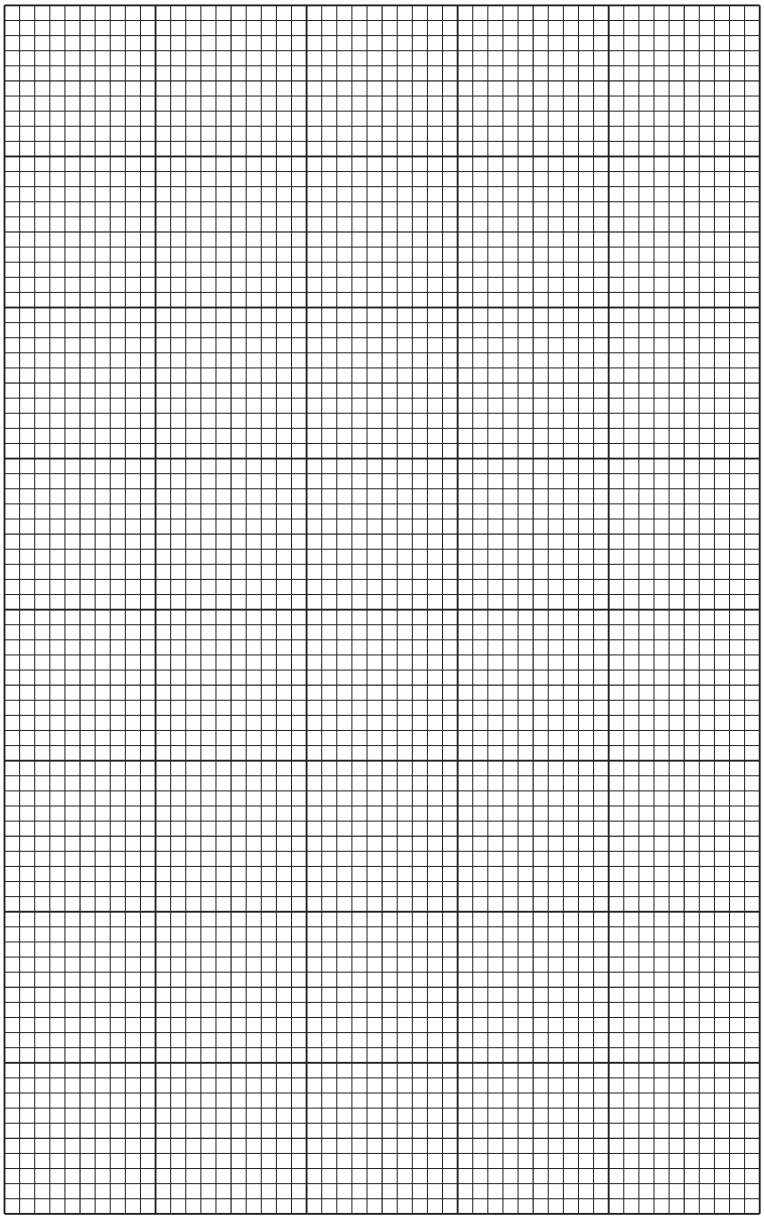


Fig. 5.3

(c) Calculate the total increase in length of the spring for each mass and complete the fourth column of Fig. 5.2. [1]

For Examiner's Use

(d) On the graph grid provided, plot a graph of the **extension of the spring** / mm (vertical axis) against the **force** / newtons (horizontal axis). Draw the best straight line.



[3]

(e) Use your graph to find the extension produced by a force of 0.8 N. Show how you do this on the graph.

extension = ... mm [1]

(f) The student suggested that if larger masses were used, the graph would not be a straight line because the spring might become over-stretched.

For Examiner's Use

On the axes in Fig. 5.4, draw a line to show the result he can expect if larger masses are used.

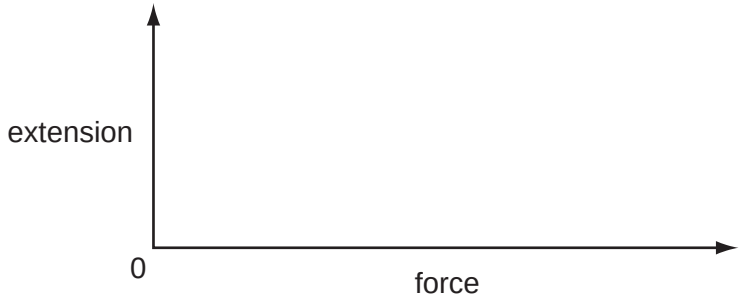


Fig. 5.4

[1]

6 The teacher gives each student three solutions labelled **A, B** and **C**. He tells them that the solutions are **calcium hydroxide, sodium carbonate** and **dilute sulphuric acid**. The students must test the solutions to identify **A, B** and **C** and give them their correct names.

(a) They add a small piece of magnesium ribbon to samples of each solution. Fig. 6.1 shows the results.

addition of magnesium ribbon to		
solution **A**	solution **B**	solution **C**
no reaction	bubbles of gas	no reaction

Fig. 6.1

(i) Suggest the name of the gas given off by solution **B**.

..... [1]

(ii) Name solution **B**.

..... [1]

(b) The students place about 2 cm^3 of solutions **A, B** and **C** in separate test-tubes. They add equal volumes of aqueous copper sulphate to each tube.
Fig. 6.2 shows the results of two of the tests.

addition of aqueous copper sulphate to		
solution **A**	solution **B**	solution **C**
blue precipitate formed		small amount of blue precipitate formed

Fig. 6.2

(i) Complete Fig. 6.2 to show what is observed when aqueous copper sulphate is added to solution **B**. [1]

(ii) Suggest the name of the blue precipitate formed by solution **A**.

..... [1]

For Examiner's Use

(c) The students bubble carbon dioxide into each solution, **A, B** and **C**, in turn. This is shown in Fig. 6.3.

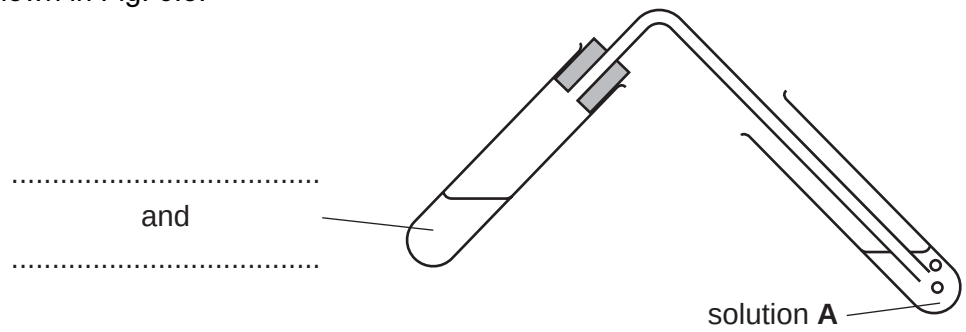


Fig. 6.3

(i) Label on Fig. 6.3, **two** substances that can be used to react together to give the carbon dioxide. [1]

The results of the experiment are shown in Fig. 6.4.

effect of passing carbon dioxide into		
solution **A**	solution **B**	solution **C**
no change	no change	

Fig. 6.4

(ii) Complete Fig. 6.4 to show what happens when carbon dioxide is passed into solution **C**. [1]

(d) The students place 2 cm^3 of solution **A** in a test-tube. They add two drops of litmus.

(i) The litmus shows that solution **A** is alkaline. What colour is the litmus in solution **A**?

..... [1]

The students add solution **B** drop by drop to the test-tube until the litmus changes colour.

(ii) Complete the word equation to show the names of the products of the reaction between solution **A** and solution **B**.

A + **B** ⟶ ..... + ... + water [2]

The litmus does not change colour until 3 cm^3 of solution **B** has been added.

(iii) Which is more concentrated, solution **A** or solution **B**? Explain your answer.

.....

..... [1]

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