Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3876146039

PHYSICAL SCIENCE **0652/62**

Paper 6 Alternative to Practical **October/November 2014**

1 hour

Candidates answer on the Question Paper.

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

This document consists of **20** printed pages.

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CAMBRIDGE International Examinations

1 The science class is doing an experiment to find the speeds of cars on the busy road in front of their school. Fig. 1.1 shows the experiment.

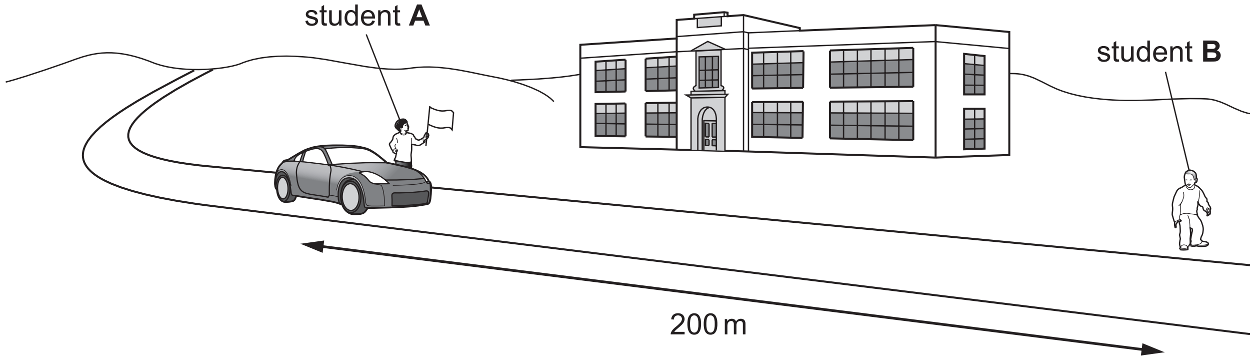


Fig. 1.1

When a car passes student **A**, he waves a flag. When student **B** sees the flag wave, he starts his stopclock and then stops the clock when the car passes him. He records the stopclock reading in Table 1.1.

Table 1.1

car number	distance travelled / m	time / s	average speed m / s	average speed / km per hour
1	200	4.5	44.4	160
2	200	7.0	28.6	103
3	200	6.2	32.3	116
4	200			
5	200			

(a) **(i)** Fig. 1.2 shows the stopclock dials for cars **4** and **5**. The dials measure from 0 s to 60 s.

Read the times and record them in Table 1.1. [2]

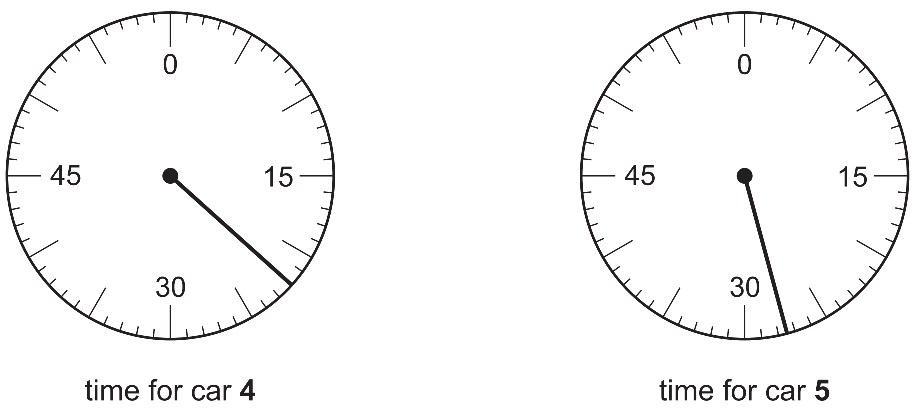


Fig. 1.2

(ii) Calculate the speeds of car **4** and car **5** in metres per second.

Record them in Table 1.1.

[2]

(iii) Calculate the speeds of car **4 and** car **5** in kilometres per hour.

Record them in Table 1.1

Use this formula.

$$\text{average speed} = \frac{720}{\text{time in seconds}}$$

[2]

(iv) Suggest why each answer to **(a)(iii)** will be the **average** speed of a car rather than a **constant** speed. Fig. 1.1 may help you.

....

....

.... [1]

(v) The teacher says that the time recorded by the students for the car to travel 200 m may be inaccurate.

Suggest **one** reason why the recorded time may be inaccurate. Refer to the way in which the second student operates the timer.

....

....

.... [1]

(b) **(i)** Find the average speed of **all** three of the cars **1, 2** and **3** in km per hour. Use data from the last column of Table 1.1.

average speed of the three cars = ... km / hr [1]

(ii) Study the results of the experiment, Table 1.1, and suggest why the school should be rebuilt in a different place.

....

.... [1]

Please turn over for Question 2.

2 A student is investigating the temperature changes when salts are dissolved in water.

- She measures 25 cm^3 distilled water into a beaker.
- She uses a thermometer to find the temperature of the water, recording it in Table 2.1.
- She adds 2 g powdered sodium chloride to the water and stirs the mixture.
- She finds the temperature after 30 s and records it in Table 2.1.
- She washes out the beaker.
- She repeats the experiment using powdered anhydrous copper(II) sulfate.
- She repeats the experiment using powdered ammonium chloride.

Table 2.1

name of salt used	sodium chloride	copper(II) sulfate	ammonium chloride
initial temperature / °C	21.9	22.0	21.7
temperature / °C after 30 s	20.8		
change in temperature / °C			

(a) Suggest a reason why the samples of the salts used in the experiment are powdered before being added to the water.

....

.... [1]

(b) **(i)** Fig. 2.1 shows the thermometer scales for the temperatures after 30 s for copper(II) sulfate and ammonium chloride.

Read the temperatures and record them in Table 2.1. [2]

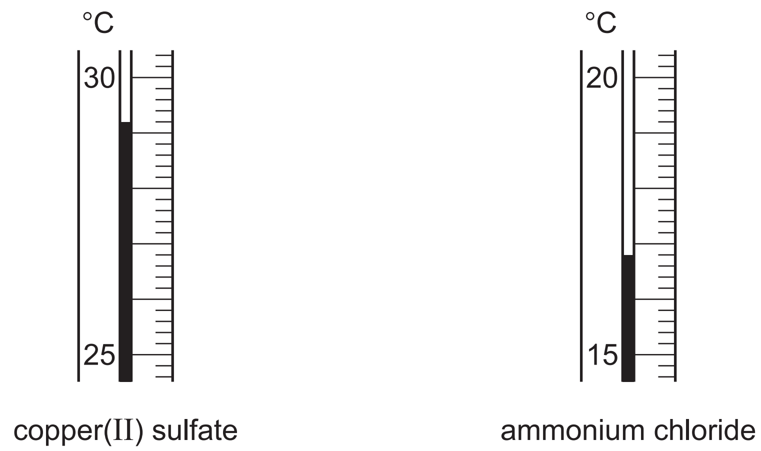


Fig. 2.1

(ii) Calculate the change in temperature for each of the salts.

Record the changes in Table 2.1.

Place a + sign in front of a temperature rise and a – sign in front of a temperature fall. [2]

(c) State the type of energy change observed for the dissolving of

copper(II) sulfate in water, ...

ammonium chloride in water. .... [2]

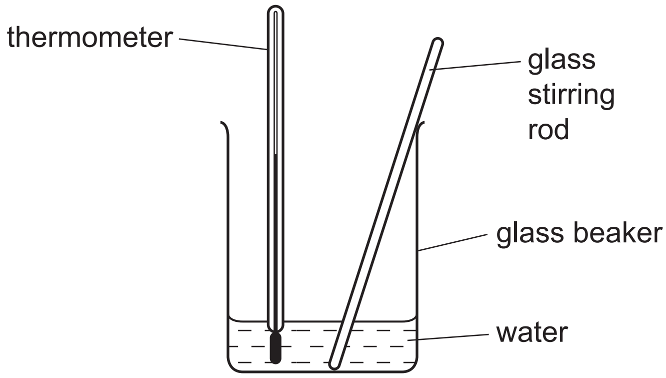


Fig. 2.2

(d) The student uses a glass beaker and a glass stirring rod, shown in Fig. 2.2, when dissolving the salts. She thinks that the results of the experiment can be made more accurate by modifying the apparatus.

Suggest **one** way that she can get a more accurate result for the temperature changes during the experiment.

....

.... [1]

(e) The teacher says that when a solid salt is dissolved in water, energy is required to pull the ions of the solid away from each other. When new bonds are formed between the ions and the water molecules to make a solution, energy is given out.

Use this information to suggest an explanation for the temperature change that took place when copper(II) sulfate was dissolved in water, according to your answer in part **(c)**.

....

....

....

.... [2]

3 A student is carrying out an experiment to determine the density of a stone.

In **Part 1** of the experiment he finds out how the extension of a spring varies with the load.
In **Part 2** he finds the extension produced when the stone is hung on the spring in air and in water.

Part 1

- The student sets up the apparatus shown in Fig. 3.1 so that the pointer reads 0.0 cm when there is no mass attached to the spring.
- He hangs a 250 g mass on the spring and records the pointer reading.
- He replaces the 250 g mass by a 500 g mass and records the pointer reading.

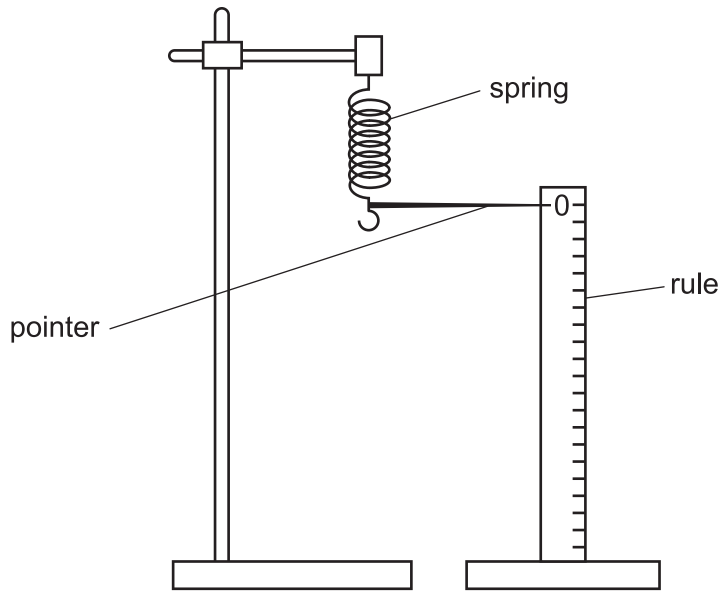


Fig. 3.1

Fig. 3.2 shows the pointer readings for the 250 g and 500 g masses.

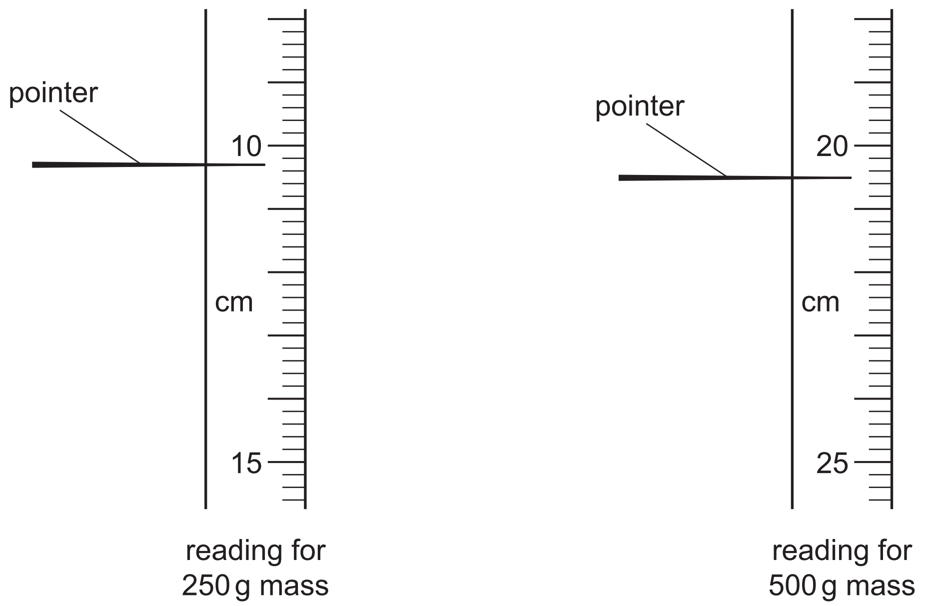


Fig. 3.2

Table 3.1

mass attached	position of pointer / cm
0	0.0
250 g	
500 g	

(a) **(i)** Read to the nearest 0.1 cm the positions of the pointer in Fig. 3.2 for the 250 g and 500 g masses.

Record the readings in Table 3.1. [2]

(ii) Use the results in Table 3.1 to state how the extension of the spring varies with the load.

.... [1]

Part 2

- The student attaches a piece of wire to the stone and hangs it on the spring.
- He reads E_A the position of the pointer and records it in Table 3.2.
- He immerses the stone in a beaker of water as in Fig. 3.3.
- He reads E_w the new position of the pointer and records it in Table 3.2.

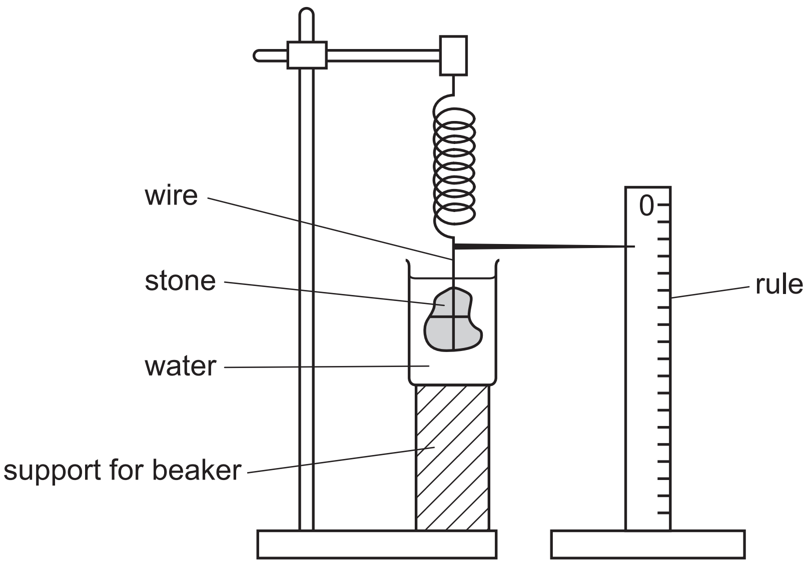
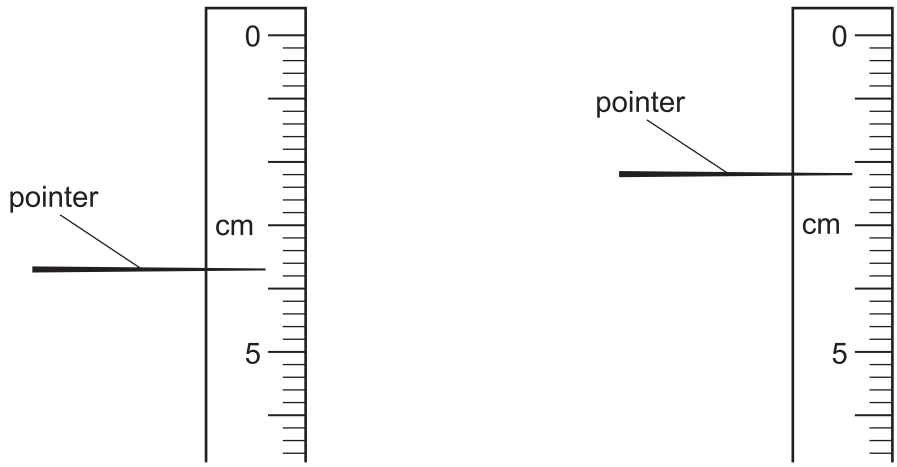


Fig. 3.3



E_A reading for stone in air

E_W reading for stone in water

Fig. 3.4

Table 3.2

mass attached	position of pointer / cm
stone hanging in air	E_A = ...
stone immersed in water	E_W = ...

(b) Read to the nearest 0.1 cm the positions of the pointer in Fig. 3.4. Record the readings in Table 3.2. [2]

(c) (i) The teacher has given the student an equation for calculating the density of the stone.

Use the equation and data from Table 3.2, to calculate the density of the stone.

$$\text{density of the stone} = \frac{E_A}{(E_A - E_W)}$$

density of the stone = ... g/cm^3 [1]

(ii) Compare the equation that you have used to calculate the density of the stone with the density equation $d = m / v$ to help you to complete this statement.

E_A is proportional to the .... of the stone. [1]

(iii) Compare the equation that you have used to calculate the density of the stone with the density equation $d = m / v$ to help you to complete this statement.

($E_A - E_W$) is proportional to the .... of the stone. [1]

(d) Suggest **two** reasons why the result may be slightly inaccurate when this method is used to find the density of the stone. Fig. 3.3 may help you.

....

.... [2]

4 A student is doing an experiment with magnesium ribbon. She reacts the magnesium ribbon with excess hydrochloric acid. She wants to find out how the volume of hydrogen collected varies with the length of the magnesium ribbon.

The apparatus is shown in Fig. 4.1.

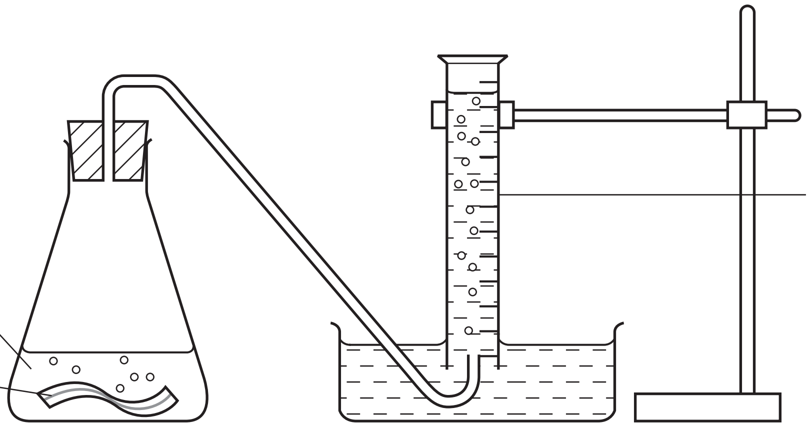


Fig. 4.1

Method

- The student fills the measuring cylinder with water and places it in position.
- She cuts a 4.5 cm length of magnesium ribbon, adds it to the dilute hydrochloric acid in the flask and quickly replaces the cork.
- When all the magnesium has reacted, she reads the volume of gas collected and records it in Table 4.1.
- She repeats the procedure with different lengths of magnesium ribbon.

Table 4.1

experiment number	**1**	**2**	**3**	**4**	**5**
length of magnesium ribbon / cm	4.5	7.0	9.5		
volume of hydrogen / cm^3	65	100	135		

(a) **(i)** The student has cut two lengths of magnesium ribbon for use in experiments **4** and **5**. They are shown in Fig. 4.2. The diagram shows the actual size of each ribbon.

Use a ruler to measure the lengths to the nearest 0.5 cm. Record them in Table 4.1. [2]

magnesium ribbon for experiment **4**

magnesium ribbon for experiment **5**

Fig. 4.2

(ii) The scales of the inverted measuring cylinders containing the hydrogen given off in experiments **4** and **5** are shown in Fig. 4.3.

Read the scales to the nearest 5 cm^3 and record the volumes in Table 4.1. [2]

experiment **4** experiment **5**

Fig. 4.3

(b) **(i)** Plot the graph of volume of hydrogen against length of magnesium ribbon on the grid below. Draw the best straight line. [2]

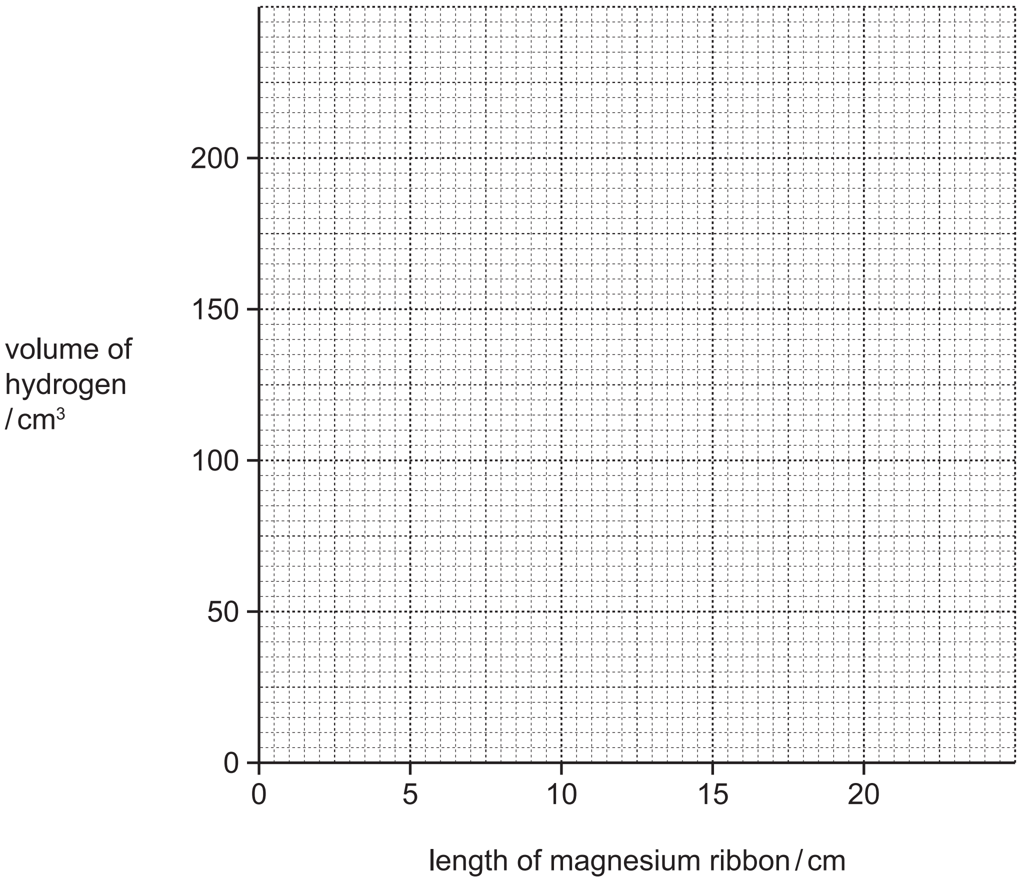


Fig. 4.4

(ii) The gradient of the straight line you have drawn is the volume of hydrogen produced by a length of 1 cm of magnesium ribbon.

Find the gradient of the straight line.

Show, on the graph, how you use the graph to find the gradient of the line.

gradient = ... [2]

(c) Suggest **one** change to the experimental method that would make the results more accurate.

....

....

.... [1]

(d) The student finds that the longest piece of magnesium ribbon takes a long time to react completely.

Suggest **one** change to the experimental method so that the ribbon reacts more quickly but gives the same volume of hydrogen.

....

.... [1]

Please turn over for Question 5.

5 A science student has been given a Test Plan to identify five metals. The Test Plan is shown on page 17.

The metals are calcium, iron, silver, zinc and magnesium. The small pieces of the metals are all grey or silver colour. The metals are labelled **A**, **B**, **C**, **D** and **E**.

The student has written some of his observations and conclusions.

Study the Test Plan and answer the questions below. **Do not write anything on the Test Plan**.

(a) **(i)** Name the gas given off in Test **1**.

.... [1]

(ii) Explain how the student can test for the presence of this gas as it escapes from the test-tube and describe the positive result of this test.

....

.... [2]

(b) **(i)** Name the white precipitate seen in observation **2b**.

.... [1]

(ii) Suggest the name of the solution formed when metal **B** reacts with cold water.

.... [1]

(c) Name metal **A**. Use the observation in Test **3** to help you.

.... [1]

(d) **(i)** Observation **5a** tells the student that metal **C** is zinc.

Explain what he sees.

....

....

.... [2]

(ii) Write the formula of the green precipitate that is seen in observation **5b**.

.... [1]

(e) Suggest what the student sees in Test **6** to tell him that metal **E** is silver.

.... [1]

TEST PLAN TO IDENTIFY FIVE METALS

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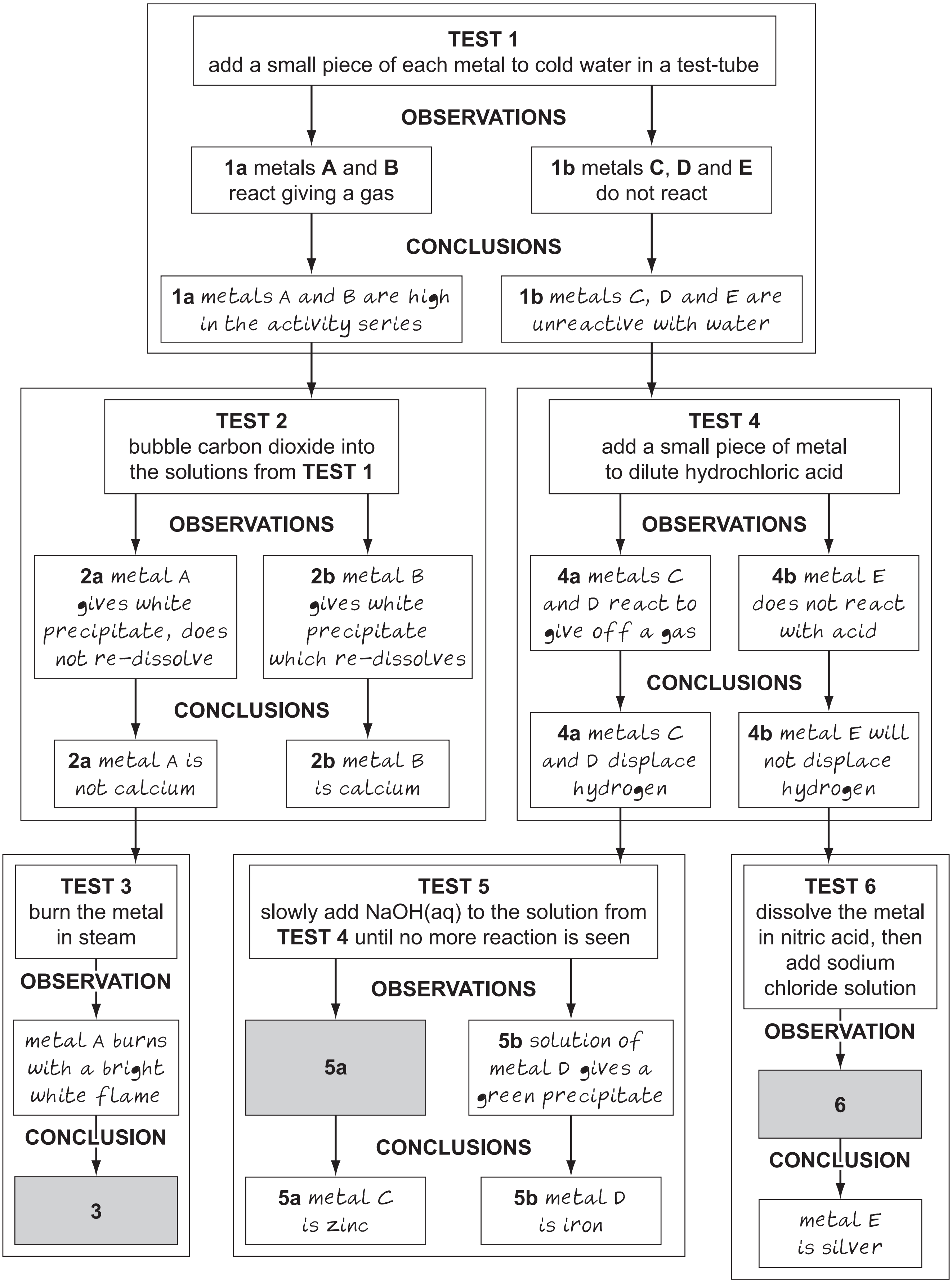

6 A student is testing the Law of Reflection which says that the angle of reflection is equal to the angle of incidence.

He is using a mirror made of polished stainless steel and a light source that creates a narrow beam. This is shown in Fig. 6.1.

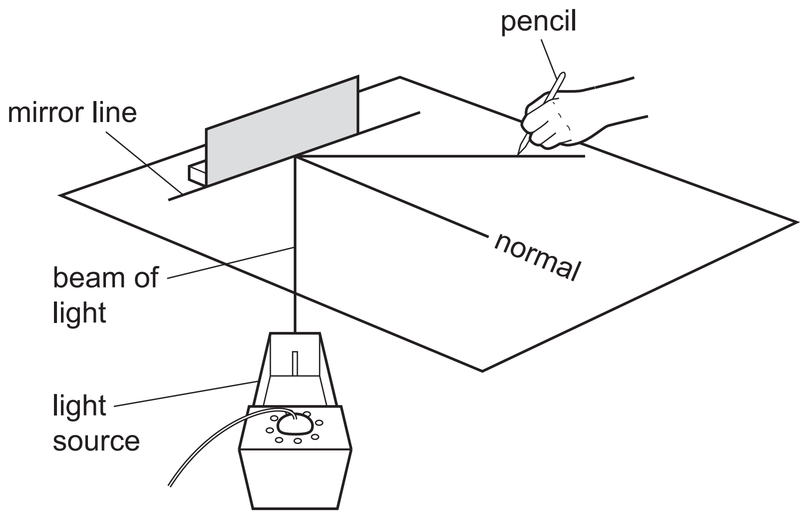

Fig. 6.1

Procedure

- The student draws a straight line on a piece of paper and labels it *mirror line*.
- He draws another line and labels it *normal*.
- He places the stainless steel mirror on the mirror line.
- He switches on the light source and arranges it so that its beam hits the mirror at the point where the normal meets the mirror line.
- Using a pencil, the student marks the incident and reflected beams of light.
- He removes the mirror and light source and then draws the incident and reflected rays. See Fig. 6.2.
- He measures two angles on the diagram.

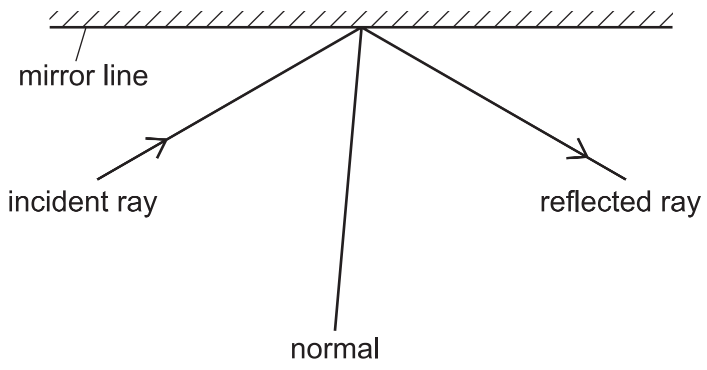

Fig. 6.2

(a) The student has measured two angles. He has written the following two statements.

A "*The angle between the incident ray and the mirror line is equal to the angle between the reflected ray and the mirror line.*"

B "*This proves that the Law of Reflection is obeyed.*"

(i) Use a protractor to measure the angle of incidence and the angle of reflection.

angle of incidence = ... degrees

angle of reflection = ... degrees [2]

(ii) Describe the student's mistake in drawing the diagram.

....

.... [1]

(iii) State and explain whether or not your measurements prove that the Law of reflection is obeyed.

....

.... [1]

(b) The student decides to test the same Law of Reflection using a mirror made from polished aluminium. He uses the same procedure as before, but he draws the normal line correctly.

Fig. 6.3 shows the result of this experiment. The student has used a pencil to mark the incident and reflected beams.

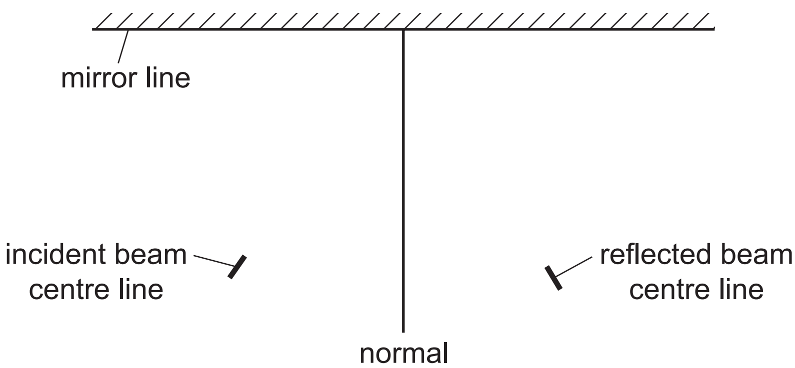

Fig. 6.3

(i) Complete Fig. 6.3 to show an incident ray and a reflected ray. [1]

(ii) Use a protractor to measure the angle of incidence and the angle of reflection.

angle of incidence = ... degrees

angle of reflection = ... degrees [2]

(iii) The teacher tells the student that he has made mistakes in this experiment. As a result, the two angles are not equal.

Suggest a mistake that the student may have made when he

placed the mirror on the paper, ...

....

drew the incident beam and reflected beam lines on the paper. ....

.... [2]

(c) The experiments use a solid metal and a solid metal alloy as reflective surfaces. The student states that solid metals reflect light because of the free movement of particles within them.

Suggest the name of these particles. .... [1]