UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5008335808

PHYSICAL SCIENCE **0652/63**

Paper 6 Alternative to Practical **October/November 2012**

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 a soft pencil for any diagrams or graphs.
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.

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1	
2	
3	
4	
5	
6	
Total	

This document consists of **19** printed pages and **1** blank page.

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International Examinations

1 The science teacher is showing the class how light energy can be used to make a fuel.

He is using a solar panel to create an electrical current. The current is used to make hydrogen by a process called electrolysis.

The apparatus is shown in Fig. 1.1.

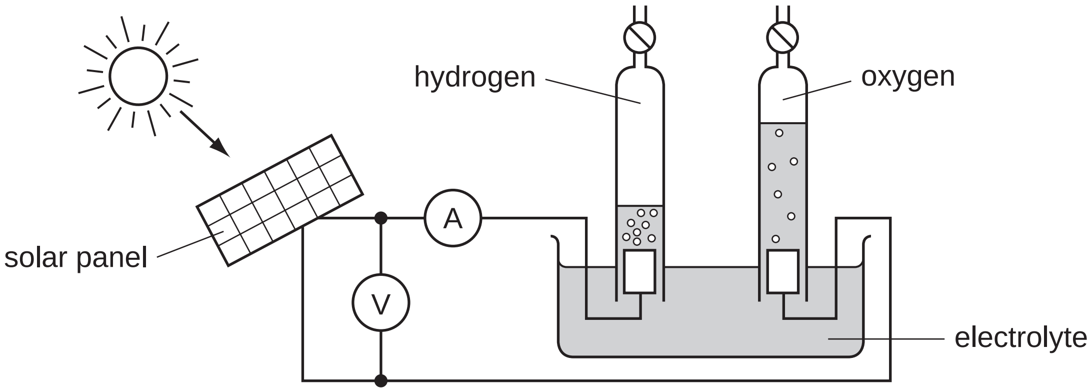

Fig.1.1

(a) (i) Complete the sentence to show the energy changes that occur during the production of hydrogen by this method.

light energy ⟶ .... energy ⟶ .... energy [2]

(ii) Fig. 1.2 shows the ammeter and voltmeter readings.

In Table 1.1, record the current to the nearest 0.25 A and the voltage to the nearest 0.5 V.

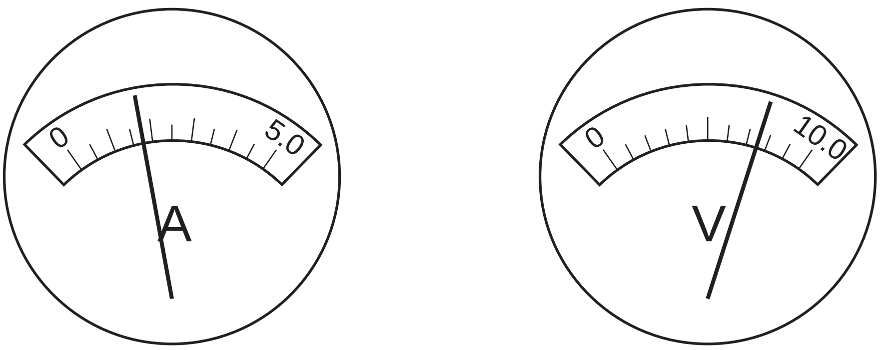

Fig. 1.2

Table 1.1

current / A	
voltage / V	

[2]

(iii) The current flows for 3 hours.

Calculate the total energy output of the solar panel in Watt-hours. Use the formula

$$E = I \times V \times t$$

total energy output = ... Watt-hours [1]

(b) The teacher collects the hydrogen from the electrolysis until there is enough to carry out a second experiment, shown in Fig. 1.3.

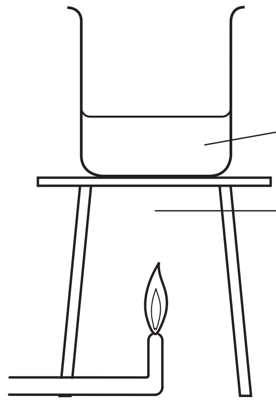

Fig. 1.3

(i) Complete the sentence to show the energy change that occurs in the hydrogen flame.

.... energy ⟶ .... energy [1]

(ii) Write a balanced equation for the reaction that occurs when hydrogen is burned.

.... [1]

(iii) Explain why energy is given out when hydrogen burns by referring to the bonds that are broken and formed during the reaction.

....

....

.... [2]

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(c) Explain why it is good for the environment to use a fuel produced by using energy.

....

....

.... [1]

2 The science teacher is doing experiments with aluminium. He has three samples of aluminium foil, **A**, **B** and **C**, of different thicknesses.

(a) Aluminium is used to make containers for cooking food.

Suggest **two** properties of aluminium metal that make it suitable for this use.

1 ....

2 .... [2]

(b) The teacher shows the class a simple experiment, using one of the pieces of foil, to prove that aluminium is a metal.

Suggest how he does this.

....

.... [1]

(c) The teacher cuts a square, size 1 cm x 1 cm, from each of the foils **A**, **B** and **C**.

- He places the square of foil **A** into a test-tube. Then he adds concentrated hydrochloric acid and fits a delivery tube.
- Hydrogen is given off. He collects the hydrogen, measures its volume and records it in Table 2.1.
- He repeats the experiment using the squares of foils **B** and **C**.

(i) Draw a diagram to show how the hydrogen gas can be collected over water in a measuring cylinder.

[2]

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(ii) Fig. 2.1 shows the scales of the measuring cylinders containing the hy… given off from foils **B** and **C**.

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

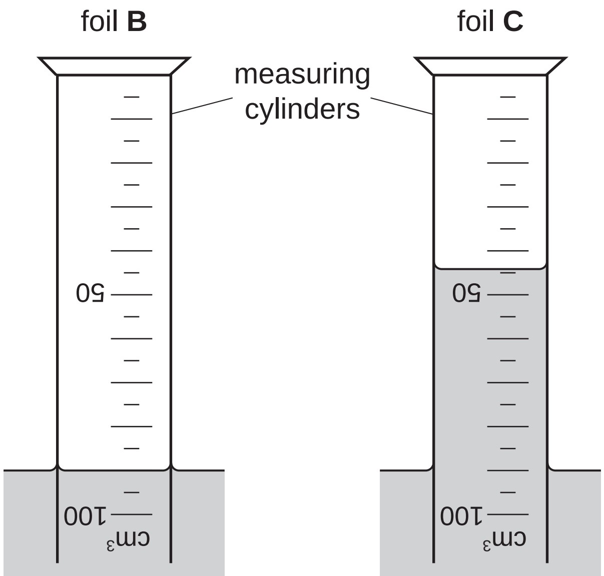

Fig. 2.1

Table 2.1

foil	**A**	**B**	**C**
volume of gas from 1 square of foil / cm^3	20		
thickness of foil / millimetres	0.06		

(d) The teacher gives the students a graph, shown in Fig. 2.2. They use the graph to find the thickness of the pieces of aluminium foil.

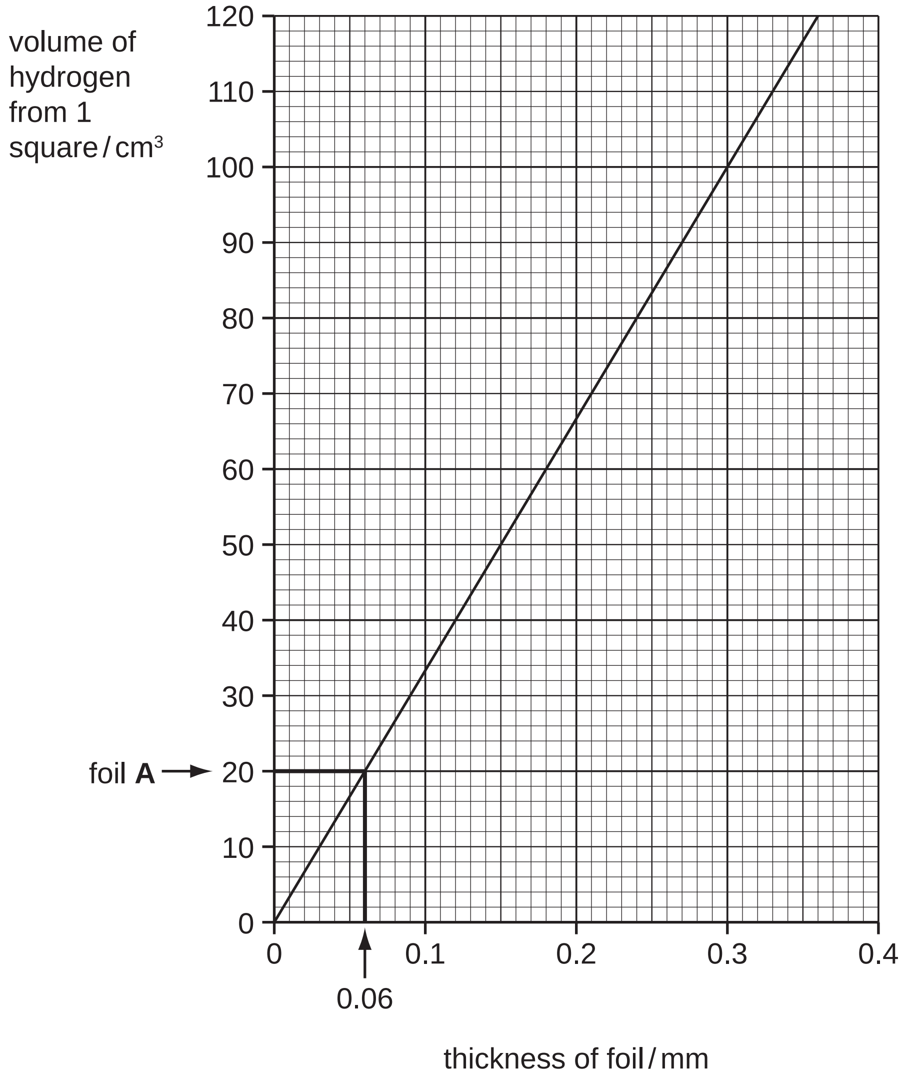

Fig. 2.2

Use the graph, Fig. 2.2, and the volumes of hydrogen from Table 2.1, to find the thickness of the foils **B** and **C** to the nearest 0.01 mm.

Foil **A** has been done for you.

Show, in the same way, on the graph how you do this for foils **B** and **C**. Record the results in Table 2.1. [3]

3 A science student is using the apparatus shown in Fig. 3.1 to investigate the relationship between the mass of a trolley and the time taken to travel along a track.

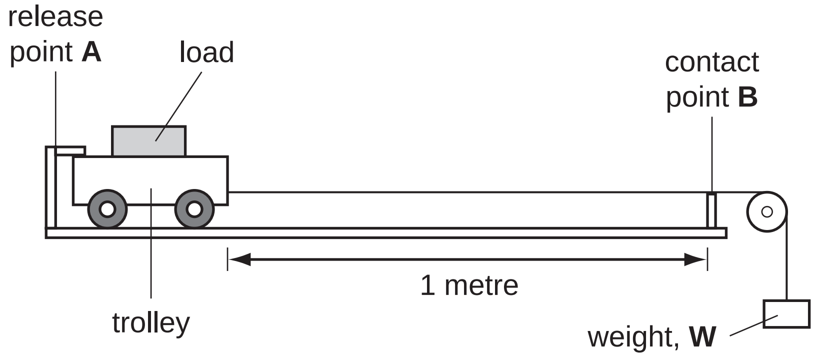

Fig. 3.1

The trolley has a mass of 100 g. It is made from a light but strong material. It can be loaded with more masses.

The weight, **W**, is a fixed mass used to accelerate the trolley along the smooth level 1 metre track.

The release mechanism at point **A** and the contact point **B** are connected to a timer.

- the student loads the trolley so that it has a total mass of 3 kg
- the trolley is released and the time taken to reach point **B** is recorded in Table 3.1
- the trolley is loaded to give a different total mass and the experiment is repeated

(a) Suggest the name of a metal or plastic that can be used to make the light, strong trolley.

.... [1]

(b) The timer displays for the two missing results are shown in Fig. 3.2.

Record the times in Table 3.1. [1]

total mass of trolley = 1.0 kg

total mass of trolley = 2.0 kg

Fig. 3.2

Table 3.1

total mass of trolley / kg	time, *t* / s
0.1	0.5
0.5	1.1
1.0	
2.0	
3.0	2.8

(c) **(i)** Plot a graph of the time taken, *t* against total mass of the trolley on the grid provided. Label the axes. Use the points to draw a smooth curve.

[3]

(ii) When the curve is extended, it does not pass through the point (0,0).

Suggest **one** reason why time, t, cannot be equal to 0.0 s.

....

....

.... [1]

(d) On the same graph grid, draw a curve that might be obtained if the mass of the weight, W, is increased. Label your curve **increased mass**. [1]

(e) (i) Name the force that causes the acceleration of the trolley.

.... [1]

(ii) State where, in the apparatus shown in Fig. 3.1, this force is acting to cause the acceleration of the trolley.

Explain your answer.

....

.... [2]

4 A student reads in a scientific magazine that iron filings can be used to extract copper from the water that flows out of the ground near a copper mine. She does an experiment to find out how this will work. She uses the apparatus shown in Fig. 4.1.

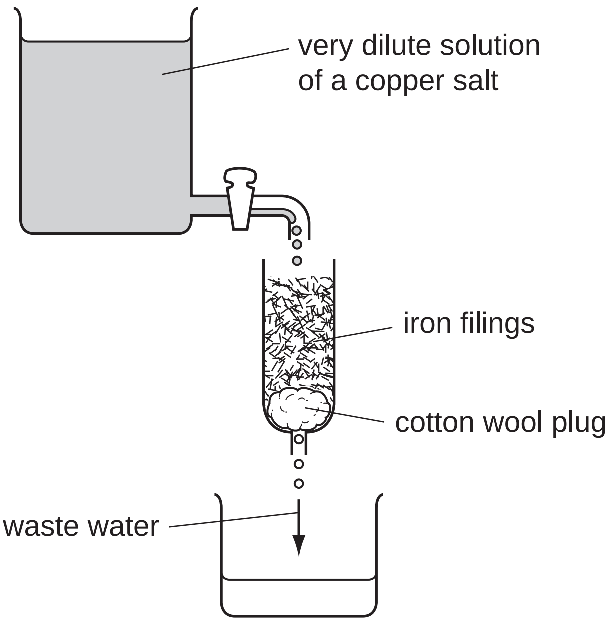

Fig. 4.1

(a) (i) Name a copper salt that she can use in this experiment.

.... [1]

(ii) The student allows some of the dilute copper salt solution to run through the iron filings. She collects a sample of the waste water running out of the apparatus in Fig. 4.1.

Use your answer to **(i)** to suggest the name of an iron salt that will be found in the waste water.

.... [1]

(iii) The student decides to make the waste water more concentrated before she carries out a test to analyse it.

Explain how she can make the solution more concentrated.

....

.... [1]

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(iv) She adds aqueous sodium hydroxide to the concentrated waste water.

Use your answer to **(a)(ii)** to suggest what she observes when sodium hydroxide is added.

....

.... [2]

(b) After a large volume of the dilute copper salt solution has passed through the apparatus, the student takes the iron filings out of the tube. The iron filings now contain some copper. She wants to remove the unused iron so that only copper remains, so she adds an acid to dissolve the unused iron.

(i) Suggest the name of an acid that will react with and dissolve the iron but not the copper.

.... [1]

(ii) After adding excess acid she warms the mixture to make sure that all the iron has dissolved in the acid, leaving solid copper particles. She lets the mixture cool down.

Draw a diagram to show how she can separate the solid copper particles from the iron salt solution.

[2]

(c) In the process shown in Fig. 4.1, iron is used up but copper is obtained.

Suggest **two** reasons why this process might be profitable. Refer to the relative abundances of copper and iron in the earth's crust and to the relative commercial values of copper metal and iron metal.

1 ....

....

2 ....

.... [2]

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5 The teacher has given a student five flasks containing the solutions **A**, **B**, **C**, **D** and **E**. The flasks are **hydrochloric acid**, **nitric acid**, **sulfuric acid**, **sodium hydroxide** solution and **ammonia** solution.

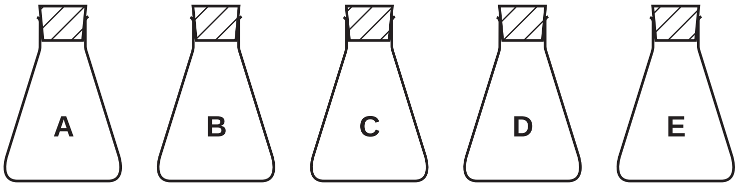

Fig. 5.1

The student must use the Test Plan, Fig. 5.2, shown on page 16 to identify the solutions. She carries out four tests on the solutions, records her observations and then names each of the solutions.

Study the Test Plan and then answer the questions on page 17.

Do not write anything on page 16.

TESTS ON FIVE SOLUTIONS, A – E
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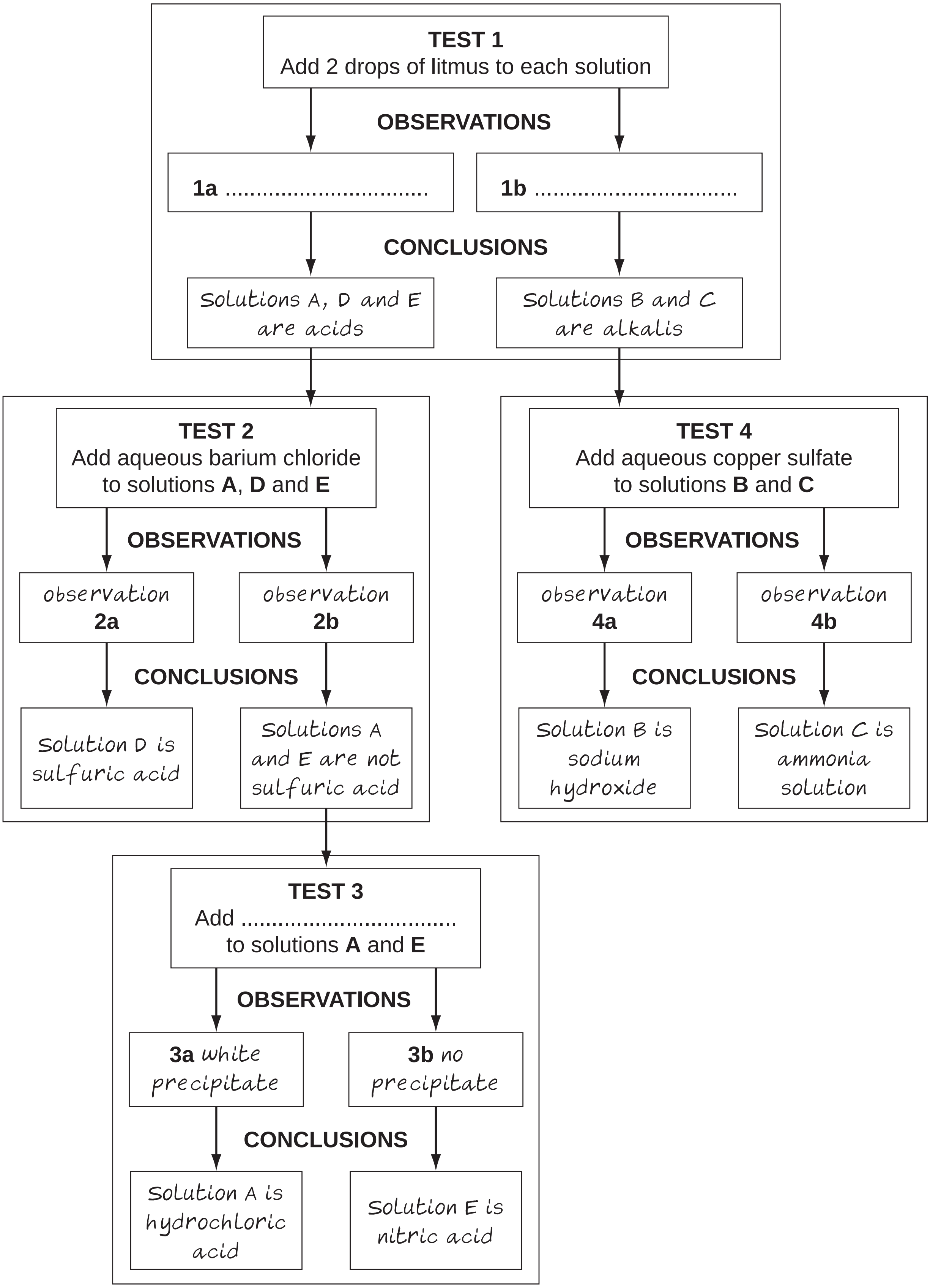

Fig. 5.2

(a) Test 1
The student adds 2 drops of litmus to each of the five solutions.

Suggest **observations 1a** and **1b**.

1a ....

1b .... [2]

(b) Test 2
She adds aqueous barium chloride solution to solutions **A**, **D** and **E**.

Suggest **observations 2a** and **2b**.

2a ....

2b .... [2]

(c) Test 3
After she adds a reagent to solutions **A** and **E**, she sees a white precipitate and concludes that solution **A** is dilute hydrochloric acid.

Name the reagent that she has added.

.... [1]

(d) Test 4
She adds aqueous copper sulfate to solutions **B** and **C**. She concludes that solution **B** is sodium hydroxide solution and solution **C** is ammonia solution.

Suggest **observations 4a** and **4b**.

4a ....

4b .... [2]

(e) The teacher asks the student to find out which solution is more concentrated, the hydrochloric acid or the nitric acid.

Explain how she can do this, using any of the substances that she has already used in the four tests.

....

....

....

.... [3]

6 The science class is carrying out experiments on waves. They are using a long shallow tank of water.

A student dips a wooden bar into the water at one end of the tank. A wave moves along the tank. This is shown in Fig. 6.1.

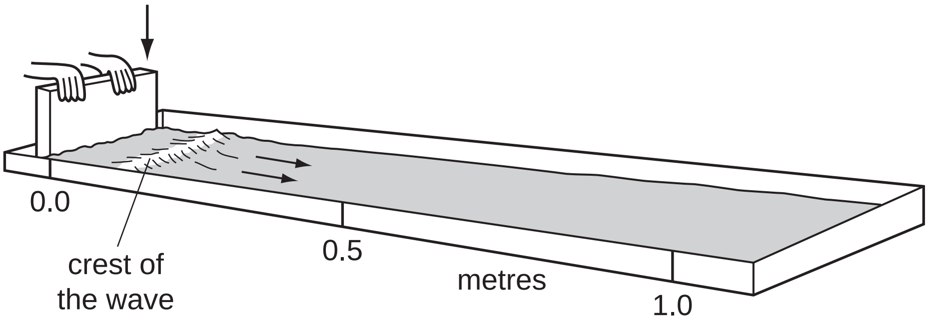

Fig. 6.1

(a) experiment 1

A timer makes a loud “tick” sound every 0.5 seconds. The student dips the bar into the tank in time with the “tick” sounds. Waves move along the tank.

A diagram of the waves as observed from above is shown in Fig. 6.2.

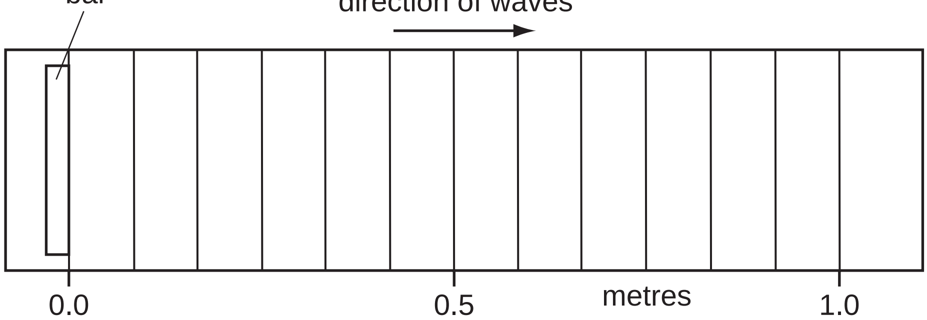

Fig. 6.2

(i) Count the number of waves in 1 metre (100 cm) of the tank.

number of waves = ... [1]

(ii) Calculate the wavelength of a wave in centimetres and convert this to metres.

wavelength = ... cm

= .... m [2]

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(iii) State the number of "ticks" that the student hears after a wave is made and is travelling to the 1.0 m mark.

number of "ticks" = ... [1]

(iv) State the time taken by one wave to travel 1.0 metre.

time = ... s [1]

(v) Calculate the velocity of the wave in metres per second.

velocity = ... m / s [1]

(vi) Calculate the frequency of the waves in Hertz.

frequency = ... Hz [1]

(b) experiment 2

A barrier is placed across the tank at 45° to the side. The student watches the waves as they hit the barrier. Fig. 6.3 shows waves **1** and **2** being reflected by the barrier.

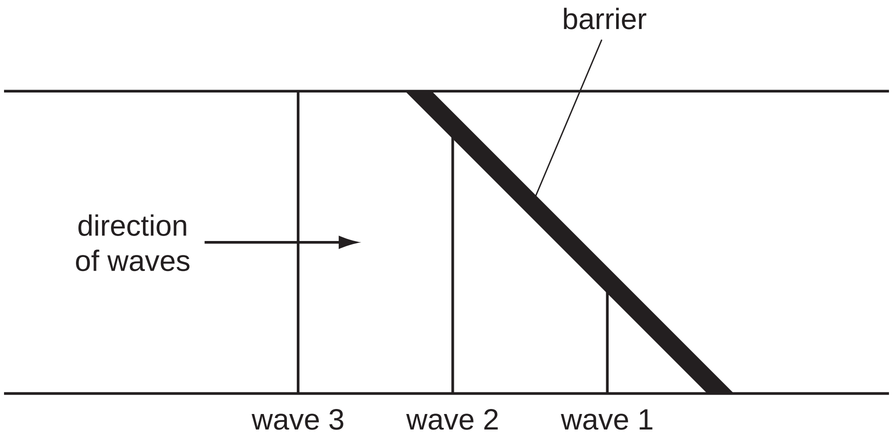

Fig. 6.3

The reflected parts of the waves **1** and **2** are missing from the diagram. On Fig. 6.3, draw the missing parts of waves so that their lengths and direction of travel are accurately shown. [2]

(c) The student thinks that the waves in the tank are like other wave forms such as light and sound. Complete Table 6.1 to show the comparison between waves in the tank, light waves and sound waves.

Table 6.1

wave form	type of wave
light waves	transverse
sound waves	longitudinal
waves in the tank	

[1]