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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

COMBINED SCIENCE **0653/63**

Paper 6 Alternative to Practical **May/June 2020**

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Blank pages are indicated.

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1 A student investigates the effect of temperature on the uptake of water by a stem.

Water containing a blue stain moves up the xylem of a plant, staining the xylem blue.

Fig. 1.1 shows a cut section of the stem with stained xylem tubes.

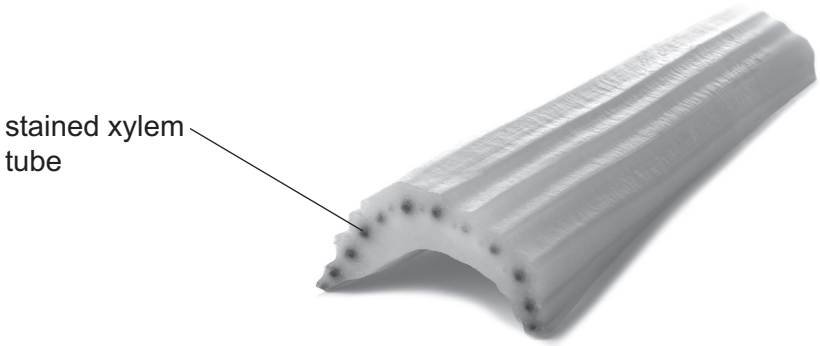

Fig. 1.1

(a) Procedure

- The student places one end of a freshly cut stem into water containing a blue stain at 20 °C.
- He leaves it in the blue stain for 60 minutes.
- He removes the stem.
- The student then cuts a 2 mm slice from the end of the stem that has been in the blue stain, as shown in Fig. 1.2.

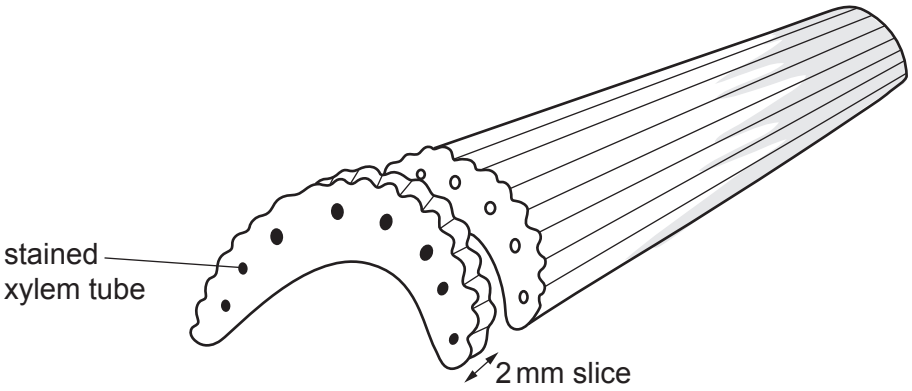

Fig. 1.2

- He observes the cut xylem tubes to see if they contain blue stain.
- If the xylem tubes contain the blue stain he takes another 2 mm slice and observes the new cut xylem tubes.
- The student repeats this until the xylem tubes are no longer stained blue.
- He then counts the number of slices cut to calculate how far the stain has travelled.
- He repeats the procedure at 25 °C, 30 °C, 35 °C and 40 °C.

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Fig. 1.3 shows the cut stems at each temperature.

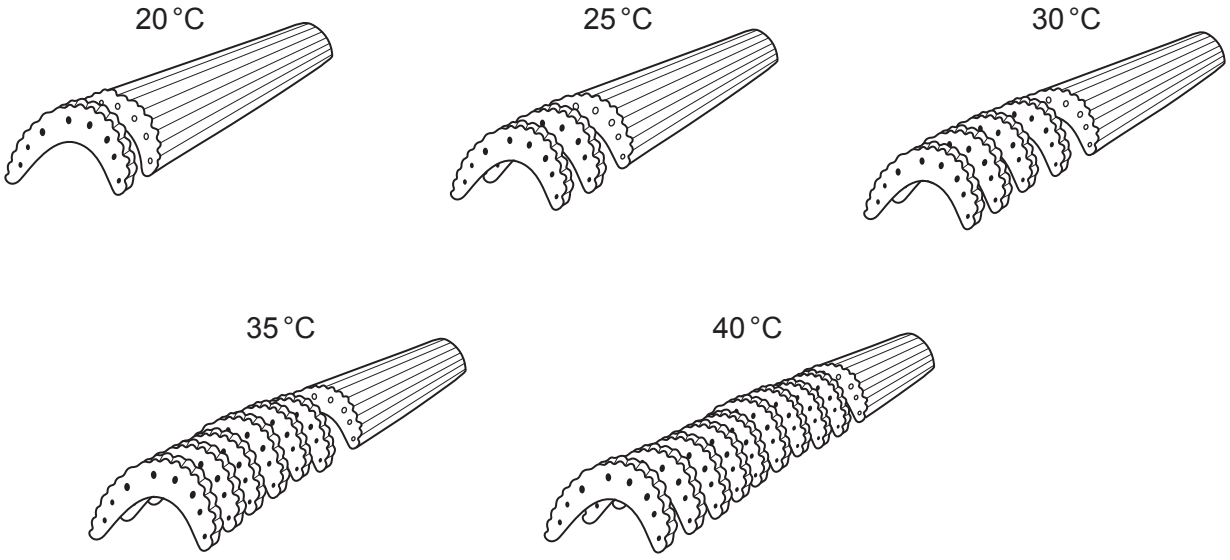

Fig. 1.3

(i) Use Fig. 1.3 to complete Table 1.1.

Table 1.1

temperature / °C	number of slices	distance moved by stain / mm
20	1	2
25		
30	4	8
35		
40	9	18

[2]

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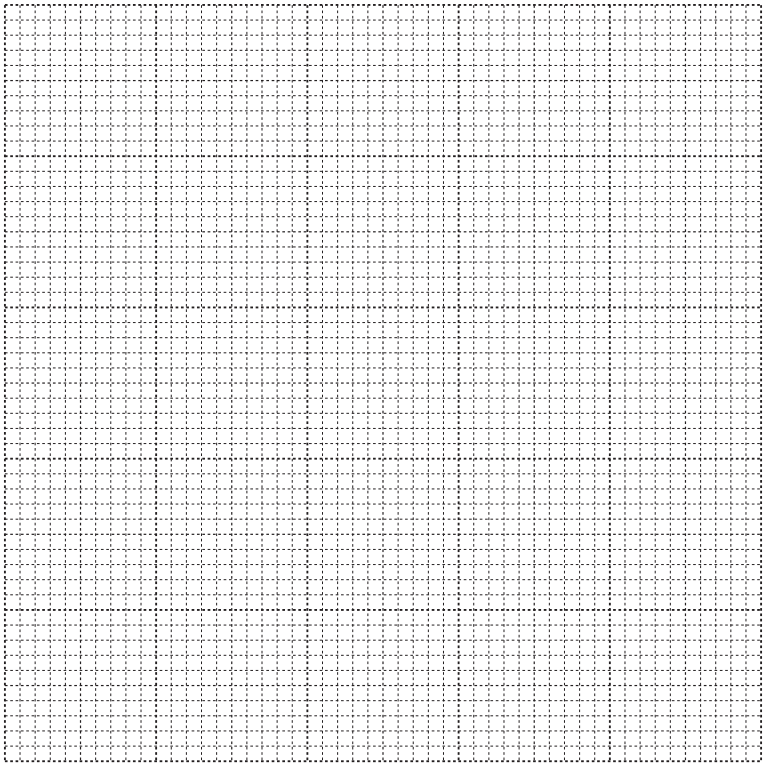
(ii) On the grid, plot a graph of the distance moved by the stain (vertical) against the temperature.



[3]

(iii) Draw a curve of best fit. [1]

(iv) Describe the relationship between the temperature and the distance moved by the stain.

.....

..... [1]

(v) State **one** variable that must be kept constant in this investigation.

.....

..... [1]

(vi) Suggest **one** possible source of error when calculating the distance moved by the stain.

.....

..... [1]

(vii) The student stated that there was a risk of cutting his hand when using the knife.

Describe **one** method of reducing this risk.

.....

..... [1]

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(b) Fig. 1.4 shows a close-up of the cut end of the stem.

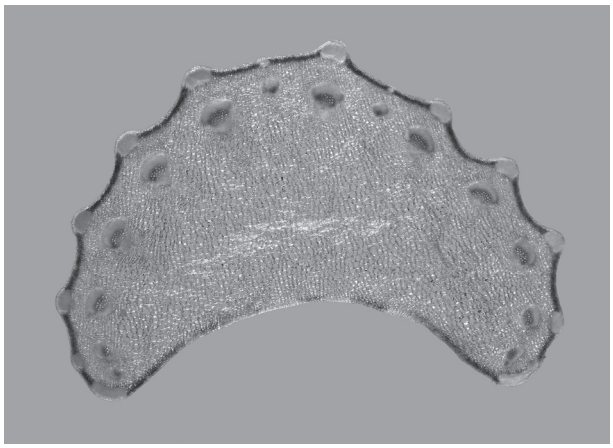

Fig. 1.4

Make an enlarged detailed drawing of the cut stem shown in Fig. 1.4.

[3]

[Total: 13]

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2 A student performs an experiment to determine the volume of dilute hydrochloric acid needed to react completely with aqueous sodium hydroxide.

(a) The student uses the apparatus shown in Fig. 2.1.

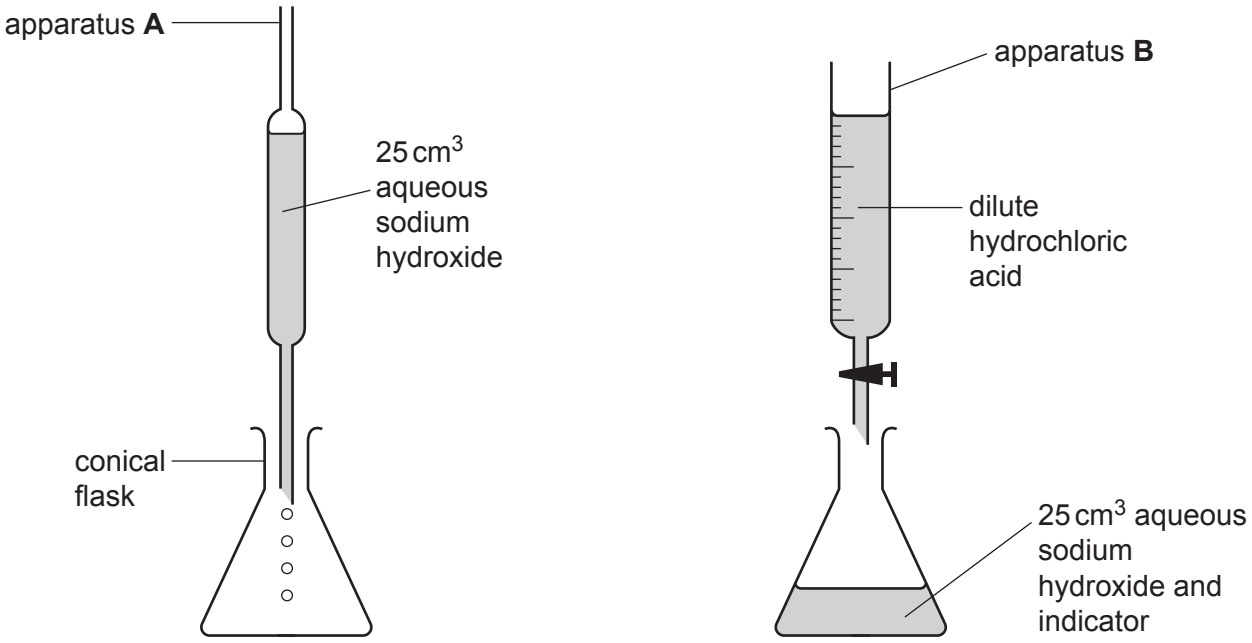

Fig. 2.1

Name apparatus **A** and **B**.

apparatus **A** .....

apparatus **B** .....

[2]

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(b) Procedure

The student:

- places 25 cm^3 aqueous sodium hydroxide into a conical flask using apparatus **A**
- adds a few drops of indicator
- fills apparatus **B** to 0.0 cm^3 with dilute hydrochloric acid
- slowly adds the dilute hydrochloric acid until the reaction is complete
- measures the volume of dilute hydrochloric acid used
- records in Table 2.1 the volume of dilute hydrochloric acid used
- repeats the experiment three times.

Table 2.1

experiment number	volume of dilute hydrochloric acid / cm^3
1	
2	12.5
3	12.7
4	

(i) Fig. 2.2 shows the volumes of dilute hydrochloric acid the student uses in experiments **1** and **4**.

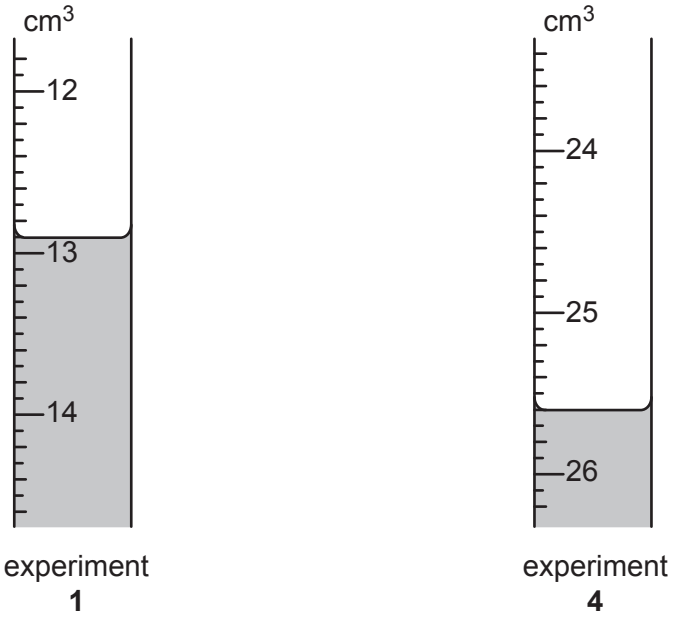

Fig. 2.2

Record in Table 2.1 these volumes to the nearest 0.1 cm^3. [2]

(ii) Name a suitable indicator.

..... [1]

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(iii) Explain how the student knows when the reaction is complete.

..... [1]

(iv) The student wants to calculate the average volume of dilute hydrochloric acid that just reacts completely with aqueous sodium hydroxide.

Select the volumes from Table 2.1 that should be used to calculate this average volume of dilute hydrochloric acid.

Explain your choice.

volumes ..... cm^3

explanation .....

.....
[1]

(v) Use the volumes chosen in **(b)(iv)** to calculate the average volume of dilute hydrochloric acid used.

average volume = ... cm^3 [1]

(vi) Predict what volume of dilute hydrochloric acid is needed to react completely with **75 cm^3** of aqueous sodium hydroxide.

..... [1]

(vii) Identify which result in Table 2.1 is anomalous.

..... [1]

(viii) Suggest what could have caused this anomaly.

..... [1]

(c) Hydrochloric acid reacts with sodium hydroxide to make sodium chloride solution.

(i) The student adds dilute nitric acid and aqueous silver nitrate to this sodium chloride solution.

Describe what the student observes in this test for a chloride ion.

..... [1]

(ii) Describe how the student can make a dry sample of sodium chloride from the sodium chloride solution.

.....

..... [1]

[Total: 13]

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3 A student investigates the stability of a plastic block.

He sets up the apparatus shown in Fig. 3.1.

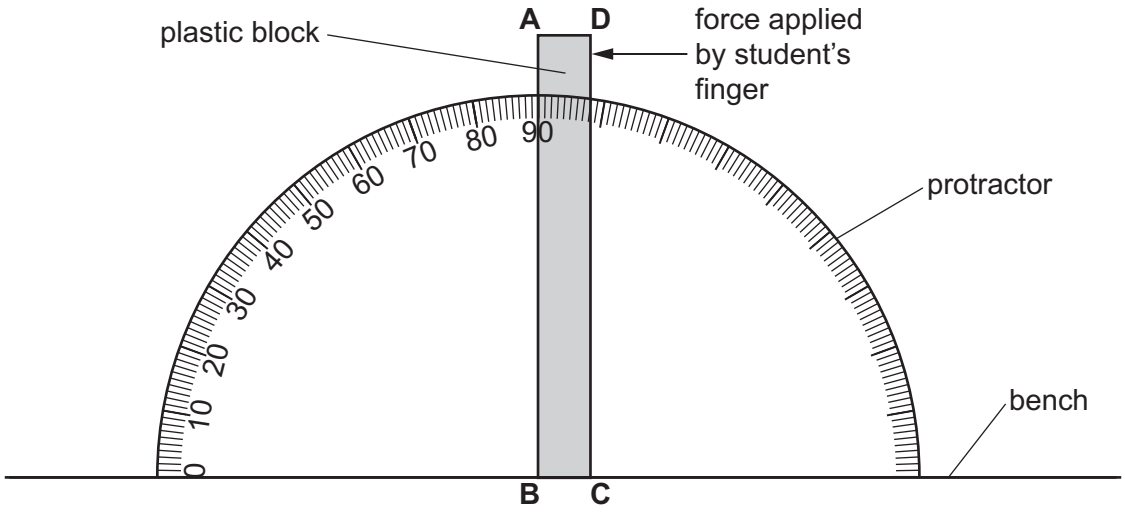

Fig. 3.1

Procedure

- The student gently pushes the top of the block until it just tips over (topples).
- He replaces the block and pushes it gently again.
- He measures the angle between the side of the block **AB** and the vertical at the point that the block just starts to topple.

(a) Fig. 3.2 shows the position of the block as it just starts to topple.

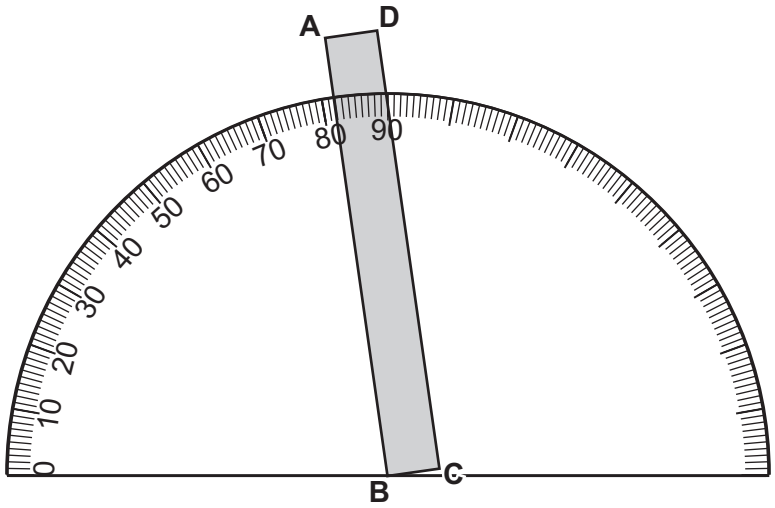

Fig. 3.2

(i) Record the angle shown on the protractor by line **AB**.

angle shown on protractor = ...° [1]

(ii) Use your value in **(a)(i)** to calculate the angle that **AB** makes with the vertical.

angle of **AB** with the vertical = ... ° [1]

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(iii) The student repeats the procedure two more times. His results are shown in Fig. 3.3.

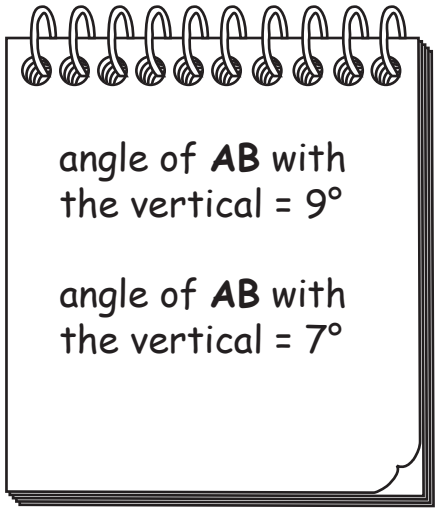

Fig. 3.3

The student carries out the test carefully on each occasion.

Suggest why his results for the angle are not identical in each experiment.

.....

..... [1]

(iv) Use the results in **(a)(ii)** and **(a)(iii)** to calculate the average angle of **AB** with the vertical when the block just starts to topple.

average angle = ... ° [1]

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(b) (i) Fig. 3.4 shows a face **ABCD** of the block.

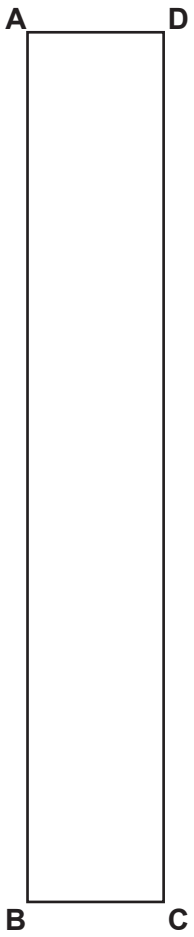

Fig. 3.4

Use a ruler to draw the diagonal line **AC**. [1]

(ii) On Fig. 3.4 use a protractor to measure the angle between lines **AC** and **CD** of the block. Record the size of this angle.

angle = ... ° [1]

(c) A student suggests that the angle in **(b)(ii)** should be the same as the angle in **(a)(iv)**.

State whether these two angles agree within the limits of experimental accuracy. Justify your answer with reference to the results.

.....

..... [1]

[Total: 7]

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Question 4 begins on page 14

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4 When a ball is released at the top of a ramp (slope) it will roll to the bottom of the ramp and then continue for some distance on a level surface before coming to rest.

A student predicts that the distance travelled by a ball from the bottom of the ramp will be proportional to the height of the top of the ramp above the bench.

Plan an investigation to test the student's prediction.

In your answer, include:

- the apparatus you will use. You may include a diagram
- a brief description of the method
- the variables which will be controlled
- the measurements you will make
- how you will ensure that your results are as accurate as possible
- how you will process your results to draw a conclusion.

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