Candidate Name _____

Centre Number	Candidate Number

MINISTRY OF EDUCATION, BOTSWANA
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
Botswana General Certificate of Secondary Education

SCIENCE : DOUBLE AWARD 0569/4

PAPER 4 Alternative to Practical

OCTOBER/NOVEMBER SESSION 2001 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator
300 mm ruler

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

You may use a calculator.

A copy of the Periodic Table is printed on page 16.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	

This question paper consists of 15 printed pages and 1 blank page.

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[Turn over

For Examiner's Use

1 Fig. 1.1 shows a 50 cm^3 and a 10 cm^3 measuring cylinder.

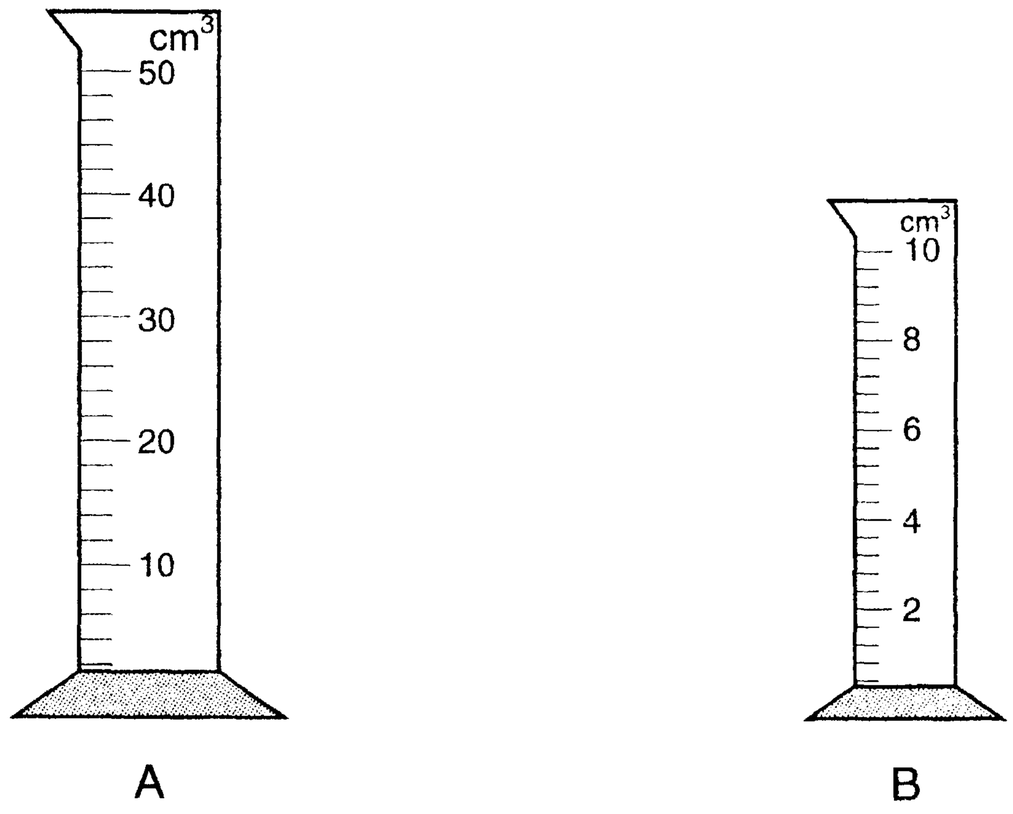


Fig. 1.1

(a) Which measuring cylinder would you use to measure 8 cm^3 of a liquid?

Explain your choice.

.....

..... [1]

(b) 8 cm^3 of the liquid has a mass of 4 g.

Calculate the density of the liquid using the formula shown.

$$\rho = \text{mass} / \text{volume}$$

ρ = ... g/cm^3 [1]

2 Fig. 2.1 shows apparatus used to determine the resistance of a wire **AB**.

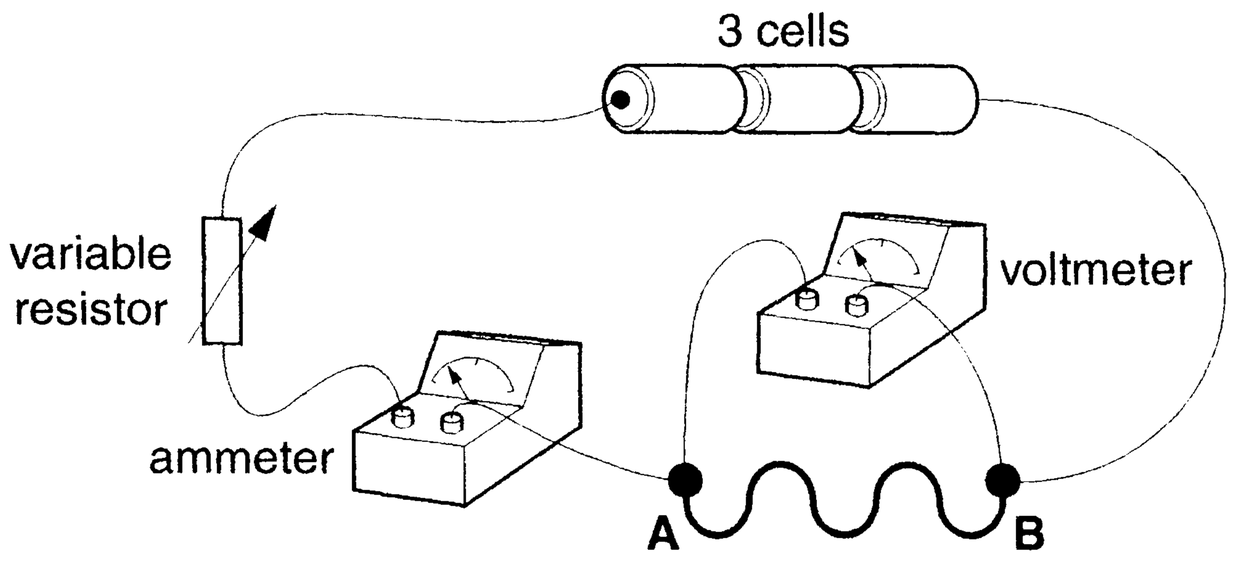


Fig. 2.1

(a) Draw this circuit using standard circuit symbols. Use the symbol for a resistor for the wire **AB**.

[4]

(b) The variable resistor is used to vary the current.

Fig. 2.2 shows five values of the current and the corresponding voltmeter readings.

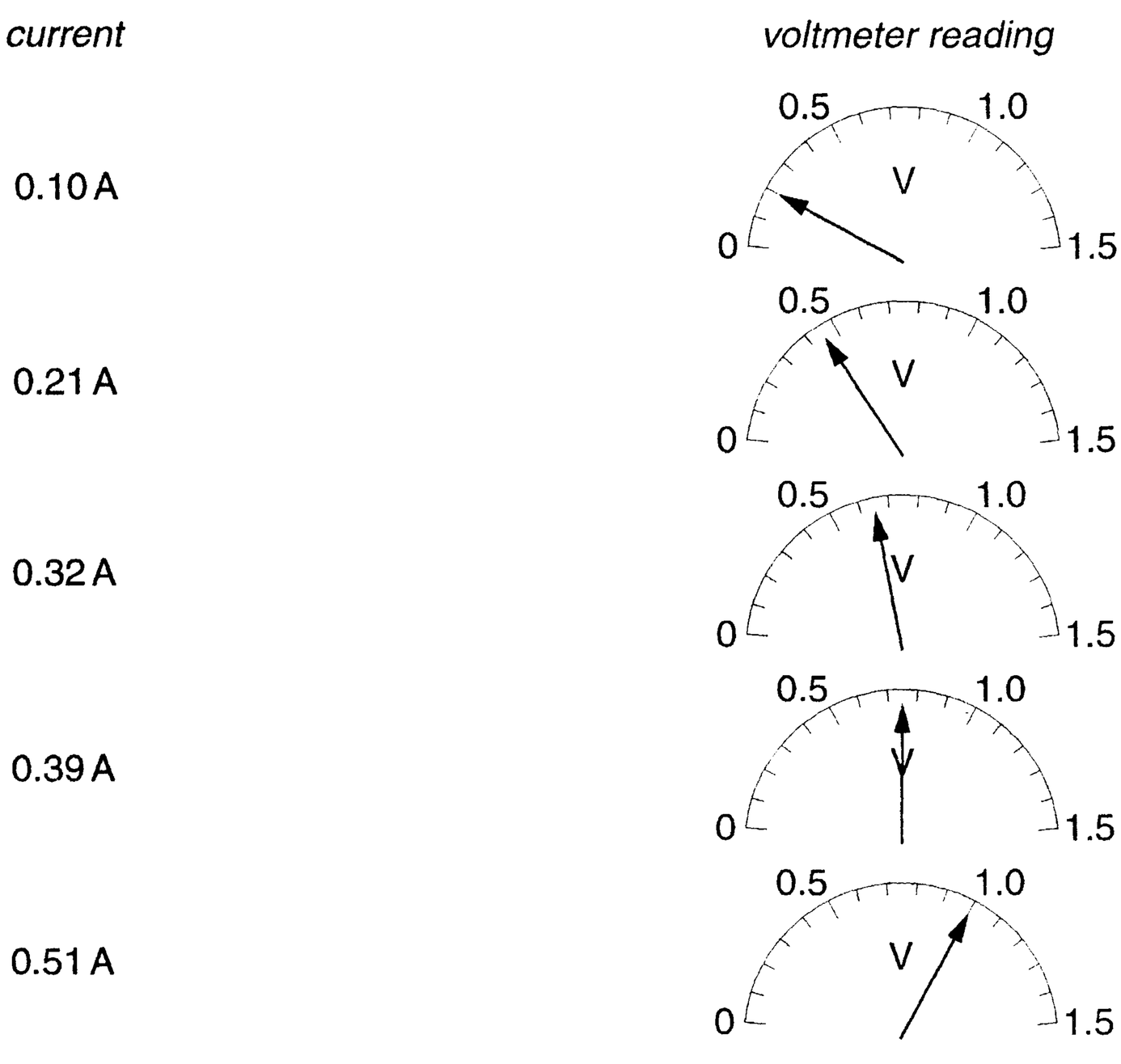


Fig. 2.2

current / A	voltmeter reading / V	voltmeter reading / current (V / A)
0.10		
0.21		
0.32		
0.39		
0.51		

(i) Read and record the voltmeter readings in the table. [1]

(ii) Calculate the values for the voltmeter reading / current (V / A) and complete the table by writing these values into the third column of the table. [1]

(iii) Calculate the average of the V / A values.

average = ... [2]

3 Fig. 3.1 shows a balanced uniform stick pivoted at the centre with a stone and mass **M** either side of the pivot. Fig. 3.1 is drawn to scale. **M** = 0.04 kg.

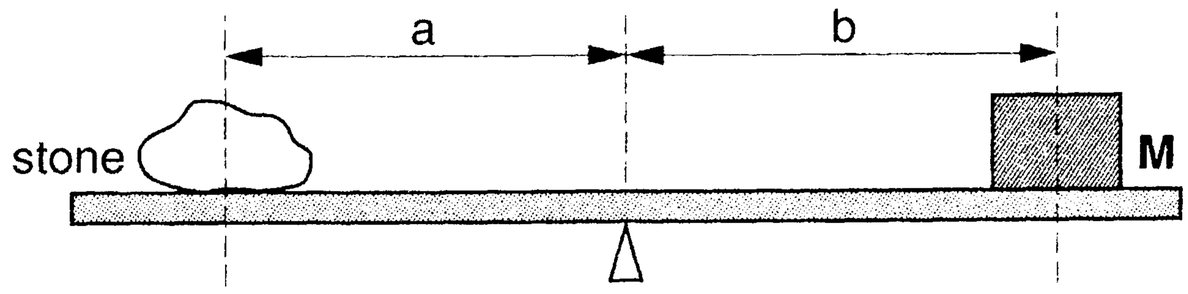


Fig. 3.1

(a) **(i)** Measure and record lengths a and b.

a. .....

b. ..... [2]

(ii) Calculate the mass m of the stone using the equation shown.

$$m = M\,(b/a)$$

m = ... kg [1]

(iii) Find the weight W of the stone using the equation shown.

$$W = 10 \times m$$

W = ... N [1]

For Examiner's Use

4 Fig. 4.1 shows apparatus used to investigate how the covering of the flask affects its absorption of heat.

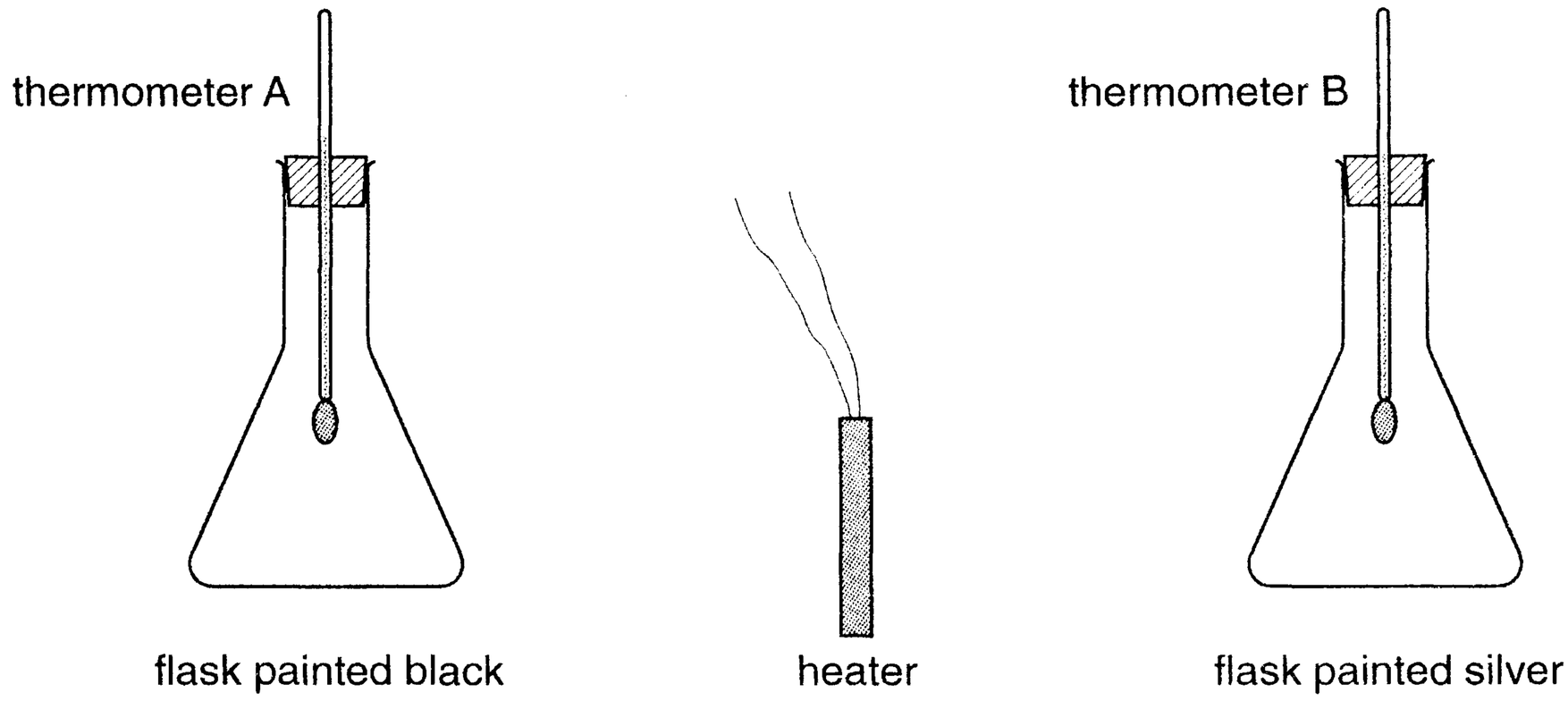
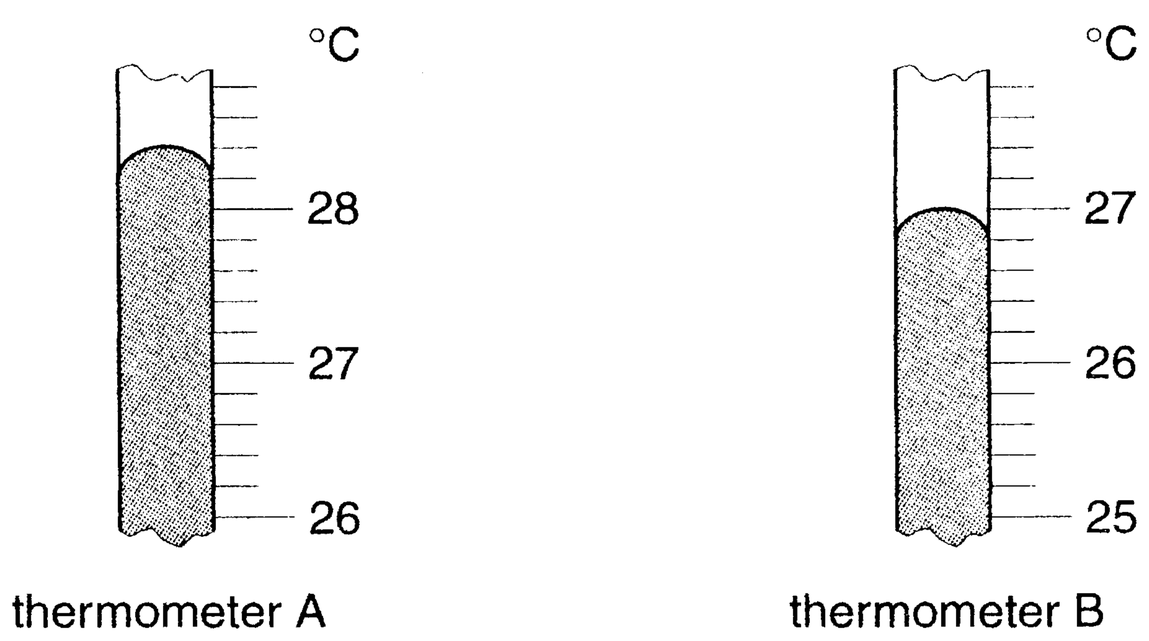


Fig. 4.1

Both thermometers initially read 23.5 °C. A heater is placed between the flasks, at an equal distance from each of them. After the heater has been on for 5 minutes, the thermometers show these readings.



(a) Write down the temperature readings shown on the two thermometers.

thermometer A: .....

thermometer B: ..... [2]

(b) **(i)** Calculate the temperature change for each flask.

black flask .....

silver flask ..... [3]

(ii) Explain why the two thermometers show different temperature changes.

..... [1]

5 A student was given two aqueous solutions, **A** and **B**. She carried out tests on the two solutions to identify the salts. Her results are shown in the table below.

solution	result of adding sodium hydroxide solution	result of adding silver nitrate solution	result of adding barium chloride solution
A	blue precipitate	white precipitate	no change
B	white precipitate, soluble in excess	no change	white precipitate

Identify the ions in **A** and **B**.

	positive ions	negative ions
A	.....	.....
B	.....	..... [3]

6 The table shows the pulse rate of a person who did vigorous exercise for one minute.

time / min	0	1	2	3	4	5	6	7
pulse rate / beats per minute	72	108	96	84	78	76	72	72

(a) State the pulse rate before exercise.

..... [1]

(b) State the effect of exercise on the pulse rate.

..... [1]

(c) Describe what happened to the pulse rate after the exercise stopped.

.....

..... [2]

(d) How long did it take for the person to recover from the exercise?

..... [1]

[Turn over

For Examiner's Use

7 2.0 g of lithium reacted with excess water and the volume of hydrogen produced was measured at intervals. The results are shown in the table.

time / minutes	volume of hydrogen / cm^3
1	8
2	24
3	72
4	138
5	172
6	172

(a) Draw a graph of volume of hydrogen against time on the graph paper on the next page.

(b) Calculate the rate of reaction, in volume of hydrogen produced per minute, between 3 and 4 minutes.

..... [1]

(c) Explain why the volume of hydrogen did not change between 5 and 6 minutes.

.....

..... [1]

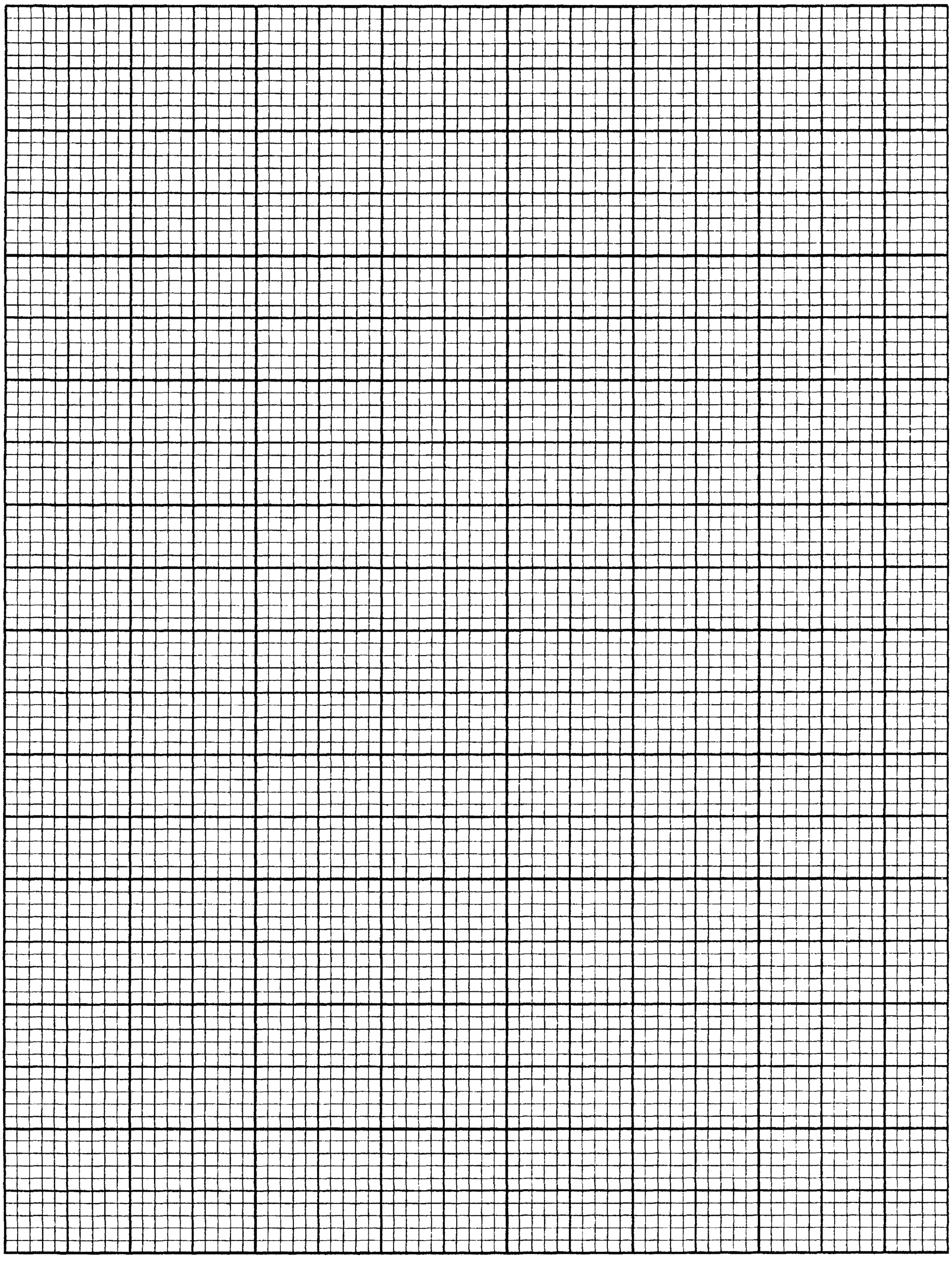
(d) In the reaction, lithium hydroxide was also produced.

Write a balanced equation for the reaction.

..... [2]

(e) What is the result if the solution is tested with litmus paper?

..... [1]



[4]

For Examiner's Use

8 25 cm^3 of 0.1 mol / dm^3 sodium hydroxide was titrated with sulphuric acid, using methyl orange indicator. The results of the titrations are shown in the following table.

titration	1	2	3
final reading / cm^3	12.55	25.60	39.50
initial reading / cm^3	0.00	13.00	27.00
volume used / cm^3	12.55	12.60	

(a) Complete the table. [1]

(b) What is the average volume of sulphuric acid used in the three titrations?

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

(c) Calculate the number of moles of sodium hydroxide used during the reaction.

moles = ... [2]

The equation below represents the reaction taking place between the sodium hydroxide and the sulphuric acid.

$$2NaOH(aq) + H_2SO_4(aq) \longrightarrow Na_2SO_4(aq) + 2H_2O(l)$$

(d) Use your answer from **(c)** to calculate the number of moles of sulphuric acid used.

moles = ... [2]

(e) Use your answers from **(b)** and **(d)** to calculate the concentration of the sulphuric acid.

concentration = ... mol/dm^3 [2]

For Examiner's Use

9 A student wants to find out if osmosis occurs when two solutions, **A** and **B**, made from the same solute, are separated by a partially permeable membrane. He used the following materials:

– Visking / dialysis tubing

– string

– capillary tube

– beaker

– solution **A** (dilute)

– solution **B** (concentrated)

(a) Draw a diagram of the experiment the student would set up. Labels are not required.

[3]

(b) The student found that water moved into the Visking tubing. On your diagram, use label lines to show where he had placed solutions **A** and **B**. [2]

For Examiner's Use

(c) The student decided to investigate whether strips of potato tuber would absorb water by osmosis when he placed them into solutions **A** and **B**. Solution **A** is less concentrated than the cell sap, while solution **B** is more concentrated. Two potato strips, **X** and **Y**, peeled on one side, were used, as shown in Fig. 9.1.

Fig. 9.1

(i) State two ways in which the strips should be similar before the experiment.

.....

..... [2]

(ii) If **X** is placed in solution **A** and **Y** in solution **B**, show the appearance of each strip after an hour.

[2]

10 Fig. 10.1 shows an experiment to investigate seed germination.

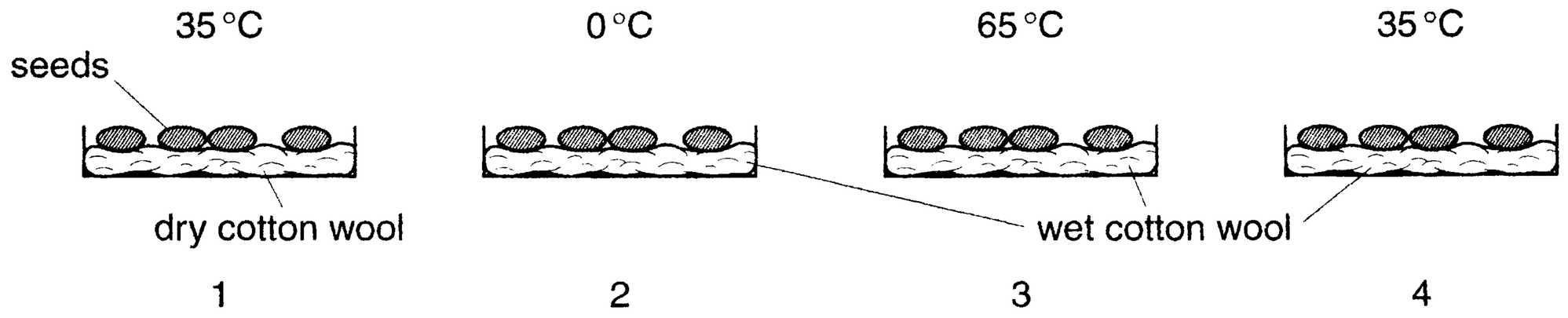


Fig. 10.1

(a) In which Petri dish would the seeds germinate?

..... [1]

(b) Explain why the seeds would not germinate in the other Petri dishes.

.....

.....

.....

..... [4]

(c) State **one** factor that is available to the seeds in all the Petri dishes.

..... [1]