

Candidate Name _____

Centre Number	Candidate Number

International General Certificate of Secondary Education
CAMBRIDGE INTERNATIONAL EXAMINATIONS
PHYSICAL SCIENCE
PAPER 6 Alternative to Practical

0652/6

MAY/JUNE SESSION 2002

1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

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.

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

This question paper consists of 16 printed pages.

- 1 A balance was made using a metre rule. The student hung it at the 50 cm mark. The rule was free to swing and was balanced when it was horizontal.

- (a) A 40 g mass was placed on the 10 cm mark of the rule. A load, l , was placed on the 90 cm mark. The rule stayed in the horizontal position. This is shown in Fig. 1.1.

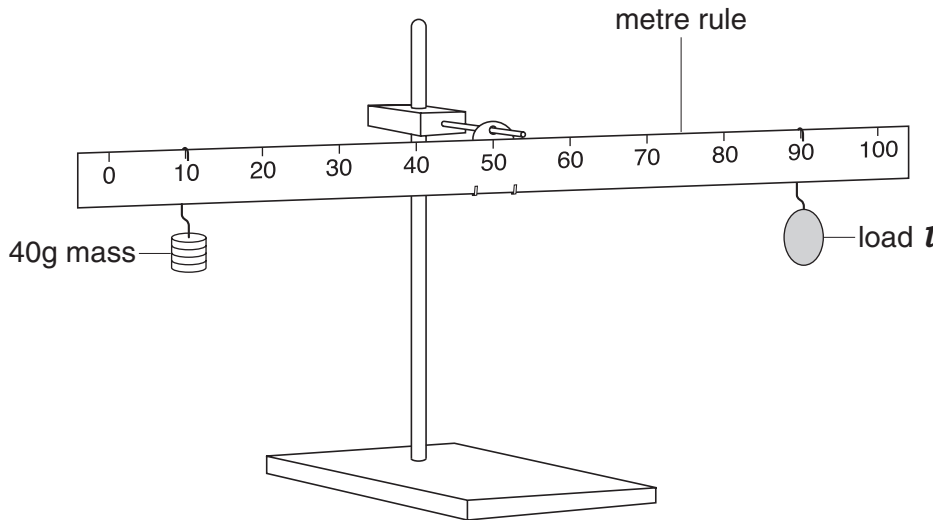


Fig. 1.1

- (i) Calculate the distance d_1 , from the 40 g mass to the 50 cm mark.

$$d_1 = \dots\dots\dots\text{cm} \quad [1]$$

- (ii) Calculate the distance d_2 from the load l to the 50 cm mark.

$$d_2 = \dots\dots\dots\text{cm} \quad [1]$$

The rule stayed in the horizontal position.

- (iii) What was the mass of the load, l ?

$$l = \dots\dots\dots\text{g} \quad [1]$$

- (b) The student was told to use the apparatus to find the mass of another load m , which was heavier than load l .

He made the metre rule balance by putting the 40 g mass and the load m in the places shown in the diagram, Fig. 1.2.

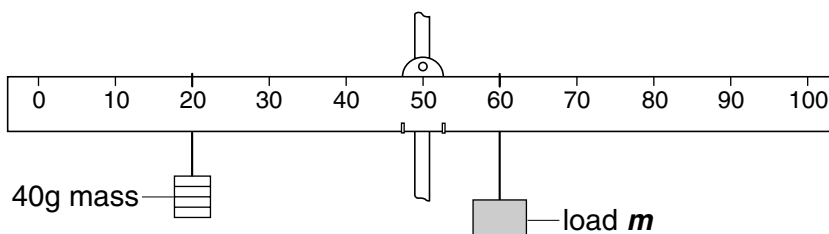


Fig. 1.2

(i) Calculate the mass of the load m .

$m = \dots\dots\dots$ g [3]

(ii) The load, m , was a cube of metal. The actual size of the cube is shown in Fig. 1.3. Measure one side of the cube and calculate its volume in cm^3 .

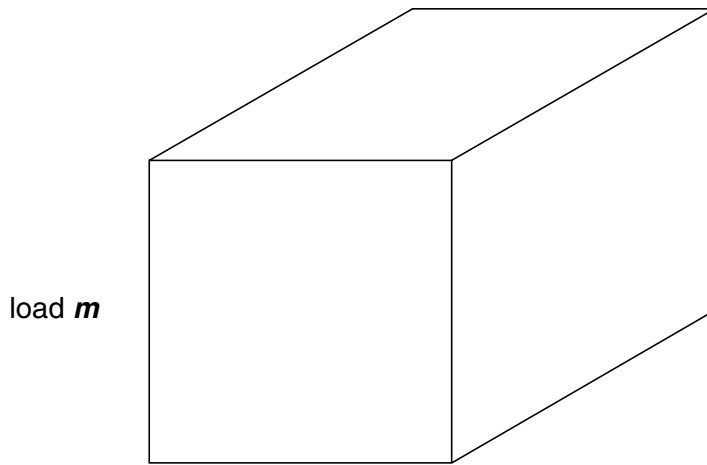


Fig. 1.3

length of one side of the cube = $\dots\dots\dots$ cm [1]

volume of the cube = $\dots\dots\dots$ cm^3 [1]

- (c) The student left the cube and the 40 g mass hanging on the rule. He hung the cube in a beaker of water. Then he moved the 40 g mass so that the rule would balance.

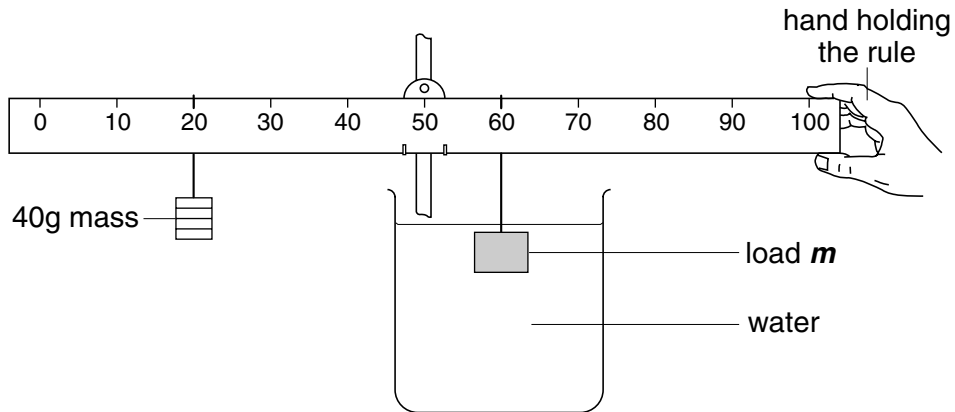


Fig. 1.4

- (i) On Fig. 1.4, draw an arrow to show which way he moved the 40 g mass to make the rule balance again. [1]
- (ii) Explain how you decided which way to draw the arrow.

.....

.....[1]

- 2 A student carried out tests on two white powders, potassium carbonate and potassium hydrogencarbonate. He recorded the results in the table, Fig. 2.1. Study the table and answer the questions which follow.

test	result for potassium carbonate	result for potassium hydrogencarbonate
1 (a) Add a portion of the powder to cold water and shake. (b) Add a portion of the powder to hot water and shake.	<i>a colourless liquid</i> <i>a colourless liquid</i>	<i>white powder below a colourless liquid</i> <i>a colourless liquid</i>
2 (a) Add a few drops of Universal Indicator to some of the solution from 1 (b) . (b) Boil the mixture from 2 (a) .	<i>dark blue</i> <i>stays dark blue</i>	<i>green/blue</i> <i>gradually turns dark blue</i>
3 (a) Heat a portion of the dry white powder. (b) Test the gas from 3 (a) with limewater. (c) Dissolve the residue from 3 (a) in water, add solid ammonium chloride and heat the mixture.	<i>stays white, no gas given off</i> <i>no reaction (no gas)</i> <i>a gas is given off which has a pungent smell and turns damp red litmus blue</i>	<i>stays white, a gas is given off</i> <i>limewater turns milky</i> <i>a gas is given off which has a pungent smell and turns damp red litmus blue</i>
4 (a) Add dilute nitric acid to some of the solution from 1 (b) . (b) Add aqueous barium nitrate to the mixture from 4 (a) .	<i>bubbles of a gas are given off</i> <i>a colourless solution</i>	<i>bubbles of a gas are given off</i> <i>a colourless solution</i>

Fig. 2.1

- (a) Which is more soluble in water, potassium carbonate or potassium hydrogencarbonate? Explain your answer.

.....
[1]

(b) (i) Suggest the pH value of potassium carbonate solution.

.....[1]

(ii) What happens to the pH value when potassium hydrogencarbonate solution is boiled?

.....[1]

(c) Name the gas given off when potassium hydrogencarbonate is heated.

.....[1]

(d) Name the gas given off in test 3 (c).

..... [1]

(e) How do the two observations in tests 4 (a) and 4 (b) differ from the results of a test for a sulphate?

.....
.....[2]

(f) The reaction of potassium carbonate with hydrochloric acid is exothermic.
The reaction of potassium hydrogencarbonate with hydrochloric acid is endothermic.
Using this information, describe an experiment to decide if a sample of a white powder is potassium carbonate or potassium hydrogencarbonate.
Briefly describe what you would do and state what measurements you would make.

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.....
.....
.....[3]

- 3 A student wants to find out if flower petals contain one coloured substance or two. He follows the procedure shown in Fig. 3.1.

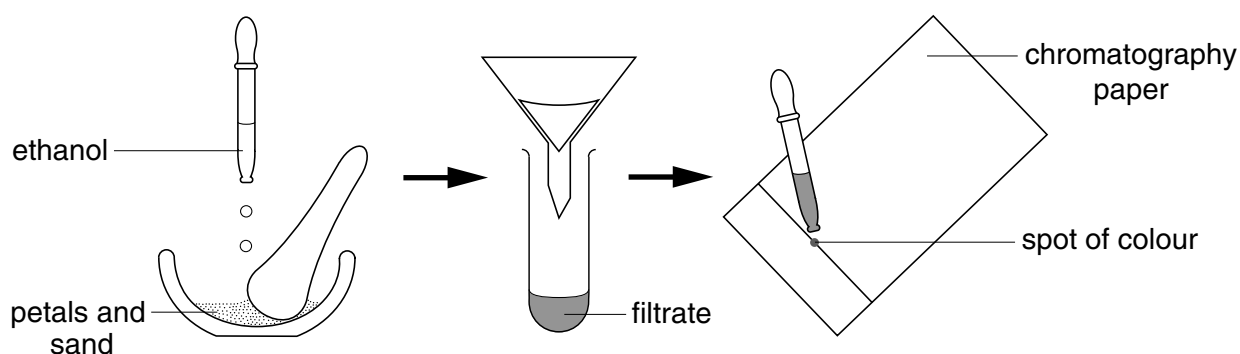


Fig. 3.1

- He grinds the petals with sand and adds a few cm^3 of ethanol. The ethanol dissolves the coloured substance in the petal.
- He filters the mixture and collects the filtrate in a test-tube.
- He places a drop of the filtrate on a piece of chromatography paper and allows it to dry. He repeats this to make a spot of colour on the paper.

- (a) Suggest a reason why ethanol is better than water for this experiment.

.....[1]

- (b) (i) The student uses the chromatography paper to find out if the colour contains one substance or two.
Draw a diagram showing how he does this experiment.

[3]

- (ii) The student concludes that there are two substances in the petal colour. On the diagram, Fig.3 .2, show what the chromatography paper looks like after the experiment.

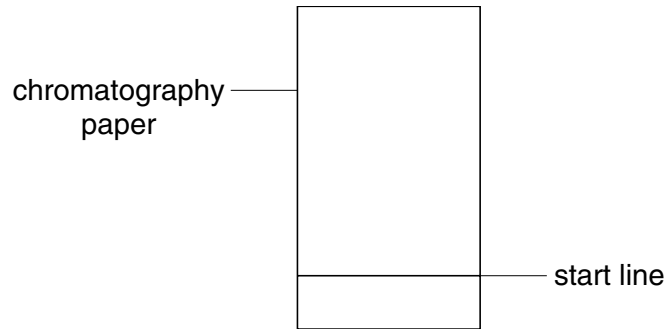


Fig. 3.2

[2]

- (c) Describe how the student can find out if the filtrate will act as an acid-base indicator.

.....
.....
.....[2]

- 4 A student investigated the way in which a current in a piece of wire varied with its length. He set up the circuit shown in Fig. 4.1.

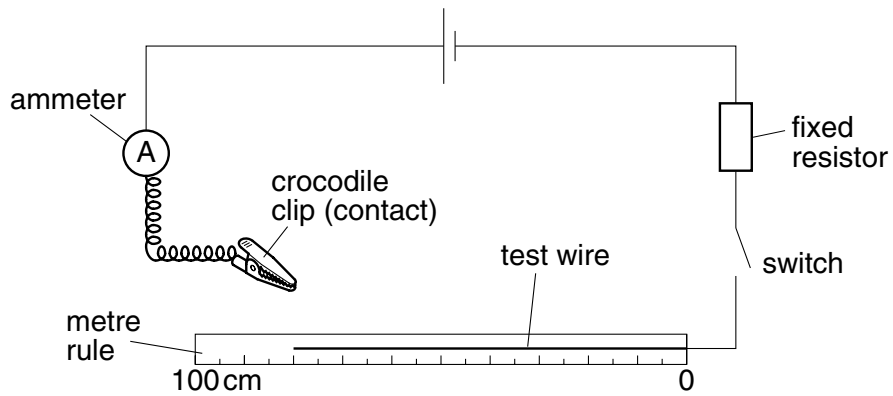


Fig. 4.1

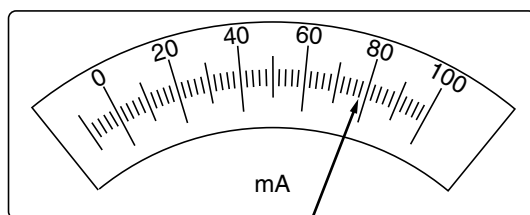
- He closed the switch and touched the contact on the wire at the 100 mm (10 cm) mark.
- He read the ammeter and recorded the reading in Fig. 4.2.
- He repeated this procedure, touching the wire at the lengths shown in Fig. 4.2.

- (a) The ammeter scale for three of his readings is shown in Fig. 4.3. Record the readings in Fig. 4.2.

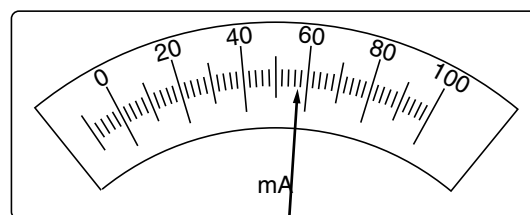
length of wire/mm	100	200	450	650	750
ammeter reading/mA	92				44

[3]

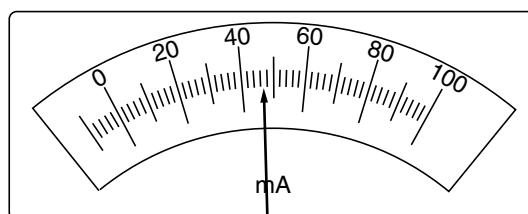
Fig. 4.2



length of wire = 200mm



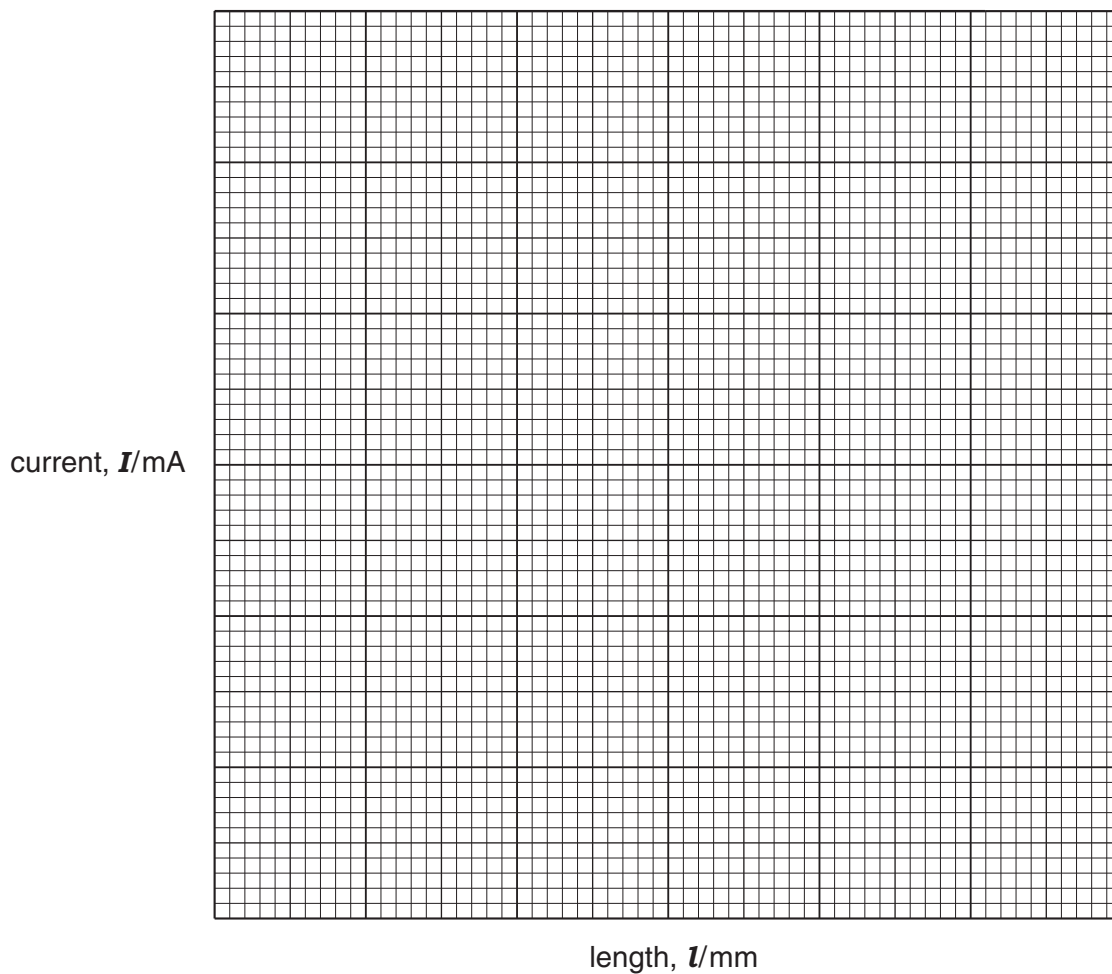
length of wire = 450mm



length of wire = 650mm

Fig. 4.3

- (b) Plot a graph of current, I , against length of wire, l , on the grid provided. Draw a suitable line through the points.



[2]

- (c) Use your graph to determine the current, I , flowing through an identical piece of wire of length 1000 mm.

.....[1]

- (d) Using the value of I from (c), calculate the resistance of 1000 mm of this wire using the formula

$$R = \frac{E}{I} \times 1000$$

E is the voltage of the cell used in the circuit, 1.5 V.

resistance of 1000 mm of wire = ohms [1]

- (e) Ohm's Law states that the current through a wire is directly proportional to the voltage across its ends.

Briefly explain how you would carry out an experiment to verify Ohm's Law. Draw a diagram of the circuit you would use. Include in the circuit a variable resistor and a voltmeter.

.....

.....

.....

.....[3]

- 5 A student investigated the rate at which a Bunsen burner supplied heat to a beaker of water.

Using a measuring cylinder he put 250 cm^3 of cold water into a beaker and recorded the temperature.

He heated the water using a Bunsen burner, with the gas full on. He stopped heating before the water reached boiling point.

Using a stopclock, he recorded the time of heating.

He removed the Bunsen burner and recorded the highest temperature reached by the water.

- (a) The initial and final temperatures of the water are shown on the thermometer scales below (Fig. 5.1). Record these in the spaces provided.



Fig. 5.1

initial temperature =°C final temperature =°C [2]

- (b) Calculate the rise in temperature.

rise in temperature =°C [1]

- (c) The heat gained by the water is given by the following formula.

$$\text{heat gained by water} = 0.25 \times 4200 \times \text{temperature rise}$$

Calculate the heat gained by the water.

heat gained by water =joules [1]

- (d) The rate at which the water gained heat, in joules per minute, is given by the following formula.

$$\text{rate of heat gain} = \frac{\text{total heat gained by water}}{\text{time}}$$

The student heated the water for 3 minutes. Calculate the rate at which the water gained heat.

rate of heat gain =joules per minute [1]

- (e) Does this answer give an **accurate** value for the rate at which the Bunsen burner gave out heat? Explain your answer.

.....
.....
.....[2]

- (f) Why is it important **not** to let the water reach boiling point in the experiment?

.....
.....[2]

- 6 A student investigated the viscosity (thickness) of three oils, **X**, **Y** and **Z**. She marked two lines 25 cm apart on a glass plate. She set the glass plate at an angle by resting it on a wooden block (Fig. 6.1).

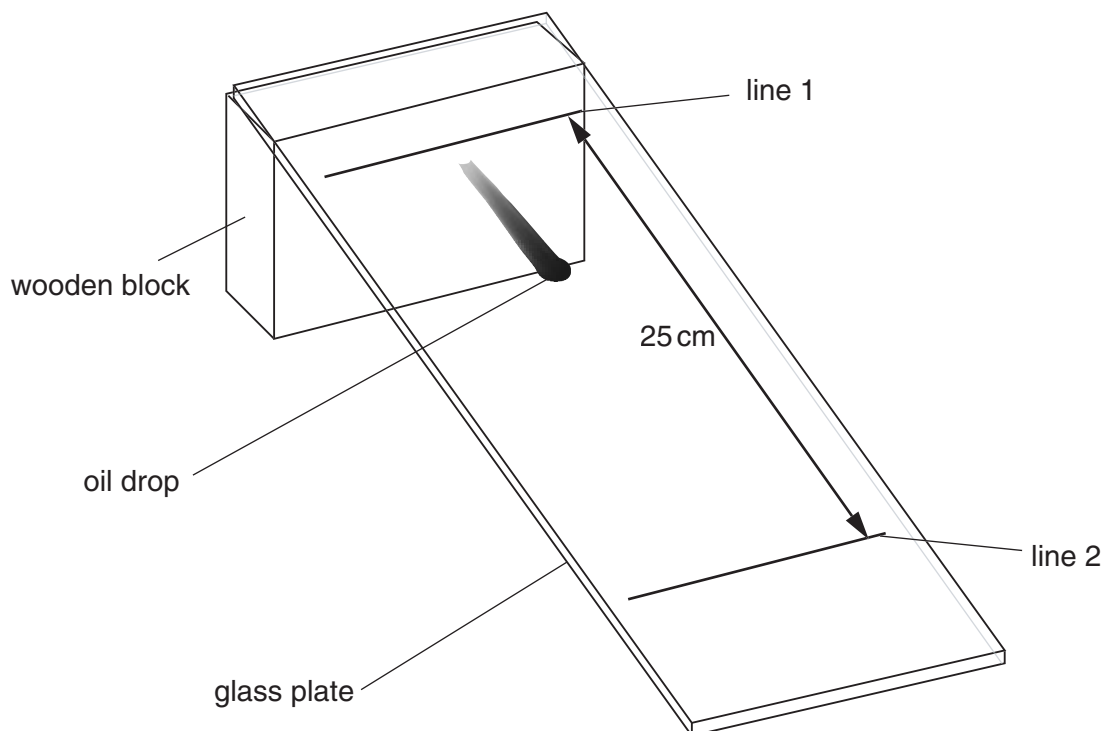


Fig. 6.1

Using a teat pipette she put one drop of the first oil, **X**, on line 1 and started a stopclock. She timed how long it took for the oil to run down the plate and reach line 2. She recorded this time in Fig. 6.3.

She cleaned the glass plate and repeated the experiment with the other two oils, **Y** and **Z**.

- (a) The times for the oils **Y** and **Z** are shown on the clocks below (Fig. 6.2).

Record these times in the table of results (Fig. 6.3).

[2]

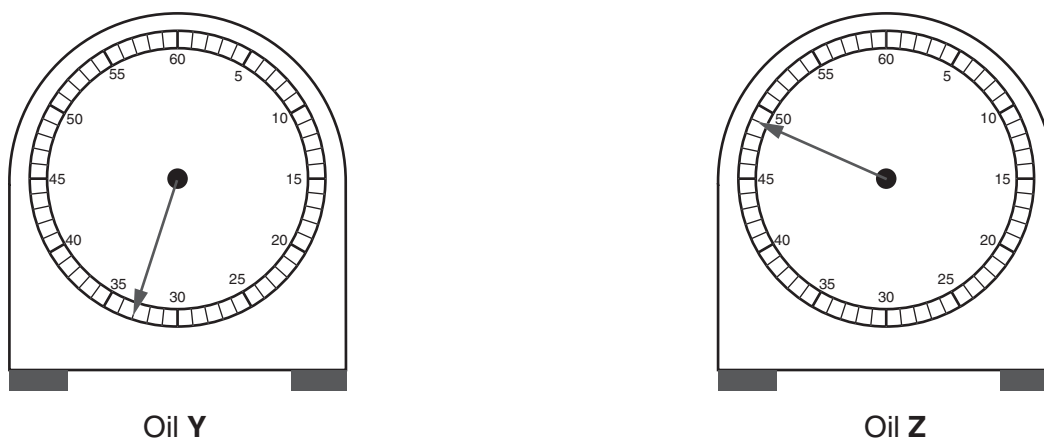


Fig. 6.2

oil	time/s
X	58
Y	
Z	

Fig. 6.3

(b) Name the force that causes the oils to run down the glass plate.

.....[1]

(c) From the results, which one of the three oils is the thickest? Explain your answer.

.....
.....[1]

(d) Why did the student clean the glass plate after each experiment?

.....
.....[1]

(e) The student repeated the experiment, this time using *smaller* drops of oil. Suggest what effect this could have on the times taken for the drops to run down the plate. Explain your answer.

.....
.....
.....[2]

(f) Suggest a way in which the student could improve the accuracy of the results.

.....
.....[1]

- 7 A student was told to carry out experiments on a mixture of two solids. She recorded her results as shown.

State the conclusions that the student could make from the results of each test.

- (a) Dilute hydrochloric acid added to mixture.

result – part of the mixture dissolved, a gas was given off which turned limewater milky and a blue solution was formed.

conclusions

.....

.....[2]

- (b) Mixture added to water in a test-tube, shaken and allowed to settle.

result – colourless liquid formed with green solid at the bottom of the tube.

conclusion[1]

- (c) Dilute nitric acid and aqueous silver nitrate added to the colourless liquid from test (b).

result – white precipitate formed.

conclusion[1]

- (d) Green solid from test (b) dissolved in dilute hydrochloric acid and excess aqueous sodium hydroxide added to the solution.

result – light blue precipitate formed.

conclusion[1]