



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
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PHYSICAL SCIENCE

0652/62

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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
Total	

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



- 1 A student is doing an experiment to find an accurate value for the electrical resistance of a piece of wire.

For
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Use

He is using the apparatus shown in Fig. 1.1. To complete the circuit, the student places the contact at a point on the wire under test. The voltmeter shows the potential drop across the wire and the ammeter shows the current passing through it.

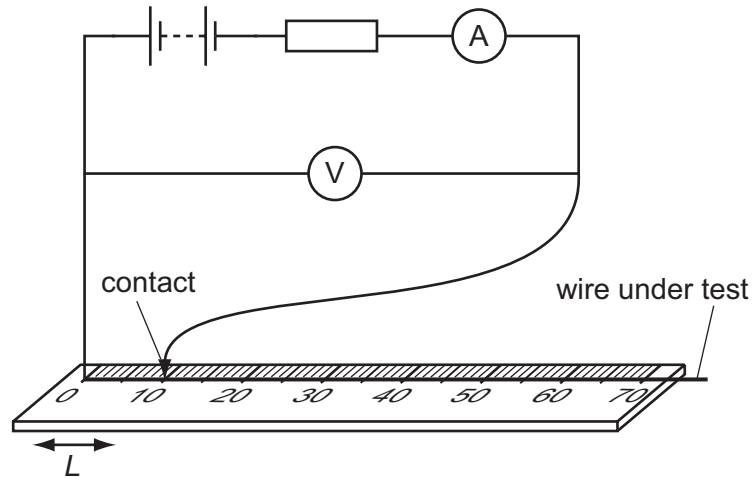


Fig. 1.1

- he closes the switch and places the contact on the wire at the 10 cm mark
- he records the ammeter and voltmeter readings in Table 1.1
- he places the contact at a different place on the wire and records the new ammeter and voltmeter readings
- he repeats this until he has five sets of readings

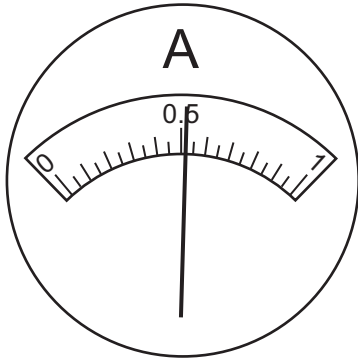
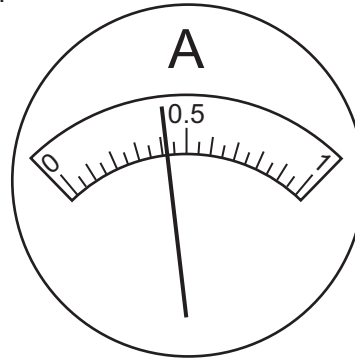
Table 1.1

length L / cm	current, I / A	potential drop, V / V	resistance, R_L / ohms	resistance of 100 cm of wire / ohms
10	0.81	0.36	0.44	4.40
25	0.65	0.73	1.12	4.48
40				
60				
70	0.39	1.20	3.07	4.39

- (a) (i) The ammeter and voltmeter readings using 40 cm and 60 cm of wire are shown in Fig. 1.2. Read the meters and record the values in Table 1.1. [4]

3

ammeter

 $L = 40 \text{ cm}$  $L = 60 \text{ cm}$

voltmeter

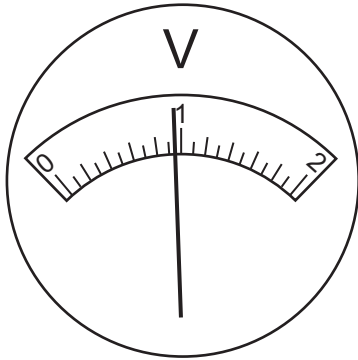
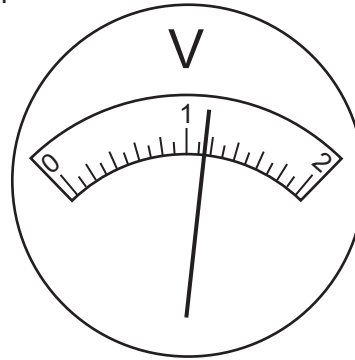
 $L = 40 \text{ cm}$  $L = 60 \text{ cm}$

Fig. 1.2

- (ii) Use the formula $R_L = \frac{V}{I}$ to calculate the values of the resistance R_L for 40 cm and 60 cm of the wire.

Show your working in the space below.

Record your answers in Table 1.1.

For
Examiner's
Use

[2]

- (iii) Use the formula $\frac{R_L}{L} \times 100$ to calculate the resistance of 100 cm of the wire for the lengths 40 cm and 60 cm.

Show your working in the space below.

Record your answers in Table 1.1.

For
Examiner's
Use

[2]

- (b) Suggest **one** reason why the calculated values for the resistance of 100 cm of the wire are all slightly different.

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

- (c) How would you use the results of this experiment to find a more accurate value for the resistance of 100 cm of the wire?

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

- 2 A student is investigating forces acting at different angles. He is using the apparatus shown in Fig. 2.1.

For
Examiner's
Use

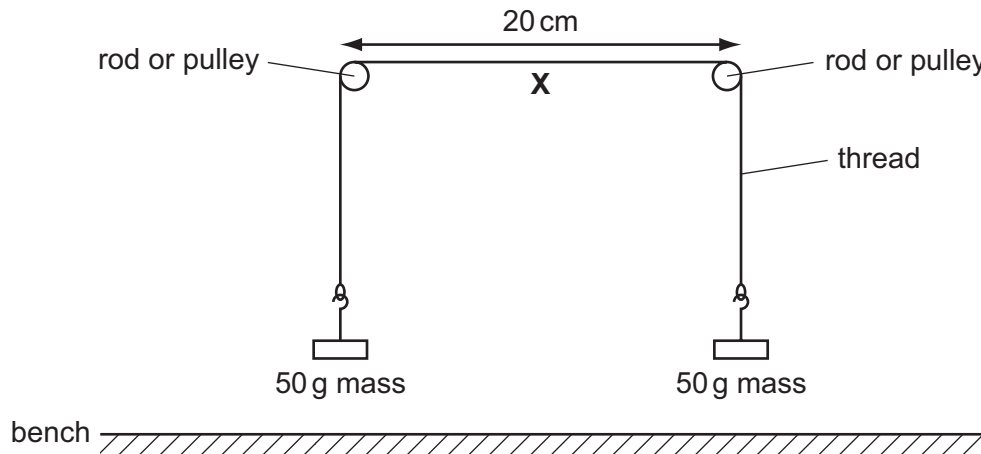


Fig. 2.1

- He hangs a 20 g mass, m , half way between the pulleys, at point **X**.
- He places a protractor behind point **X** so that angle θ can be measured, as in Fig. 2.2.
- He measures angle θ and records it in Table 2.1.
- He repeats the experiment using masses of 40, 60 and 80 g for mass, m .

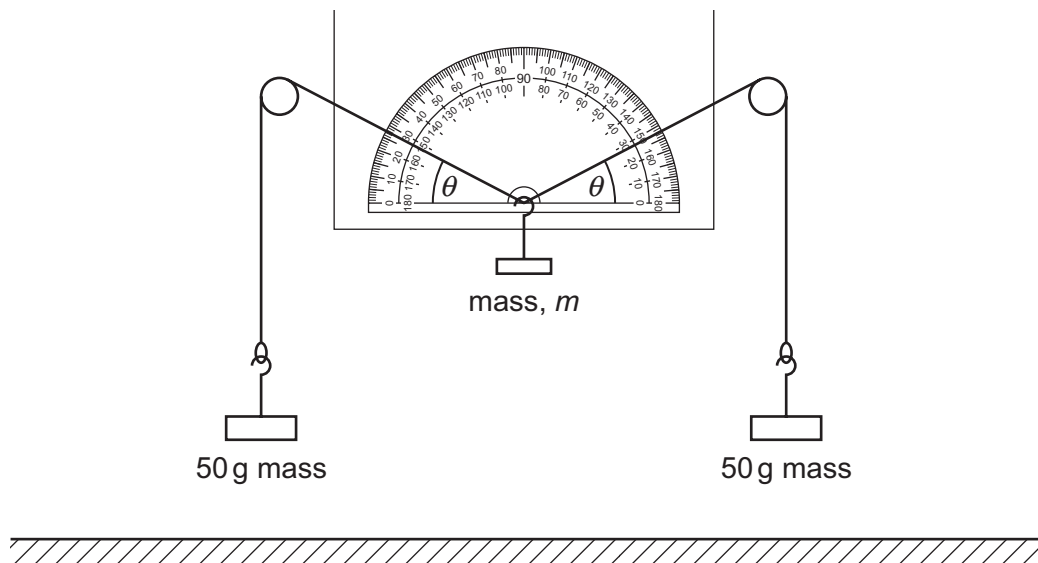


Fig. 2.2

Table 2.1

mass, m/g	angle $\theta/^\circ$	sine θ
0	0	0.00
20	11	0.19
40	22	0.37
60		
80		

For
Examiner's
Use

(a) (i) Fig. 2.3 and 2.4 show the angles at point X for the masses $m = 60\text{ g}$ and $m = 80\text{ g}$.

For each diagram, read angle θ and record it in Table 2.1.

[2]

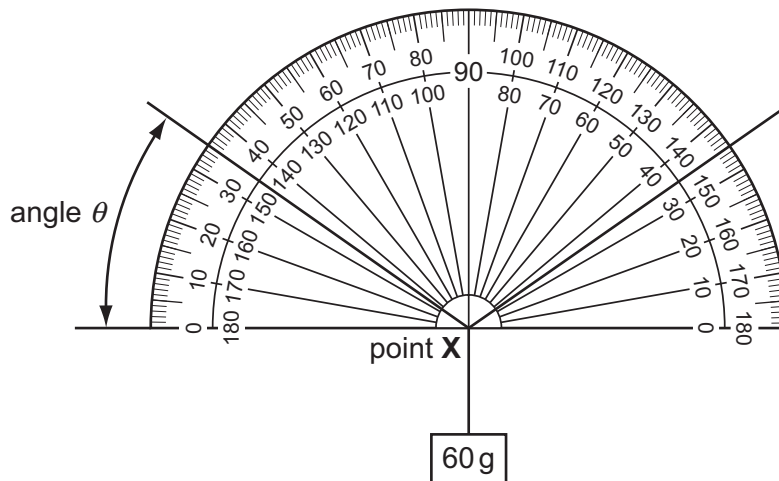


Fig. 2.3

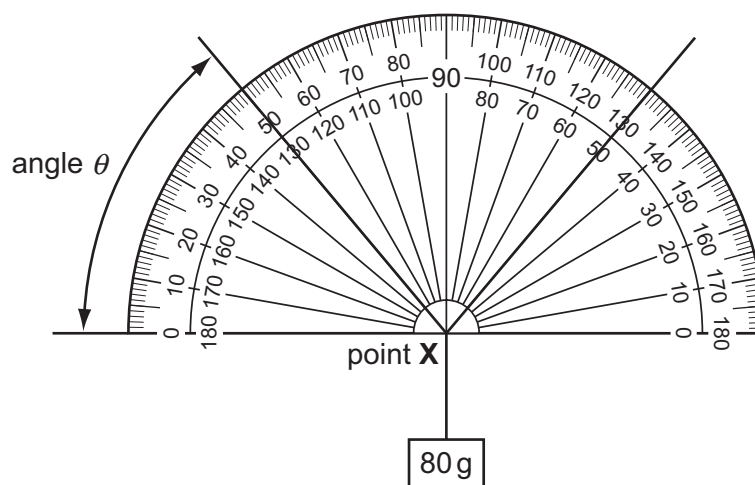


Fig. 2.4

- (ii) Use Table 2.2 to find the sines of the angles you have recorded in column 2 of Table 2.1.

Record them in column 3 Table 2.1.

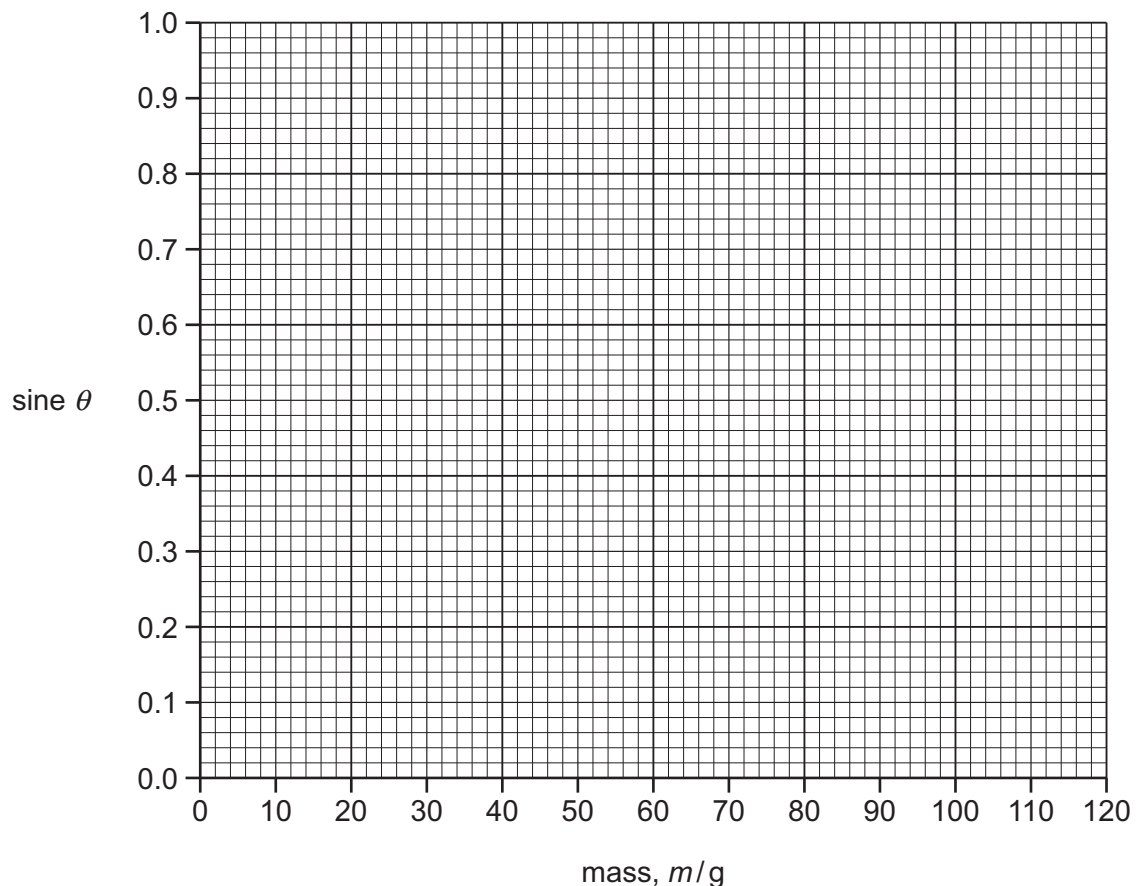
[2]

Table 2.2

angle $\theta/^\circ$	sine θ	angle $\theta/^\circ$	sine θ	angle $\theta/^\circ$	sine θ
0	0.00	35	0.57	70	0.94
5	0.09	40	0.64	75	0.97
10	0.17	45	0.71	80	0.98
15	0.26	50	0.77	85	1.00
20	0.34	55	0.82	90	1.00
25	0.42	60	0.87		
30	0.50	65	0.91		

- (b) (i) Plot a graph of sine θ (vertical axis) against mass, m on the grid below.

Draw the best straight line. Extend it to the value of sine $\theta = 1.0$.



[3]

(ii) Read and record the value of mass, m , when $\sin \theta = 1.0$.

When $\sin \theta = 1.0$, mass $m = \dots\dots\dots$ g [1]

For
Examiner's
Use

(iii) In theory, m , from (b)(ii) should equal the sum of the two masses on the ends of the thread (= 100 g). In practice it is rarely equal to the sum of the two masses.

Suggest another force, acting in the apparatus, which could cause the difference.

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

(c) Suggest how the results of this experiment will compare if the experiment is carried out on the surface of the Moon, where the acceleration due to gravity is much smaller than on Earth.

Explain your answer.

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

- 3 The science class is analysing **solid A** and aqueous **solution B**. **Solid A** is an element in the form of a grey powder. **Solution B** contains one cation and one anion, It is a yellow colour.

For
Examiner's
Use

Complete Table 3.1 showing the tests (a) – (d), observations and conclusions.

Table 3.1

test	observation	conclusion
(a) Place a spatula load of solid A in a test-tube. Add dilute hydrochloric acid. Test the gas with a lighted splint. [2]	Solid A is a metal. The gas given off is [1]
(b) To 2 cm ³ of solution B add 2 cm ³ of aqueous sodium hydroxide.	The yellow solution turns to a precipitate. [1]	The cation in solution B is iron(III), Fe ³⁺ .
(c)(i) To 10 cm ³ of solution B in a large test-tube add a spatula full of solid A . Stir the mixture and allow the solid to settle to the bottom.	The yellow solution turns to a [1] colour.	The Fe ³⁺ ions have been changed to Fe ²⁺ ions.
(ii) Filter the mixture from (c)(i). To 2 cm ³ of the filtrate add 2 cm ³ of aqueous sodium hydroxide.	A precipitate is formed which has a [1] colour.	The name of the precipitate is [1]
(d) To 2 cm ³ of solution B add dilute nitric acid then aqueous silver nitrate. [1]	Solution B contains the chloride ion.

(e) Suggest the identity of the metal in **solid A**. [1]

(f) Write the formula of the compound in **solution B**.

..... [1]

- 4 The science class is studying chemical reactions that involve a change of temperature. The teacher carries out four experiments.

For
Examiner's
Use

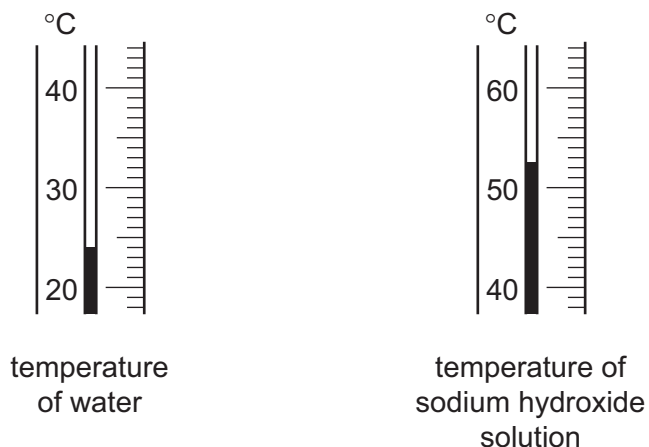
experiment 1

The teacher places 100cm^3 of water in a beaker and finds its temperature using a thermometer. She adds 10g of sodium hydroxide pellets and stirs until the pellets have dissolved, then she finds the new temperature.

- (a) (i) The thermometer scales are shown in Fig. 4.1.

Read the temperatures and record them in Table 4.1.

[2]



experiment 1

Fig. 4.1

Table 4.1

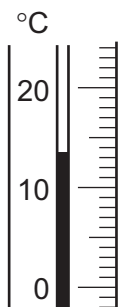
experiments 1 and 2	experiment 1	experiment 2
temperature of water/°C	temperature of sodium hydroxide solution/°C	temperature of ammonium nitrate solution/°C

experiment 2

The teacher weighs out 10g of ammonium nitrate crystals. She dissolves them in 100 cm³ of water which has the same temperature as in **experiment 1**.

For
Examiner's
Use

- (ii) The thermometer scale in Fig. 4.2 shows the new temperature. Record it in Table 4.1. [1]



temperature of
ammonium nitrate solution

experiment 2**Fig. 4.2**

- (iii) Each time, use **one** word to state the type of reaction that occurs in **experiment 1** and **experiment 2**.

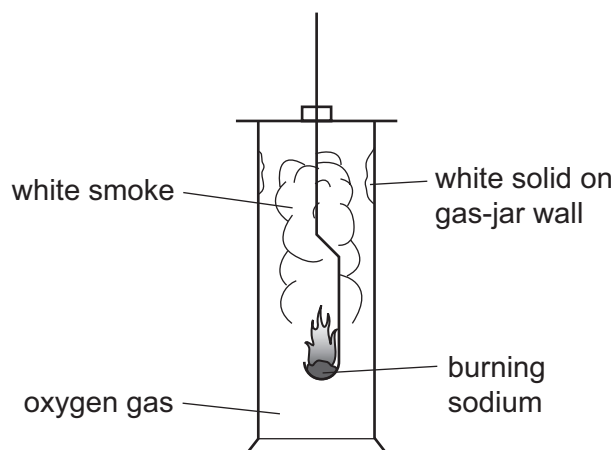
experiment 1

experiment 2 [2]

experiment 3

The teacher places a piece of sodium in a steel spoon. She heats the spoon until the sodium ignites. Then she lowers the spoon into a gas-jar of oxygen.

A flame is seen, the gas-jar fills with white smoke and a white solid forms on the gas-jar wall. This is shown in Fig. 4.3.

**Fig. 4.3**

- (b) The teacher says that during this reaction, bonds in oxygen are broken and bonds are formed in the white solid.

Give the names of these **two** types of bonds.

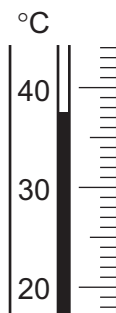
name of bonds in oxygen

name of bonds in white solid [2]

experiment 4

A student mixes 25 cm³ of sodium hydroxide solution with 25 cm³ of dilute hydrochloric acid. She finds and records the temperatures of the alkali, the acid and the mixture.

- (c) (i) Read the thermometer scale for the temperature of the mixture and record it in Table 4.2. [1]



temperature of mixture
of acid and alkali

experiment 4

Fig. 4.4

Table 4.2

temperature of sodium hydroxide solution / °C	21
temperature of hydrochloric acid / °C	22
temperature of mixture / °C	

For
Examiner's
Use

- (ii) The student thinks that the rise in temperature is because covalent bonds have been formed during the reaction. One of the products of the reaction must contain these covalent bonds.

*For
Examiner's
Use*

Explain how covalent bonds are formed. You may draw a diagram to illustrate your answer.

.....

.....

..... [2]

- 5 A student wants to find out how the change of temperature of dilute acid affects the rate of reaction. She uses ethanoic acid and a marble chip in the apparatus shown in Fig. 5.1. Bubbles of carbon dioxide are seen in the tube of water.

For
Examiner's
Use

- she takes the temperature of the dilute acid
- she places a marble chip in the test-tube, adds 20 cm³ of the acid and replaces the delivery tube
- she starts the clock
- she makes a mark in Table 5.1 every time she sees a bubble coming out of the end of the tube
- after 20 seconds, she stops making the marks
- she warms a new sample of the acid to the next temperature and repeats the procedure

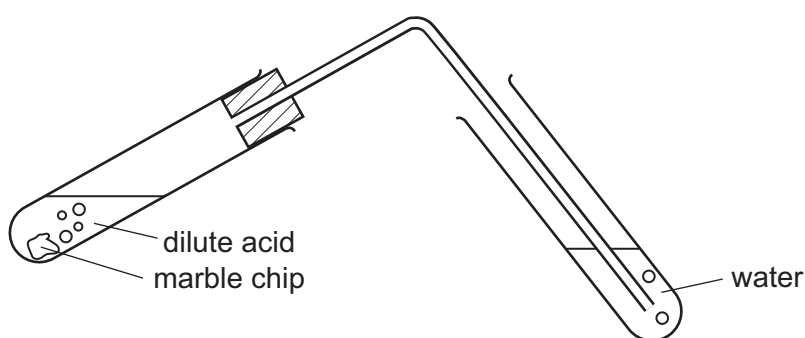


Fig. 5.1

Table 5.1 shows the number of bubbles that the student sees in 20s at each temperature.

Table 5.1

temperature /°C	bubbles given off in 20 s	number of bubbles in 20 s
18	/////	5
30	////////////////////	
42	////////////////////////////////////	
49	////////////////////////////////////	

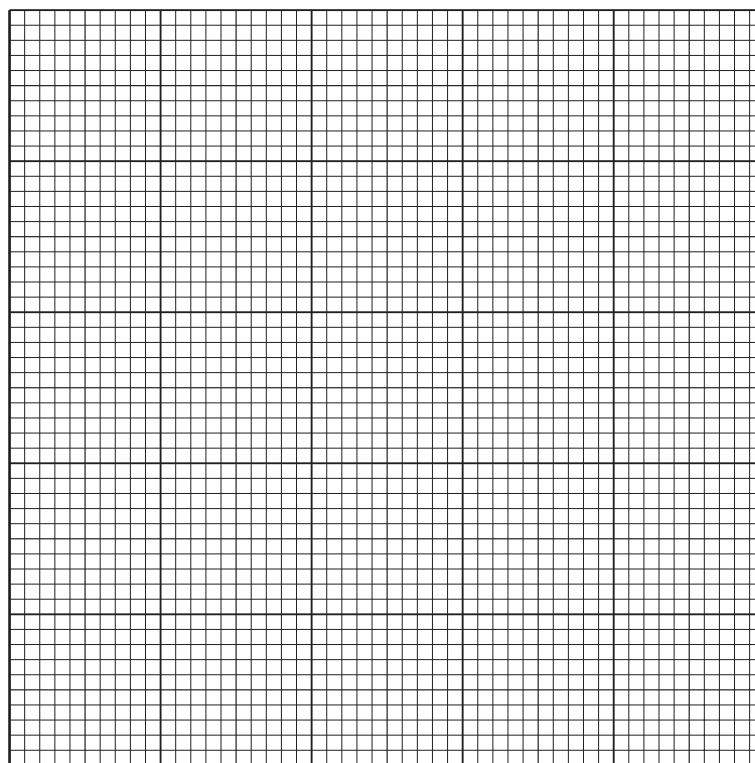
Count the numbers of marks in each row of column 2 and complete column 3 in Table 5.1. [1]

(b) Plot a graph of number of bubbles (vertical axis) against temperature.

Draw a smooth curve.

[3]

For
Examiner's
Use



(c) (i) Suggest why it will be difficult for the student to use a higher temperature for this experiment.

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

(ii) Explain, in terms of the behaviour of the reacting particles, why more carbon dioxide is given off when the temperature of the acid is raised.

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

- (d) (i) The student adds some limewater to the water through which the gas has bubbled. The mixture turns milky.

Write a word equation for this reaction.

..... [2]

- (ii) Explain why this reaction causes the limewater to turn milky.

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

For
Examiner's
Use

- 6 (a) The science teacher is doing an experiment to find the density of ice. He has cooled all the apparatus and chemicals to a temperature of -5°C in a freezer, to prevent the ice from melting.

For
Examiner's
Use

He has made ice cubes in the freezer. He places 4 ice cubes in a weighed beaker and weighs the beaker.

- (i) Fig. 6.1 shows the balance window. Read the scale to the nearest 0.1 g and record the mass in Table 6.1. [1]

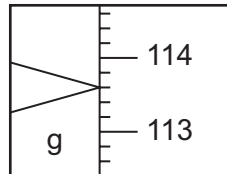


Fig. 6.1

Table 6.1

mass of beaker + ice /g	
mass of beaker /g	75.8
mass of ice /g	

- (ii) Calculate the mass of ice and complete Table 6.1.

[1]

- (b) The teacher pours 50 cm^3 of the hydrocarbon hexane, C_6H_{14} , into a 100 cm^3 measuring cylinder. Then he adds the ice cubes. This is shown in Fig. 6.2.

For
Examiner's
Use

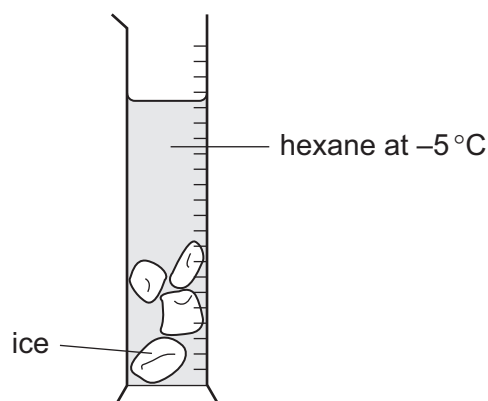


Fig. 6.2

- (i) Fig. 6.3 shows the scale of the measuring cylinder after the ice cubes have been added to the hexane.

Read the scale to the nearest 1 cm^3 and record the total volume in Table 6.2. [1]

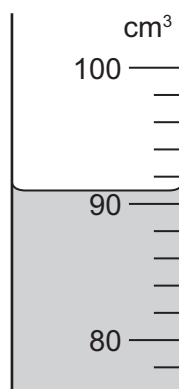


Fig. 6.3

Table 6.2

volume of hexane + ice / cm^3	
volume of hexane / cm^3	50
volume of ice / cm^3	

- (ii) Calculate the volume of the ice and complete Table 6.2.

[1]

- (c) Use data from Table 6.1 and Table 6.2 to calculate the density of ice in g/cm^3 .

For
Examiner's
Use

density of ice = g/cm^3 [2]

- (d) State **two** properties of hexane that make it a suitable liquid to use in this experiment. Fig. 6.2 will help you to do this.

1
2 [2]

- (e) Fig. 6.4 shows a polar bear.

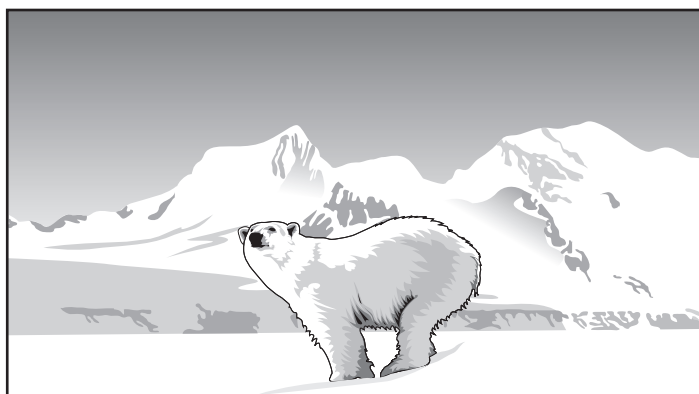


Fig. 6.4

- (i) A large part of the Arctic Ocean around the North Pole is covered by ice. Explain why it is important for animals such as the polar bear that the density of ice is lower than the density of sea-water.

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

- (ii) Considering your answer to (e)(i), how might global warming badly affect animals such as the polar bear?

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

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