UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

9314134517

CO-ORDINATED SCIENCES **0654/62**

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, graphs, tables or rough working.
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.

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UNIVERSITY of CAMBRIDGE International Examinations

1 **(a)** Fig. 1.1 shows drawings of a holly leaf and a grass leaf. Both are drawn to the same scale.

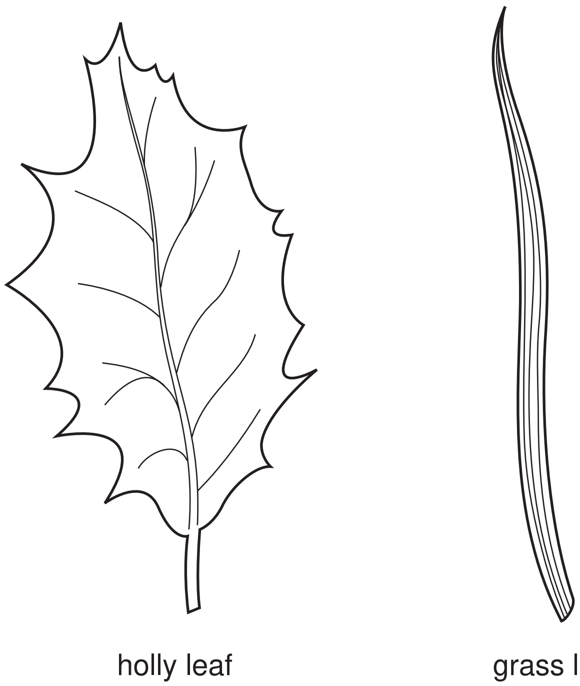


Fig. 1.1

(i) The **actual** length of the holly leaf, from the tip to the base, not including the stalk, was 45 mm.

Measure the length of the **drawing** of the holly leaf from tip to base, not including the stalk.

length of drawing .... mm

Calculate the magnification of the drawing.

Show your working.

magnification .... [2]

(ii) State **two visible** differences between the two leaves in Fig. 1.1, other than the difference in size.

1 ....

....

2 ....

.... [2]

(b) Leaves contain air-spaces. If a leaf is placed in hot water, the air in these spaces expands, and so some of the air can be seen escaping from the stomata of the leaf as bubbles.

A student placed a holly leaf and a grass leaf into hot water, and compared the amount of air bubbling out of the upper and lower surfaces of each leaf. The results are shown in Table 1.1.

Table 1.1

holly leaf		**grass leaf**	
bubbles from upper surface	**bubbles from lower surface**	**bubbles from upper surface**	**bubbles from lower surface**
no bubbles	large numbers of bubbles	very small numbers of bubbles	small numbers of bubbles

(i) The main function of the leaves of a plant is to carry out photosynthesis.

Explain how having air inside the leaves helps with this function.

....

.... [1]

(ii) Explain, in terms of leaf structure, the differences in the results from the upper and lower surfaces of the holly leaf.

....

....

.... [1]

(iii) Suggest why the structural difference between the two sides of the holly ... important.

....

....

.... [2]

(iv) Compare the results from the holly and grass leaves, and suggest a reason for any differences.

....

....

....

.... [2]

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

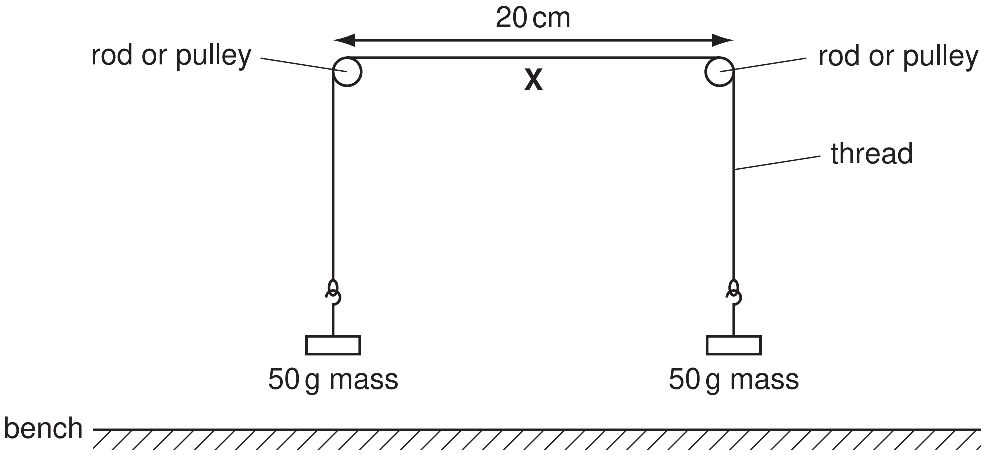


Fig. 2.1

- 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*.

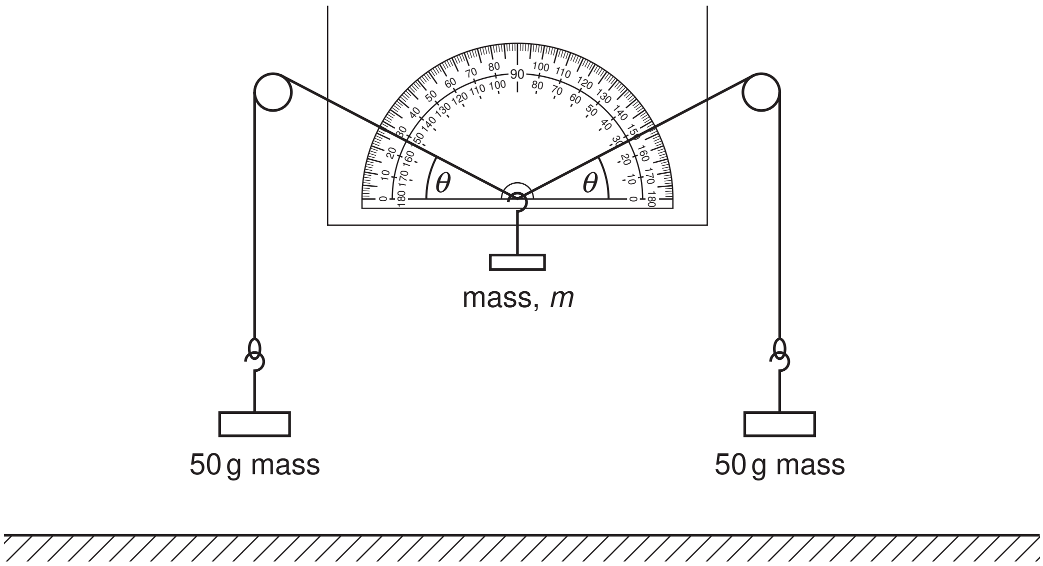


Fig. 2.2

Table 2.1

mass, *m* / g	angle *θ* / °	sine *θ*
0	0	0.00
20	11	0.19
40	22	0.37
60		
80		

(a) (i) Fig. 2.3 and 2.4 show the angles at point **X** for the masses m = 60 g and m = 80 g.

For each diagram, read angle θ and record it in Table 2.1. [2]

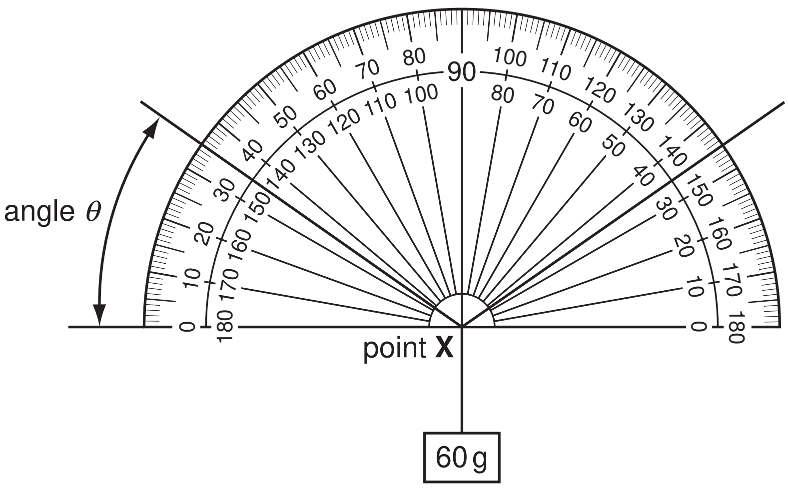


Fig. 2.3

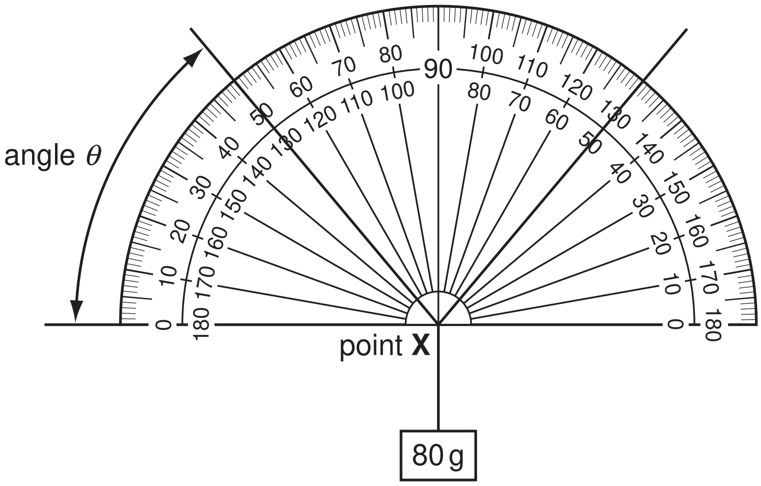


Fig. 2.4

(ii) Use Table 2.2 to find the sines of the angles you have recorded in colum… Table 2.1.

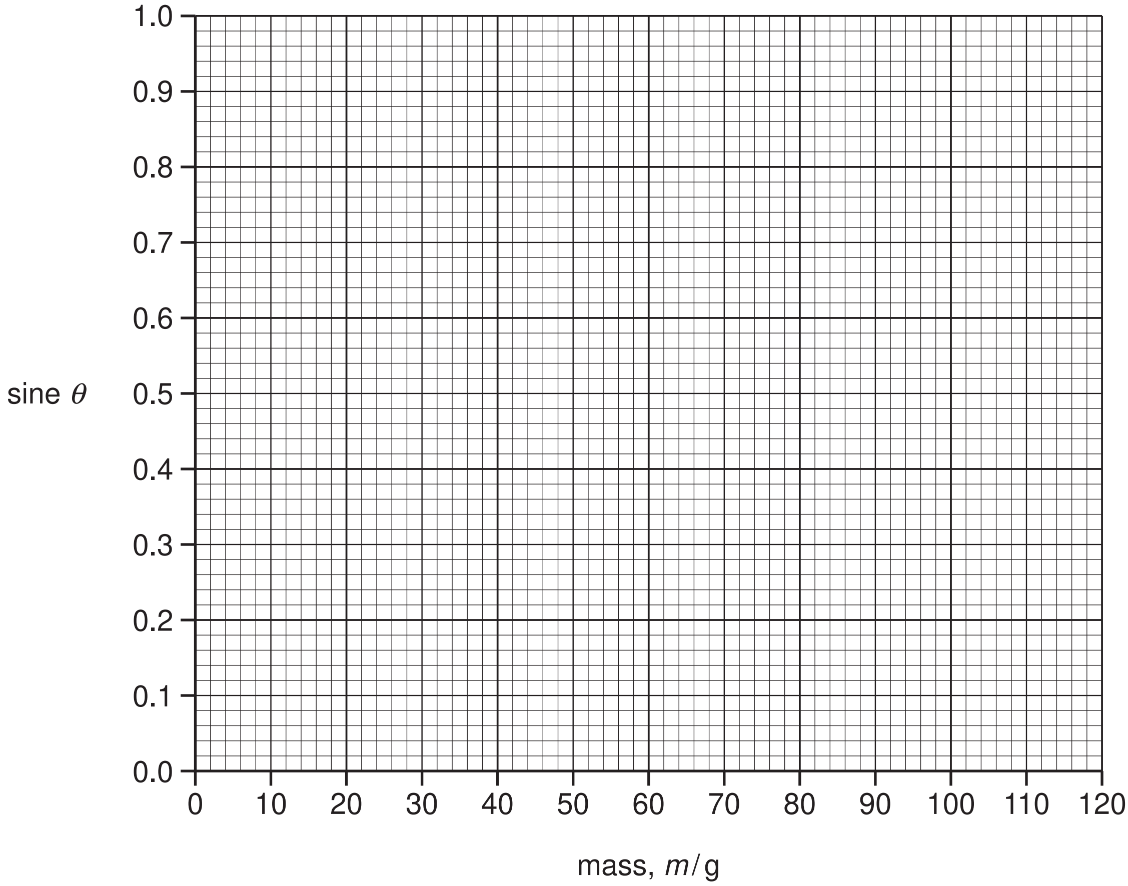
Record them in column 3 Table 2.1. [2]

Table 2.2

angle θ/°	sine θ	angle θ/°	sine θ	angle θ/°	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 θ = 1.0.



[3]

(ii) Read and record the value of mass, *m*, when sine θ = 1.0.

When sine θ = 1.0, mass *m* = ... g [

(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.

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 cm³ of **solution B** add 2 cm³ 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 cm³ 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 cm³ of the filtrate add 2 cm³ of aqueous sodium hydroxide.	A precipitate is formed which has a .... [1] colour.	The name of the precipitate is .... [1]
(d) To 2 cm³ 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 A student did an experiment to compare the amount of reducing sugar in different fl
Reducing sugar is found in nectar which is produced in nectaries inside some flow
Insects are attracted to the sugary solution and as they enter the flowers their bodies pi
up pollen.

The student used Benedict's solution to compare the amounts of reducing sugar. Benedict's solution can produce a range of colours that indicate different amounts of reducing sugar as shown in Table 4.1.

Table 4.1

colour	**blue**	**green**	**yellow**	**orange**	**brick-red**
relative concentration of reducing sugar	none	low	increasing concentration →		high

The flowers that were tested are shown in Fig. 4.1. The diagrams are not drawn to scale.

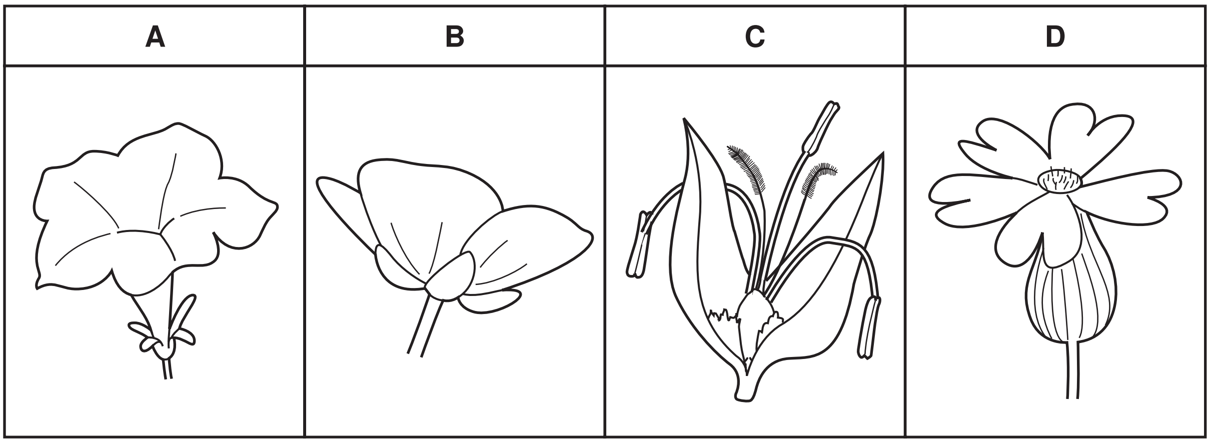


Fig. 4.1

(a) (i) All of the flowers used in this experiment were pale-coloured.

Suggest why.

....

.... [1]

(ii) Which one of the flowers is wind-pollinated?

Explain your answer.

....

.... [1]

(b) (i) Describe how the student tested the flowers for reducing sugar. In your answer include

1 how she prepared a suitable solution from the flowers,

....

....

....

2 how she carried out the test using Benedict's solution.

....

.... [3]

(ii) Describe **two** things the student did to make a fair comparison of the amount of reducing sugar in the flowers.

....

....

.... [2]

Table 4.2 shows the results of the Benedict's test with the four flowers.

Table 4.2

flower	**colour of Benedict's solution**
A	red
B	green
C	blue
D	orange

(iii) Put the letters of the flowers in the spaces provided to indicate the order of increasing amount of reducing sugar in the flowers.

least ....

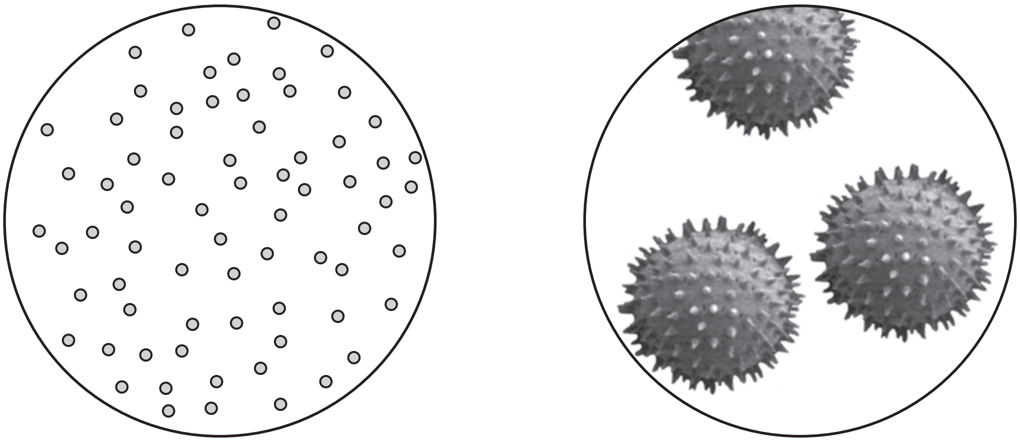
....

....

greatest .... [1]

(c) The student prepared one slide of pollen from an insect-pollinated flower and a slide of pollen from a wind-pollinated flower.

The view under the microscope of the two slides is shown in Fig. 4.2. The microscope was set at the same magnification for both slides.



slide 1   slide 2

Fig. 4.2

Choose **one** of the slides in Fig. 4.2 and state if it comes from a wind or insect-pollinated flower.

slide .... method of pollination ....

Describe **one** feature of the chosen pollen and explain its importance to the method of pollination

feature ....

....

importance .... [2]

Please turn over for Question 5.

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

- she takes the temperature of the dilute acid
- she places a marble chip in the test-tube, adds 20 cm^3 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

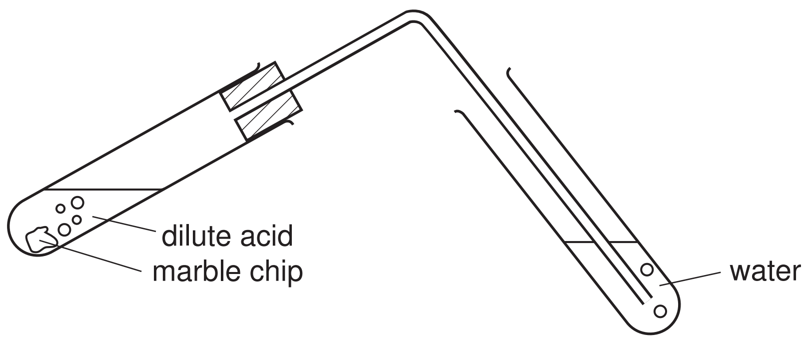


Fig. 5.1

Table 5.1 shows the number of bubbles that the student sees in 20 s 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	/////////////////////////////////////	

(a) 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. [

(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]

For Examiner's Use

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

Write a word equation for this reaction.

.... [2]

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

....

.... [1]

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

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]

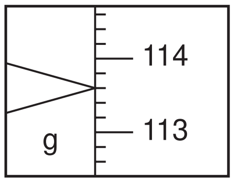


Fig. 6.1

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.

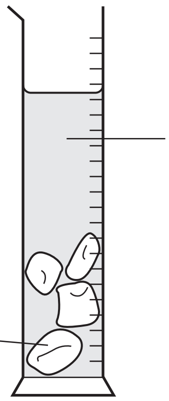


Fig. 6.2

(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]

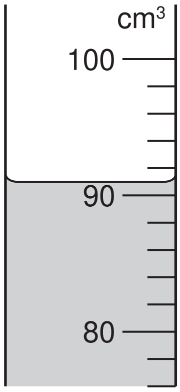


Fig. 6.3

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.

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.

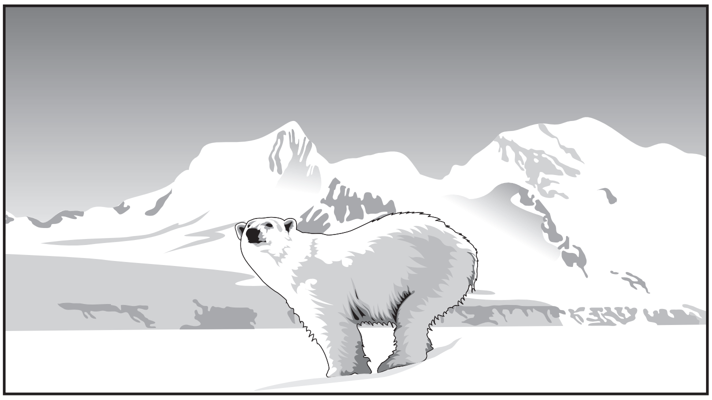


Fig. 6.4

(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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