UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 1 2 2 3 7 7 5 3 6 8 *

CO-ORDINATED SCIENCES

0654/63

Paper 6 Alternative to Practical

May/June 2013

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 pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

IB13 06_0654_63/3RP
© UCLES 2013

UNIVERSITY of CAMBRIDGE
International Examinations

[Turn over

www.theallpapers.com

For Examiner's Use

1 A student did an experiment to investigate the effect of temperature on the rate of respiration of yeast. This was done by measuring the rate at which the yeast produced bubbles of carbon dioxide. Yeast is able to respire, and produce carbon dioxide, even in the absence of oxygen.

Apparatus was set up as shown in Fig. 1.1.

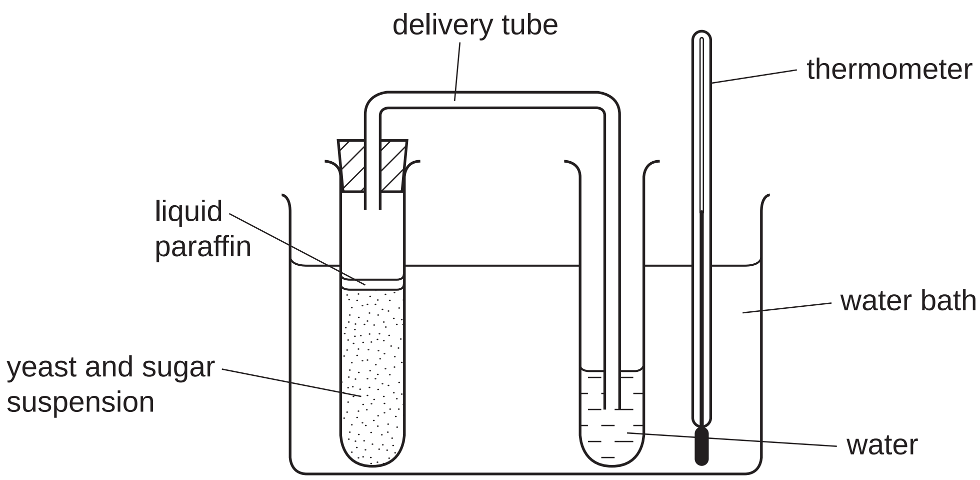


Fig. 1.1

The student made sure that the temperature of the water bath was 20 °C, and then waited for three minutes. After this time, the number of bubbles produced was counted each minute for three minutes.

The procedure was then repeated at 30 °C, at 40 °C, at 60 °C, and finally at 80 °C.

The results are shown in Table 1.1.

Table 1.1

temperature / °C	number of bubbles in one minute			
	1st minute	2nd minute	3rd minute	average
20	3	5	4	4
30	10	7	7	
40	15	13	19	
60	15	16	14	
80	0	0	0	0

(a) Complete Table 1.1, by working out the average numbers of bubbles produced per minute at 30 °C, 40 °C, and 60 °C giving each of your answers to the nearest whole number. [1]

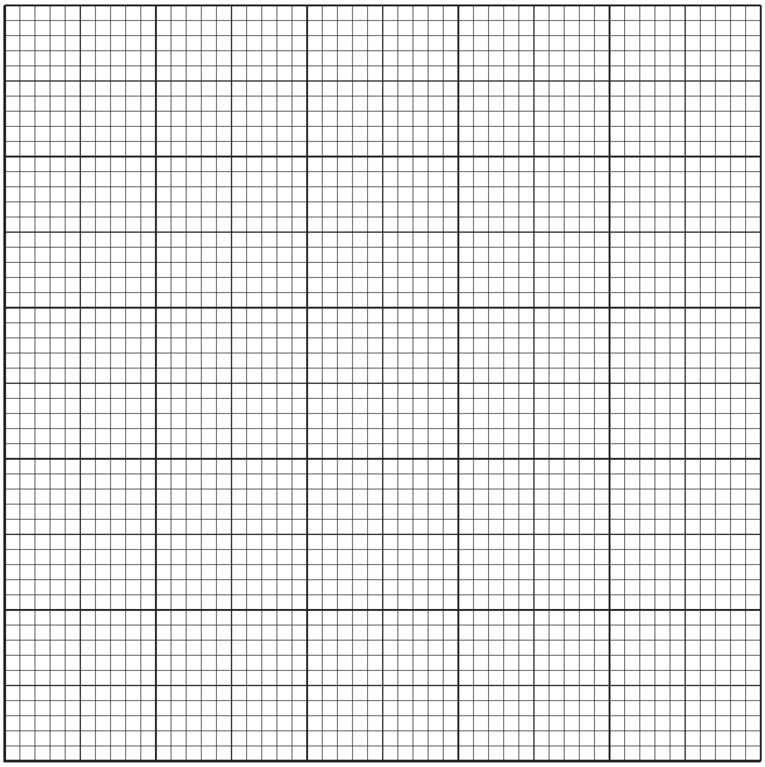
www.theallpapers.com

For Examiner's Use

(b) On the grid below, plot the average number of bubbles per minute against temperature.

Join your points with straight lines.

average number bubbles per minute



temperature / °C

[2]

(c) Suggest explanations for

(i) the change in rate of bubble production between 20 °C and 40 °C,

....

.... [1]

(ii) the result obtained at 80 °C.

....

.... [1]

www.theallpapers.com

(d) Explain why

(i) the student waited three minutes before taking readings at each temperature,

....

.... [1]

(ii) three readings were taken at each temperature,

....

.... [1]

(iii) the experiment at 80 °C was done last.

....

.... [1]

(e) Suggest how this experiment could be modified to show that the bubbles of gas given off contain carbon dioxide.

....

.... [1]

(f) Suggest a suitable control experiment for this investigation.

....

....

.... [1]

For Examiner's Use

www.theallpapers.com

2 A student is investigating the characteristics of a converging lens by two different methods.

A converging lens is a lens that is thicker in the middle. It bends rays of light together so that they can form an image on a screen, as shown in Fig. 2.1.

Method 1

She sets up a converging lens so that light from a distant object produces a sharp image on a screen as shown in Fig. 2.1.

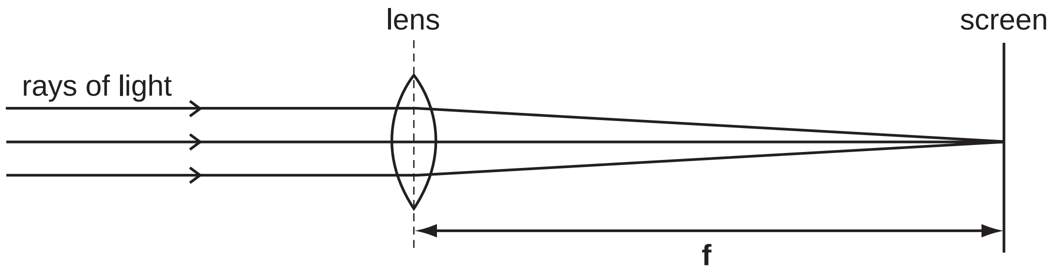


Fig. 2.1

(a) The distance **f**, from the screen to the lens, is called the focal length. Use a ruler to measure the distance **f**.

f = ... cm [1]

Method 2

The student sets up the apparatus shown in Fig. 2.2. The light shines through the hole and the screen can be moved until a sharp image of the illuminated object is formed.

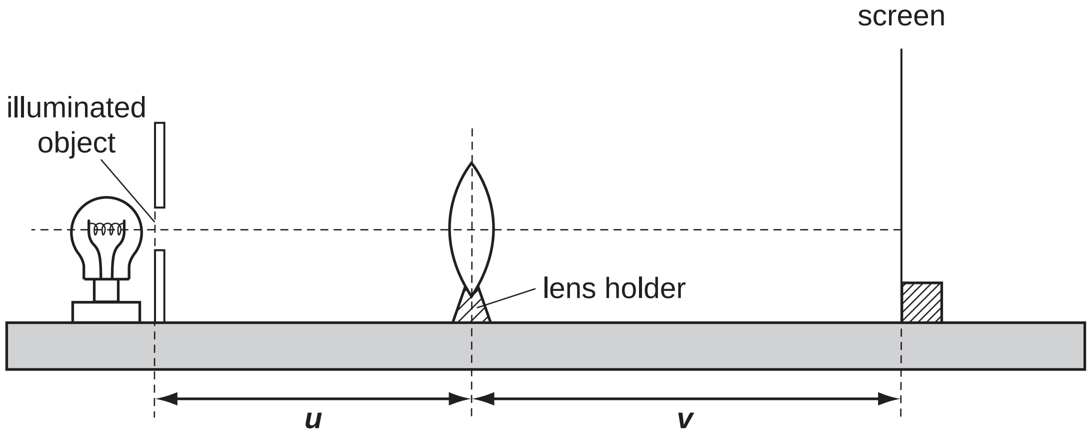


Fig. 2.2

She moves the lens so that distance, ***u***, is 50.0 cm. She moves the screen until a sharp image is seen. She measures distance, ***v***, and records the value in Table 2.1. She repeats this for different values of ***u***.

© UCLES 2013
www.theallpapers.com

Table 2.1

u / cm	v / cm	$u+v$ / cm	uv / cm^2
20.0	59.8	78.8	1196
30.0	30.1	60.1	903
40.0			
45.0	22.7	67.7	1021
50.0	21.5	71.5	1075

Fig. 2.3 shows a diagram of the apparatus when distance u = 40.0 cm.

The diagram is drawn to the scale of 1 to 10. That means that 1 cm in the diagram is actually 10 cm.

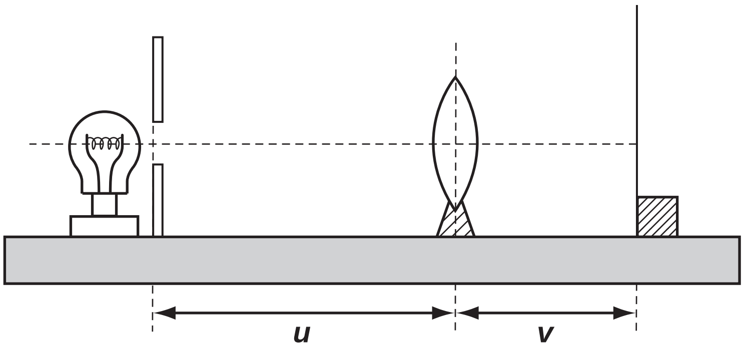


Fig. 2.3

(b) **(i)** Use a ruler to measure the distance for v in Fig. 2.3, to the nearest 0.1 cm.

distance = ... cm [1]

(ii) Convert this measurement to the actual value of v and complete the second column of Table 2.1. [1]

(iii) Complete column 3 of Table 2.1 by adding u and v. [1]

(iv) Complete the final column of Table 2.1 by multiplying u and v. [1]

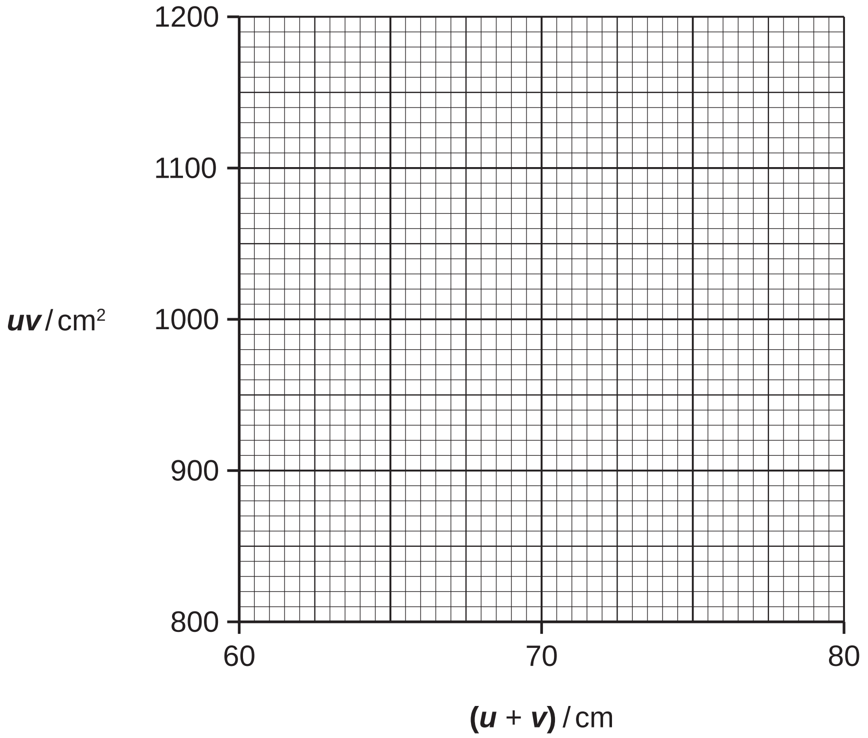
For Examiner's Use

www.theallpapers.com

For Examiner's Use

(c) **(i)** On the grid provided plot a graph of ***uv*** against ***u*** + ***v***.

Draw the best straight line.



[2]

(ii) Find the gradient of your line.

Show clearly on the graph how you did this.

gradient = ... [2]

(d) Your answer to **(c)(ii)** is the focal length of the lens.

Compare this to your answer in **(a)** and suggest the scale that Fig. 2.1 is drawn to.

....

.... [1]

www.theallpapers.com

3 In this experiment a student is investigating how the rate of the reaction between magnesium and acid is affected by the surface area of the solid. She sets up the apparatus as in Fig. 3.1.

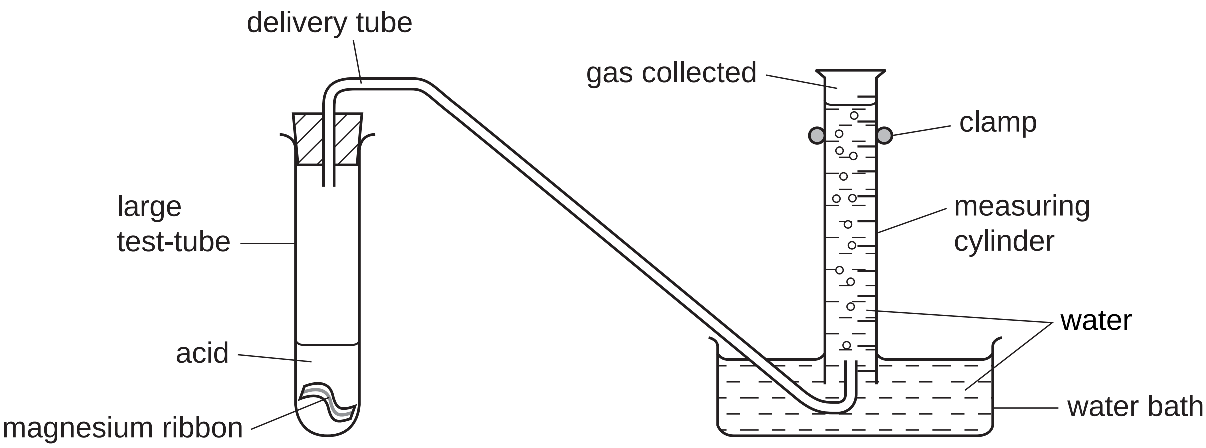


Fig. 3.1

- She removes the bung from the large test-tube and places 1 cm of magnesium ribbon in the bottom of the test-tube.
- She measures out 10 cm^3 acid.
- She starts the stopclock.
- When the time on the stopclock reaches 10 seconds, she adds the acid to the test-tube and quickly replaces the bung as tightly as possible.
- She stops the clock when the volume of gas collected in the inverted measuring cylinder is 10 cm^3.
- She subtracts 10 seconds from the time displayed on the clock, then records the result in Table 3.1.

Table 3.1

length of magnesium / cm	time / s	rate / cm^3 per s
1	37.5	
2	19.0	
3		
4		

She repeats the above steps using 2 cm of magnesium ribbon. She subtracts 10 seconds from the time shown on the clock and records the result in Table 3.1.

© UCLES 2013

www.theallpapers.com

(a) Fig. 3.2 shows the stopclock readings for lengths of magnesium 3 cm and 4 cm.

Subtract 10 seconds from each and record the result in Table 3.1.

length of magnesium = 3 cm

length of magnesium = 4 cm

Fig. 3.2

[2]

(b) (i) For each length of magnesium, complete column 3 of Table 3.1 by calculating the rate of the reaction using the formula

$$\text{rate} = \frac{10}{\text{time}}$$

[1]

(ii) How does the rate of the reaction between magnesium and acid vary with the length of magnesium ribbon?

....

.... [1]

(iii) Since the magnesium ribbon is thin, doubling the length of the ribbon approximately doubles the surface area.

How does the rate of the reaction between magnesium and acid vary with the surface area of the magnesium ribbon?

....

.... [1]

For Examiner's Use

www.theallpapers.com

(iv) The teacher said '*The rate of reaction doubles when the length of the magnesium ribbon is doubled*'.

State whether the results show that the statement is correct or incorrect. You must show which results support your statement.

....

....

....

....

.... [3]

(c) Suggest why she waited 10 seconds before adding the acid.

....

.... [1]

(d) The student suspects that the gas collected in the reaction is hydrogen.

Suggest how the student should test the gas collected in this experiment to show that it is hydrogen.

....

.... [1]

www.theallpapers.com

For Examiner's Use

4 The enzyme pectinase is used in industry for preparing fruit juices. Pectinase speeds up the release of fruit juice from plant cells by breaking down the cell walls.

A student used apples as the source of the plant cells. He wanted to produce a clear fruit juice.

- He placed some apple pieces and a little water in a blender and used this to produce a smooth apple paste.
- He then placed equal volumes of apple paste in each tube.
- He then placed pectinase and water in the tubes as shown in Table 4.1.
- He incubated the tubes at the temperatures indicated for ten minutes.

Table 4.1

tube number	apple paste / cm^3	pectinase / cm^3	water / cm^3	temperature / °C
1	5	1	0	20
2	5	0	1	20
3	5	1	0	40
4	5	0	1	40

Results

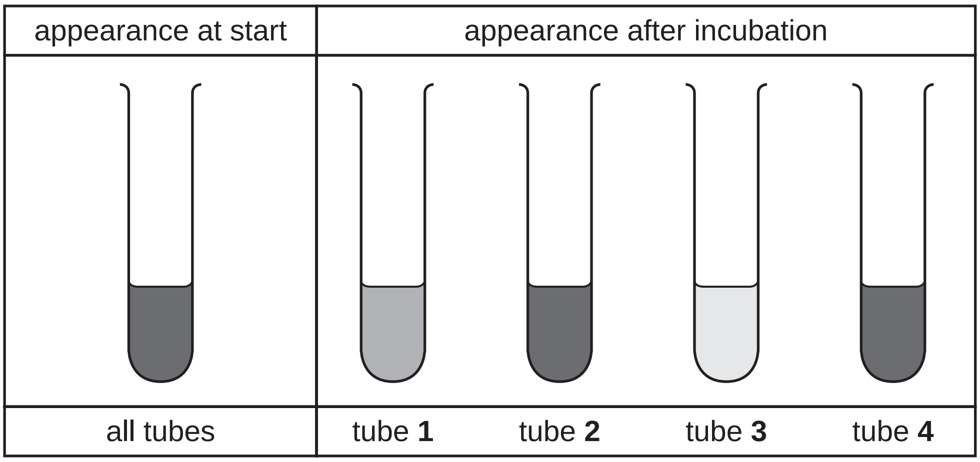


Fig. 4.1

(a) **(i)** Pectinase was not included in tubes **2** and **4**.

Explain why tubes **2** and **4** were included in the experiment.

....

.... [1]

www.theallpapers.com

(ii) Explain why both tubes **2** and **4** were used for this purpose.

....

.... [1]

The student looked carefully at tube **3** after incubation. The apple paste had become less cloudy than in the other tubes.

(iii) Compare the appearance after incubation of tube **1** with the appearance of all tubes at the start and record your observation.

....

.... [1]

(iv) Compare the appearance after incubation of tube **3** with the appearance of tube **1** after incubation and record your observation.

....

.... [1]

(v) Explain the difference between tube **1** and tube **3** after incubation.

....

.... [1]

Although fruit juice had been produced in tube **3** the juice was still rather cloudy. The student suspected that starch from the broken apple cells was suspended in the juice.

(b) (i) Suggest a test he could carry out on the contents of tube **3** to find out if starch is present.

Describe the test and a positive result.

....

.... [1]

(ii) The student found that starch was present. Name an enzyme he could use that could break down the starch.

name of enzyme .... [1]

www.theallpapers.com

(iii) The student modified his original experiment to make the fruit juice as clear as possible.

Describe in detail what he did and how he could prove that the enzyme named in **(b)(ii)** was effective.

....

....

....

....

....

.... [3]

For Examiner's Use

www.theallpapers.com

For Examiner's Use

5 **(a)** A motor manufacturer is testing his new electric car.

The driver is given instructions on how to drive over a set distance on a special test track, as shown in Fig. 5.1.

Poles are placed 10 m apart and a photograph of the position of the car is taken every second.

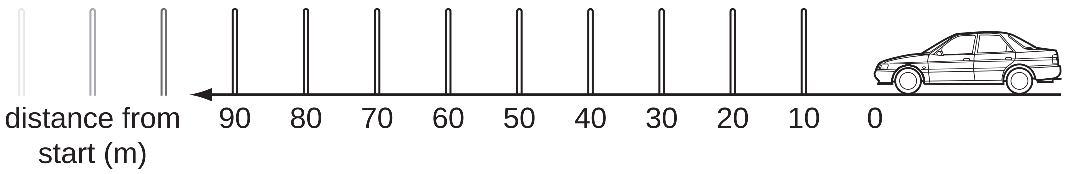


Fig. 5.1

The distances for one test run are recorded in Table 5.1.

Table 5.1

time / s	0	1	2	3	4	5	6	7	8	9	10
distance / m	0	8	18	34	52		99		161	199	239

(i) Use Fig. 5.2 to record in Table 5.1 the distances travelled after 5 and 7 seconds.

Take your measurement from the front of the car. [2]

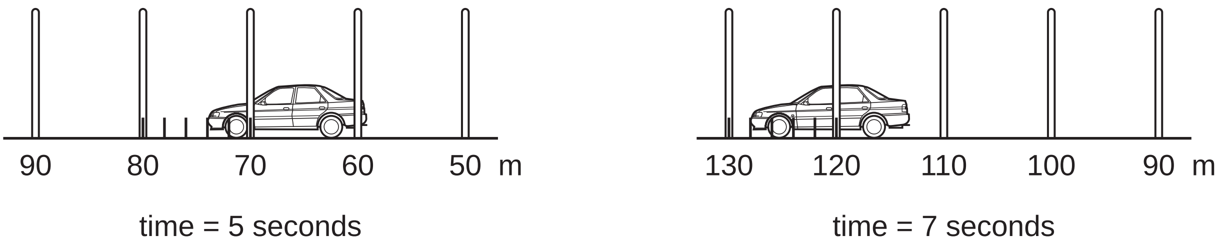


Fig. 5.2

www.theallpapers.com

For Examiner's Use

(ii) On the grid provided plot a graph of distance / m (vertical axis) against time / s.

Draw a smooth curve of best fit.

[3]

(iii) Explain what the shape of the graph tells you about the motion of the car.

.... [1]

(iv) Calculate the average speed of the car over the first six seconds.

....

.... [1]

www.theallpapers.com

For Examiner's Use

Fig. 5.3 shows sketch graphs of 3 more tests runs.

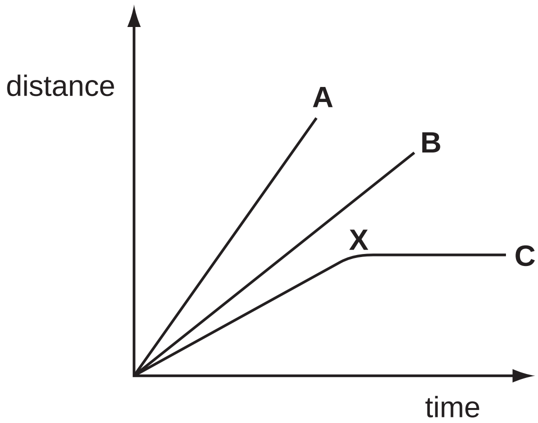


Fig. 5.3

(b) (i) State in what ways test runs **A** and **B** are similar and different.

similar ....

....

different ....

.... [2]

(ii) Suggest what may have happened at point **X** in test run **C**.

....

.... [1]

© UCLES 2013

www.theallpapers.com

Please turn over for Question 6.

www.theallpapers.com

6 **(a)** Fig. 6.1 shows words and phrases about different anion tests cut from a page of a student's note book.

Use a ruler to construct a table, showing each anion, test reagent and result which identifies the anion.

barium chloride

chloride

carbonate

yellow precipitate

bubbles

white precipitate

silver nitrate

dilute hydrochloric acid

Fig. 6.1

[4]

© UCLES 2013

www.theallpapers.com

(b) (i) The teacher asks the student to make a dry sample of copper sulfate crystals from sulfuric acid and powdered copper oxide.

The student begins by using these chemicals to prepare a solution of copper sulfate.

Describe in detail how the student prepares this solution.

....

....

....

.... [3]

(ii) She leaves the copper sulfate solution prepared in **(b)(i)** in a warm place to remove the water.

Name this process by which the water leaves the solution.

process .... [1]

(iii) She washes and dries the crystals from **(b)(ii)**.

What colour are the crystals?

colour .... [1]

(c) Copper oxide is an example of a base.

Copper sulfate, barium chloride and silver nitrate are all examples of another group of chemicals.

Name this group.

name .... [1]

www.theallpapers.com

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

www.theallpapers.com