Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

COMBINED SCIENCE **0653/06**
CO-ORDINATED SCIENCES **0654/06**

Paper 6 Alternative to Practical

October/November 2004

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 in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use	
1	
2	
3	
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6	
Total	

This document consists of **15** printed pages and **1** blank page.

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1 A student did an experiment to find out how temperature affects the activity of the e
catalase. Catalase is released from potato cells when they are cut open. The enzyme spe
up the production of oxygen from hydrogen peroxide.

- She set up the apparatus as shown in Fig. 1.1.

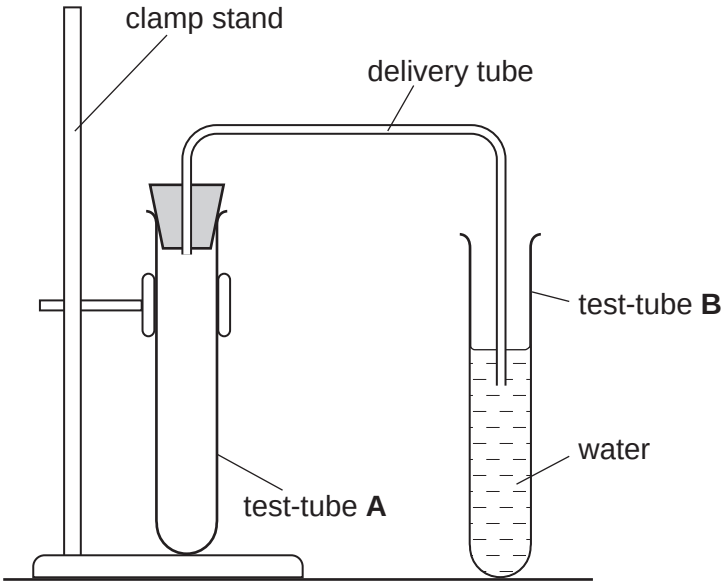

Fig. 1.1

- She put 10 cm^3 hydrogen peroxide into tube **A** and measured its temperature.

(a) Read the thermometer, Fig. 1.2 below, and write the correct temperature in the table, Fig. 1.3, on page 4.

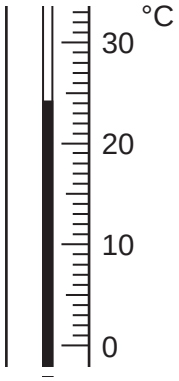

Fig. 1.2

- She cut several identical pieces of potato.
- She put one piece of potato into the hydrogen peroxide, placed the bung firmly in the top of tube **A** and started timing. The oxygen appeared as bubbles in tube **B**.
- She counted the number of bubbles produced during a period of 2 minutes.
- She rinsed out tube **A**, then put 10 cm^3 fresh hydrogen peroxide into it.
- She warmed the tube in a water bath until the temperature of the hydrogen peroxide reached 35 °C.
- After replacing tube **A** in the clamp she added the next piece of potato, started timing and counted the bubbles as before.
- She did three further readings at 45 °C, 55 °C and 60 °C.

(b) Complete the results table, Fig. 1.3.

temperature / °C	number of bubbles counted in 2 minutes	number of bubbles per minute
.....	26	13
35	30	15
45	.....	14
55	.....	12
60	8	.....

Fig. 1.3 [3]

(c) Plot the number of bubbles per minute (vertical axis) against temperature on the grid on page 5 opposite. [3]

(d) Explain the shape of your graph using your knowledge of enzyme action.

.....

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.....

.....[2]

(e) Suggest **one** way you could improve the experiment to make it more accurate.

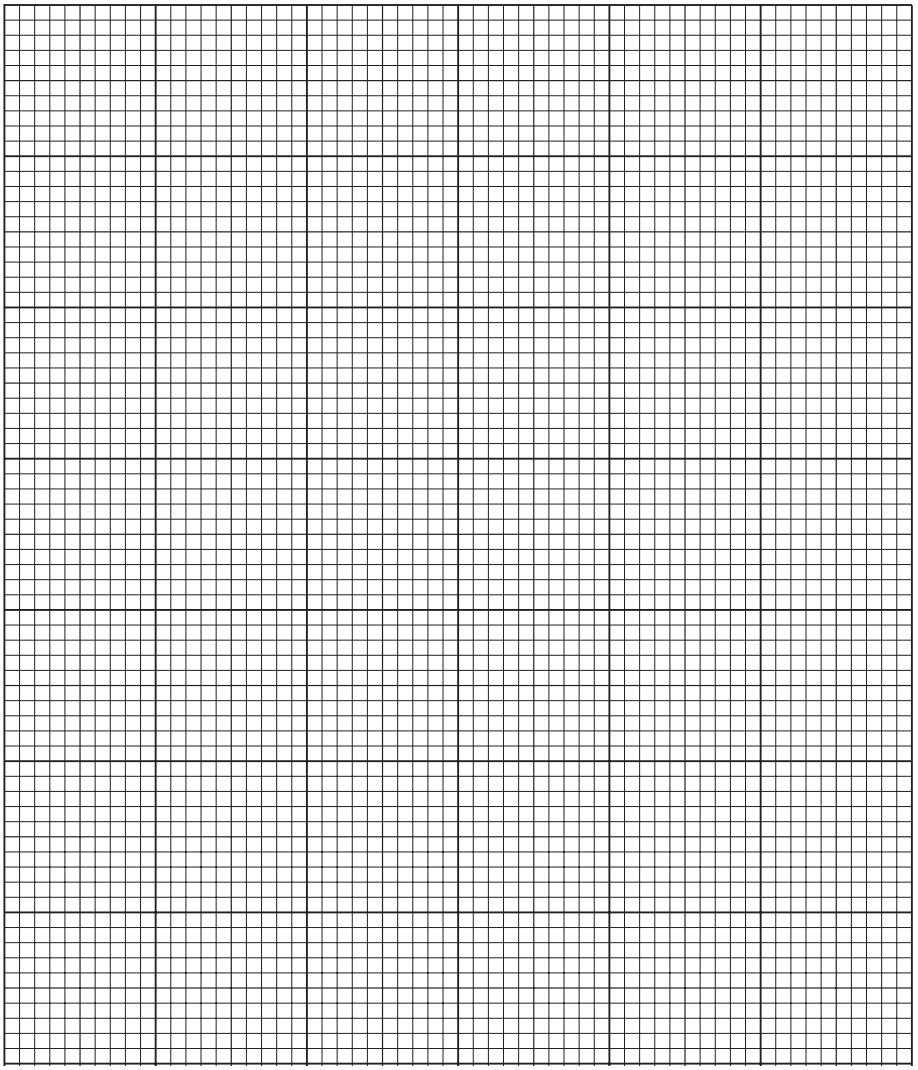
.....

.....

Explain why your improvement would work.

.....

.....[2]



2 An experiment was carried out to investigate the time taken for strips of magnesium to d in varying concentrations of hydrochloric acid. These different solutions of hydrochloric were prepared by mixing suitable volumes of the acid and water as shown in Fig. 2.1.

- The magnesium was cut into 5 cm long pieces.
- A piece of magnesium was placed in a beaker containing 100 cm^3 of hydrochloric acid of concentration 4.0 mol / dm^3, and a clock was started.
- The time the magnesium took to dissolve was noted in Fig. 2.1.
- The procedure was repeated using the other concentrations of acid.

expt. no.	volume of 4.0 mol / dm^3 hydrochloric acid / cm^3	volume of water / cm^3	concentration of mixture in mol / dm^3	time the magnesium took to dissolve / s
1	100	0	4.0	12
2	75	25		
3	50	50	2.0	48
4	25	75		

Fig. 2.1

(a) (i) Calculate the concentrations of the mixtures of acid and water in experiments 2 and 4, and write them in the table.

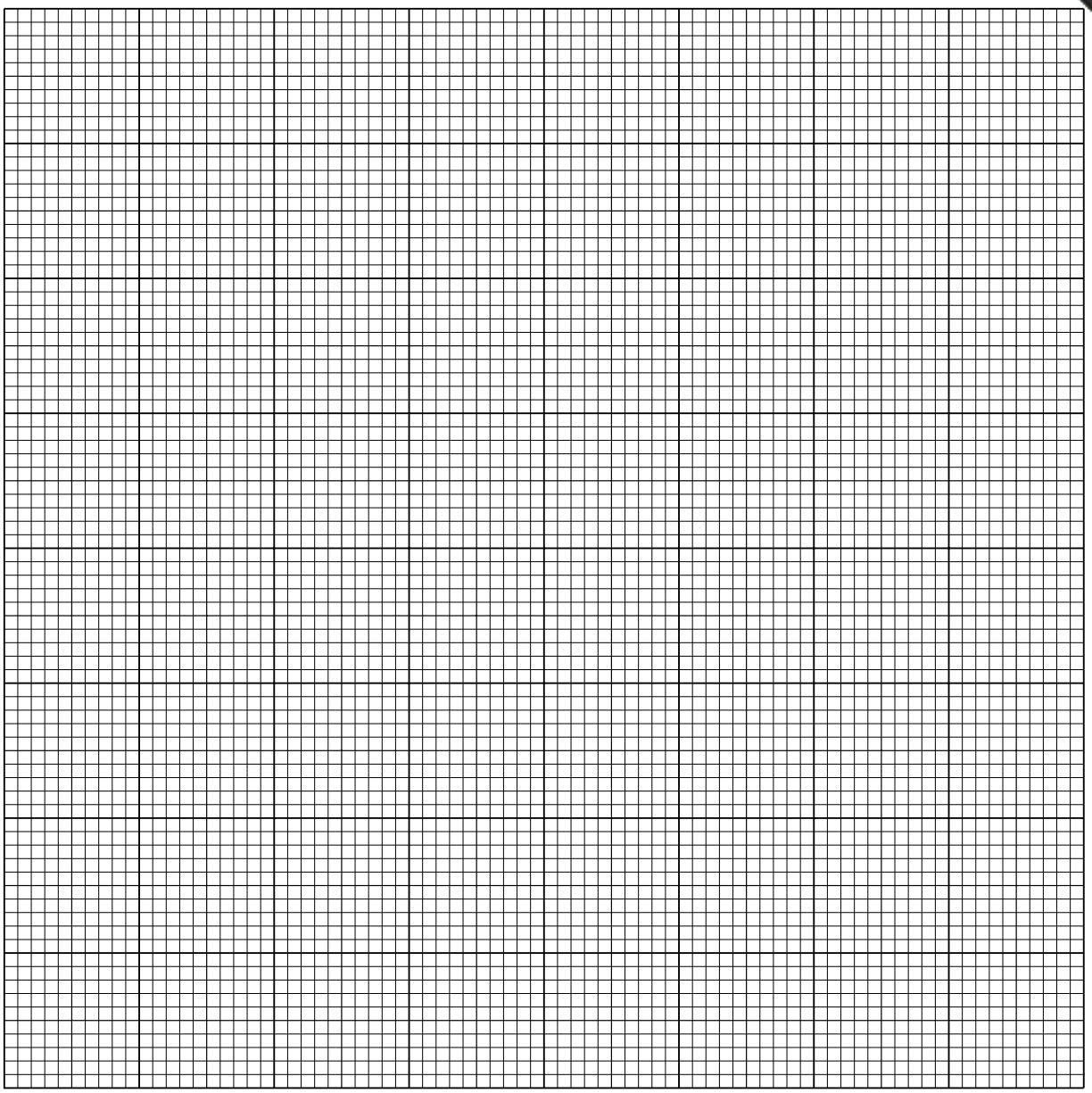
[2]

(ii) Fig. 2.2 shows the digital readout of the time taken for experiments 2 and 4. Read and record the times taken in Fig. 2.1.

experiment 2 experiment 4

Fig. 2.2 [2]

(b) Plot a graph of concentration of acid (horizontal axis) against the time for the mag to dissolve.



[3]

(c) Use the graph to predict the time that the magnesium will take to dissolve in acid of concentration 2.5 mol / dm^3.

.....[1]

Question 2 continues on the next page

(d) A student read in a book that 0.1 g of magnesium produces 100 cm^3 of hydroge it dissolves in acid. Draw a diagram of the apparatus you would use to test statement.

[2]

3 A student is given a convex lens, a small white screen and a ruler.

(a) At the other end of the laboratory there is a bright light. Explain how she can use the lens, the screen and the bright light to find the focal length of the lens.

.....

.....

.....[2]

(b) The student finds out that the focal length of the lens is 15 cm.
She fixes the lens upright on the 50 cm mark of the ruler.
She marks the points **F** and **2F** on the ruler that are 15 cm and 30 cm away from the lens on the left.
She also marks the points $\mathbf{F^1}$ and $\mathbf{2F^1}$, 15 cm and 30 cm away from the lens on the right.
Write in the spaces on Fig. 3.1 the **actual numbers on the ruler** for the points **F**, **2F**, $\mathbf{F^1}$ and $\mathbf{2F^1}$.

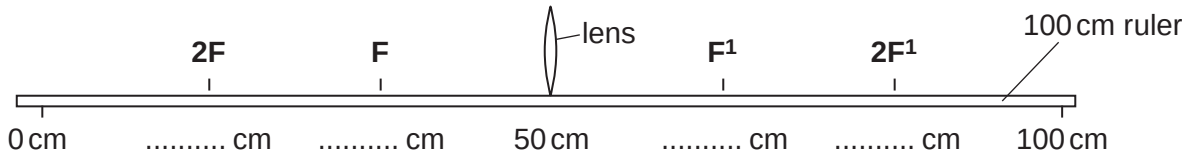


Fig. 3.1

[2]

(c) In experiment 1, the student puts a lighted candle more than **2F** cm away from the lens. Then she moves the screen on the other side of the lens so that a sharp image of the candle flame is formed. See Fig. 3.2.

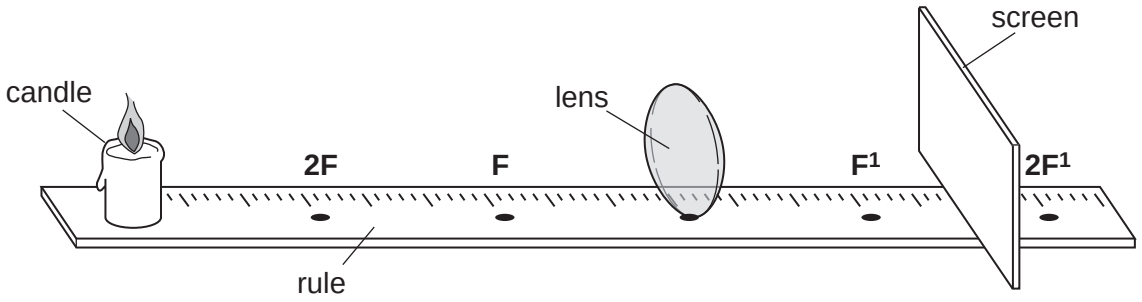


Fig. 3.2

She does two more experiments with the candle in different positions.
Each time, the student draws a picture of the image of the candle flame.
Use the pictures in Fig. 3.4 to help you to fill in the last two columns of Fig. 3.3. [

expt. no.	candle position	image position	what the image is like	
			Is it **larger**, **smaller** or **same size** as the candle?	Is it **upright** or **inverted**?
1	beyond **2F**	between $\mathbf{F^1}$ and $\mathbf{2F^1}$		
2	at **2F**	at $\mathbf{2F^1}$		
3	between **F** and **2F**	beyond $\mathbf{2F^1}$		

Fig. 3.3

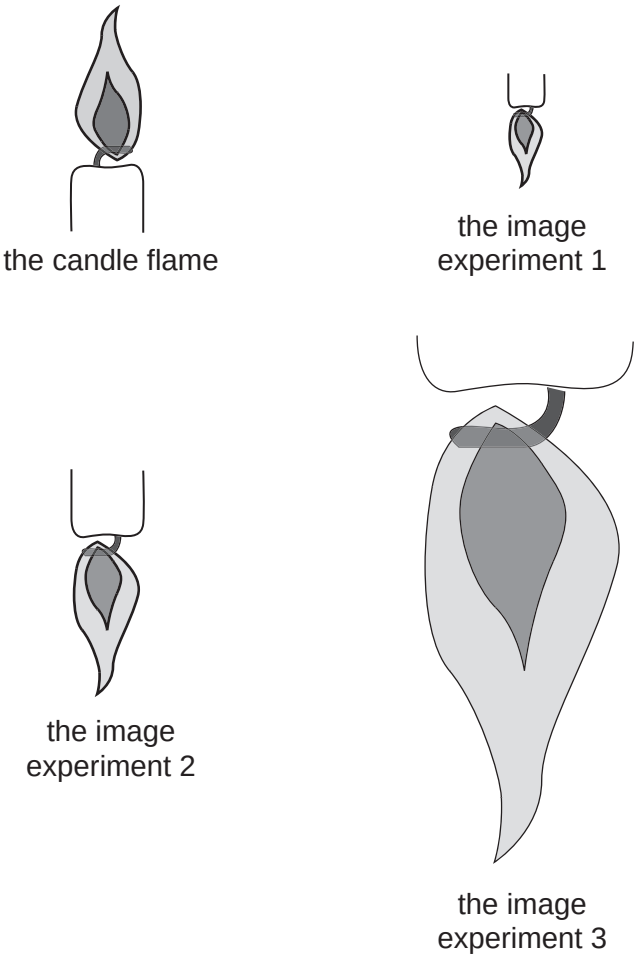


Fig. 3.4

(d) The teacher gives the student an unfinished diagram to show the rays of light leave the candle, pass through the lens and form the image.

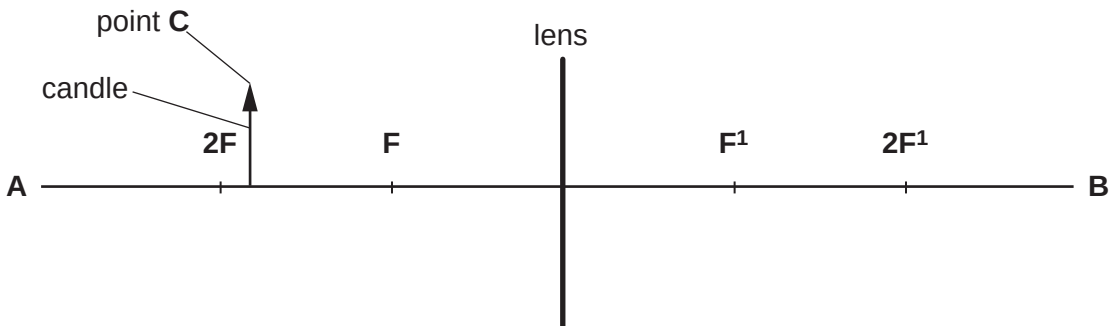


Fig. 3.5

(i) On Fig. 3.5, draw a horizontal line from point **C**, the candle flame, to the lens, then continue it to pass through the point **F^1**.

(ii) Draw a straight line from point **C** through the centre of the lens, meeting line **(i)** on the opposite side of the lens. Label point **X**, where lines **(i)** and **(ii)** meet.

(iii) Draw a vertical line from **X** to the line **AB**, cutting **AB** at **Y**.

[1]

(iv) Measure the distance **XY** in millimetres and record the distance in the space below.

XY ..... mm [1]

(e) Which of the experiments in Fig. 3.3 is illustrated by your diagram in **(d)**?

experiment number ..... [1]

4 Fig. 4.1 shows a cross section of part of a leaf as it looks under the light microscope.

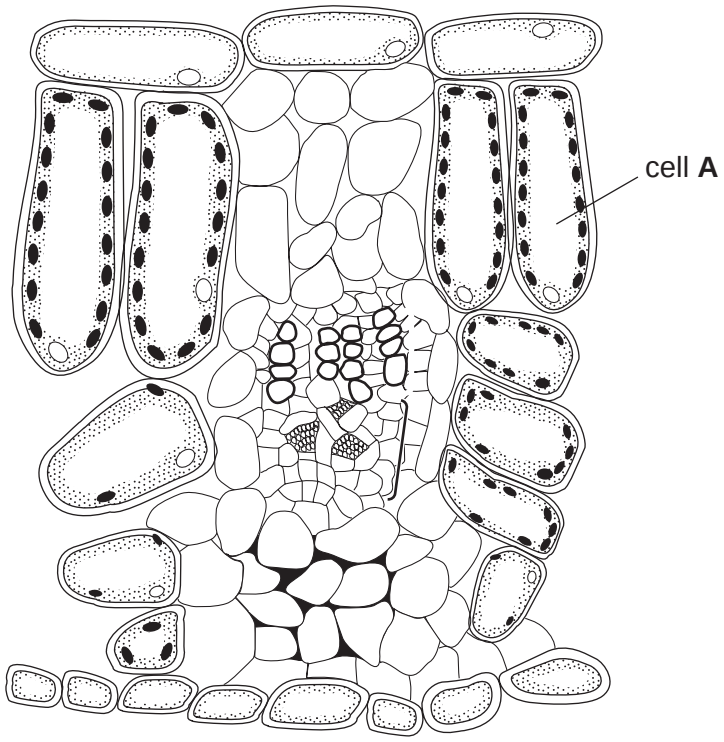


Fig. 4.1

(a) Make a large drawing of cell **A** in the space below.

[2]

(b) **(i)** Measure the height of the cell you have drawn and record it below.

height = ... mm

(ii) Measure the height of cell **A** on the diagram, Fig. 4.1.

height = ... mm

[2]

(iii) Use the two measurements to work out the magnification of the diagram yo drawn.

.....

.....

.....

.....[2]

(c) Add the following labels to your diagram.

(i) Use the letter **P** to label one place where photosynthesis takes place.

(ii) Label the controlling centre of the cell with the label **C**.

[2]

(d) Outline an experiment you could do to find out which parts of a complete plant transport water.

.....

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.....

.....[2]

5 The apparatus shown in Fig. 5.1 was used to investigate how two black powders, carb copper oxide, reacted with three different gases.

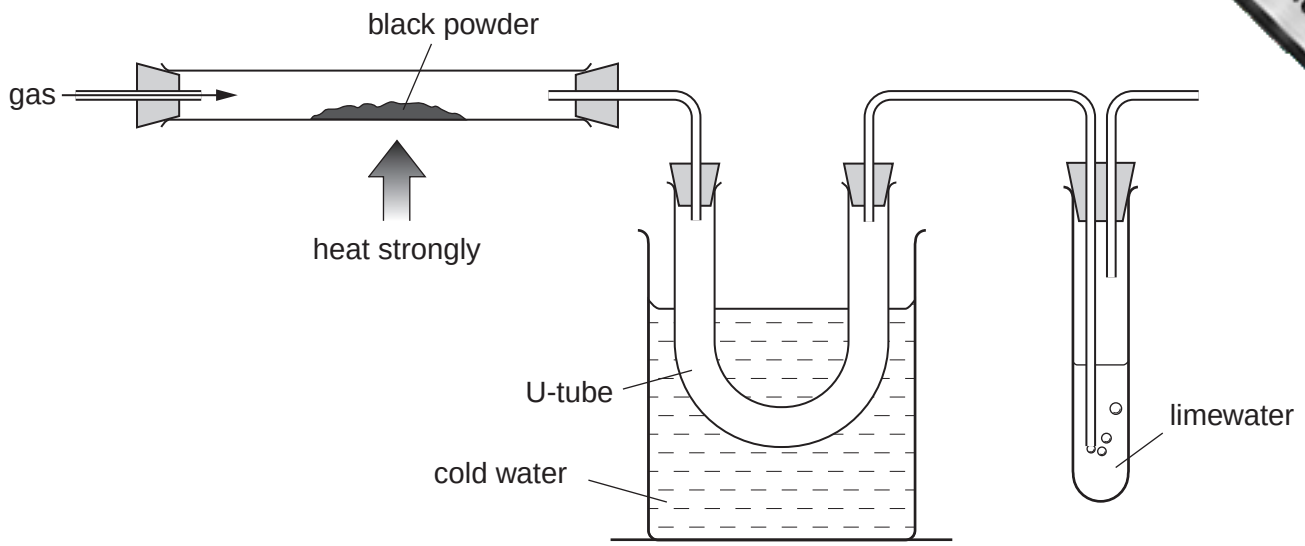

Fig. 5.1

The gases carbon monoxide, hydrogen and oxygen were passed in turn over the heated powders. The products of the reaction passed through a cooled U-tube and then through limewater. Some of the results are shown in Fig. 5.2.

Results for carbon

expt. no.	gas used	what was seen in heated tube	did liquid collect in U-tube? (yes/no)	did limewater turn cloudy? (yes/no)
1	carbon monoxide			
2	hydrogen	no change	no	no
3	oxygen	red glow, powder disappeared	no	yes

Results for copper oxide

expt. no.	gas used	what was seen in heated tube	did liquid collect in U-tube? (yes/no)	did limewater turn cloudy? (yes/no)
4	carbon monoxide	powder turned red/brown	no	yes
5	hydrogen			
6	oxygen	no change	no	no

Fig. 5.2

(a) Complete Fig. 5.2 to show the results for experiments 1 and 5.

(b) How could you show that any liquid that collects in the U-tube is water?

.....

.....[2]

(c) Choose any **one** of the reactions in Fig. 5.2 and use it to explain the meaning of the terms *oxidation* and *reduction*.

.....

.....

.....

.....[2]

6 The teacher sets up the apparatus shown in Fig. 6.1 to demonstrate energy changes. A large 5 kg mass is attached to a cord wound around a spindle. The mass is initially at rest at point **X**. As the mass falls, the spindle turns. The motion is transmitted to a generator. The current from the generator passes through the circuit containing a voltmeter, an ammeter and a light bulb. The mass falls a distance of 1 metre in 10 seconds and hits the workbench.

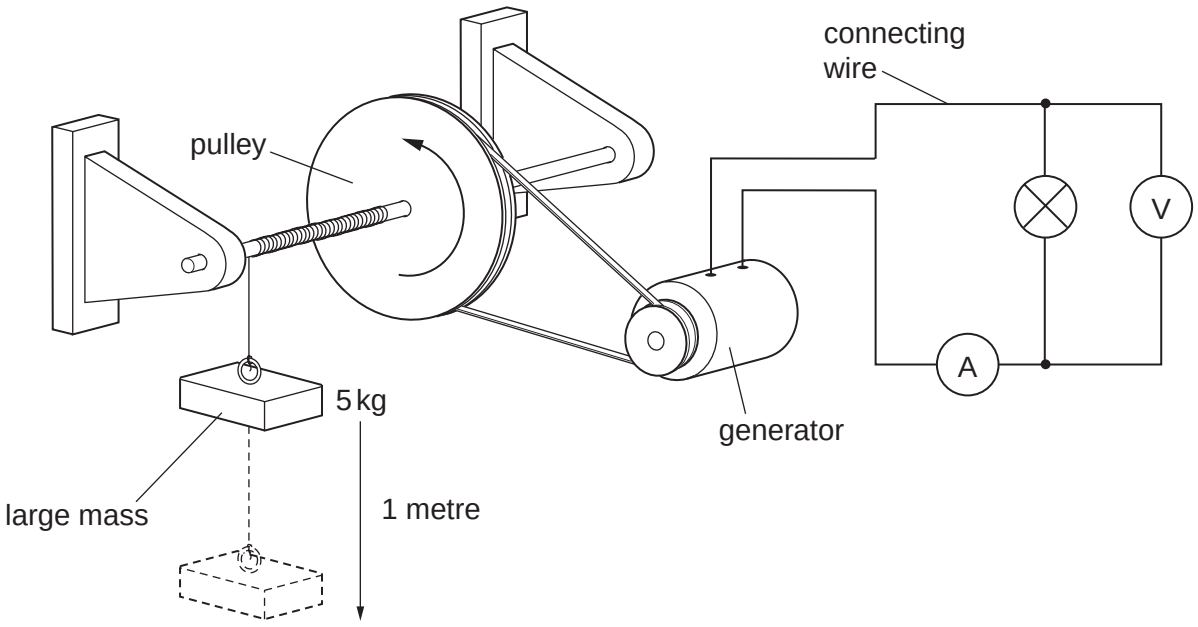

Fig. 6.1

(a) Energy conversions occur while the mass falls.

In what form is the energy

(i) in the mass, ...

(ii) in the pulley, ...

(iii) in the connecting wire? .....

[3]

(b) Fig. 6.2 shows the ammeter and voltmeter readings when the mass is falling.

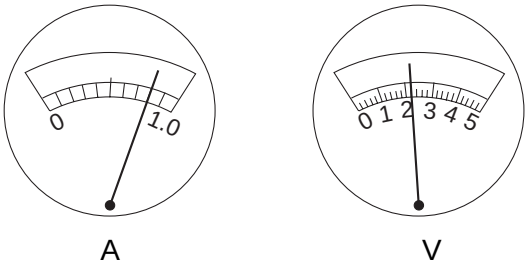

Fig. 6.2

Read and record the current and voltage in the spaces below.

current = ... A

voltage = ... V [2]

(c) The 5 kg mass falls through a distance of 1 metre in 10 seconds.
Calculate the work done by the falling mass. Take **g**, the acceleration due to gravity, as 10 N / kg. Use the formula below.

work done in joules = mass in kg × distance it falls in metres × **g**

[1]

(d) Find the work done to light the bulb using the formula below.

work done in joules = p.d. in volts × current in amps × time in seconds

[1]

(e) Suggest **two** reasons why the answers to **(c)** and **(d)** are not equal.

1. .....

.....

2. .....

.....[2]

(f) Suggest **one** observation that will be different if the mass moves more quickly.

.....[1]