9. Coal is a non-renewable fossil fuel.

(a) Explain the terms

(i) non-renewable: .....
.....

(ii) fossil fuel: .....
..... (2)

You have a theory that coal from different sources stores different amounts of energy.

(b) Suggest how you might carry out an experiment in the laboratory to see if your theory is correct. Briefly describe what you would do and what measurements you would take.

(You may draw a diagram if it helps.)

.....
.....
.....
.....
.....
.....
.....
..... (3)

(c) State **two** things you would do to make your experiment a fair test.

1: .....
2: ..... (2)

Jan 2016

6. Electromagnets are used in many applications in the home and in industry.

(a) Describe how you would construct an electromagnet using materials available in your school laboratory. Your answer should include a labelled diagram.

.....

.....

..... (4)

(b) Describe two things you could do to increase the strength of the electromagnet.

1: .....

.....

2: .....

..... (2)

(c) Describe one safety precaution you would take when constructing the electromagnet.

.....

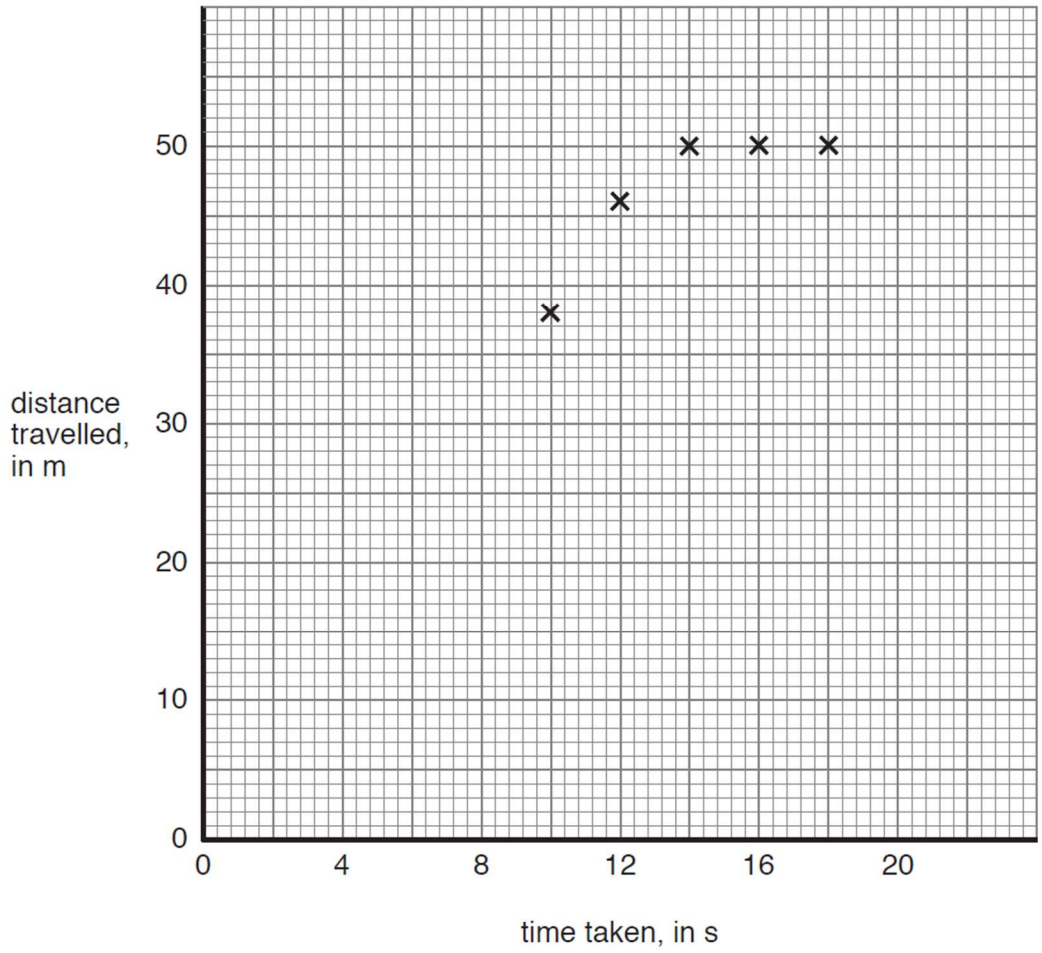
..... (1)

8. The table below shows the distance which a runner has travelled at several different times in a race.

distance travelled, in m	0	2.5	5	8	18	28	38	46	50	50	50
time taken, in s	0	2	3	4	6	8	10	12	14	16	18

(a) (i) Plot the first six data points on the graph grid below.
(The others have been plotted for you.) (2)

(ii) Draw a line or curve of best fit for all the points. (2)



(b) Label the graph

(i) with **W** to show when the runner is moving at a steady speed (1)

(ii) with **X** to show when he is getting faster (1)

(iii) with **Y** to show when he is getting slower (1)

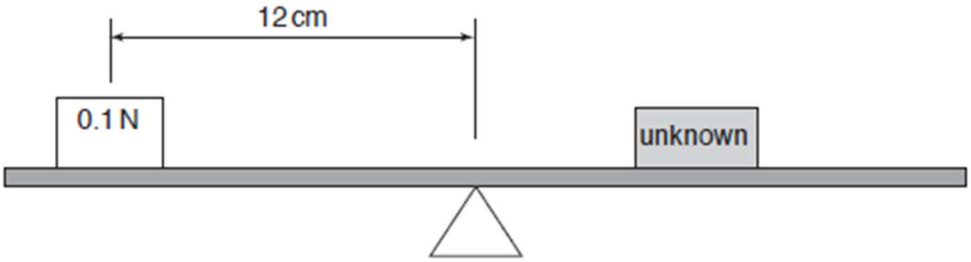
(iv) with **Z** to show when he is not moving (1)

(c) Use the graph to find how far the runner has moved after 11 seconds.

..... (1)

Jan 2015

8. This question is about weighing an unknown object.
Some pupils made a balance to weigh unknown objects as shown in the diagram below.



The pupils know they have to use moments to calculate the weight of the unknown object.

(a) Explain how to use moments to find the weight of the unknown object.

.....
.....
.....
..... (3)

The distance of the centre of the 0.1 N weight from the pivot is shown in the diagram.

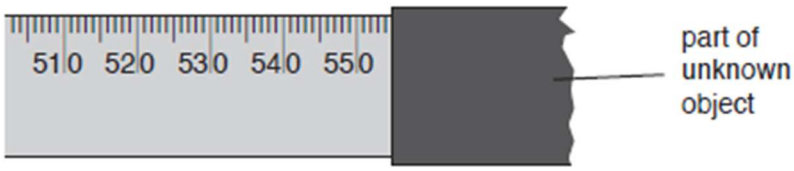
(b) (i) Show that the anticlockwise moment of the 0.1 N weight is 1.2 N cm.

.....
.....
..... (2)

(ii) Explain why the measurement is taken to the centre of the weight.

.....
..... (1)

Seen from above, the position of the unknown object on the ruler is shown in the drawing below. The object is exactly 5 cm long. The pivot is exactly at the 50 cm mark of the ruler.



(c) (i) Write down the measurement shown for the end of the object nearest the pivot.

..... cm (1)

(ii) Show that the distance of the middle of the object from the pivot is 8 cm.

..... (1)

(iii) Calculate the weight of the unknown object.

.....

.....

..... (3)

(iv) The force of gravity is 10 N for every kg. Calculate the mass of the unknown object. Give the correct unit.

.....

.....

mass = ... unit ..... (2)

nov 2014

6. Alice wants to find out if an Olympic gold medal is made of pure gold.

She knows that the density of pure gold is 19.3 g/cm^3.

(a) Describe how Alice could accurately measure the volume of the medal.

.....

.....

.....

.....

.....

..... (3)

Alice finds that the medal has a mass of 350 g and a volume of 28 cm^3.

(b) (i) State the relationship between density, mass and volume.

..... (1)

(ii) Calculate the density of the medal in g/cm3.

.....

.....

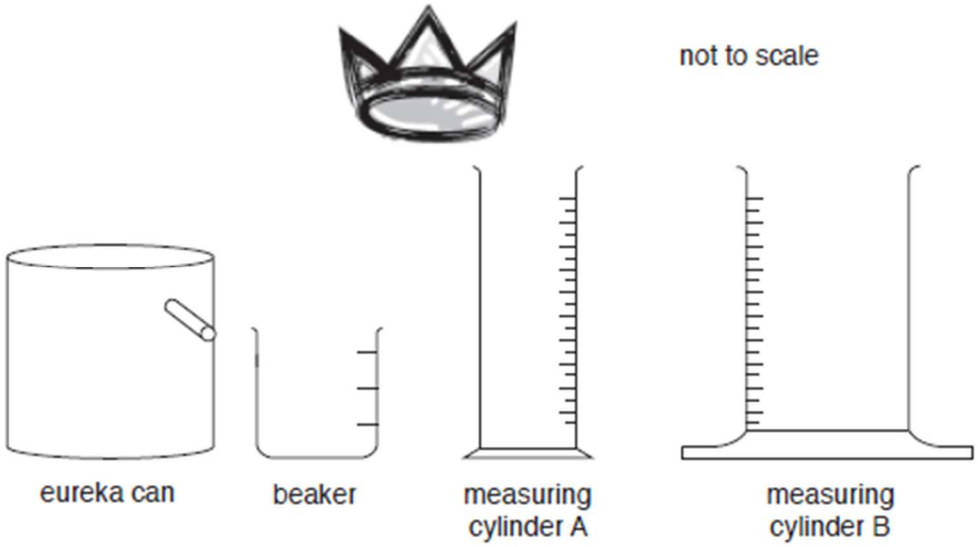
..... (2)

(iii) Was the medal pure gold?

..... (1)

Summer 2014

4. A king wanted to check that his crown was made of pure gold.



The pieces of apparatus shown in the diagram above were available to him.

(a) Suggest how the king could measure the volume of the crown.
It will fit in the eureka can, but not in any of the other containers.

.....
.....
.....
.....
..... (2)

(b) (i) State which measuring cylinder would give the more precise reading.

..... (1)

(ii) Explain why.

..... (1)

(c) Name a piece of apparatus the king could use to measure the mass of the crown.

..... (1)

The density of gold is 19.3 g/cm^3

The king found the volume of the crown was 31 cm3, and its mass was 598 g.

(d) (i) Write down the formula which relates density to mass and volume.

..... (1)

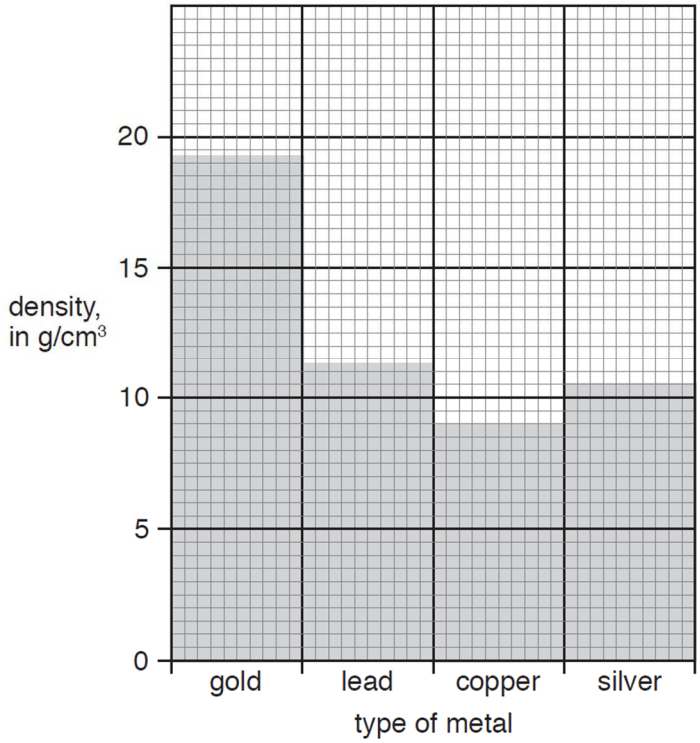
(ii) By calculating the density of the crown, decide whether it is made of gold.

.....

.....

..... (2)

The king did similar experiments to find the density of a lead pipe, some copper coins and a silver spoon. His results are shown on the bar chart below.



(e) Using the bar chart, complete the table below to show the missing density values

metal	density, in g/cm^3
gold	19.3
lead	
copper	
silver	10.5

(2)

Samples of all four metals had the same volume.

(f) State which one would have the least mass.

..... (1)

Jan 2014

5. Conrad is given three wires made of different materials but all with the same diameter. He wants to find out which of the materials has the lowest electrical resistance. To do this, he connects each wire (one at a time) in a circuit with a cell and an ammeter.

(a) Draw a suitable circuit diagram below, using the correct circuit symbols. You should use the symbol for a resistor to represent the wire being tested.

(2)

(b) State TWO factors which Conrad must keep constant to make this a fair test.

1: .....

2: ..... (2)

(c) Explain how he can use the results of his experiment to compare the electrical resistance of the three wires.

.....

.....

.....

..... (2)

Nov 2013

7. This question is about measuring the thickness of paper. Some pupils have a large pile of paper. They want to find how many sheets are in the pile without counting them all.

(a) They take 25 sheets from the pile and find that the total mass of these sheets is 10 g.

(i) Name the measuring instrument they should use to measure the mass of the sheets.

..... (1)

(ii) Explain carefully what they should now do to find the number of sheets in the whole pile without counting them.

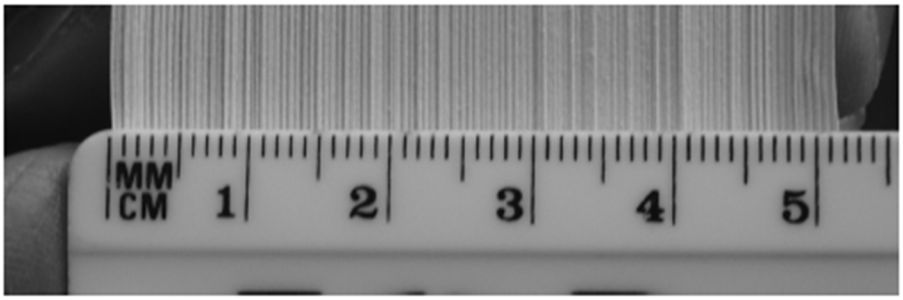
.....

.....

.....

..... (3)

Having found that there are exactly 500 sheets, the pupils decide to measure the thickness of one sheet. They hold the pile of paper tightly together and measure it with a ruler, as shown in the picture.



(b) Write down the thickness of the 500 sheets to the nearest 0.5 mm.

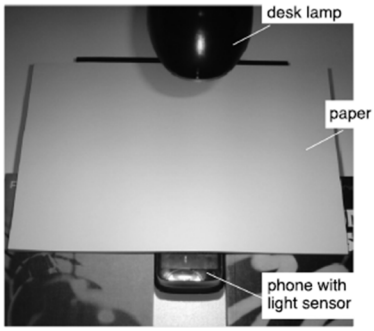
thickness = ...mm. (1)

(c) Calculate the thickness of one sheet, in mm.

.....

..... (2)

To try another way of finding the thickness of a sheet, the pupils use a desk lamp and the light sensor on a mobile phone. They measure how much light is let through by different numbers of sheets.

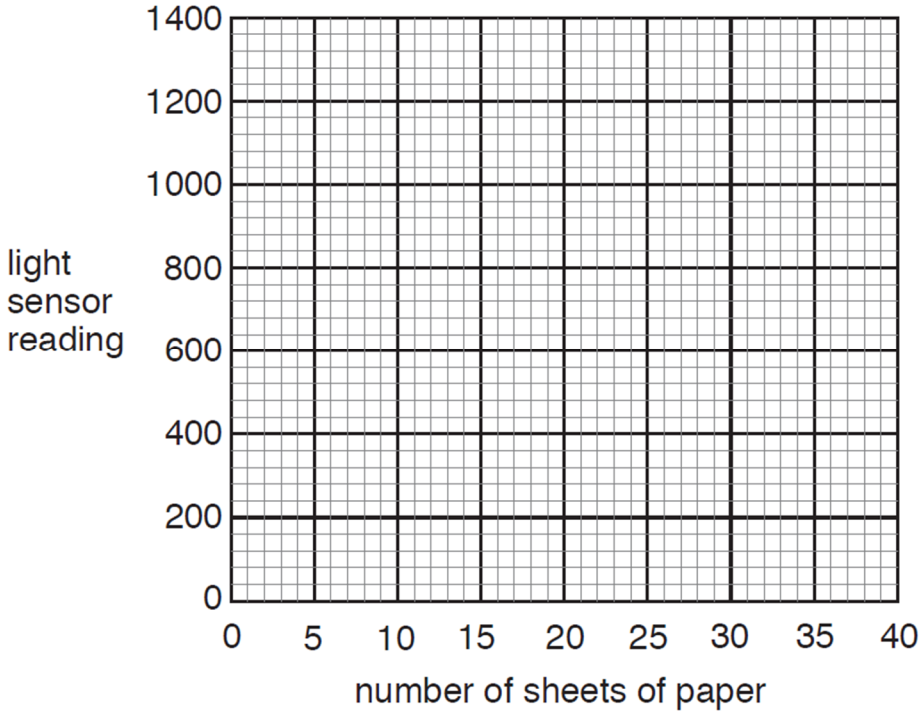


Their results are shown in the table below.

number of sheets	light sensor reading
1	1280
2	640
6	320
10	220
16	160
36	90

(c) (i) On the grid, plot the results of their experiment. (2)

(ii) Draw a line or curve of best fit to complete the graph. (1)



(e) Explain whether or not you think the arrangement used in this experiment is good for counting sheets of paper.

.....
.....
..... (2)

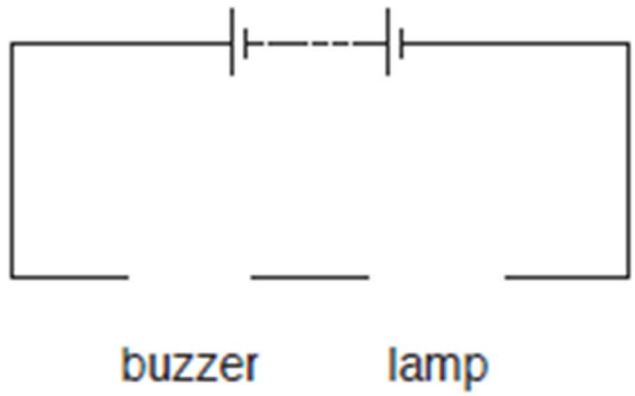
The light sensor circuit in the mobile phone is quite complicated but it is possible to make a simple light sensor circuit in the lab using an ammeter and other circuit components.

(f) In the space below, draw a possible circuit for a light sensor which gives a Different reading on the ammeter for different light levels.
Use correct circuit symbols.

(3)

Summer 2013

2. Tim connects a cell in series with a buzzer and a lamp.
(a) In the gaps in the diagram below, insert the correct circuit symbols for the Labelled components.



(2)

When connected correctly, the buzzer sounds, but the lamp does not light. Tim says, 'This is because electricity reaches the buzzer first, which uses up the electricity, so there is not enough left to light the lamp.' You decide to use an ammeter to show Tim that he is wrong.

(b) (i) Describe how you would use the ammeter to show Tim that he is wrong.

.....
.....
..... (2)

(ii) State and explain how your results would show Tim that he is wrong.

.....
.....
..... (2)

(c) If no ammeter is available, explain how you might still convince Tim that he is wrong.

.....
.....
..... (2)

7. The diagram below shows a bar magnet.

(a) (i) Add FOUR lines to the diagram to show the shape of the magnetic field produced by the magnet. (2)

(ii) Add arrows to your lines to show the direction of the magnetic field. (1)

An iron nail is attracted by the north pole of this bar magnet.

(b) State whether the nail will be attracted or repelled by the south pole of the magnet.

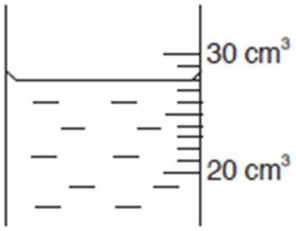
..... (1)

George thinks that the bar magnet will make a ray of light bend slightly, but Sarah thinks he is wrong.

(c) Describe an experiment which Sarah could do to show George that he is wrong. You should explain how she could create a ray of light and what she should do to make her test sensitive. You may wish to draw a diagram to make your answer clear.

.....
.....
.....
.....
..... (3)

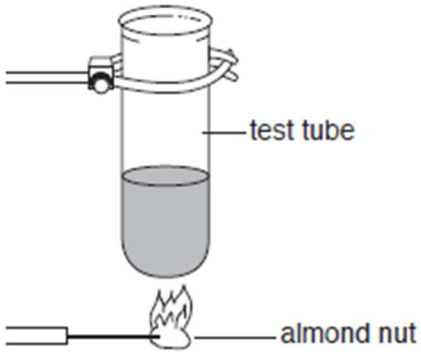
8. Laura decided to measure how much energy there was in an almond nut. First she poured some water into a measuring cylinder. The diagram shows the volume of water she used.



(a) State the amount of water she used.

..... (1)

Laura poured this water into a test tube. She set light to the almond nut and used the burning nut to heat the water, as shown below. She measured the temperature of the water as she started the heating, then every minute until the nut finished burning.



(b) Name the instrument which Laura should have used to measure the temperature of the water.

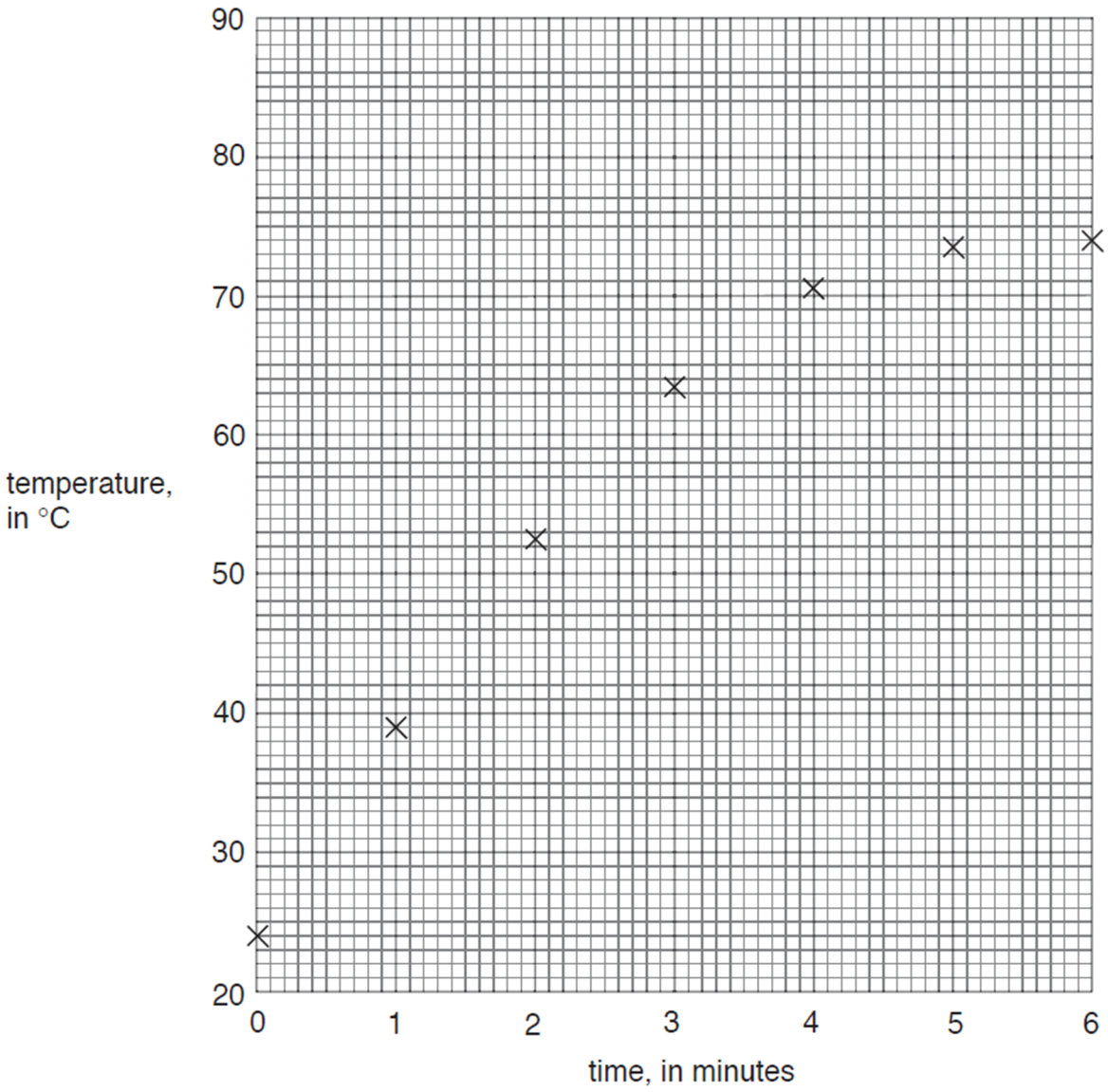
..... (1)

Laura's results are shown in the graph on the next page.

(c) Draw a suitable graph line. (2)

(d) Use the graph to find the total temperature rise of the water.

..... (2)



The amount of energy transferred to the water from the burning nut can be found using the formula

$$\underset{(\text{in J})}{\text{Energy}} = 4.2 \times \underset{(\text{in cm}^3)}{\text{volume of water}} \times \underset{(\text{in °C})}{\text{temperature rise}}$$

(e) Calculate the amount of energy transferred to the water.

.....

.....

Energy =..... J (2)

(f) In what form did the nut store this energy?

..... (1)

(g) Suggest two reasons why the nut probably contained more energy than your answer to (e).

1: .....

..... (1)

2: .....

..... (1)

Laura could have used more water in the test tube.

(h) Suggest and explain whether this would make her measurement of the energy of the nut more accurate or less accurate.

.....

.....

.....

.....

..... (3)