Write your name here

Surname	Other names

Centre Number

Learner Registration Number

Application of Science
Unit 8: Scientific Skills

Friday 20 May 2016 – Morning
Time: 1 hour 15 minutes

Paper Reference
20474E

You must have:
Calculator, Ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need*.

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P51691A0120

PEARSON

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then put a cross in another box ☒.

1 (a) Catherine investigates how much energy is in crisps.

Catherine burns a crisp to heat some water.

She repeats the experiment with different types of crisp.

She uses the equipment in the diagram.
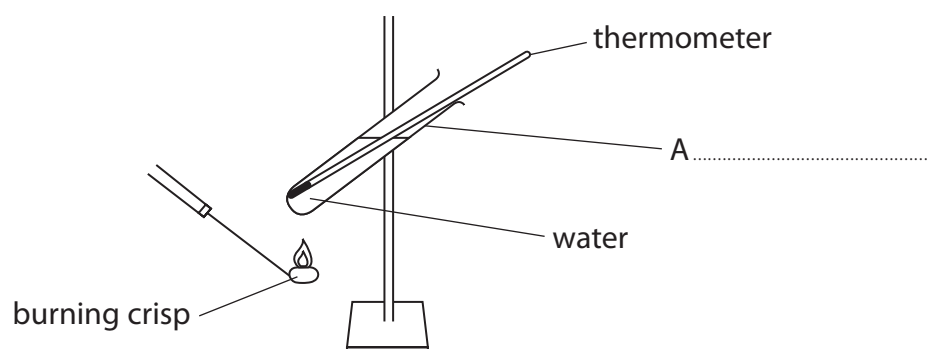
(i) Complete the missing label, A, on the diagram.

(1)

(ii) State **two** hazards in this experiment.

(2)

1 ....

....

2 ....

....

(iii) State the independent variable for this experiment.

(1)

....

(b) Catherine makes the following hypothesis about heating water with a burning crisp:

'the more water there is the less the temperature will go up.'

Write a plan to test this hypothesis.

(6)

(Total for Question 1 = 10 marks)

2 Andrew investigates the number of daisies growing in a park.

He randomly throws a quadrat onto the ground.

He counts the number of daisies inside the quadrat.

He repeats this five times in different areas of the park.
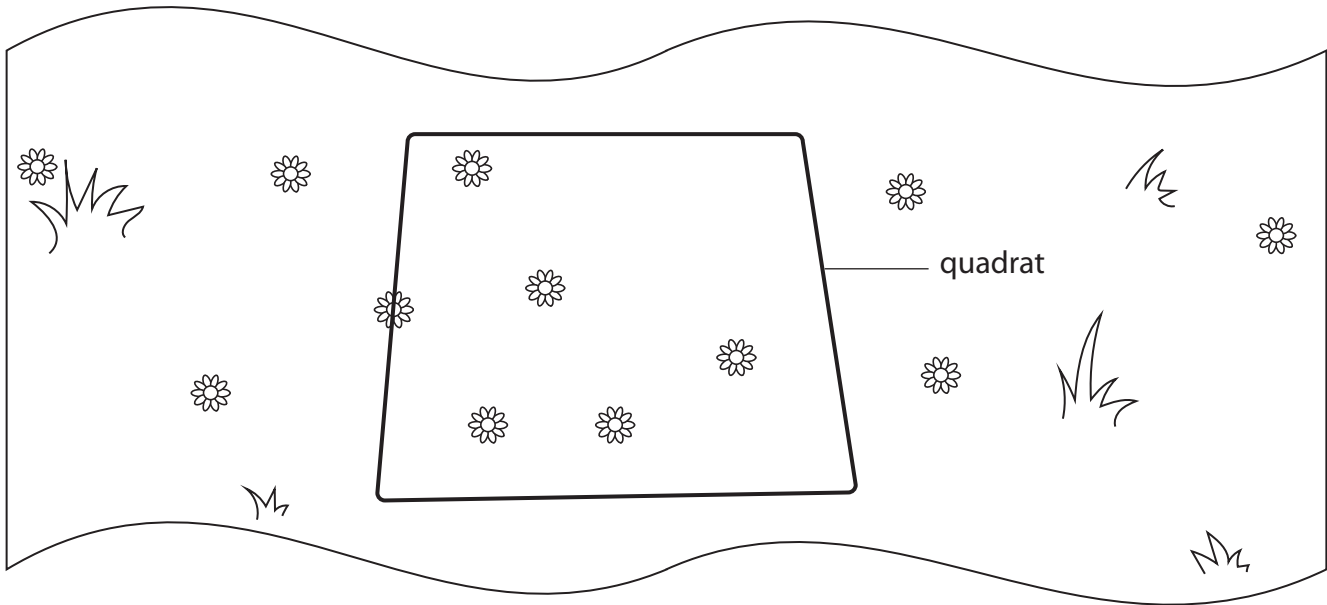
Here are his results.

number of daisies inside the quadrat					average number of daisies inside the quadrat
throw 1	**throw 2**	**throw 3**	**throw 4**	**throw 5**	
4	3	6	4	5	

(a) Calculate the average number of daisies inside the quadrat.

Show your working.

(2)

average number of daisies ....

(b) Andrew investigates different types of flower found inside a quadrat in a park.

Here are his results.

dandelion 3.5

clover 14.0

buttercup 3.0   daisy 5.0

primrose 8.5

Complete the table for these results.

(3)

(Total for Question 2 = 5 marks)

3 (a) Jane uses a thermometer to measure the body temperature of a hospital patient every hour.

Jane draws a graph of the patient's body temperature.
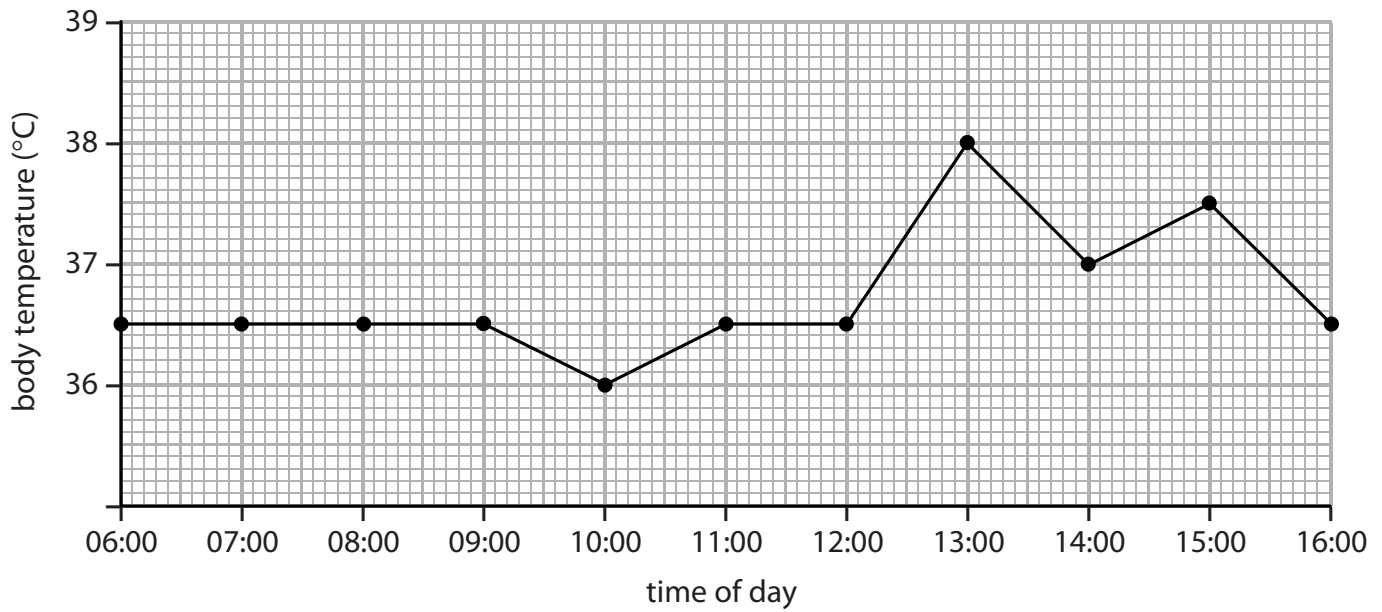
(i) Identify the time of day when the body temperature was highest.

(1)

☒ **A** 07:00

☒ **B** 10:00

☒ **C** 13:00

☒ **D** 16:00

Jane uses two different thermometers on a hospital patient to check their body temperature at 17:00.

She records these measurements.

body temperature (°C)	
thermometer 1	thermometer 2
36.5	37

(ii) State why the measurement from thermometer 1 is more accurate than the measurement from thermometer 2.

(1)

....

....

(b) Jane measures the hospital patient's lung capacity three times.

Jane records these measurements in a table.

lung capacity of hospital patient (litres)
5.465
4.466
5.463

Jane thinks that the measurement of 4.466 litres is an anomaly.

State **two** ways in which Jane should deal with the anomalous measurement.

(2)

1 ....

....

2 ....

....

(Total for Question 3 = 4 marks)

4 Paul investigates how the colour of a can affects the cooling of hot water inside the can.

He uses the equipment shown in the diagram.
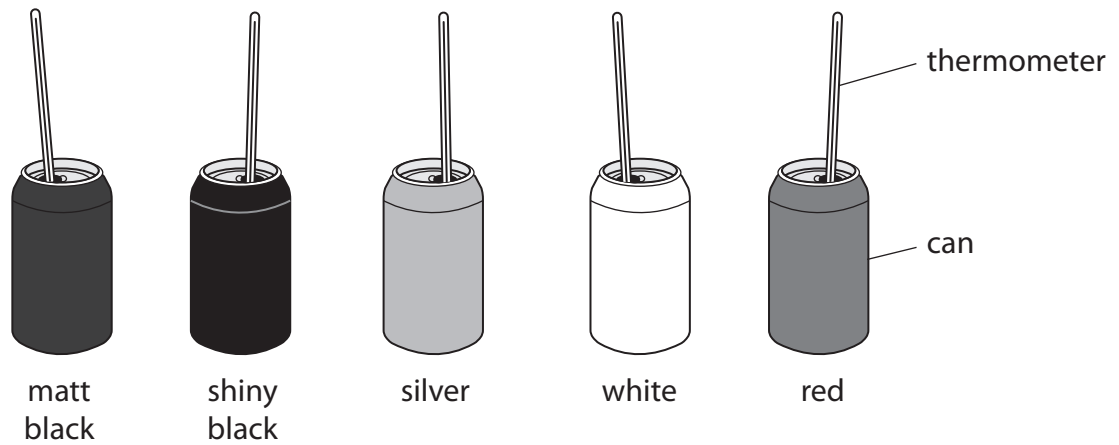
He pours hot water at 70 °C into each can.

Paul measures the temperature of the water inside the cans after 10 minutes.

Here are his results.

colour of can	temperature after 10 minutes (°C)
matt black	36
shiny black	45
silver	60
white	54
red	48

(a) Give the colour of can that has lost the most heat after 10 minutes.

(1)

....

(b) Plot a bar graph of Paul's results on the graph paper.

(6)
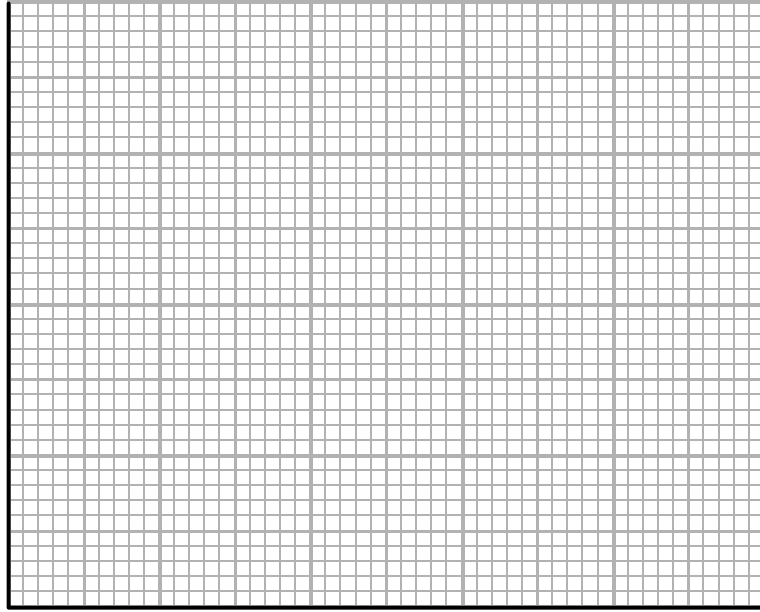
(Total for Question 4 = 7 marks)

5 Vanessa investigates how the force on a toy car affects the time taken for the toy car to travel one metre.

She uses the equipment shown in the diagram.
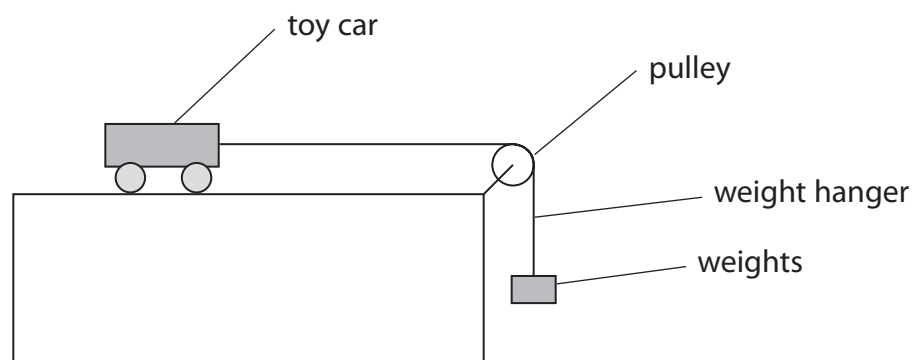
The weight on the weight hanger pulls the toy car along.

Vanessa adds weights to the weight hanger and records the time taken for the toy car to travel one metre.

Her results are shown in the table.

weight added to weight hanger (N)	time taken for toy car to travel one metre (s)		
	test 1	test 2	test 3
1.0	0.93	0.90	0.96
2.0	0.62	0.60	0.64
3.0	0.41	0.40	0.15
4.0	0.24	0.26	0.24

(a) In test 3, there was an error at 3.0 N.

Explain **two** possible reasons for this error.

(4)

Reason 1...

....

....

....

Reason 2...

....

....

....

P 5 1 6 9 1 A 0 1 1 2 0

(b) Vanessa calculates the speed of the toy car when different weights are added to the weight hanger.

The graph shows Vanessa's results.
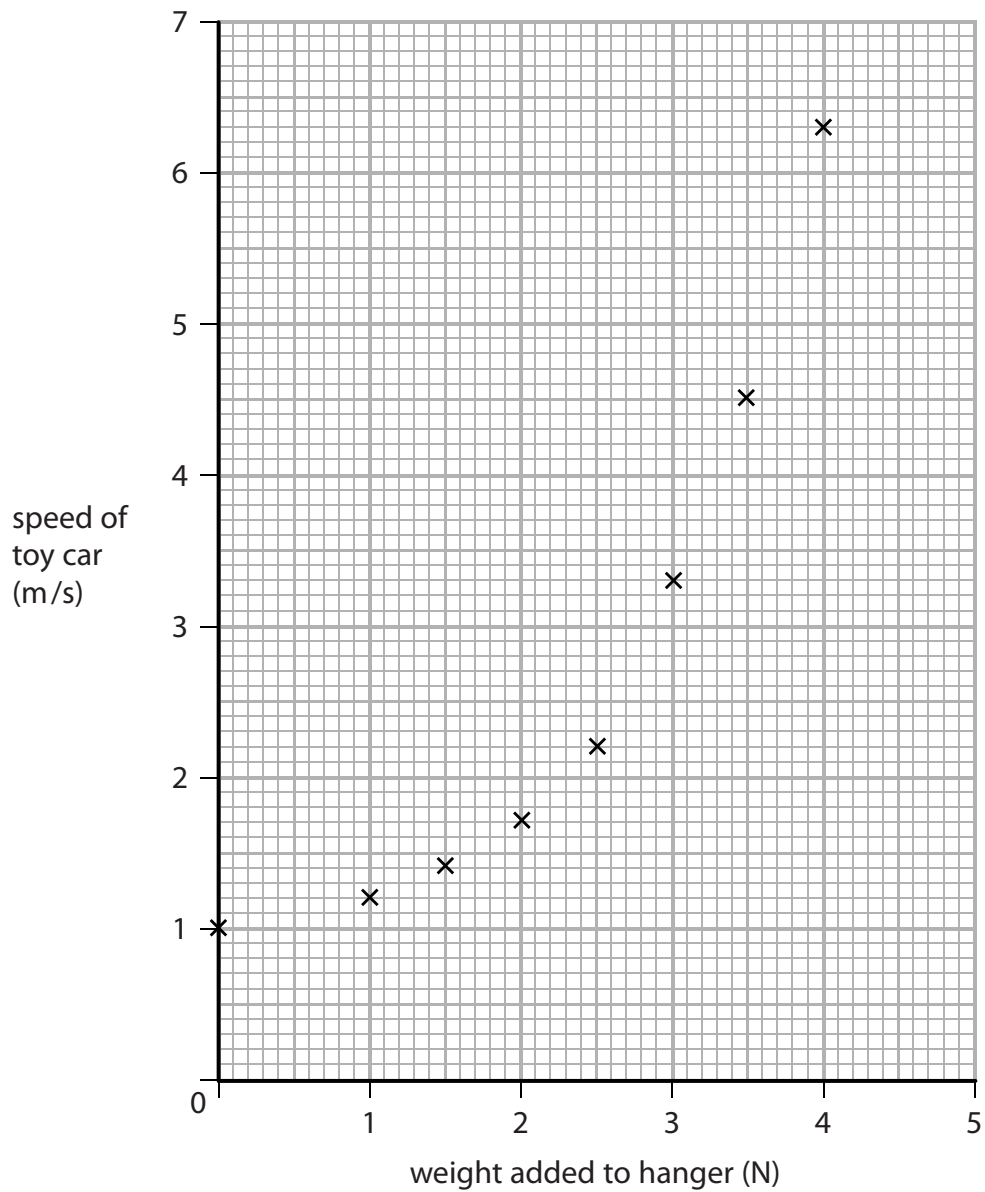
(i) Draw a curve of best fit on the graph.

(1)

(ii) Describe the trend shown by the graph.

(2)

....

....

....

....

(c) A lorry transports materials around the country.

The lorry's engine gives a force of 1500 N.

The mass of the lorry is 1×10^4 kg.

Calculate the acceleration of the lorry.

$$\text{force (N)} = \text{mass (kg)} \times \text{acceleration (m/s}^2)$$

Show your working.

(3)

acceleration = ... (m/s^2)

(Total for Question 5 = 10 marks)

6 Sam has a graph showing the energy required to jog at different speeds.
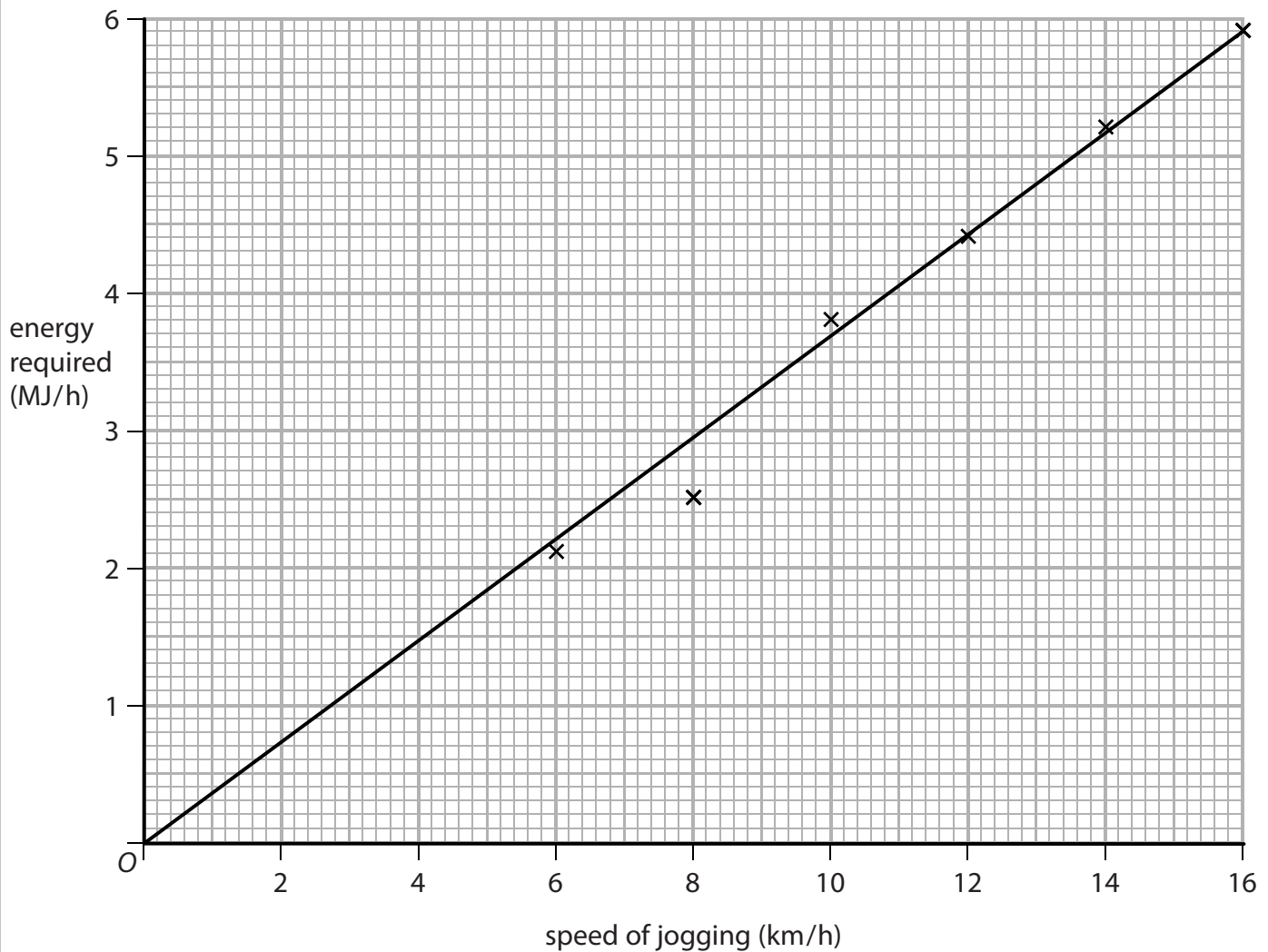
(a) Circle the anomalous point on the graph.

(1)

(b) Sam has some information about the energy required for jogging.

activity	energy needed for 1 hour (J)
jogging	2 600 000

Calculate the energy needed to jog for 30 minutes.

Show your working.

(2)

.... J

(c) Sam uses a treadmill in a gym to exercise.

The treadmill displays how much energy Sam has used during his exercise.

Here are his results.

activity	time (minutes)	total energy used (J)
running on a flat road	20	1 600 000
running uphill	10	1 200 000

Sam uses the data from the table to draw a conclusion.

'I use more energy when I run on the flat road than when I run uphill.'

Explain if this conclusion is correct or incorrect, using the data from the table.

(2)

....

....

....

....

....

....

(Total for Question 6 = 5 marks)

Turn over ▶

7 The pie chart shows the relative amounts of energy sources used around the world.
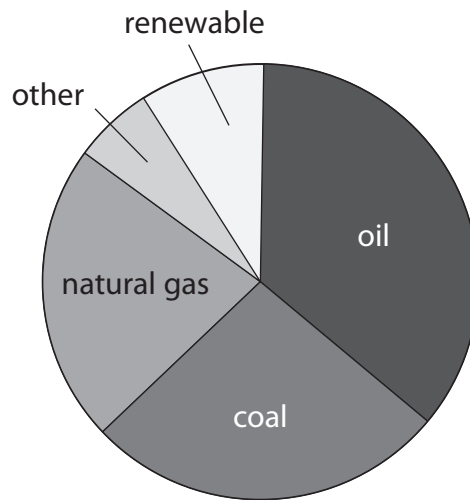
Relative amounts of energy sources
used globally

(a) Carlos makes this conclusion:

'Oil is the most used of all the energy sources.'

State how the pie chart supports this conclusion.

(1)

....

....

(b) Coal, natural gas and oil are non-renewable energy sources.

Non-renewable energy sources cannot be replaced.

Carlos thinks this information means the pie chart will be different in the future.

State **two** ways the pie chart might be different in the future.

(2)

1 ....

....

2 ....

....

(Total for Question 7 = 3 marks)

BLANK PAGE

QUESTION 8 BEGINS ON THE NEXT PAGE.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

8 Tracy researches the reactivity series of metals.

She finds part of the reactivity series.

```
                    ↑   magnesium
                    |
   increasing       |   zinc
   reactivity       |
                    |   iron
                    |
                    |   tin
```
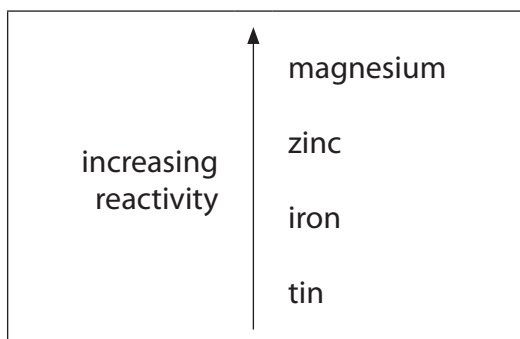
When some metals react with copper sulfate solution the temperature of the solution will rise.

A more reactive metal will give a higher temperature rise than a less reactive metal.

Tracy carries out an experiment to test if the order of the reactivity of these four metals is correct.

Here is her method:

1. Add a piece of magnesium to copper sulfate solution.
2. Measure the temperature of the solution when the reaction has stopped.
3. Repeat for all of the other metals.

Tracy thinks that she can improve her method.

Explain the improvements she could make to this method.

(6)

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 8 = 6 marks)

TOTAL FOR PAPER = 50 MARKS

BLANK PAGE