Pearson BTEC Level 1/Level 2 First Award

Centre Number

Learner Registration Number

Application of Science
Unit 8: Scientific Skills

Thursday 3 November 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 ▶

Answer ALL questions. Write your answers in the spaces provided.
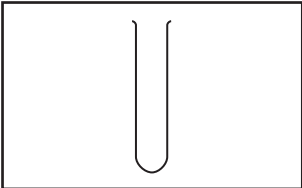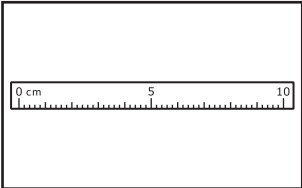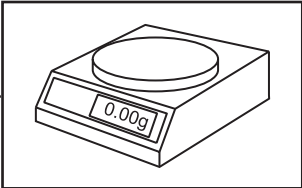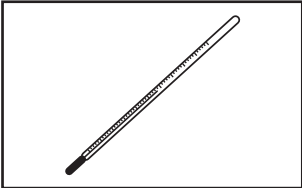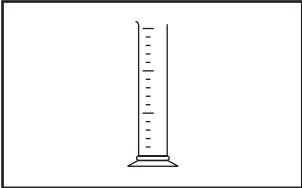
Some questions must be answered with a cross in a box ⊠. If you change your mind about an answer, put a line through the box ⊠ and then put a cross in another box ⊠.

1   Michael chooses some equipment for an investigation.

Draw **one** line from each use to the correct piece of equipment.

One line has already been drawn for you.

(2)

use	equipment

measures volume

measures mass

measures distance

(Total for Question 1 = 2 marks)

2 Haroon investigates the best habitat for woodlice.

He places five woodlice into a choice chamber.

The woodlice carry bacteria from soil on their bodies.

(a) State **one** risk from the bacteria.

(1)

....

....

(b) A choice chamber is a dish divided into four sections.

Each section gives different conditions for the woodlice.

Explain why five woodlice is a suitable range for this investigation.

(2)

....

....

....

....

(Total for Question 2 = 3 marks)

BLANK PAGE

3 Alex is investigating electric circuits.

(a) Alex wants to investigate how the current in the circuit affects the brightness of the lamp.
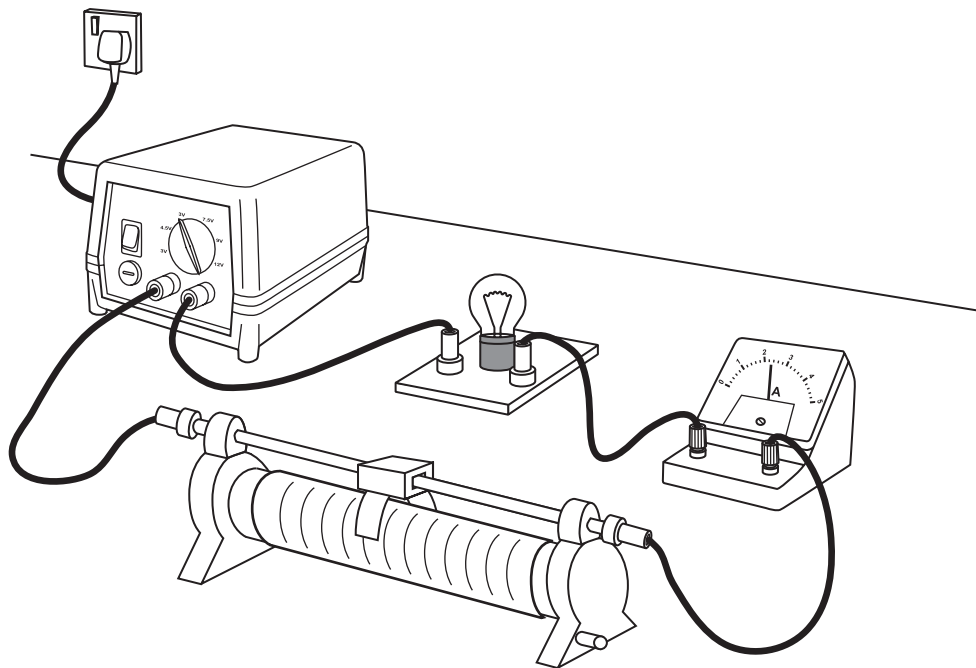
Alex uses an ammeter to measure the current in the circuit.

(i) State the independent variable in this investigation.

(1)

....

(ii) Identify **two** variables that Alex will need to control for this investigation.

(2)

1 ....

....

2 ....

....

P 4 8 1 7 9 A 0 5 2 0

(b) Alex is given a circuit with a light dependent resistor (LDR) and a lamp.

He plans to measure the resistance of the LDR at different lamp brightness levels.

He draws a graph of what he thinks will happen to the resistance of the LDR at different lamp brightness levels.

(i)   Write a hypothesis for how changing the lamp brightness levels affects the resistance of the LDR.

(2)

....

....

....

....

(ii) Write a plan to test how lamp brightness affects the resistance of the LDR.

(6)

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 3 = 11 marks)

4 Yasmin researches the heat capacity in joules per kilogram of different substances.

This is what she found.

copper 0.385 J/K		water 4.182 J/K		sand 0.290 J/K
steel 0.450 J/K			concrete 0.880 J/K	

(a) Complete the table with these results.

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
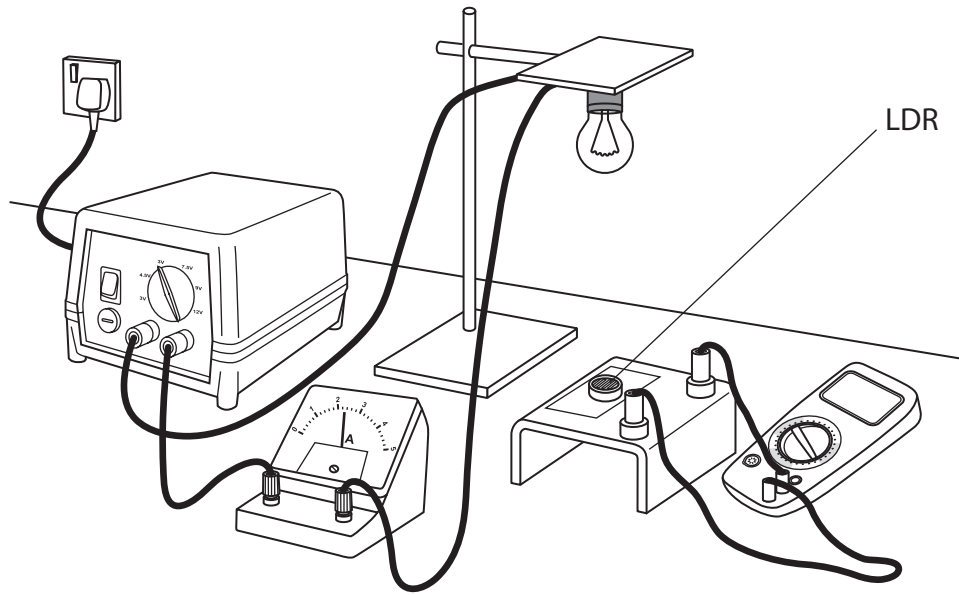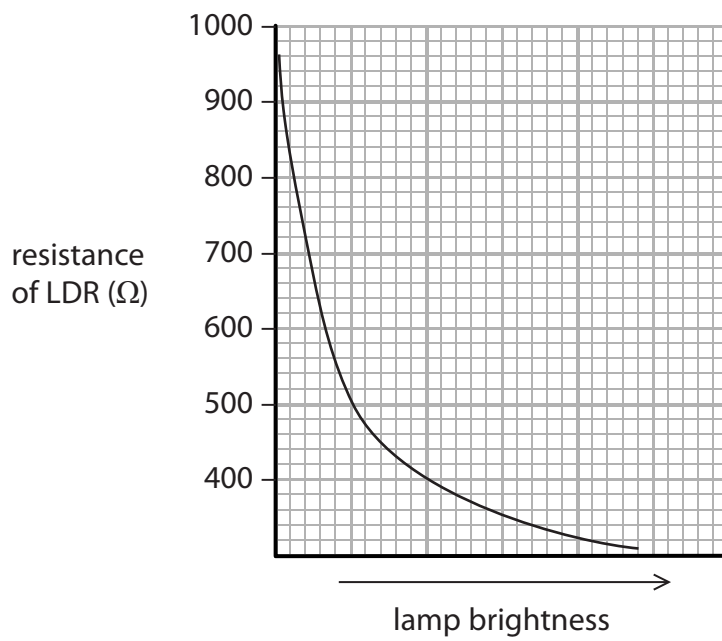
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) Burning ethanol can be used to heat water.

Yasmin investigated the mass of ethanol needed to increase the temperature of different masses of water by 10 °C.

Here are her results.

mass of water (g)	mass of ethanol (g)
100	0.18
200	0.37
300	0.56
400	0.76
500	0.95
600	1.15

Plot a line graph of these results on the graph paper.

(6)
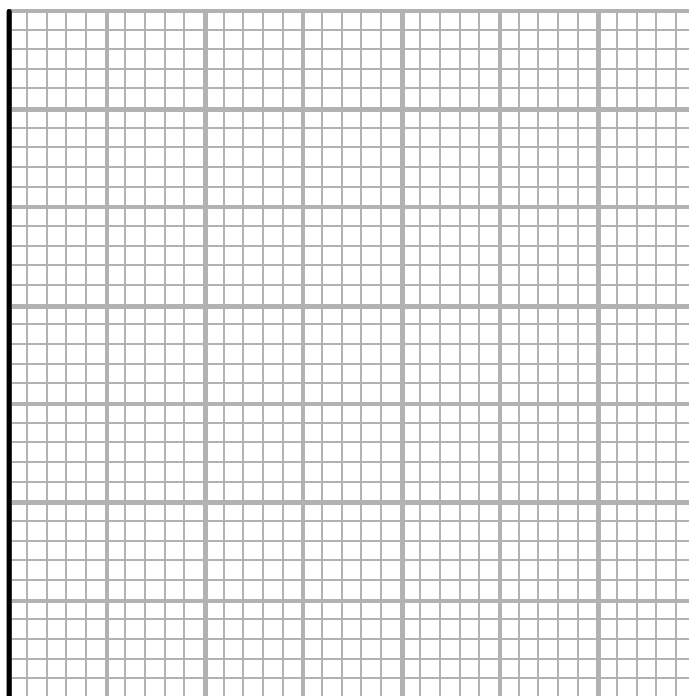
(c) Yasmin heats 20 g of water.

The water absorbs 260 J of heat energy.

Calculate the temperature change of the water using the equation:

| heat energy absorbed (J) | = | mass (kg) | × | 4200 ($J K^{-1} kg^{-1}$) | × | temperature change (K) |

Give your answer to two significant figures.

Show your working.

(4)

temperature change = ...K

(Total for Question 4 = 13 marks)

BLANK PAGE

5 Amber researches how the number of zebras changes in an African wildlife reserve over a period of time.

Here is the graph that Amber found.

year
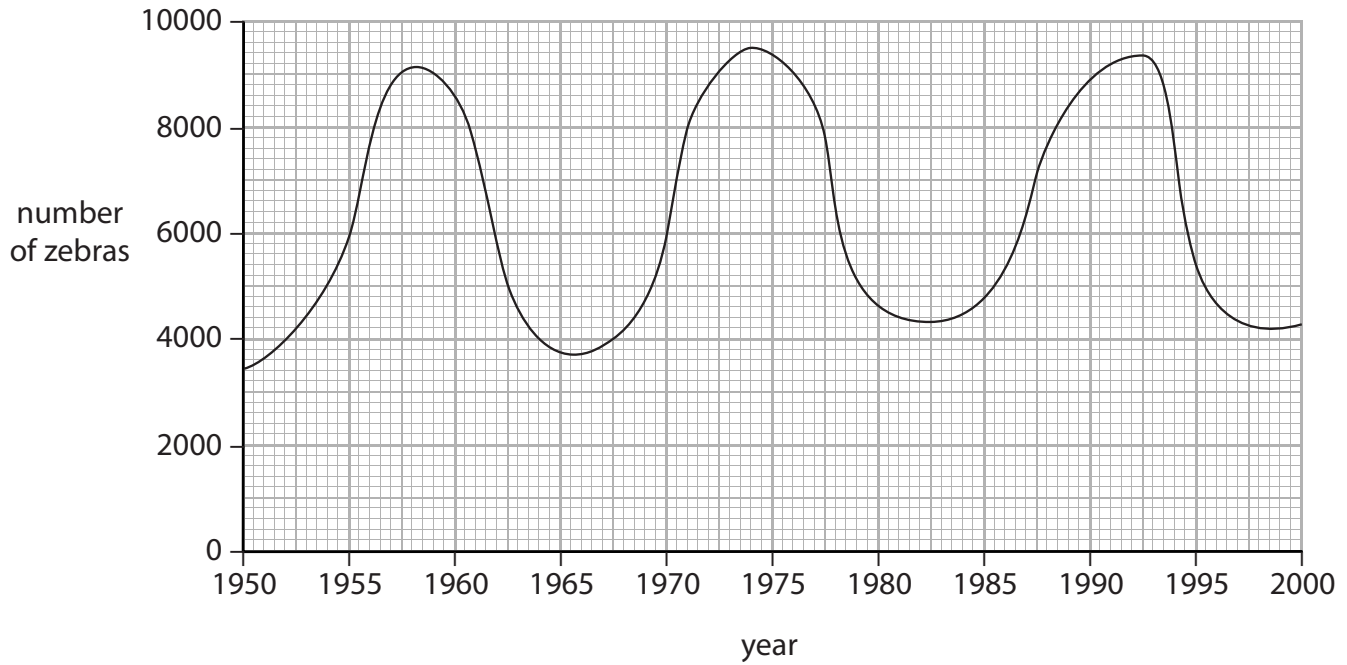
(a) Give the number of zebras living in the wildlife reserve in 1955.

(1)

....

(b) Describe the pattern in the number of zebras.

(2)

....

....

....

....

....

....

(Total for Question 5 = 3 marks)

6 Colin and Jane investigate their reaction time.

The reaction time was measured using a computer program.

Here are their results.

attempt	reaction time for Colin (seconds)	reaction time for Jane (seconds)
1	0.37	0.42
2	0.82	0.43
3	0.38	0.41
4	0.36	0.45
5	0.41	0.40

(a) Colin realises that there is an anomaly in the table for his results.

(i) Circle the anomaly in the table.

(1)

(ii) Give **one** factor that may have caused this result to be anomalous.

(1)

....

....

(b) Calculate the average reaction time for Jane.

Show your working.

(2)

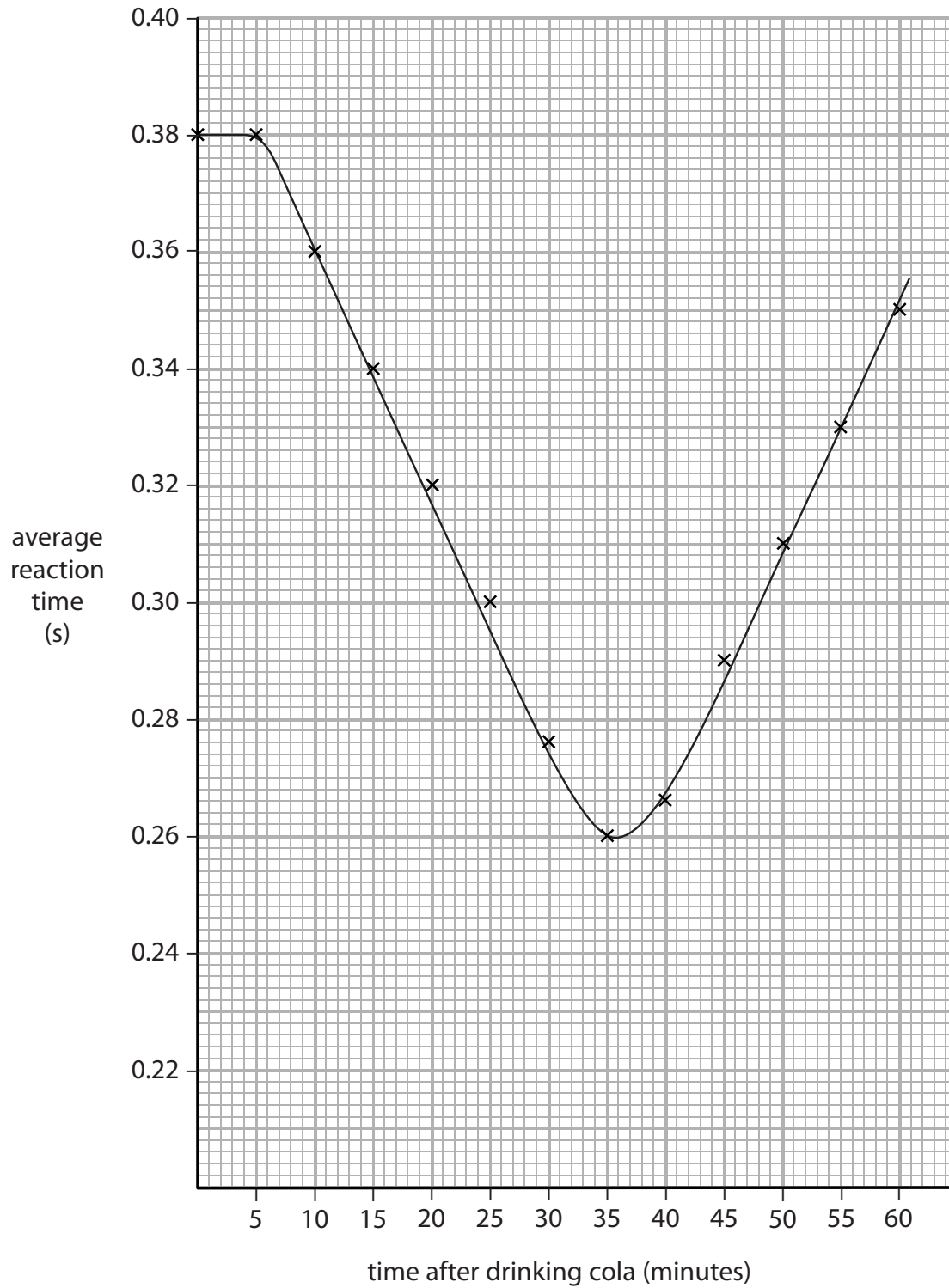...s

(c) Colin drank a large glass of cola.

He measured his reaction time every five minutes for one hour after drinking the cola.

Colin drew this graph of his results.

P 4 8 1 7 9 A 0 1 4 2 0

(i) Analyse, using the evidence from the graph, how drinking cola affected Colin's reaction time.

(3)

....

....

....

....

....

....

(ii) Colin knows that some types of cola contain caffeine.

Colin makes this hypothesis.

'Caffeine affects your reaction time.'

Suggest how he could extend his investigation to support his hypothesis further.

(3)

....

....

....

....

....

....

(Total for Question 6 = 10 marks)

7 (a) Katie investigates how the area of a toy parachute affects the time the toy parachute takes to fall five metres.

Katie plots her results and makes a conclusion.

> 'There is a strong relationship between the area of the toy parachute and the time taken to fall five metres.'

(i) Identify the graph, A, B, C or D, that best supports her conclusion.

(1)

A

B

C

D
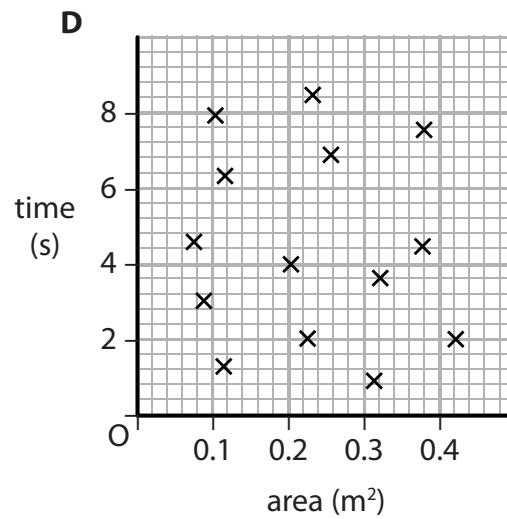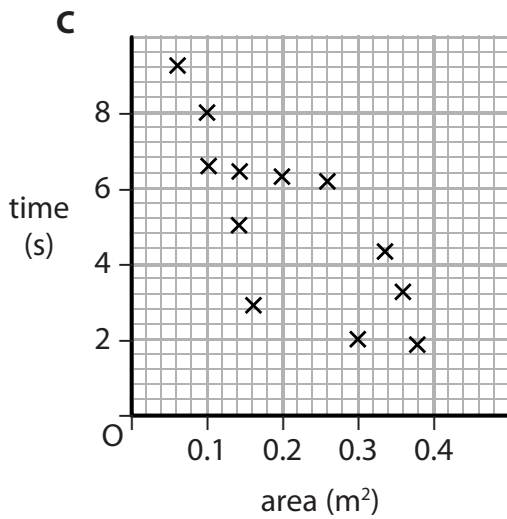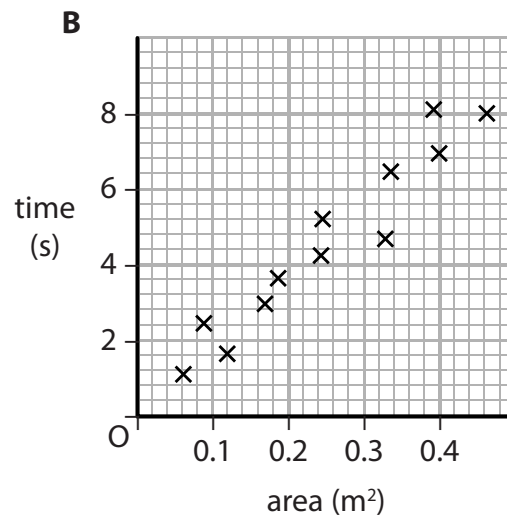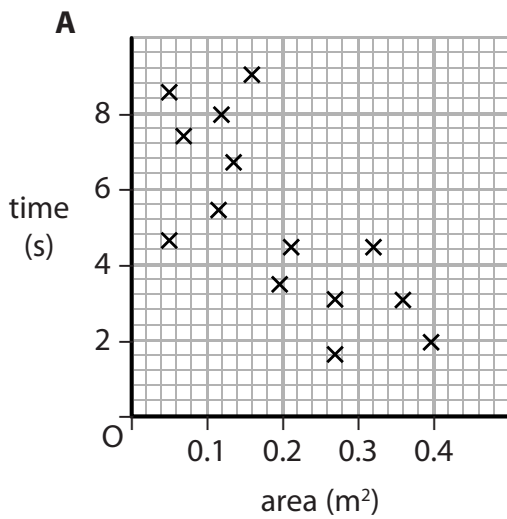
☒ **A** Graph **A**

☒ **B** Graph **B**

☒ **C** Graph **C**

☒ **D** Graph **D**

(ii) Katie dropped a toy parachute with an area of 0.5 m^2.

The time taken for this parachute to fall five metres was 10 seconds.

Suggest how long a toy parachute with an area of 1 m^2 would take to fall five metres.

(1)

....

(b) Katie drops balls of different sizes and materials from a height.

She measures the time it takes the balls to reach the ground.

Here are her results.

material of ball	mass of ball (kg)	diameter of ball (cm)	time of fall (s)
iron	1.0	8.0	1.7
stone	1.0	8.0	1.7
plastic	1.0	10.0	1.7
feather	1.0	50.0	5.3

material of ball	mass of ball (kg)	diameter of ball (cm)	time of fall (s)
iron	3.0	15.0	1.7
stone	3.0	15.0	1.7
plastic	3.0	25.0	1.7
feather	3.0	100.0	9.5

Katie makes a hypothesis for this experiment.

- 'The heavier the ball the faster it will fall.'

- 'The larger the diameter of the ball the faster it will fall.'

Explain why Katie's results do not support her hypothesis.

(6)

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 7 = 8 marks)

TOTAL FOR PAPER = 50 MARKS

BLANK PAGE