

Write your name here

Surname

Other names

Pearson BTEC
Level 1/Level 2
First

Centre Number

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Learner Registration Number

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Application of Science

Unit 8: Scientific Skills

Friday 7 March 2014 – Afternoon
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 ►

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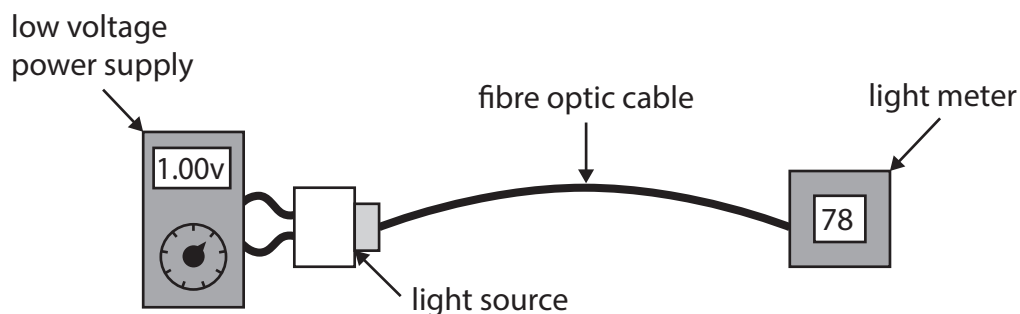
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Some questions must be answered with a cross . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

Fibre optic cables can be used to carry light from a light source to the place where it is needed.

Chloe and Britney are going to set up an experiment to investigate fibre optic cables.

They will connect a fibre optic cable to a light source. They will measure the light intensity at the other end of the cable.



1 Chloe and Britney want to find out if the brightness of the light source will affect the light intensity at the end of the cable.

(a) Identify the piece of equipment they will use to measure the light intensity.

(1)

(b) Chloe and Britney keep the length of the fibre optic cable the same.

Identify **two** other variables that will need to be controlled for this experiment.

(2)

1

2

(c) It is important to be safe when carrying out an experiment.

Describe a health risk with this experiment.

(2)

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(Total for Question 1 = 5 marks)

.....



3 James and Gary investigated the effects of burning different fuels.

They heated separate samples of 25 cm³ of water by burning each of the fuels.

They measured the temperature of the water at the beginning of their experiment and then again after **five** minutes.

(a) (i) Identify the **most** appropriate piece of equipment to measure 25 cm³ of water. (1)

- A Conical flask
- B Measuring cylinder
- C Measuring jug
- D Test tube

(ii) Name **one** piece of equipment used to measure the temperature of the water. (1)

(b) James and Gary recorded their results.

The results are shown in the table.

Fuel	Temperature of water at the start (°C)	Temperature of water after five minutes (°C)
ethanol	21	51
propanol	21	71

Calculate the temperature change **per minute** for **propanol**. (2)

..... °C per minute



(c) James and Gary repeated the experiment for ethanol and measured the temperature of the water every minute for **five** minutes.

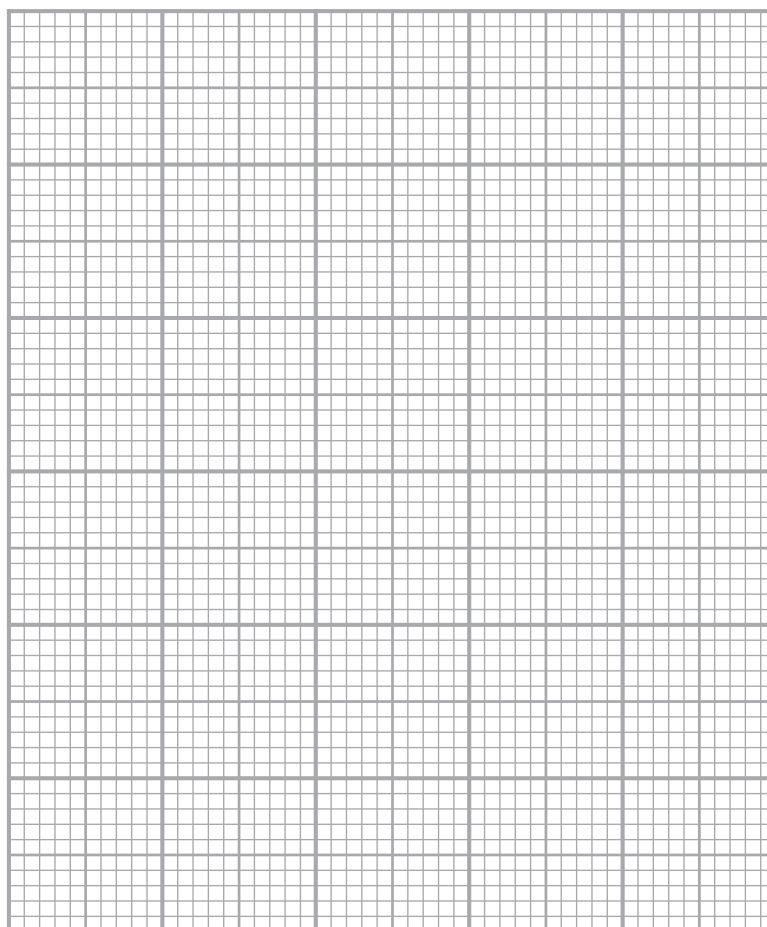
The results are shown in the table.

Time in minutes	0	1	2	3	4	5
Temperature (°C)	21	27	33	39	45	51

Plot a line graph of these results.

Use the graph paper below.

(6)



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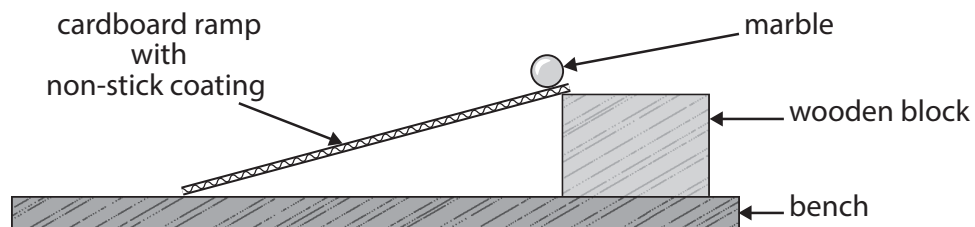


4 Saucepans are lined with non-stick coating to prevent food sticking to the saucepan.

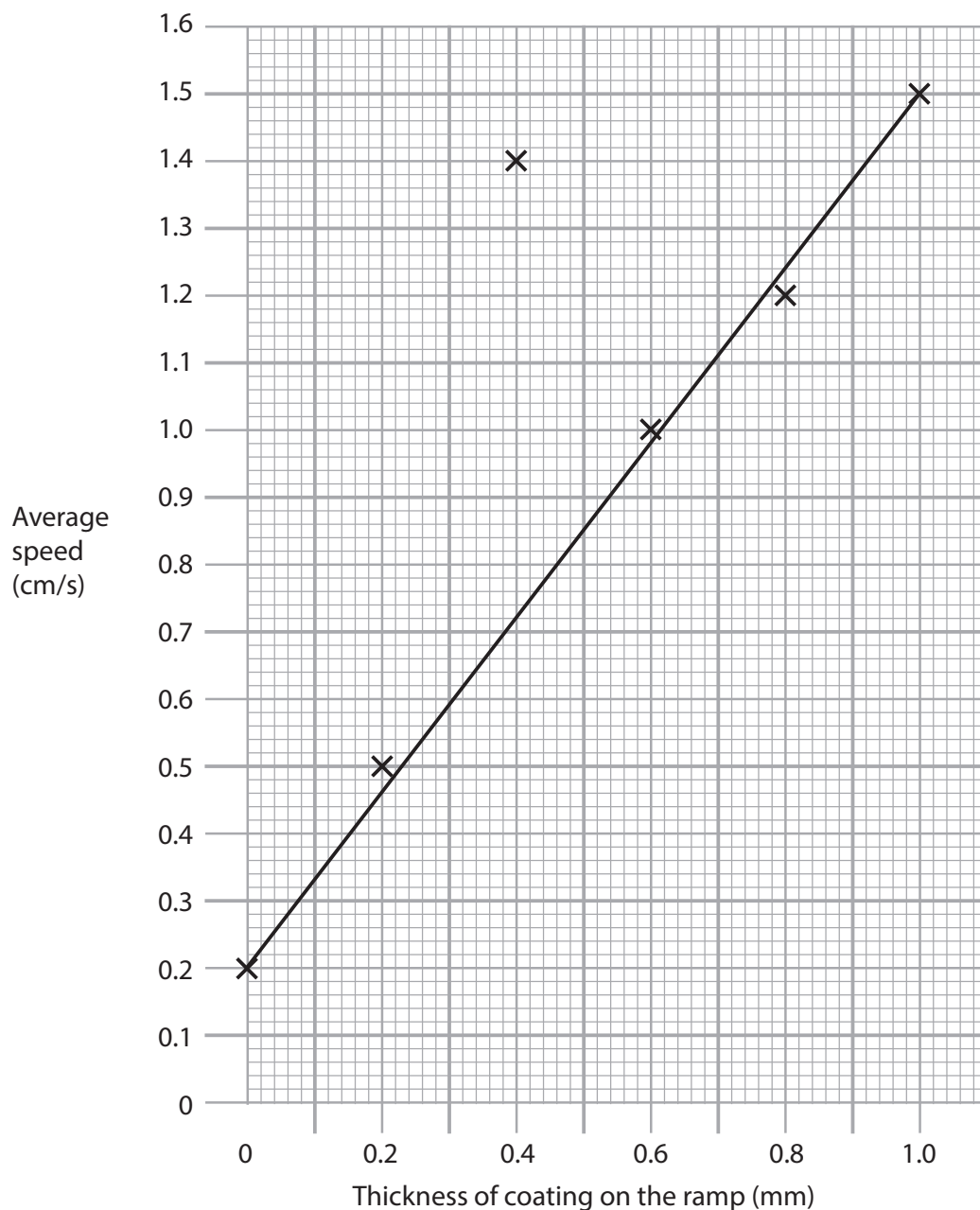
Sedef and David investigated the use of a non-stick coating.

They coated cardboard ramps with different thicknesses of the non-stick coating and rolled a marble down the cardboard to test how slippery the coatings were.

They measured how quickly the marble moved down the cardboard ramp and calculated the speed of the marble for each thickness of the coating.



Here is a graph of their results.



(a) (i) One of the points is anomalous. Circle this point on the graph. (1)

(ii) Give **two** possible reasons why the anomalous result occurred. (2)

(b) (i) State what happens to the speed of the marble as the thickness of the non-stick coating increases. (1)

(ii) The formula for calculating speed is:

$$\text{speed (cm/s)} = \frac{\text{distance (cm)}}{\text{time (s)}}$$

A marble travels for 10 seconds at a speed of 0.6 cm/s.

Calculate the distance the marble travels in 10 seconds. (2)

..... cm

(Total for Question 4 = 6 marks)

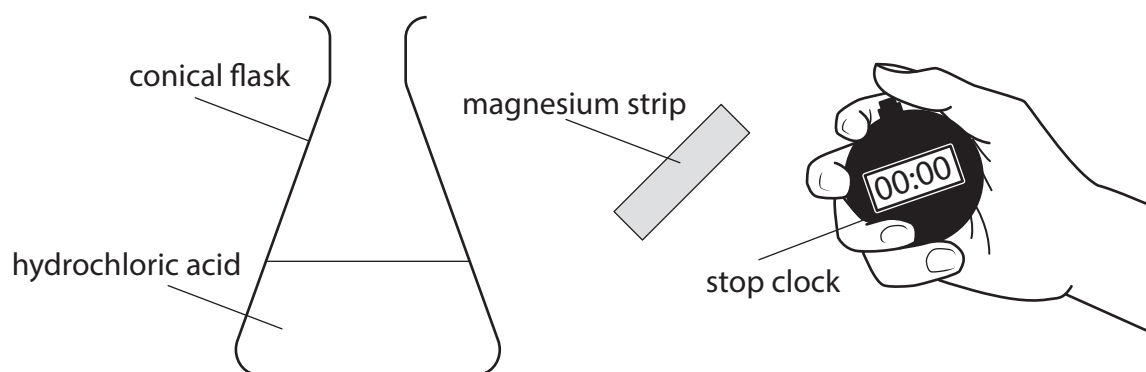


5 Samantha and Luke investigated the rate of reaction between hydrochloric acid and magnesium strips.

They dropped a 2 cm length strip of magnesium into a conical flask containing 50 cm³ of hydrochloric acid.

They timed how long it took for the magnesium strip to disappear.

They repeated the experiment with different concentrations of hydrochloric acid.



Samantha recorded the following results for concentration and time.

1.0 M	10 s	0.4 M	80 s	0.8 M	30 s
0.2 M	120 s	0.6 M	50 s		

(a) Complete the table for these results.

(3)

Concentration of hydrochloric acid (M)	Time taken for magnesium strip to disappear (s)



(b) Samantha and Luke investigated the effect of temperature on the rate of reaction.

They carried out a similar experiment at a range of temperatures.

Temperature (°C)	Time (s) for magnesium to disappear		
	Experiment 1	Experiment 2	Experiment 3
20	80	76	81
30	42	87	40
40	22	23	21
50	11	12	10

The result for experiment 2 at 30°C is anomalous.

Explain **two** ways Samantha and Luke can deal with the anomaly at 30°C.

(4)

1.....

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2.....

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(Total for Question 5 = 7 marks)



- 6 Freya and her friends are going to investigate the effect of different types of exercise on pulse rate.

Here is their chosen method:

1. Choose four exercises.
2. Exercise for two minutes for each exercise.
3. Record the pulse rate for 15 seconds and multiply this by 4 to give beats per minute.

- (a) Freya thinks that their method could be improved.

Select **two** ways in which their method could be improved.

(2)

- A** Exercise for different periods of time for each exercise set
- B** Measure the initial resting pulse rate
- C** Record the pulse rate for 5 seconds
- D** Rest between each exercise set
- E** Use a different person for each exercise set



(b) Here is a table of their results.

Exercise for 2 minutes	Pulse rate in beats per minute		
	Freya	Saul	Jane
Hopping	88	103	105
Running	110	120	125
Skipping	96	112	118
Walking	75	84	82

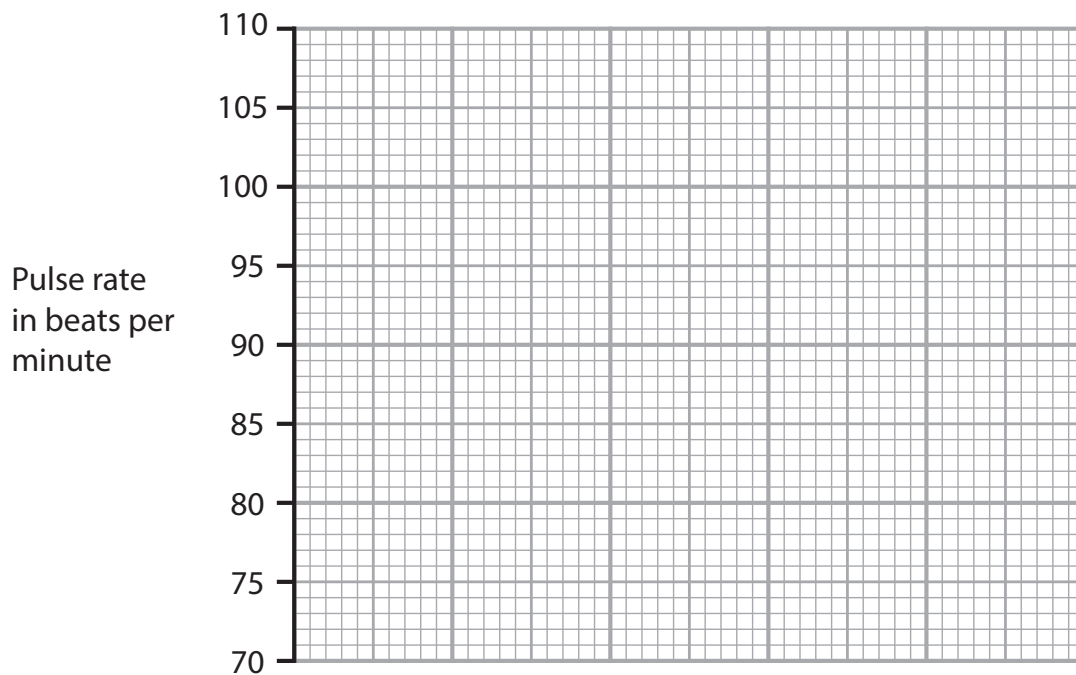
(i) Identify the exercise which caused the fastest pulse rate for Freya.

(1)

- A Hopping
- B Running
- C Skipping
- D Walking

(ii) Draw a bar chart of **Freya's** results on the graph paper.

(3)



(iii) In the table, Freya's pulse rate is always lower than Saul and Jane's.

Give **two** possible reasons why Freya's pulse rate in the table is always lower.

(2)

1.....

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.....

2.....

.....

.....

(Total for Question 6 = 8 marks)



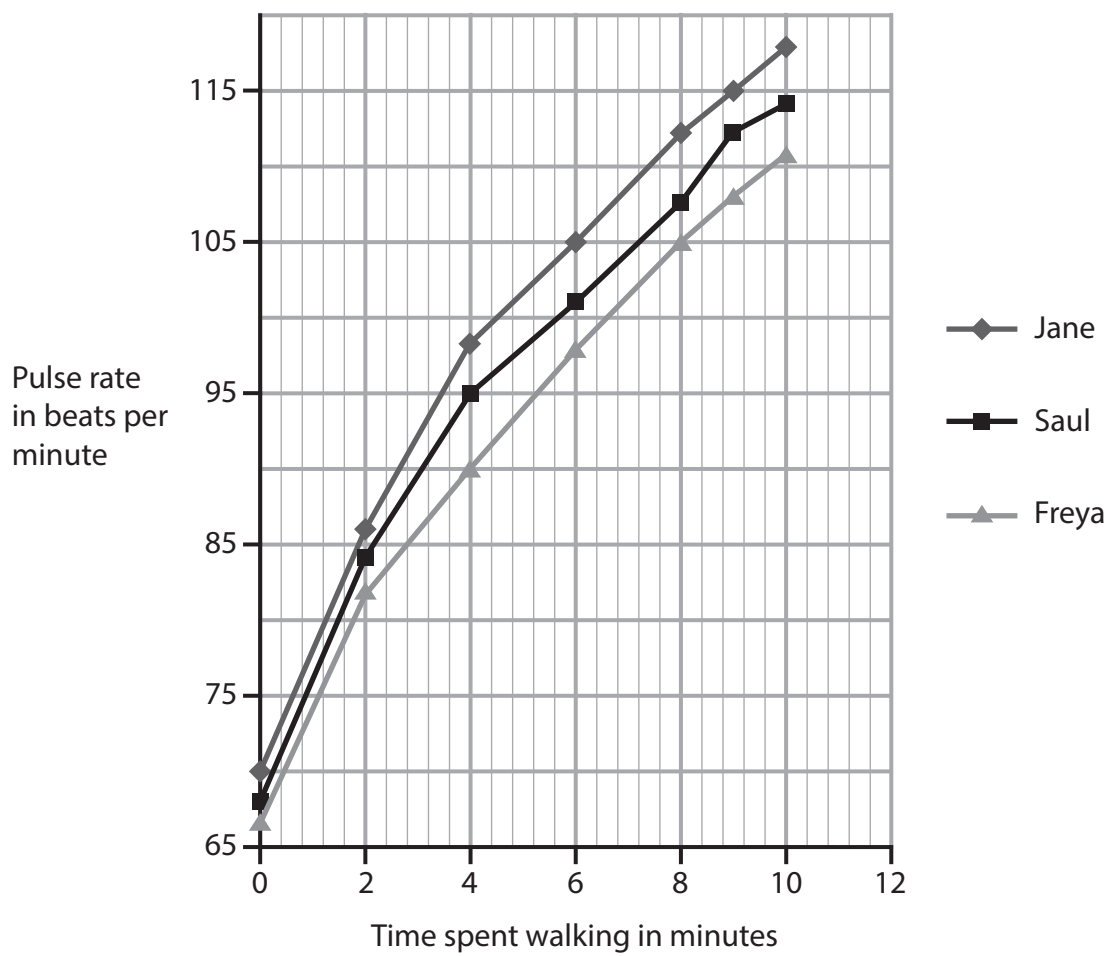
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7 Freya and her friends decide to investigate the effect of walking on pulse rate.

Here is a table and graph of their results.

Time spent walking in minutes	Pulse rate in beats per minute		
	Jane	Saul	Freya
0	70	68	67
2	86	84	82
4	98	95	90
6	105	101	98
8	112	108	105
9	115	112	108
10	118	114	111





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