

Write your name here

Surname

Other names

**Pearson BTEC
Level 1/Level 2
First Award**

Centre Number

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Learner Registration Number

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Application of Science

Unit 8: Scientific Skills

Friday 22 May 2015 – 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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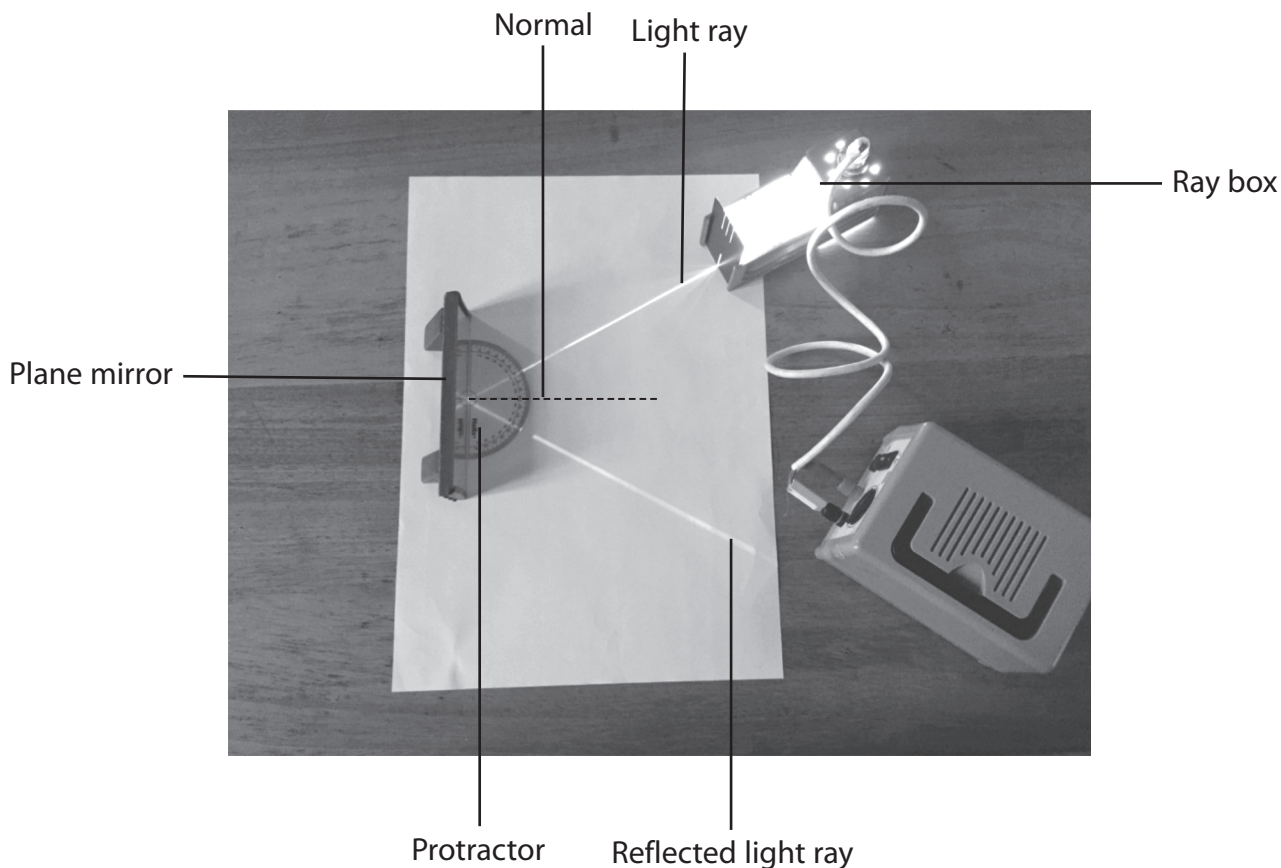


PEARSON

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

1 Alice sets up an experiment to investigate plane mirrors.

She shines a ray of light onto a mirror and measures the angle of the reflected light ray.



Alice wants to find if the angle at which the light ray hits the mirror surface affects the angle of the reflected light ray.

(a) Identify **one** piece of equipment she would use to measure the angle.

(1)

Alice uses the same mirror for each measurement.

(b) State **two** other variables that will need to be controlled.

(2)

1

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2

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(c) The mirror is a possible hazard.

(i) State **one** risk when using the mirror.

(1)

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(ii) Give **one** precaution to reduce the risk.

(1)

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(d) Alice carries out a further experiment to investigate if changing the angle of the mirror affects the angle of reflection.

She uses the same equipment as in the previous experiment.

Write a plan for this experiment that will give a range of results.

(6)

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(Total for Question 1 = 11 marks)



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2 Peter investigates the relationship between mass and height.

He measures the mass (kg) and height (m) of five people and records the results.

65 kg 1.63 m

63 kg 1.61 m

79 kg 1.70 m

82 kg 1.82 m

60 kg 1.57 m

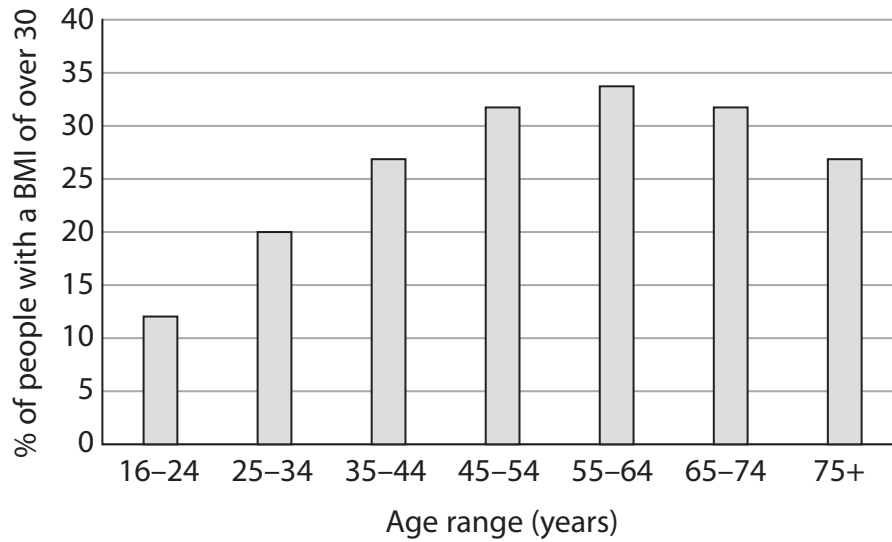
(a) Put these results in the table.

(3)



Height and mass can be used to calculate BMI (body mass index).

Peter researches how BMI changes with age.



(b) Describe what the graph shows about how BMI changes with age.

(2)

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The formula for calculating BMI is:

$$\text{BMI} = \frac{\text{mass (kg)}}{[\text{height (m)}]^2}$$

Peter has a mass of 101.6 kg and is 2 m tall.

(c) Calculate Peter's BMI.

(2)

BMI

(Total for Question 2 = 7 marks)



3 Sherbet is a sweet that reacts with water to produce carbon dioxide gas.

Holly carries out an experiment to find the mass of carbon dioxide produced with increasing masses of sherbet.

Her results are shown in the table.

Mass of sherbet (g)	Carbon dioxide produced (g)
3.0	0.6
4.5	0.9
6.0	1.2
7.5	2.5
9.0	1.8
10.5	2.1

Holly realises that there is an anomaly in her results.

(a) (i) Circle the anomaly in the table.

(1)

(ii) State **one** way Holly should deal with the anomalous result.

(1)

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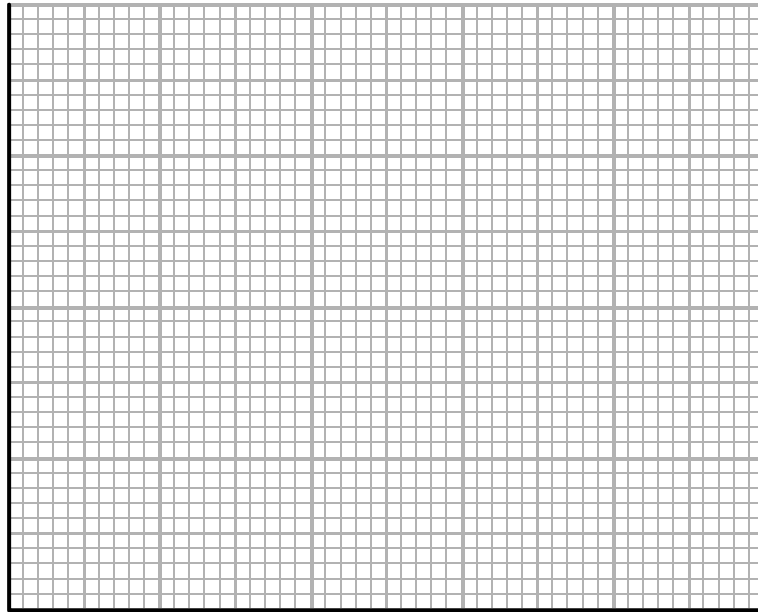
(b) Holly then investigates how the temperature changed when sherbet was added to water.

She measures the temperature change after 30 seconds.

Mass of sherbet mixture (g)	0.5	1	2	4	8	10
Temperature change (°C)	1	1.5	2	2.5	2.9	3.0

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

(6)



(c) Holly extends her original investigation using 12 g of sherbet.

She repeats the experiment three times and records the masses of carbon dioxide.

These are her results:

2.5 g 2.4 g 2.7 g

She calculates the average mass of carbon dioxide to be 2.5333 g.

She records the result as 2.5 g.

Explain why she recorded the result as 2.5 g.

(2)

Reason.....
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(Total for Question 3 = 10 marks)



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4 Toby investigates the amount of fibre in freshly squeezed orange juice.



He filters 500 ml of juice to separate the fibre.

He dries the fibre and measures the mass.

He repeats this for freshly squeezed orange juice from three other bottles.

Bottle of freshly squeezed orange juice	Mass of fibre (g)
1	1.1
2	1.2
3	1.0
4	1.1

(a) (i) State which bottle of freshly squeezed orange juice contains the largest mass of fibre.

(1)

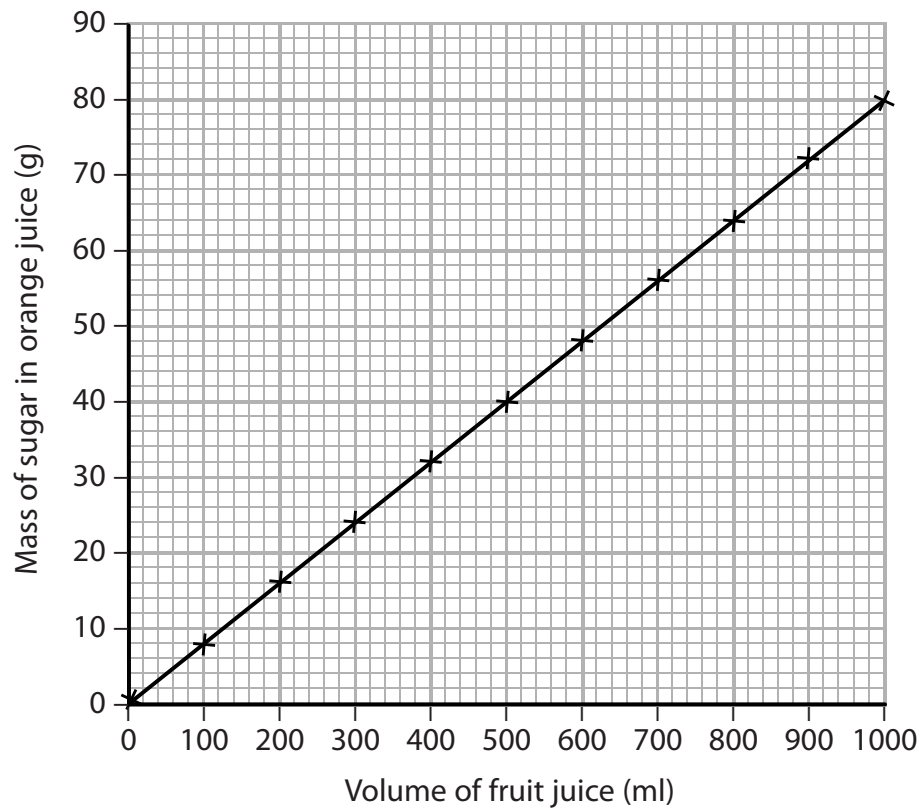
(ii) Calculate the average mass of fibre in these bottles of freshly squeezed orange juice.

(2)

g



(b) David researched how the mass of sugar in orange juice changes with volume.
 He plotted his results on a graph.



(i) Identify the volume of orange juice that contains 60 g of sugar.

(1)

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(ii) Describe the trend in the graph.

(2)

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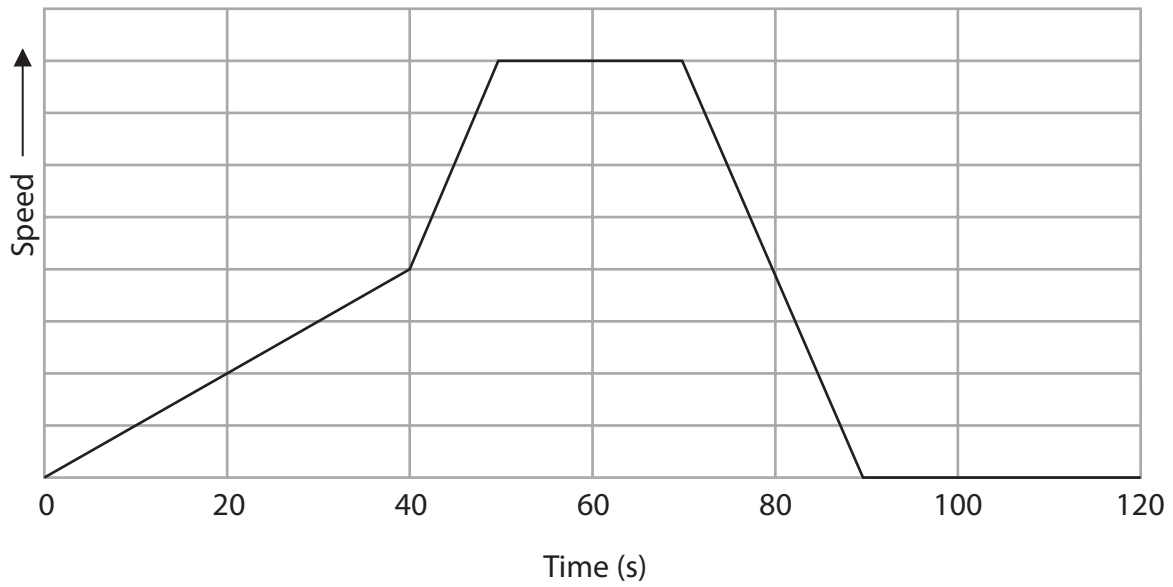
(Total for Question 4 = 6 marks)



5 Terry controls the trains on journeys between two stations.

He needs to monitor the speed of the trains.

The graph shows the speed of a train during its journey.



Use the graph to explain **two** ways the speed of the train changes during the journey.

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(Total for Question 5 = 4 marks)



6 Alison and Paul measure the length of a shadow produced by a light shining on an object.



They want to investigate if the length of a shadow will change with objects that have different heights.

They write a hypothesis:

The taller the object the longer the shadow.

Paul writes a method to test the hypothesis:

1. Shine a light on the object.
2. Measure the length of the shadow.

Alison thinks that they could improve the method.

Explain **one** improvement that could be made to their method.

(2)

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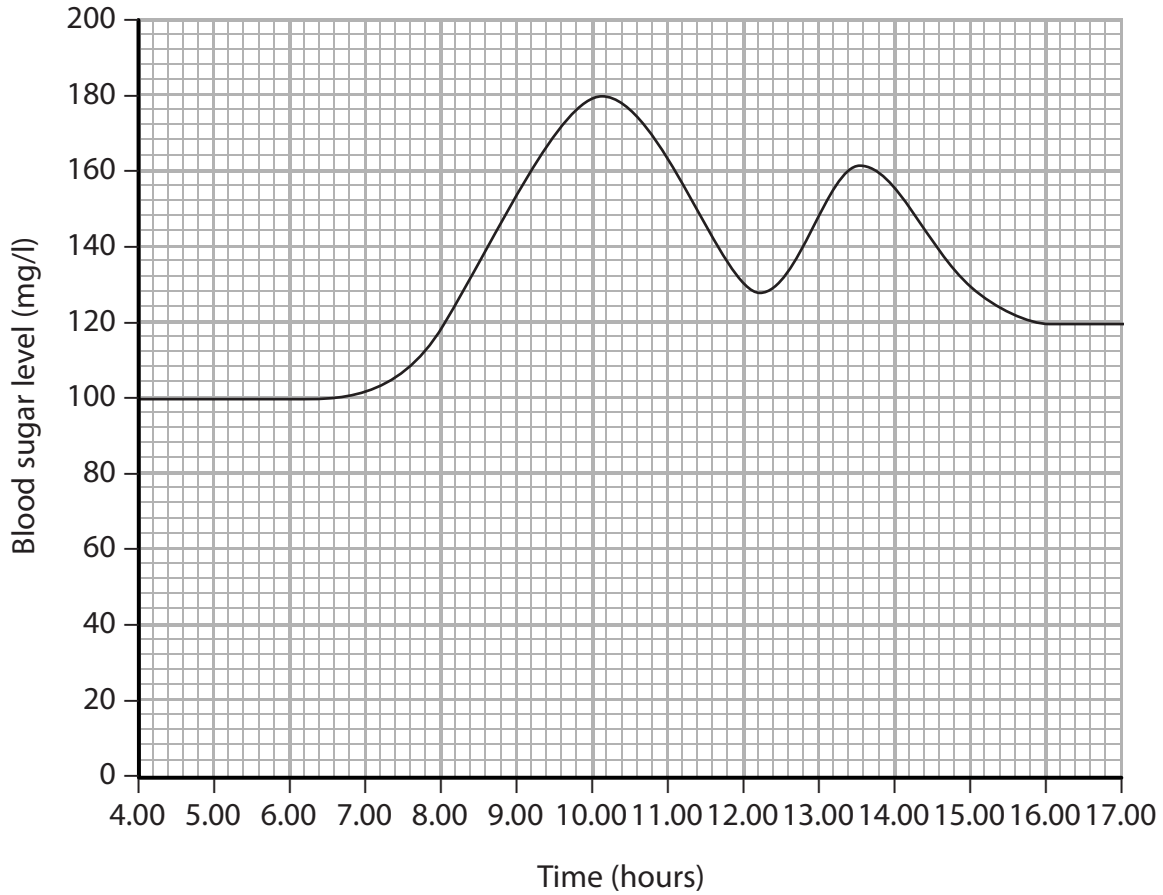
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(Total for Question 6 = 2 marks)



7 Daisy researches some data on blood sugar levels.

She finds a graph showing how blood sugar level changes for one patient over a number of hours.



(a) State how Daisy knows the patient ate at around 12.00.

(1)

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(b) State how Daisy knows that the patient's breakfast contained more sugar than the patient's lunch.

(1)

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(Total for Question 7 = 2 marks)



- 8 Bailey investigates the chemical and physical properties of some of the Group 1 alkali metals of the periodic table.

Physical properties

Element	Lithium	Sodium	Potassium
Appearance before it is cut	Dull	Dull	Dull
Appearance when freshly cut	Shiny	Shiny	Shiny
Number of electron shells	2	3	4

Chemical properties

Element	Lithium	Sodium	Potassium
Observation when added to water	Fizzing	Rapid fizzing. Sparks are sometimes seen.	Very rapid fizzing. The metal may explode. The gas burns with a lilac flame.
Products when the element reacts with water	Hydrogen + lithium hydroxide	Hydrogen + sodium hydroxide	Hydrogen + potassium hydroxide

- (a) Caesium is in the same group as lithium, sodium and potassium.

Use the information in the table to help complete this word equation:

(2)

Caesium + water = +



(b) Bailey writes this conclusion:

Group 1 alkali metals all react in the same way. The Group 1 alkali metals become more reactive as the number of electron shells increase.

Explain how the evidence Bailey has collected supports her conclusion.

(6)

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(Total for Question 8 = 8 marks)

TOTAL FOR PAPER = 50 MARKS



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