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Surname	Other names

Pearson BTEC Level 1/Level 2 First Award

Centre Number | | | | | | |

Learner Registration Number | | | | | | | | |

Application of Science

Unit 8: Scientific Skills

Friday 3 March 2017 – 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 ▶

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Pearson

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

1 Rachel wants to heat some water for an investigation.

She uses the apparatus shown in the photograph to do this.

(a) Name the apparatus shown in the photograph.

(1)

.....

(b) Rachel investigates if salt will dissolve more quickly in hot water than in cold water.

She has two beakers each containing 100 ml of water.

One beaker of water is at 90 °C, and the second beaker of water is at 10 °C.

She adds 20 g of salt to each beaker and measures the time it takes for the salt to dissolve.

(i) State the dependent variable in this investigation.

(1)

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(ii) State **two** variables that Rachel controls.

(2)

1 .....

2 .....

(c) Explain **one** risk in this investigation.

(2)

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(Total for Question 1 = 6 marks)

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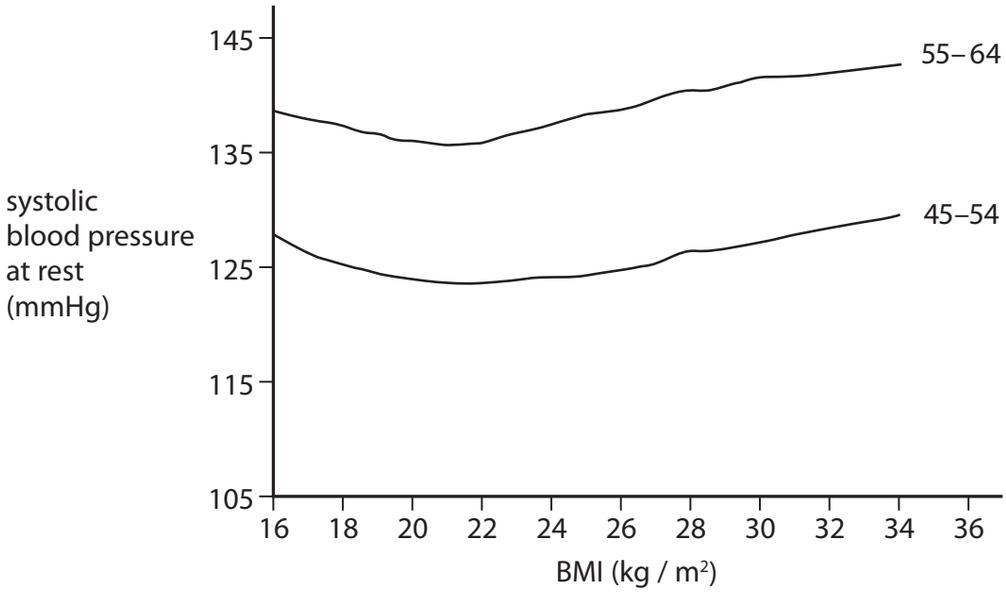
2 Tanya researches the relationship between Body Mass Index (BMI) and systolic blood pressure at rest.

She finds this graph for groups of adults aged 45–54 and 55–64.



Tanya could not find the data for adults aged 35–44, but she can make a hypothesis using this graph.

(a) Give a hypothesis for how BMI affects the systolic blood pressure at rest for a group of adults aged 35–44.

(3)

(b) BMI is calculated using the height and mass of a person.

Blood pressure is measured using a blood pressure gauge.

Tanya makes the following hypothesis.

'BMI affects the blood pressure at rest more in males than in females.'

Write a plan for an investigation to test this hypothesis.

(6)

(Total for Question 2 = 9 marks)

3 (a) Sam researches the power (W) of different electrical appliances.

Here are his results.

washing machine 3000 W	kettle 2000 W	toaster 800 W
microwave 1000 W	hairdryer 2500 W	

Complete the table with these results.

(3)

(b) An iron has a power of 1.5 kW.

The voltage across the iron is 240 V.

Calculate the current in the iron.

Power (W) = Voltage (V) × Current (A)

Give your answer to two significant figures.

Show your working.

(4)

..... A

(Total for Question 3 = 7 marks)

4 Adam investigates how the speed of a car affects the braking distance.

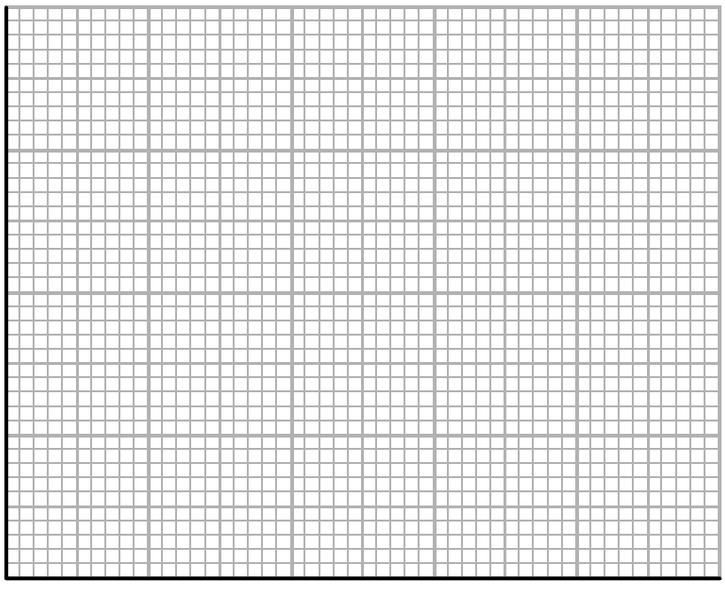
The braking distance of a car is the distance it travels from when the brakes are applied to when the car comes to a complete stop.

(a) Here are his results for braking distances in dry weather.

speed of car (km / h)	braking distance (m)
32	6
48	14
64	24
80	38
96	55
112	75

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

(6)



(b) Here are Adam's results for braking distances in wet weather.

speed of car (km / h)	braking distance (m)		
	test 1	test 2	test 3
32	8.1	9.4	8.1
48	18.1	17.3	19.2
64	33.1	50.0	32.3
80	47.2	48.1	47.1

(i) Adam circles an anomalous result in the table.

Give **two** ways Adam can deal with this anomalous result.

(2)

1 .....

2 .....

(ii) Adam calculates the average braking distance for a speed of 32 km/h.

His calculator showed the result as 8.533333 m.

Write the result to the correct level of accuracy.

(1)

.....

(Total for Question 4 = 9 marks)

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5 A school recycles aluminium drink cans.

The school records the number of drink cans recycled by each class in the table.

class	number of drink cans recycled			
	week 1	week 2	week 3	week 4
11LW	150	158	180	200
11FA	255	183	171	151
11SC	95	190	190	380
11VC	230	202	190	190

(a) (i) Calculate the weekly average of recycled cans for class 11LW.

Show your working.

(2)

..... cans

(ii) Describe the pattern shown in the table for class 11SC.

(2)

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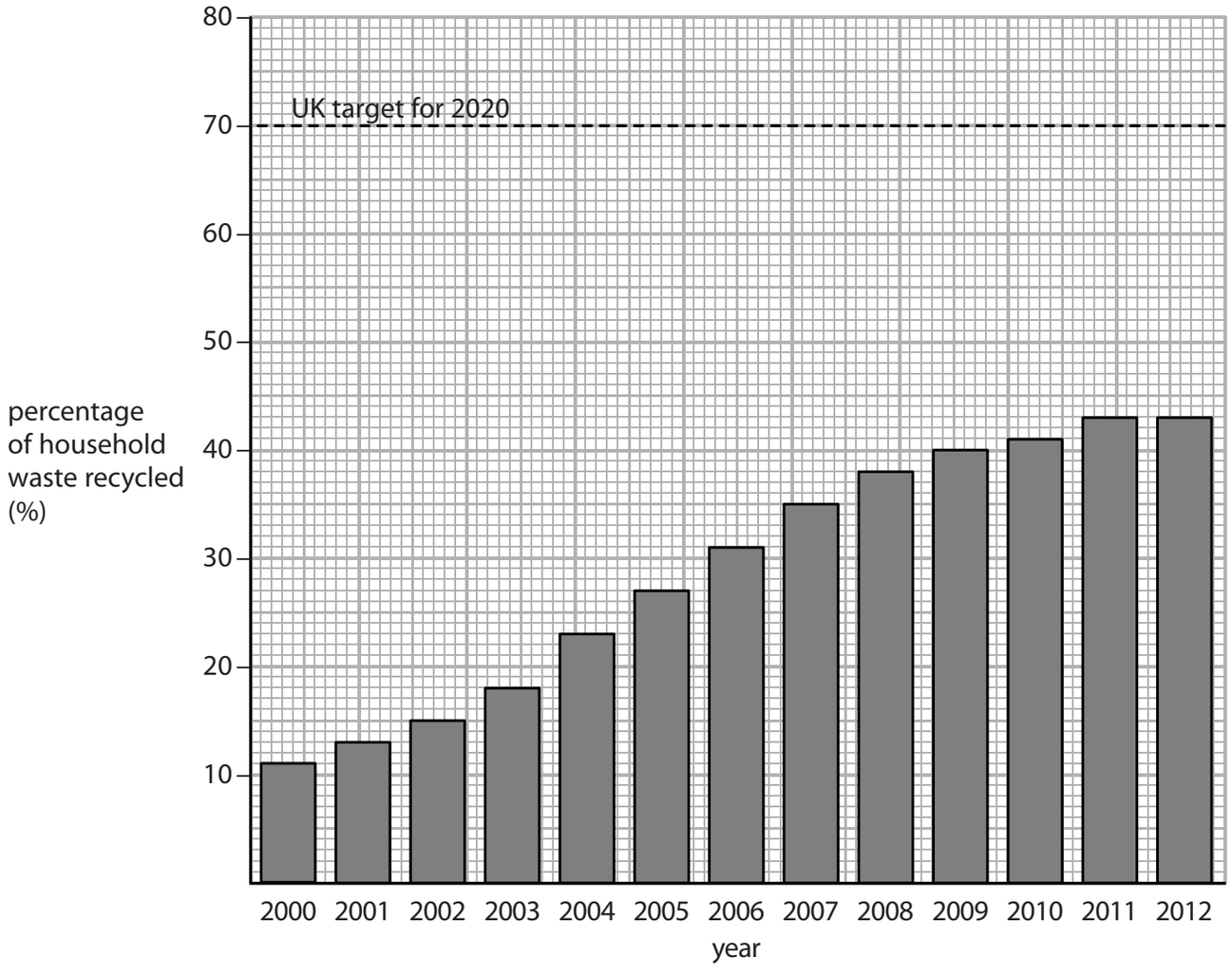
(b) A student researches recycling in the UK.

The student finds a graph that shows the percentage of household waste recycled from 2000 to 2012.

The graph also shows the recycling target for the UK to reach by 2020.

Here is the graph.



(i) Give the percentage of waste recycled in 2007.

(1)

.....

(ii) The student concludes from the graph that the UK will meet the recycling target for 2020.

Explain why the evidence in the graph does not support the student's conclusion.

(2)

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(Total for Question 5 = 7 marks)

6 Frankie uses a rowing machine for exercise.

Frankie records the time that she uses the rowing machine, the distance rowed and the energy used during rowing.

Here are her results.

	rowing time (mins)	distance rowed (km)	energy used (J)
week one	4	1	2 000
week two	8	2	400
week three	12	3	6 000
week four	16	4	8 000
week five	20	5	10 000
week six		6	12 000

(a) State **one** factor that may have caused the energy used in week two to be incorrect.

(1)

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.....

(b) Suggest the time it takes Frankie to row 6 km.

(1)

..... minutes

(Total for Question 6 = 2 marks)

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QUESTION 7 BEGINS ON THE NEXT PAGE.

7 Richard investigates some properties of group 1 alkali metals.

He finds this data, some of the data is missing.

alkali metal	atomic number	density (g/cm^3)	boiling point (°C)
lithium	3	0.53	1347
sodium	11	0.97	883
potassium	19	0.86	
rubidium	37	1.48	
caesium	55	1.87	

Richard makes this hypothesis about the data.

'As the atomic number increases, both the density and the boiling point of the alkali metal decrease.'

(a) Discuss the extent to which the data in the table supports Richard's hypothesis.

(4)

(b) Richard investigates how the temperature of hydrochloric acid affects the rate of reaction between the acid and calcium carbonate.

Here is his method.

1. Pour some hydrochloric acid into a beaker.
2. Add a spoonful of calcium carbonate powder.
3. Time how long it takes the solution to stop bubbling.
4. Heat the hydrochloric acid and repeat.

Richard thinks that he can improve this method.

Explain the improvements he could make to this method.

(6)

(Total for Question 7 = 10 marks)

TOTAL FOR PAPER = 50 MARKS

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