Write your name here

Surname	Other names

Pearson BTEC Level 1/Level 2 First Award

Centre Number

Learner Registration Number

Application of Science

Unit 8: Scientific Skills

Monday 5 March 2018 – 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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P 5 5 6 3 2 A 0 1 2 0

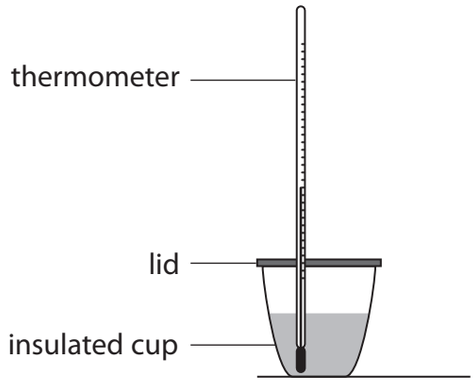
Pearson

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

1 Raj investigates the reaction between hydrochloric acid and sodium hydroxide solutions.

The reaction produces heat.

The equipment Raj uses is shown in the diagram.



(a) (i) Raj measures out 25 cm^3 of hydrochloric acid.

Name **one** piece of equipment Raj should use to measure the hydrochloric acid.

(1)

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(ii) State what Raj measures with the thermometer.

(1)

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(b) Suggest **one** reason why Raj covers the insulated cup with a lid.

(1)

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(c) (i) The sodium hydroxide solution is corrosive.

State **one** risk to Raj when using the sodium hydroxide solution.

(1)

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(ii) There is a risk when using hydrochloric acid because it is an irritant.

Explain **one** precaution Raj should take to reduce this risk.

(2)

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(Total for Question 1 = 6 marks)

2 Alex wants to investigate the fitness of a group of students.

Alex makes this hypothesis:

'The student with the smallest change in heart rate after pedalling on an exercise bike is the fittest.'

(a) State the dependent variable in this hypothesis.

(1)

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(b) Write a plan for an investigation to test Alex's hypothesis.

Your plan should include:

- details of the measurements to be taken and recorded
- variables that need to be controlled.

(6)

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(Total for Question 2 = 7 marks)

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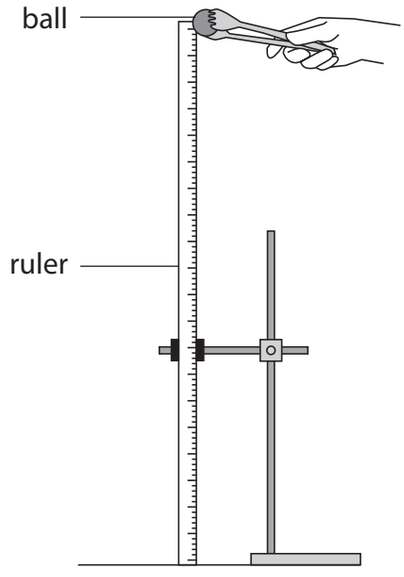
QUESTION 3 BEGINS ON THE NEXT PAGE

3 Oday investigates how the temperature of a ball affects how high the ball bounces.

He uses a water bath to heat a ball to 40 °C.

He drops the ball from the top of a metre ruler and measures how high the ball bounces.

Oday carries out the investigation five times at different temperatures.



Here are his results.

40 °C, 30 cm	60 °C, 40 cm
25 °C, 20 cm	
100 °C, 50 cm	
80 °C, 45 cm	

(a) Complete the table for these results.

(3)

(b) Oday holds a ball 200 cm above the ground.

Oday drops the ball onto the top of a 20 cm high box.

The change in gravitational potential energy (GPE) of the ball is 3.6 J.

Calculate the mass of the ball.

change in GPE	=	mass	×	acceleration due to gravity	×	change in height
(J)		(kg)		(m/s^2)		(m)

acceleration due to gravity = 10 m/s^2

Show your working.

(4)

mass of ball = ... kg

(Total for Question 3 = 7 marks)

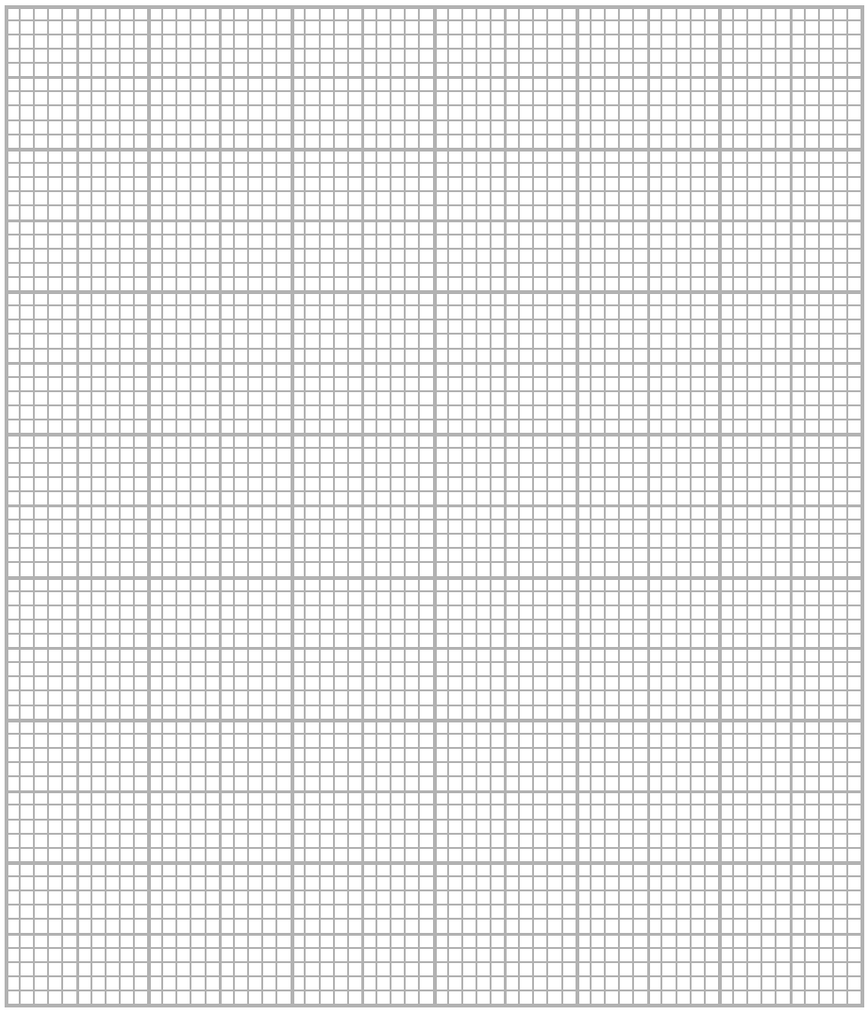
4 (a) Heng researches how the percentage of adults who smoke cigarettes has changed with time.

He finds this data.

year	percentage of adults who smoke cigarettes (%)
2010	19.5
2011	18.0
2012	17.3
2013	16.0
2014	14.5
2015	13.2

Draw a bar chart for this data on the graph paper.

(6)



(b) Heng found that smoking inside public buildings was banned from the year 2007.

He wanted to see how this affected the number of people smoking.

He found this data on the percentage of young adult men and young adult women who smoke cigarettes.

year	1976	1980	1984	1988	1992	1996	2000	2004	2008	2012
percentage of young adult men (%)	48	43	38	33	30	29	29	26	13	10
percentage of young adult women (%)	38	38	36	32	28	26	25	22	11	9

Write a conclusion, using the data, about how the smoking ban affected the percentage of young adult men and young adult women who smoke cigarettes.

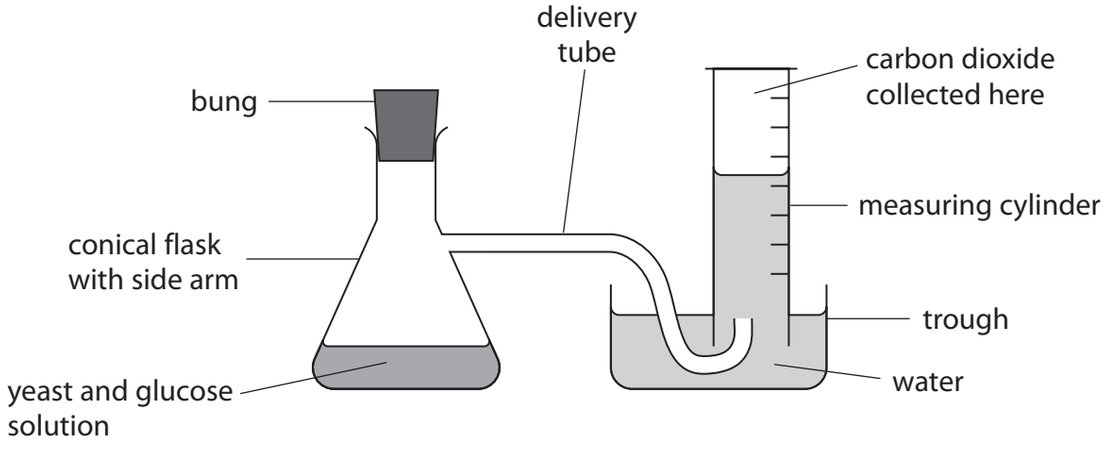
(3)

(Total for Question 4 = 9 marks)

5 Tara carries out a fermentation experiment.

She investigates how the change in concentration of glucose solution affects the volume of carbon dioxide produced.

She uses the equipment shown.



She adds the same amount of yeast to different concentrations of glucose solution.

For each concentration of glucose solution, she measures the volume of carbon dioxide produced.

She repeats the experiment three times for each concentration of glucose solution.

For each experiment all other conditions are kept the same.

Here are Tara's results.

concentration of glucose solution (%)	volume of carbon dioxide produced (cm^3)		
	trial 1	trial 2	trial 3
20	2.0	2.4	2.6
30	4.2	4.6	4.3
40	6.2	2.2	6.0
50	8.2	7.8	8.1

(a) Tara has circled an anomaly in the table.

(i) State how Tara should deal with the anomaly.

(1)

.....

(ii) Explain **two** reasons that might have caused this anomaly.

(4)

Reason 1 .....

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Reason 2 .....

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(b) Calculate the average volume of carbon dioxide produced for the glucose solution with a concentration of 20%.

Show your working.

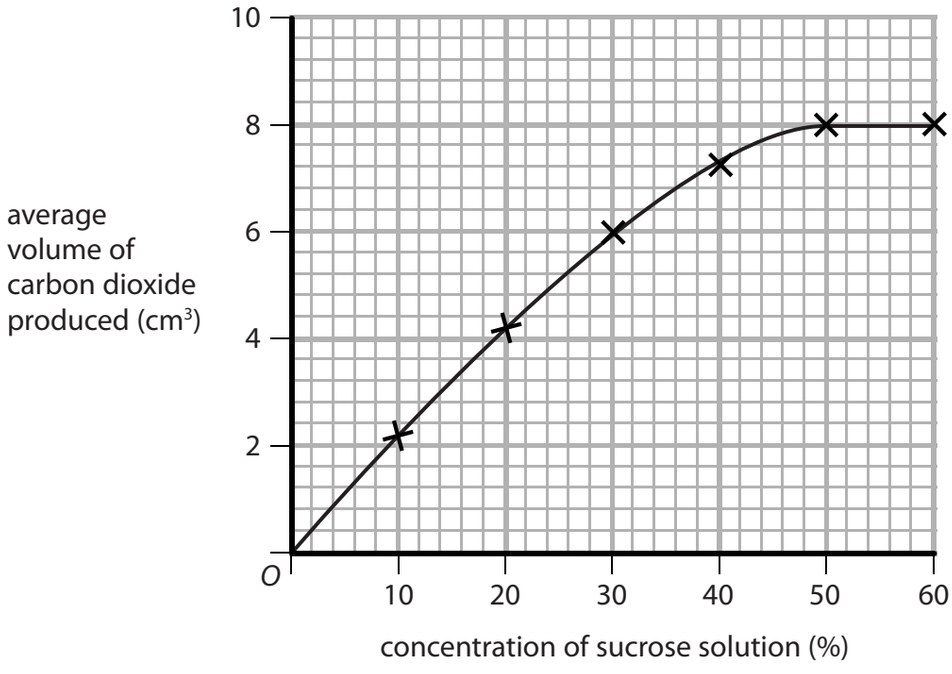
(2)

average volume = ... cm^3

(c) Lee repeated Tara's experiment using a sucrose solution instead of a glucose solution.

Lee plotted a graph of his results.

Here is his graph.



(i) Give the average volume of carbon dioxide produced for a sucrose solution of 25%.

(1)

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(ii) Describe the pattern in the graph.

(3)

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(Total for Question 5 = 11 marks)

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QUESTION 6 BEGINS ON THE NEXT PAGE

6 Jessica carries out an experiment using a prism to split a beam of white light.

This produces a spectrum of colours.

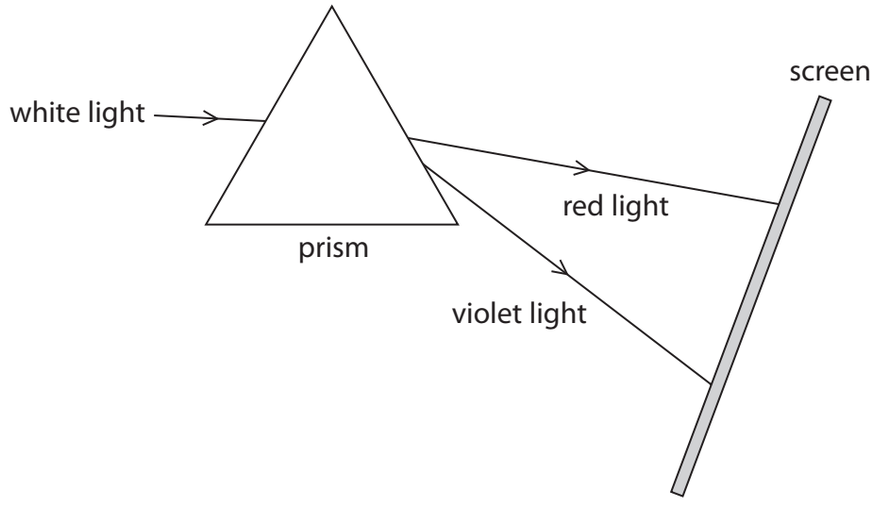
Some of the colours of the spectrum are labelled in the table.

RED			GREEN			VIOLET

Jessica makes this conclusion:

> 'White light is made up of many colours. The colour that refracts the least is red light. The colour that refracts the most is violet light.'

The diagram shows part of the spectrum produced by the white light.



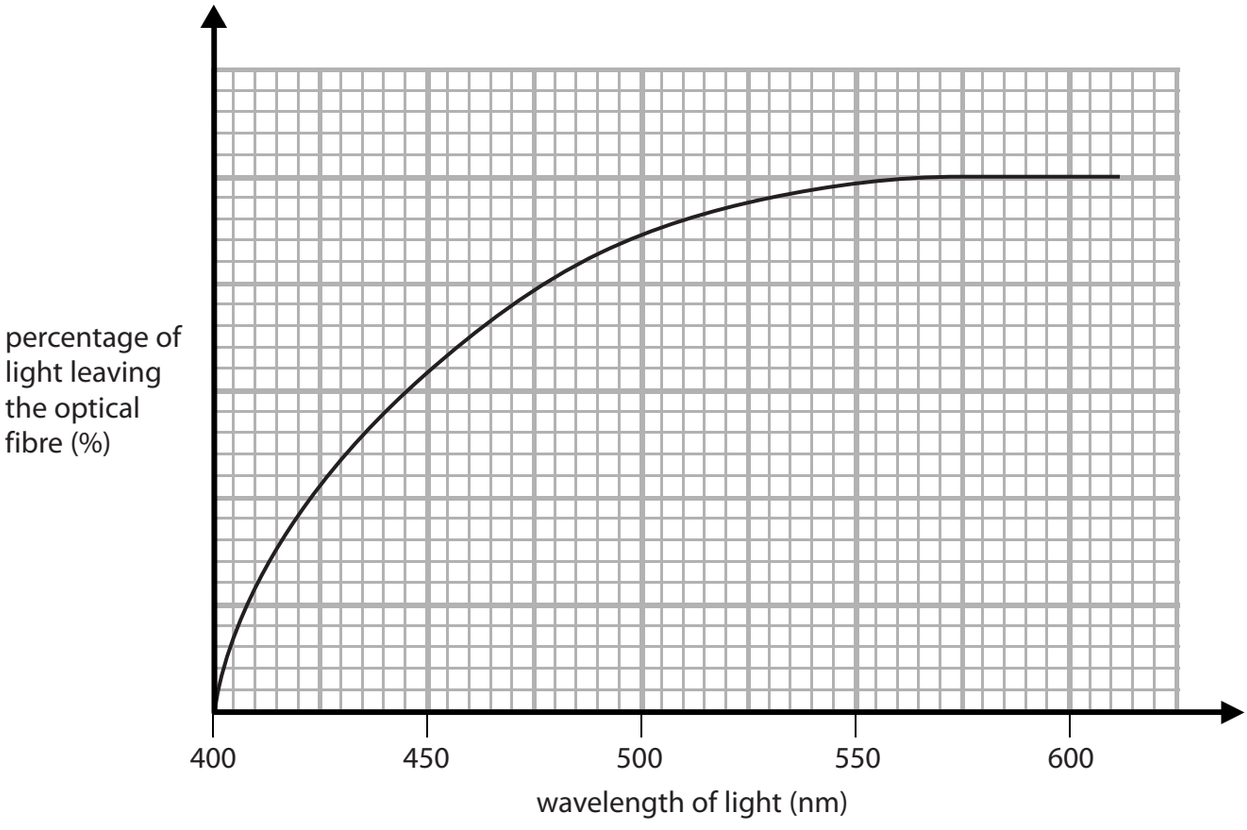
(a) Draw a line on the diagram to show the path of the green light.

(1)

(b) Jessica investigates how the percentage of light leaving an optical fibre is related to its wavelength.

She draws a graph of the percentage of light leaving the optical fibre for a range of wavelengths.

Here is her graph.



Jessica makes a conclusion based on the graph:

'The percentage of light leaving the optical fibre is proportional to the wavelength.'

Comment on whether the graph supports Jessica's conclusion.

(3)

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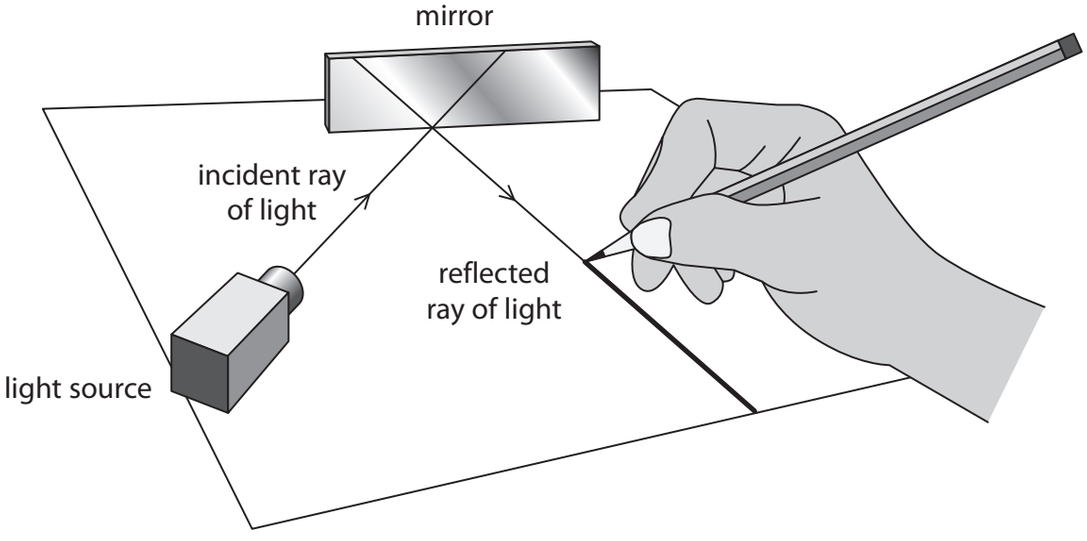
(Total for Question 6 = 4 marks)

7 Frank investigates the relationship between the angle of incidence and the angle of reflection for light reflecting from a flat mirror.

He shines a ray of light onto the mirror.

He uses the equipment shown.



Here is his method.

1. Place a mirror onto a sheet of paper.
2. Shine a ray of light onto the mirror.
3. Measure the angle that the ray reflects from the mirror.

Frank thinks that his method can be improved.

Explain the improvements he could make to the method.

(6)

(Total for Question 7 = 6 marks)

TOTAL FOR PAPER = 50 MARKS

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