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Pearson BTEC Centre Number Learner Registration Number
Level 1/Level 2
First Award

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Application of Science

Unit 8: Scientific Skills

Friday 19 May 2017 – Morning Time: 1 hour 15 minutes	Paper Reference 20474E
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You must have: Calculator, Ruler	Total Marks
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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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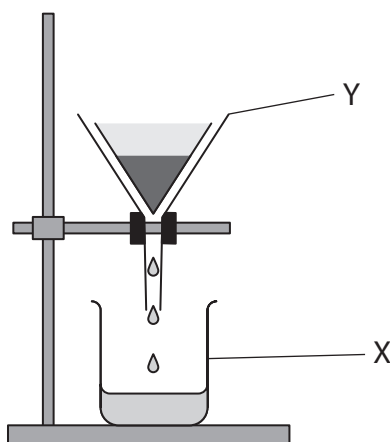
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Pearson

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

- 1 Jack mixes sodium hydroxide solution with a salt solution to make an insoluble solid. He separates the insoluble solid from the mixture. He uses the equipment shown.



- (a) (i) Name the piece of equipment labelled Y. (1)

- (ii) State the purpose of the piece of equipment labelled X. (1)

- (b) Jack wants to find out if adding the same volume of sodium hydroxide solution to different salt solutions will give different masses of insoluble solid.

State **two** variables that he will need to keep the same. (2)

1

2

- (c) The sodium hydroxide solution used in the experiment is corrosive.

State **one** precaution that Jack should take when using sodium hydroxide solution. (1)

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(Total for Question 1 = 5 marks)



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QUESTION 2 BEGINS ON THE NEXT PAGE



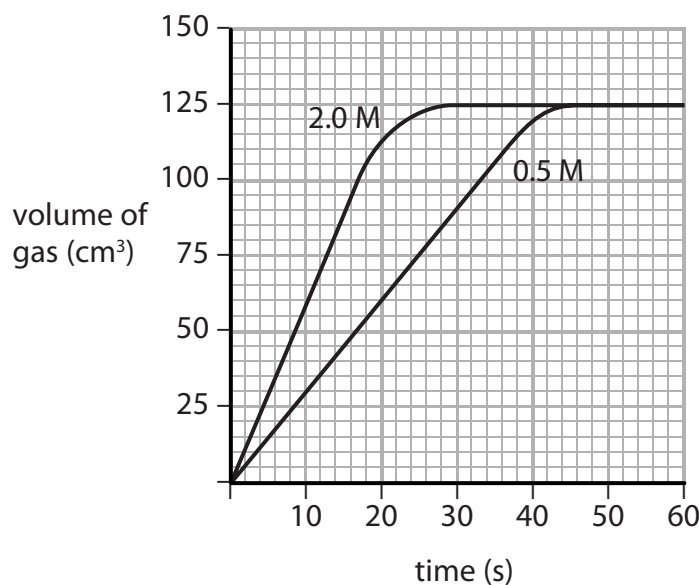
- 2 (a) Clare investigates how changing the concentration of an acid affects the volume of gas released in a reaction.

She adds a piece of magnesium ribbon to a flask containing 2.0 M hydrochloric acid.

She records the volume of gas produced every 5 seconds for 60 seconds.

She repeats the same experiment, but uses 0.5 M hydrochloric acid.

Clare draws a graph of her results.



Draw a line on the graph to show the expected results for the same reaction when using 1.0 M hydrochloric acid.

(2)

- (b) Clare wants to investigate how temperature affects the rate of reaction.

When hydrochloric acid reacts with sodium thiosulfate, the solution changes from clear to cloudy.

Clare places a flask on a cross drawn on a piece of paper.

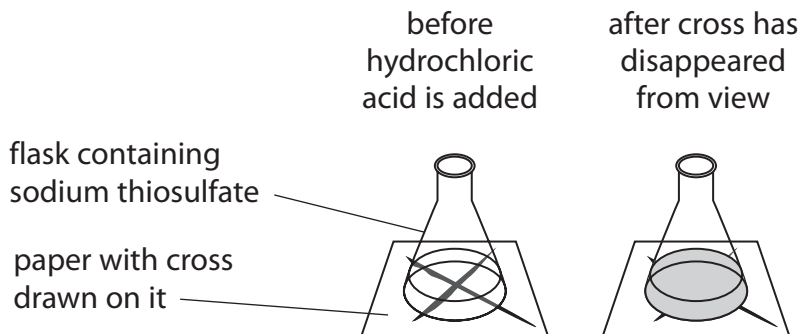
She adds hydrochloric acid to sodium thiosulfate in the flask.

She records the time it takes the cross to disappear from view.



Clare makes this hypothesis:

'As you increase the temperature of the sodium thiosulfate solution the cross will disappear from view more quickly.'



Write a plan to test this hypothesis.

Your plan should include:

- measurements to record
- variables that should be controlled.

(6)

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(Total for Question 2 = 8 marks)



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3 George and Sally research the speed of nerve impulses in nerve fibres.
George finds that the nerve fibre diameter affects the speed of the nerve impulses.
George records some information in a table.

(micrometres)	speed of nerve impulses (m/s)
20	120
6	35
1	2
13	80
2	5

(a) Suggest **two** improvements that George should make to the table.

(2)

Improvement 1

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Improvement 2

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- (b) Sally carries out an experiment to find the time it takes for a nerve impulse to travel down different lengths of nerve fibre.

Here are her results.

length of nerve fibre (cm)	time for a nerve impulse to travel along the nerve fibre (ms)			
	trial 1	trial 2	trial 3	trial 4
5	1.5	1.4	1.7	1.6
10	3.6	3.7	3.5	3.2
15	4.8	4.7	4.5	4.6
20	6.9	4.5	6.8	6.8

- (i) Calculate the average time for a nerve impulse to travel along the 10 cm nerve fibre.

Show your working.

(2)

average time = ms

- (ii) Sally's result of 4.5 ms for the 20 cm length of nerve fibre is an anomaly.

Sally has circled the anomaly in the table.

State **two** ways in which Sally should deal with the anomaly.

(2)

1

2

(Total for Question 3 = 6 marks)



4 (a) Suzie investigates the energy an electric motor uses to lift different masses.

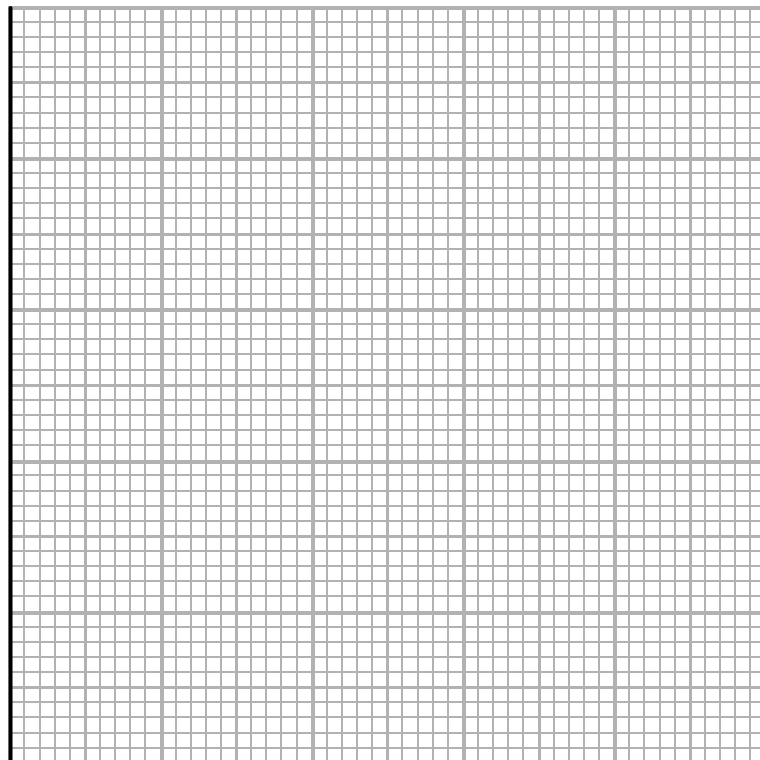
She uses a joulemeter to measure the input energy to the motor.

Here are her results.

mass lifted (g)	input energy to the motor (J)
10	0.3
20	0.6
30	1.3
35	2.0
40	2.8
45	4.2

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

(6)



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(b) A different motor lifts a mass with a weight of 3.75 N.

The motor does 8.6 J of work.

Calculate the distance the mass is lifted.

$$\text{work done (J)} = \text{force (N)} \times \text{distance (m)}$$

Show your working.

Give your answer to two significant figures.

(3)

distance = m

(Total for Question 4 = 9 marks)



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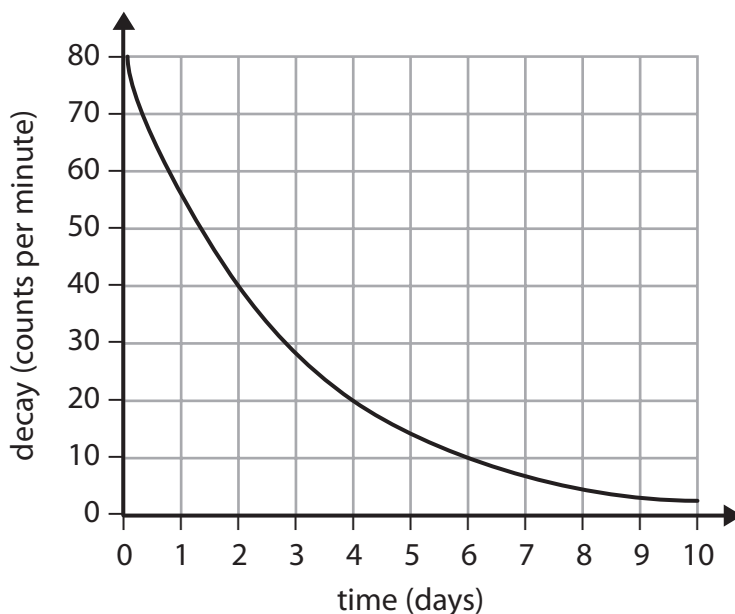
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5 Chris researches the decay of radioactive elements.

He finds a graph showing the decay of a radioactive element in counts per minute over 10 days.

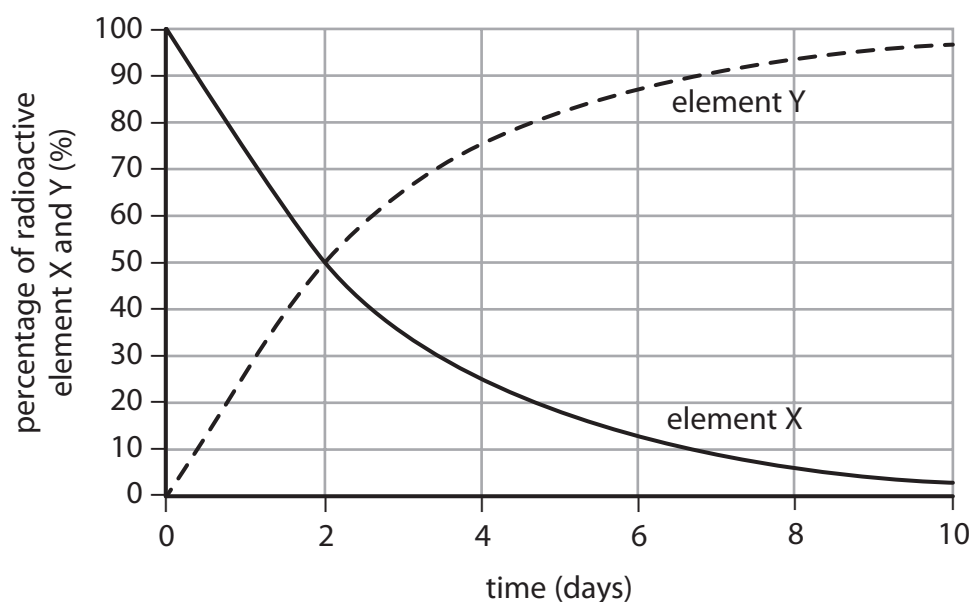


(a) State the number of days this radioactive element takes to decay from 80 to 40 counts per minute.

(1)

(b) Chris finds more information on radioactive decay.

He finds a graph that shows when element X decays it turns into element Y.



Describe the pattern of decay of element X into element Y.

(4)

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(Total for Question 5 = 5 marks)

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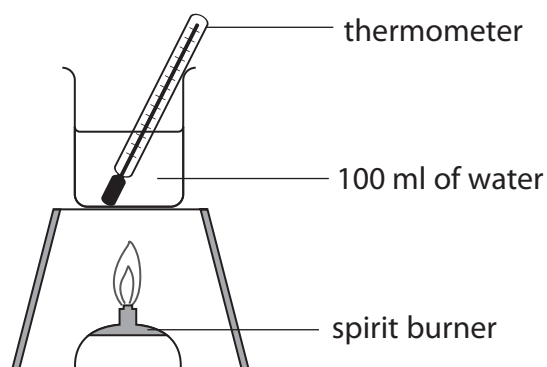
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6 Anne investigates the change in temperature of water when heated.

Anne uses the equipment shown.



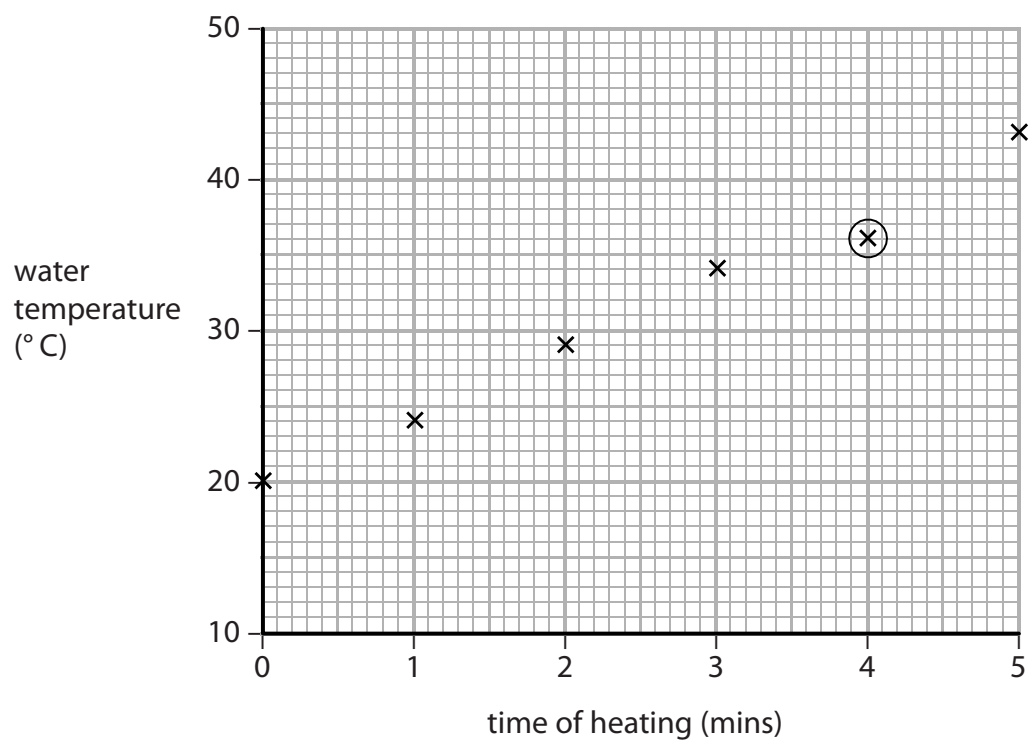
Anne places water in the beaker.

She heats the water for 5 minutes.

She measures the temperature of the water every minute.

Anne plots a graph of the water temperature against the time.

Here is the graph.



(a) Draw a line of best fit on the graph.

(1)

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(b) Anne has drawn a circle around an anomaly.

Explain **two** possible reasons for this anomaly.

(4)

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(Total for Question 6 = 5 marks)

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7 (a) Anyi reads a newspaper article with a headline that reads:

'Eating more than five a day has "no extra health benefit", claim researchers'

Anyi makes the hypothesis:

'Eating more than five portions of fruit and vegetables a day will not make me any healthier.'

Here is some data.

portions of fruit and vegetables eaten per day	decreased risk of heart disease (%)
0-1	0
2-3	9
4-5	18
6-7	20
7+	31

Give **two** reasons why the data in the table does not support Anyi's hypothesis.

(2)

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(b) Anyi produced a survey to find out how many students eat five portions of fruit and vegetables a day.

In the survey, she asked six girls in her class:

- if they ate fruit and vegetables
- how many times a week they ate fruit and vegetables.

She produced a hypothesis based on her survey results.

'I think that all school students don't eat their five portions of fruit and vegetables a day.'

Explain what improvements could be made to the survey to give more useful data.

(4)

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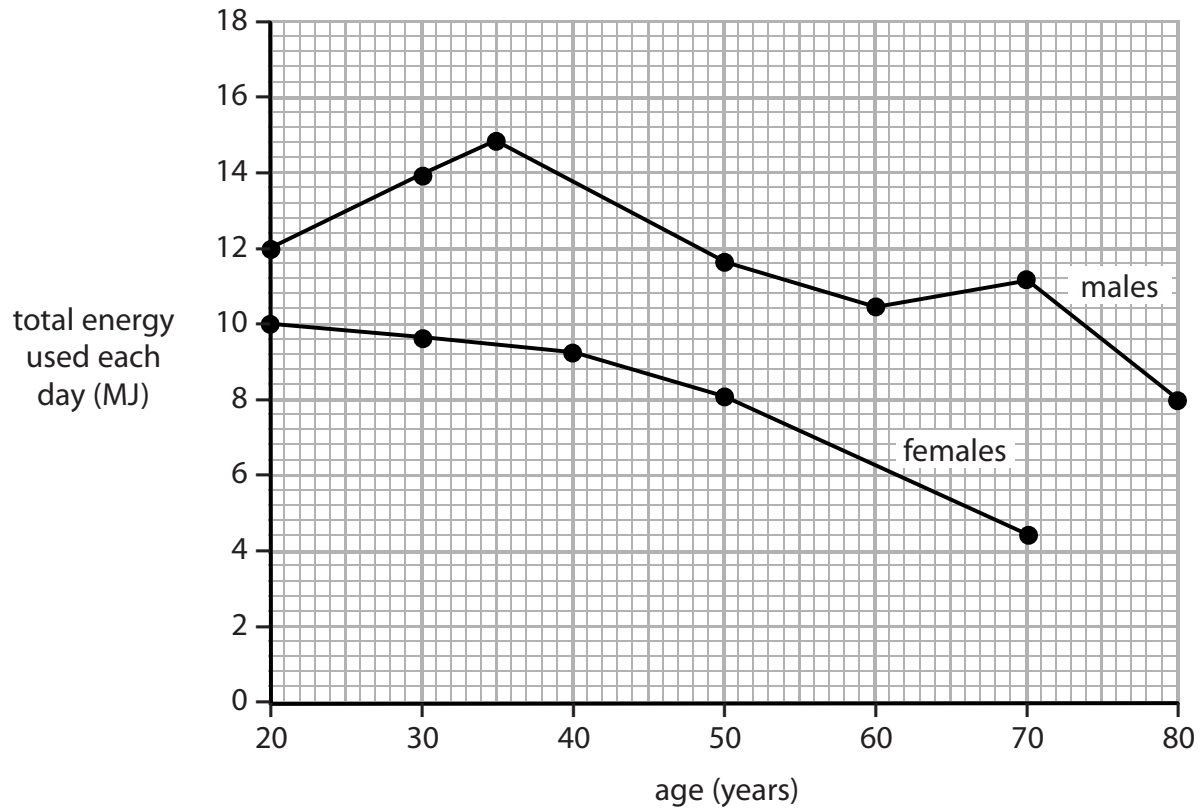
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(c) Males and females use energy provided by their food.

Anyi researches the total energy used each day by males and females of different ages in the UK.

Anyi produces a graph of her findings.



Anyi makes two conclusions based on her graph.

'All males need more energy throughout their lives than females.'

'The older you get the less energy you use at a steadily decreasing rate.'

Discuss the extent to which Anyi's graph supports her conclusions.

(6)

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(Total for Question 7 = 12 marks)

TOTAL FOR PAPER = 50 MARKS





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