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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

Monday 21 May 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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Pearson

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

1 (a) Lily chooses some equipment for an investigation.

Draw **one** line from each use to the correct piece of equipment.

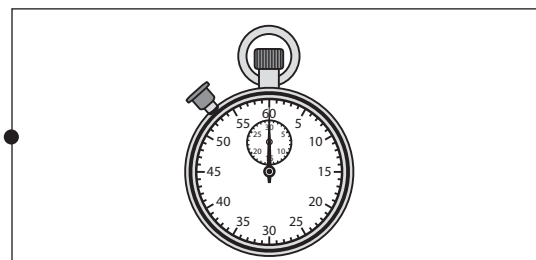
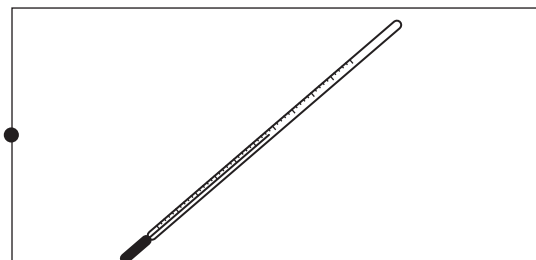
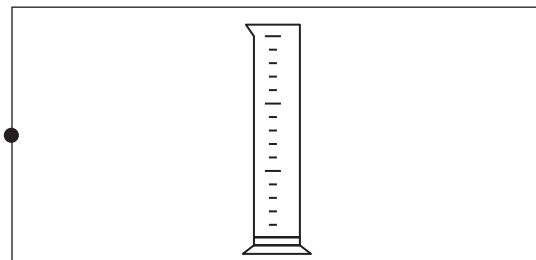
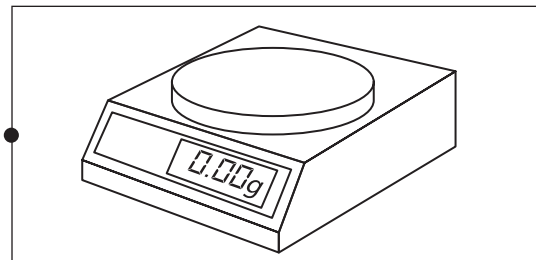
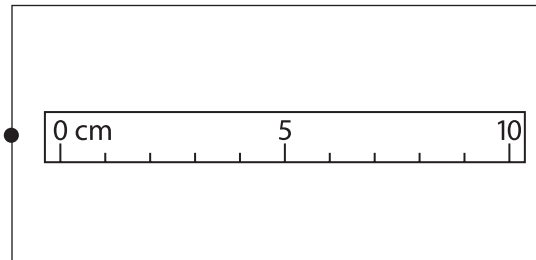
(2)

use

piece of equipment

measures time

measures mass



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(b) Lily investigates how changing the concentration of hydrochloric acid affects the time taken for a piece of magnesium ribbon to react completely.

She adds a piece of magnesium ribbon to some hydrochloric acid in a beaker.

She repeats the experiment with five different concentrations of hydrochloric acid.

(i) Give the independent variable in this investigation. (1)

(ii) State **two** variables that Lily should control. (2)

variable 1 .....

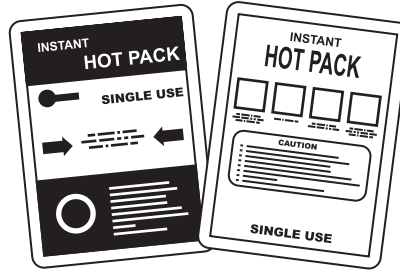
variable 2 .....

(c) Explain **one** risk in this investigation. (2)

(Total for Question 1 = 7 marks)



2 Hot packs can be used to warm cold hands.



Alfie investigates how hot packs work.

A hot pack contains calcium chloride and a bag of water.  
When the hot pack is squeezed the bag of water bursts.  
As the calcium chloride dissolves in the water, heat is produced.

Alfie makes the following hypothesis:

‘If more calcium chloride is dissolved in water, more heat is produced.’

Write a plan for an investigation to test this hypothesis.

(6)

A series of horizontal dotted lines for writing an investigation plan.

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Handwriting practice area with 20 horizontal dotted lines.

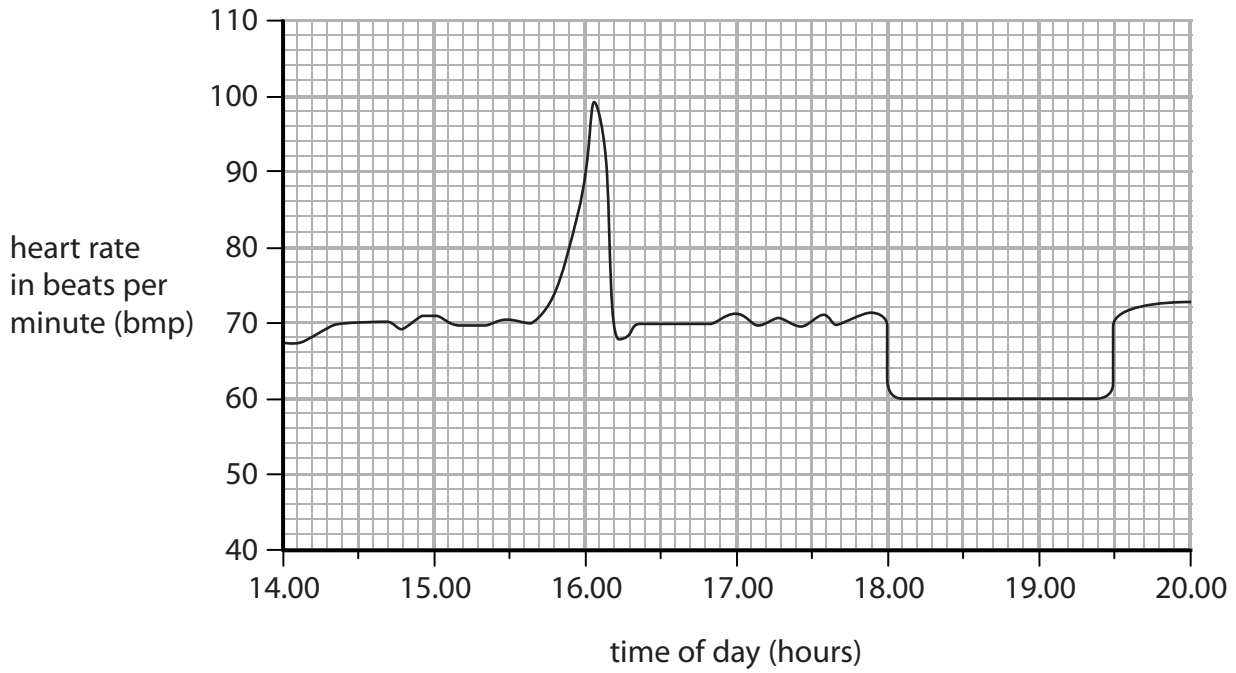
**(Total for Question 2 = 6 marks)**



3 (a) Julie wears a heart rate monitor.

It measures and records her heart rate.

The graph shows her heart rate, in beats per minute (bpm), from 14:00 hours to 20:00 hours.



(i) Give Julie's highest recorded heart rate.

(1)

heart rate = ..... bpm

(ii) When Julie is asleep her heart rate is 60 bpm.

Give the length of time that Julie is asleep.

(1)

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(b) Julie investigates the average resting heart rate, in beats per minute (bpm), for infants and young people.

She finds this data.

16 years	70 bpm		
		4 years	90 bpm
		0.5 years	140 bpm
10 years	80 bpm		
		2 years	110 bpm

Complete the table using this data.

(3)


(Total for Question 3 = 5 marks)



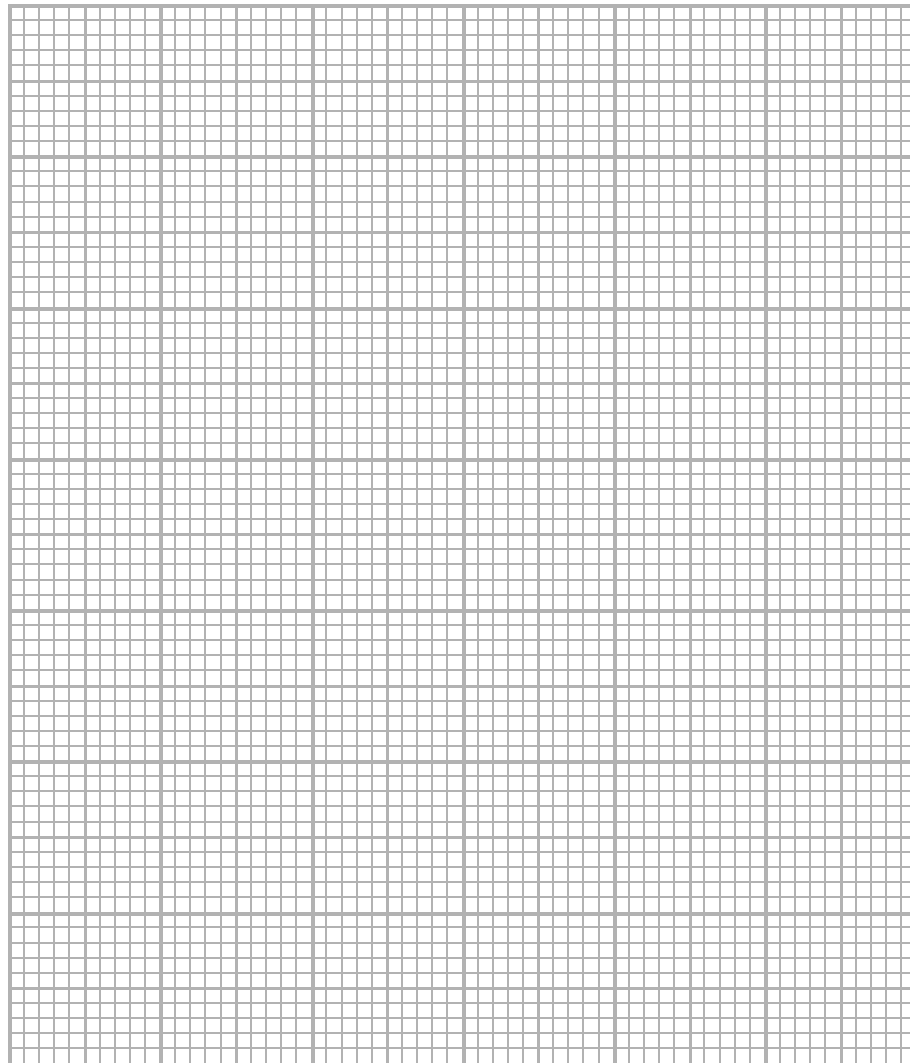
4 (a) Harry researches the time it takes for blood to clot at different temperatures.

He finds this data.

<b>temperature of blood (°C)</b>	10	20	30	40	50	60
<b>time for blood to clot (s)</b>	40	30	21	21	33	82

Plot a graph of the data on the graph paper.

(6)



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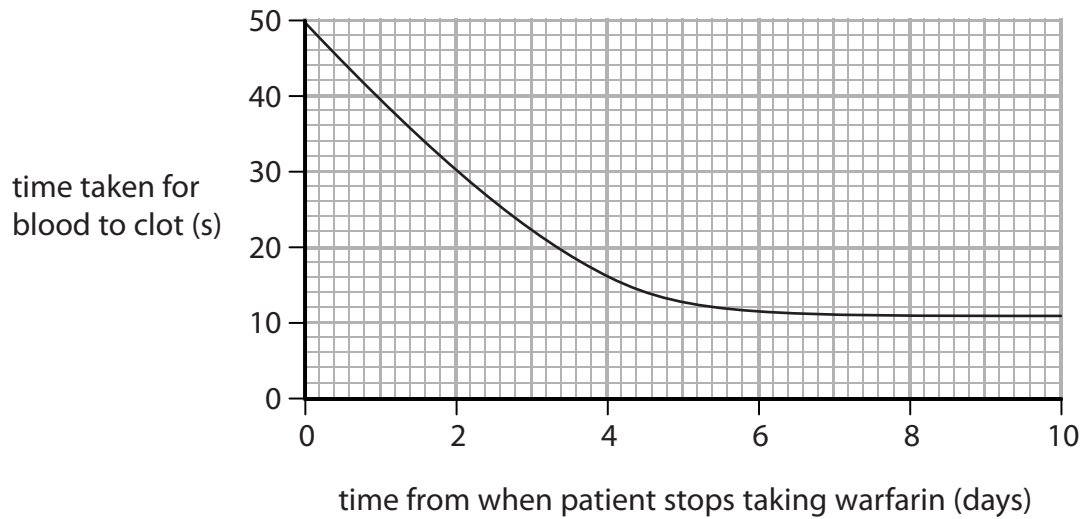




(b) Warfarin is a drug used to thin blood.

Harry researches the time it takes for blood to clot after a patient stops taking warfarin.

He finds this graph.



Describe what the graph shows about the time taken for blood to clot after the patient stops taking warfarin.

(3)

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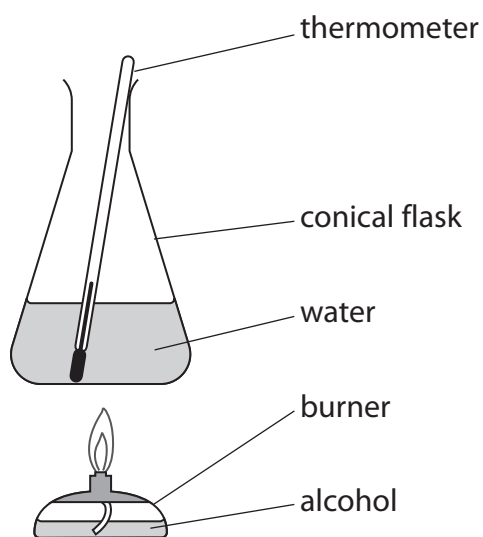
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**(Total for Question 4 = 9 marks)**



5 Eniola investigates the energy released by burning different alcohols.

He uses the equipment shown.



He measures the temperature of the water before heating and after heating to find the rise in temperature.

He repeats the experiment four times for each type of alcohol.

In each experiment he uses the same volume of water and burns the same mass of alcohol.

Here are Eniola's results.

type of alcohol	rise in temperature of water (°C)			
	trial 1	trial 2	trial 3	trial 4
ethanol	10	11	10	9
propanol	14	16	15	17
butanol	20	10	21	22
pentanol	25	27	26	27

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(a) Eniola has drawn a circle round an anomaly in the table.

(i) State how Eniola should deal with this anomaly.

(1)

.....  
.....

(ii) Explain **two** possible reasons for the anomaly.

(4)

reason 1 .....

.....  
.....  
.....

reason 2 .....

.....  
.....  
.....

(b) Calculate the average rise in temperature of the water when propanol is burnt.

Show your working.

(2)

temperature rise = ..... °C

**(Total for Question 5 = 7 marks)**

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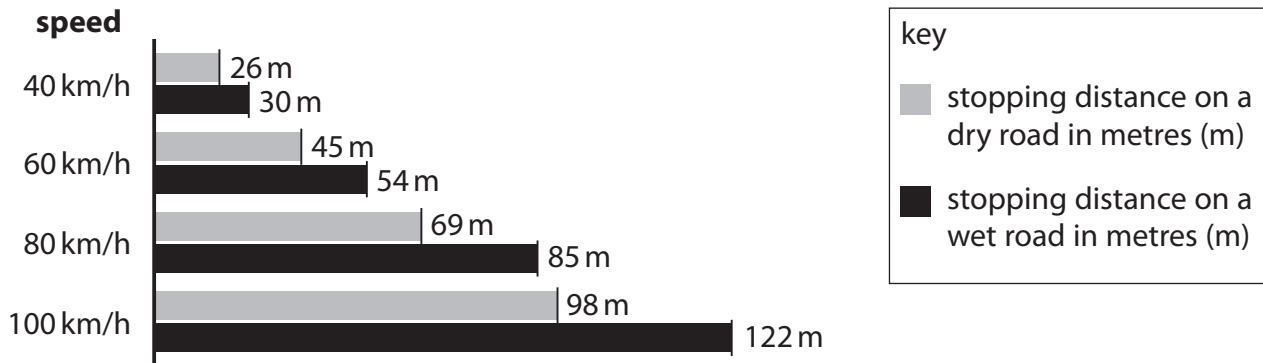
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- 6 (a) Ella researches how the stopping distances of cars change when they are driven at different speeds on dry roads and wet roads.

Ella finds this chart.



Write a conclusion about how the stopping distances of cars change when they are driven at different speeds on dry roads and wet roads.

(3)

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- (b) A car is travelling at a steady speed of 25.0 m/s.

Calculate the time taken for the car to travel 3.644 km.

$$\text{distance (m)} = \text{speed (m/s)} \times \text{time (s)}$$

Give your answer to three significant figures.

Show your working.

(4)

time = ..... s

(Total for Question 6 = 7 marks)



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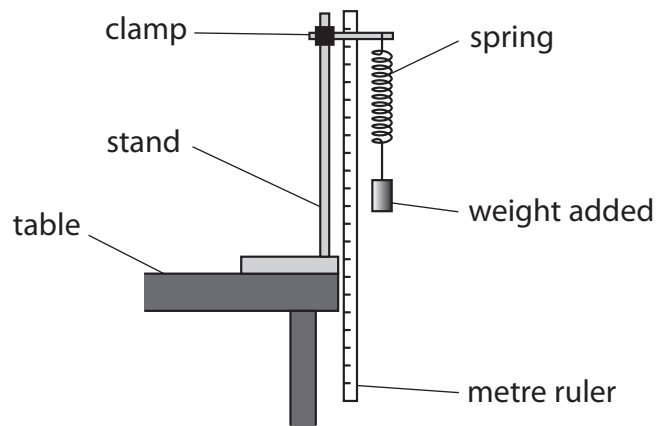
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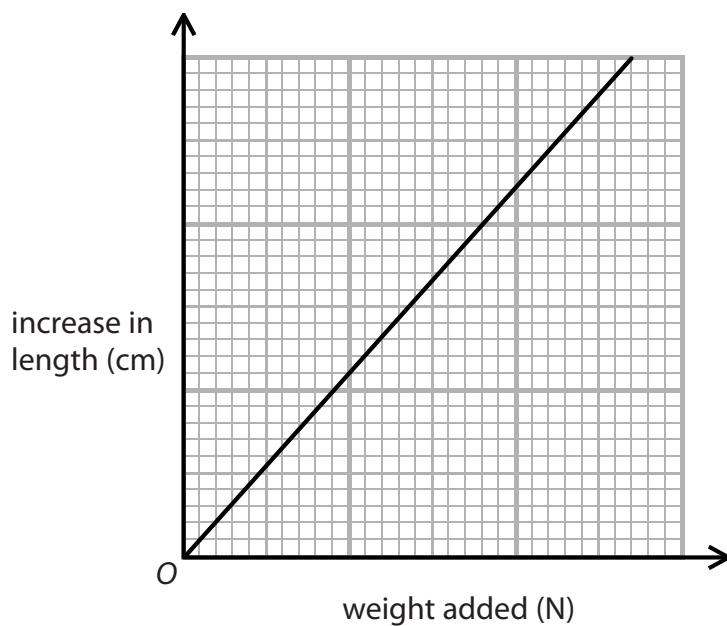
7 (a) Stephen stretches a spring by adding a series of weights.

He uses the equipment shown.



After each weight is added he measures the increase in length of the spring.

Here is a graph of his results.



Stephen repeats the experiment with a second spring.

The second spring does not stretch as much when the same weights are added.

Draw a line on the graph to show the results that could be produced with the second spring.

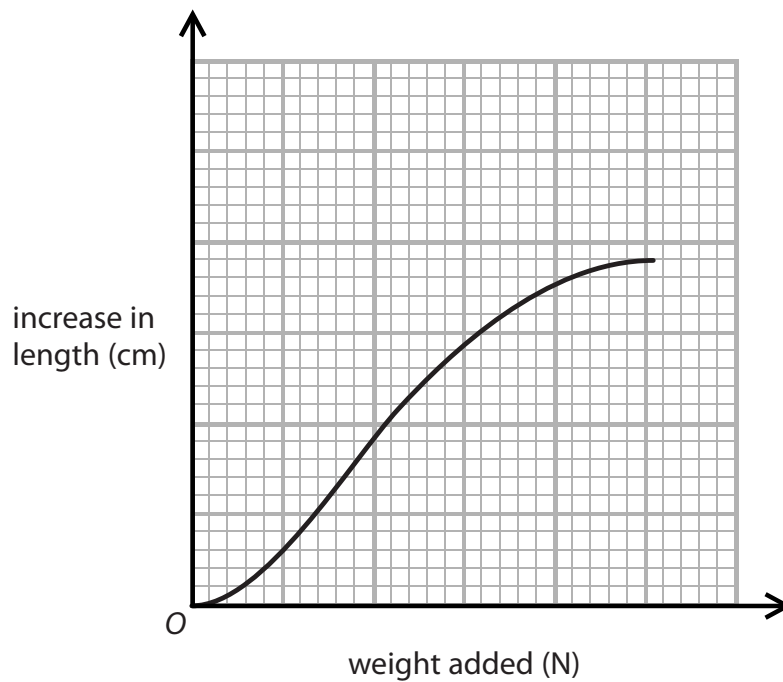
(1)



(b) Stephen replaces the spring with an elastic band.

He adds weights to the end of the elastic band and measures the increase in length.

Here is a graph of his results.



Stephen makes a hypothesis:

'Adding weights to the elastic band makes it longer and the increase in length is directly proportional to the weight added.'

Comment on the extent to which the graph supports Stephen's hypothesis.

(2)

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(c) Stephen repeats the experiment with a different elastic band to see how much it increases in length when weights are added.

Here is his method.

1. Attach an elastic band to the clamp.
2. Add a weight.
3. Measure the length of the band.
4. Add a further weight to the band and repeat the measurements.

Stephen thinks that he can improve this method.

Explain the improvements he could make to this method.

(6)

Dotted lines for writing the answer.



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**(Total for Question 7 = 9 marks)**

**TOTAL FOR PAPER = 50 MARKS**

