Write your name here

Surname	Other names

Pearson BTEC Level 1/Level 2 First

Centre Number

Learner Registration Number

Application of Science

Unit 8: Scientific Skills

Monday 2 March 2015 – 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 ▶

P45200A

1/1/1/1/1/1/2/

P 4 5 2 0 0 A 0 1 1 6

PEARSON

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

1 Hazel and Daisy are sports scientists.

They are investigating how the amount of glucose in different sports drinks affects how long athletes can keep running.

(a) (i) Give the name of a suitable piece of equipment that could be used to time how long an athlete can keep running.

(1)

.....

(ii) Give the variable Hazel and Daisy will be changing in this experiment.

(1)

.....

(iii) Identify a variable they will need to control for this experiment.

(1)

.....

(iv) Give **one** precaution they would need to take when carrying out this experiment to minimise risk.

(1)

.....

.....

Hazel and Daisy are going to use different athletes to investigate how one sports drink affects the athletes' pulse.

(b) Name the dependent variable for this investigation.

(1)

.....

(Total for Question 1 = 5 marks)

2 Toni and Saul investigated the average speed of a bowling ball.

Toni and Saul bowl along a flat surface.

They investigated how the distance the bowling ball travels affects its average speed.

They have drawn a sketch graph of what they think will happen.

Write a quantitative hypothesis for how the distance travelled by the bowling ball affects its average speed.

(3)

(Total for Question 2 = 3 marks)

3 Claire and Toby are investigating sports equipment.

An athlete runs on a treadmill.

They make a hypothesis for their investigation:

'As the angle of the treadmill increases, the more the athlete will sweat'.

They collect sweat from an athlete using paper tissues.

(a) Describe a method that Claire and Toby could use to measure the mass of sweat collected on the paper tissues.

(2)

.....

.....

(b) Write a plan for Claire and Toby to find out how the angle of the treadmill affects the amount of sweat produced by an athlete.

(6)

Include in your plan:

- The number of angles they should test.
- The number of experiments they should carry out.
- An explanation of why this would test the hypothesis.

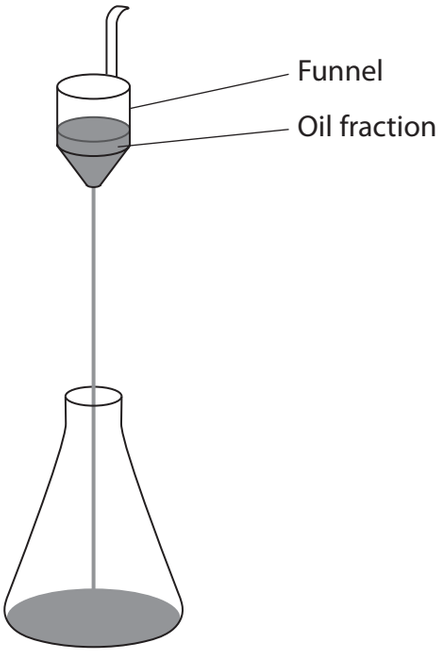
(Total for Question 3 = 8 marks)

4 Alexis is investigating how quickly different oil fractions flow.

Each oil fraction contains molecules with different numbers of carbon (C) atoms.

Alexis pours 100 cm^3 of each oil fraction through a small funnel.

He times how long it takes them to flow through in seconds (s).



Here are the results of his experiment.

C_{10} 20 s	C_{30} 360 s	C_{20} 70 s
C_{15} 45 s	C_{25} 160 s	

(a) Complete the table with the results.

(3)

(b) Alexis then investigates the effect of using funnels with holes of different diameters.

He pours 100 cm^3 of one of the oil fractions through each funnel.

He takes several readings for each diameter.

Here are his results.

Diameter of hole (mm)	Speed of oil (cm/s)			
	1	2	3	Average
2	0.35	0.36	0.37	
4	0.40	0.39	0.41	0.40
6	0.51	0.50	0.52	0.51
8	0.64	0.66	0.65	0.65
10	0.86	0.85	0.81	0.84

(i) Calculate an average of the results for the **2 mm** diameter hole.

(2)

..... cm/s

(ii) Describe what the information in the table shows.

(2)

.....

.....

.....

.....

(Total for Question 4 = 7 marks)

5 Cold packs are used to treat injuries.

Some cold packs have compartments containing ammonium nitrate and water.

When the ammonium nitrate and water are mixed the pack feels very cold.

Sophie and Hussein investigated the temperature change of different cold packs.

Here are their results:

Cold pack	Temperature at the start (°C)	Temperature after 2 minutes (°C)
A	20	9
B	20	12
C	20	11
D	20	15

(a) Identify which cold pack gives the biggest temperature change.

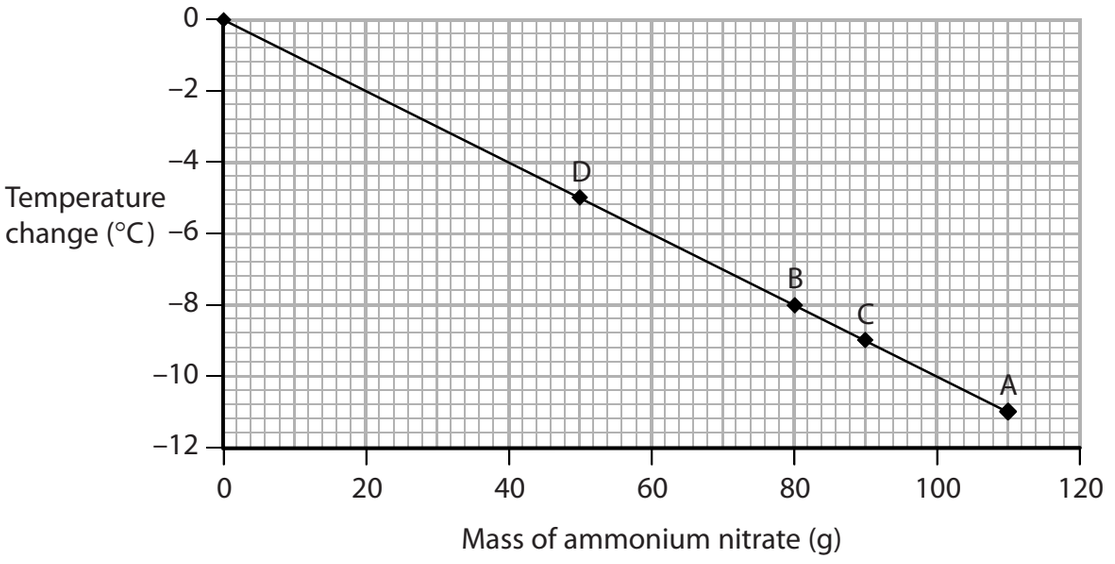
(1)

.....

Sophie and Hussein measured the mass of ammonium nitrate in each cold pack.

They plotted the results of mass against temperature change on a graph.

Here is a graph of their results.



(b) Use the graph to answer the following questions.

(i) State how the temperature changes as the mass of ammonium nitrate in the cold pack increases.

(1)

.....

.....

The experiment with a mass of 30 g of ammonium nitrate took 2 minutes.

(ii) What is the temperature fall per minute for this mass of ammonium chloride?

(2)

..... °C/min

(Total for Question 5 = 4 marks)

6 Gregor and Dimitri carried out an experiment using a toy parachute.

They dropped the parachute from different heights and timed how long it took the parachute to reach the ground.

Their stopwatch could record to two decimal places.

Gregor and Dimitri repeated the experiment four times and recorded their results in a table.

Drop height (m)	Time (s)			
	1	2	3	4
1	2.15	2.17	2.19	2.16
2	3.44	3.45	3.42	3.41
3	4.31	2.05	4.28	4.31
4	5.25	5.20	5.22	5.21

(a) (i) Gregor and Dimitri realise one of the results is anomalous.

Explain which result is anomalous.

(2)

.....

.....

.....

(ii) State what may have caused the anomaly to occur.

(1)

.....

(b) Gregor calculated an average for drop height 1 and said that the result was 2.1675 s.

Explain why this is not an appropriate average from the results they collected.

(2)

.....

.....

.....

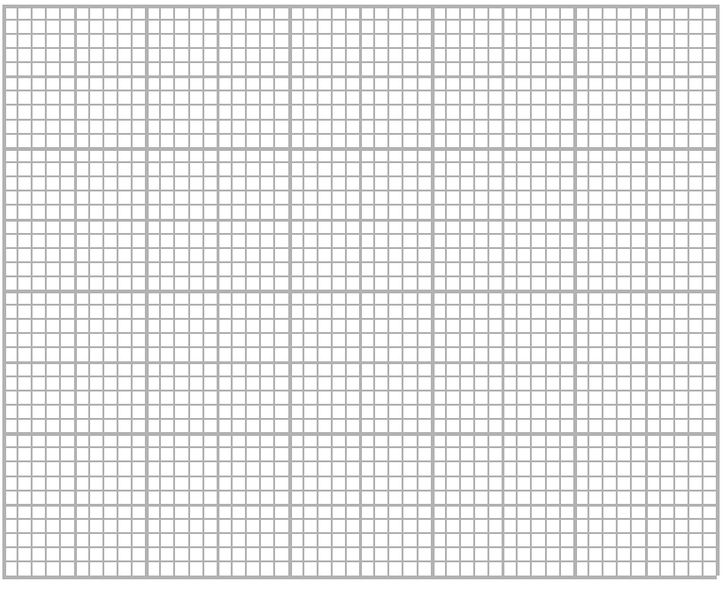
(c) Gregor and Dimitri next investigated how the material used for the toy parachute affected the speed as it fell.

Material used for parachute	Speed (m/s)
Plastic bag	0.6
Newspaper	0.8
Cotton fabric	0.7
Nylon fabric	0.5
Tissue paper	0.4

Plot a bar graph of these results.

Use the graph paper below.

(6)



(d) Identify from the graph which toy parachute took the longest time to reach the ground.

(1)

.....

Gregor and Dimitri calculated that the average velocity of the parachute made out of newspaper was 0.8 m/s.

The kinetic energy of an object can be calculated using the following formula.

$$\text{Kinetic energy (J)} = \tfrac{1}{2} \times \text{mass (kg)} \times \text{velocity}^2\ (\text{m/s})^2$$

The mass of their parachute was 0.03 kg.

(e) Calculate the kinetic energy of the parachute.

(2)

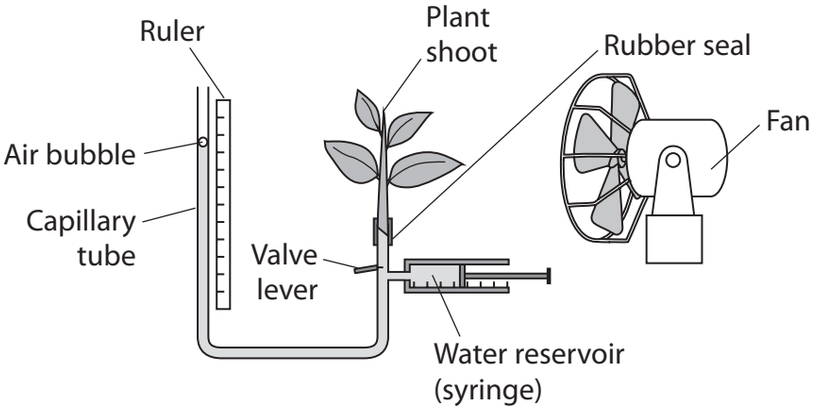
..... J

(Total for Question 6 = 14 marks)

7 Susie investigated the water lost from a plant shoot.

She compared the water lost when the air was still and when it was windy.

The more water lost by the plant shoot the further the air bubble moves down the capillary tube.



Air conditions	Distance moved by the air bubble (mm)			
	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Still air	8	7	9	6
Windy	11	13	14	12

Susie wrote a conclusion.

'I think that **all** plants lose more water when it is windy.'

Discuss how well the evidence Susie collected supports the conclusion she made.

(3)

(Total for Question 7 = 3 marks)

8 Jamal and Paul decided to investigate the pH of different chemicals.

Here is their method:

1. Choose some chemicals.
2. Put some chemical in a test tube.
3. Add some indicator liquid.
4. Note the colour produced.

Jamal thinks that they could make some improvements to their method to make it repeatable.

Explain improvements they could make to this method.

(6)

(Total for Question 8 = 6 marks)

TOTAL FOR PAPER = 50 MARKS