

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson BTEC  
Level 1/Level 2  
First Award**

Centre Number

--	--	--	--	--	--	--

Learner Registration Number

--	--	--	--	--	--	--	--	--	--

**Friday 5 February 2021**

Morning (Time: 1 hour 15 minutes)

Paper Reference **20474E**

**Application of Science**

**Unit 8: Scientific Skills**

**You must have:**

A calculator, a pencil and a 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 ►

P67680A

©2021 Pearson Education Ltd.

1/1/1/1/1/1/1/1/e2/1



Pearson

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

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 (a) A learner chooses some equipment to use in an investigation.

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

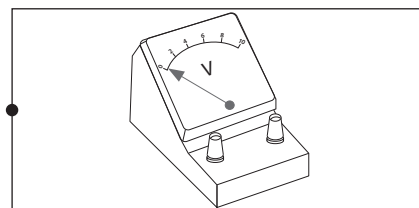
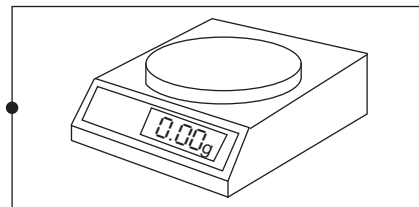
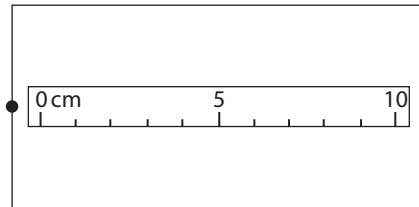
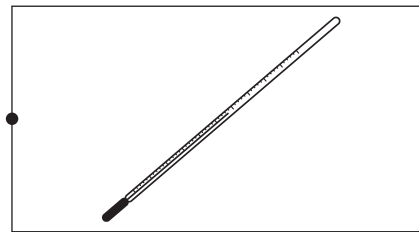
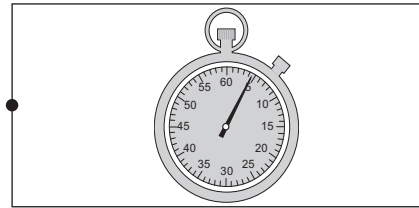
(2)

use

piece of equipment

measures voltage

measures length



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(ii) A learner needs to measure 85 cm<sup>3</sup> of hydrochloric acid.

Which piece of equipment gives the most accurate measurement?

(1)

- A beaker
- B boiling tube
- C jug
- D measuring cylinder

(b) A technician heats some water in a conical flask.

Figure 1 shows the equipment used to heat the water.

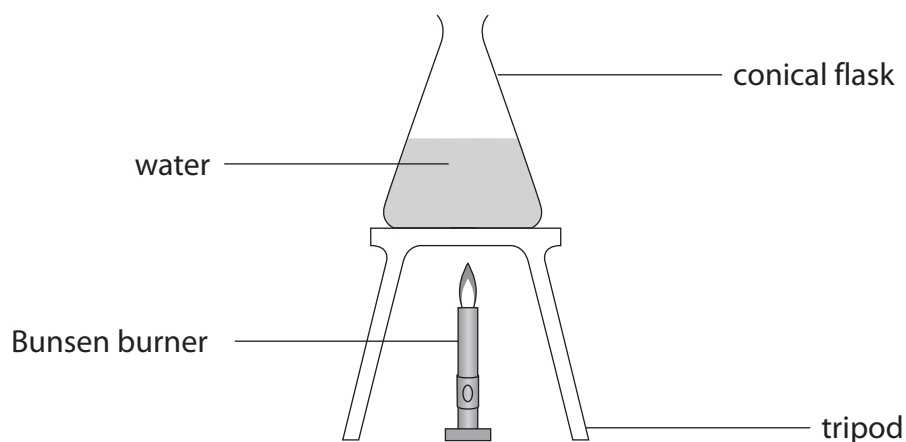


Figure 1

After heating the water, the conical flask is very hot.

There is a risk that the hot flask could burn the technician's skin.

Give **two** ways that the technician could reduce this risk when picking up the conical flask.

(2)

1 .....

.....

2 .....

.....

(Total for Question 1 = 5 marks)





DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



2 (a) A learner investigates how changing the temperature of hydrochloric acid affects the volume of gas produced in a reaction.

(i) The dependent variable in the experiment is the volume of gas produced.

State the independent variable in the experiment.

(1)

(ii) The learner:

- places a flask of hydrochloric acid in a water bath at a temperature of 25 °C
- adds a piece of magnesium ribbon to the flask
- records the volume of gas produced every five seconds for 80 seconds
- repeats the same experiment but at a different temperature of 35 °C.

Figure 2 shows a graph of the results.

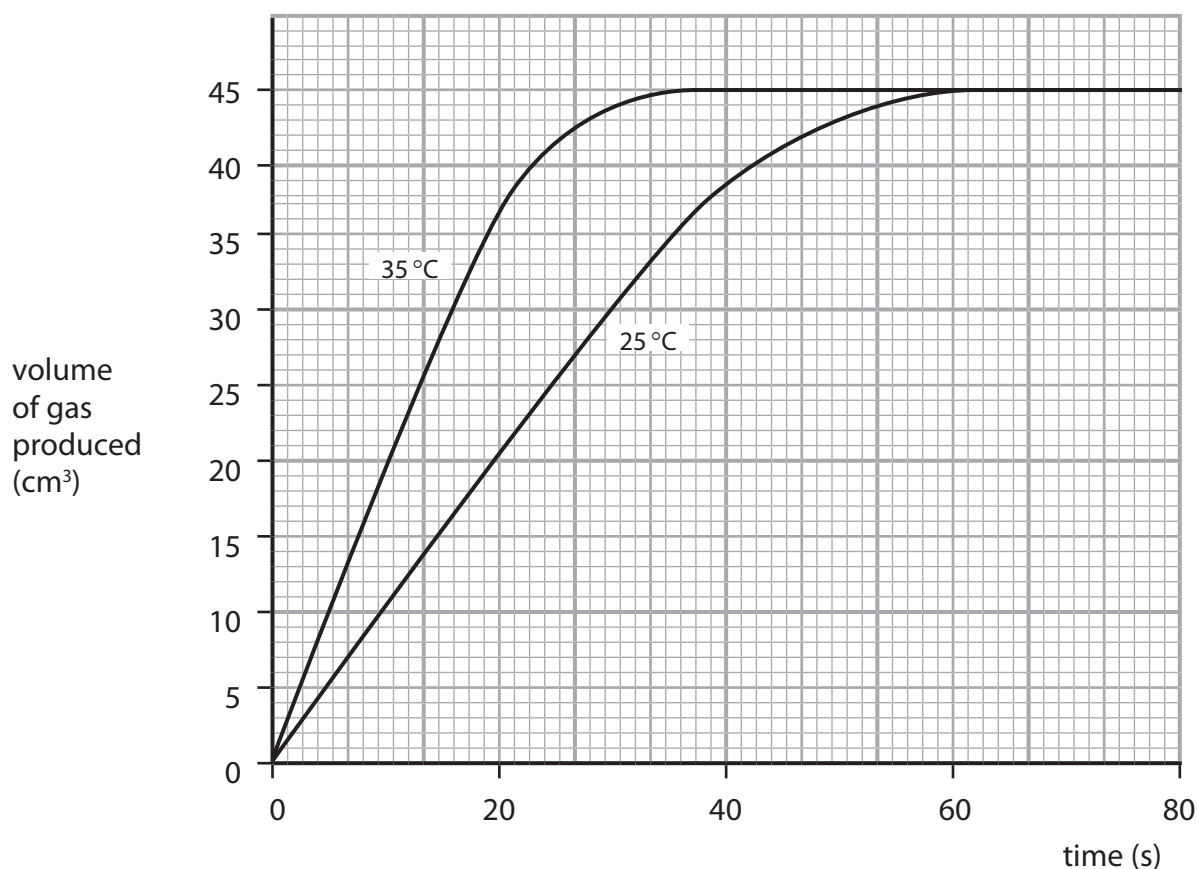


Figure 2

The learner then repeated the experiment at a temperature of 30 °C.

Draw a line on Figure 2 to show the expected results.

(3)



(b) Another learner wants to investigate how the concentration of sodium thiosulfate solution affects the speed of the reaction with hydrochloric acid.

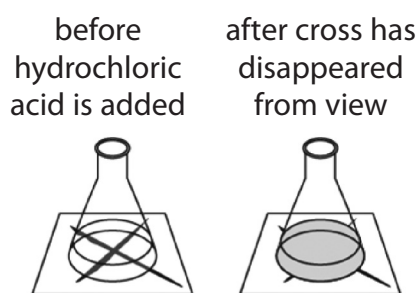
When hydrochloric acid reacts with sodium thiosulfate solution, the solution changes from clear to cloudy.

The learner:

- draws a cross on a piece of paper
- places a flask of sodium thiosulfate solution on the cross
- adds hydrochloric acid to the sodium thiosulfate solution.

The time taken for the cross to disappear from view is recorded.

Figure 3 shows some of the equipment used.



**Figure 3**

The learner makes this hypothesis:

'As the concentration of the sodium thiosulfate solution increases, the time taken for the cross to disappear from view decreases.'

Write a method to test this hypothesis.

Your method should include:

- measurements to record
- variables that should be controlled.

(6)

.....

.....

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

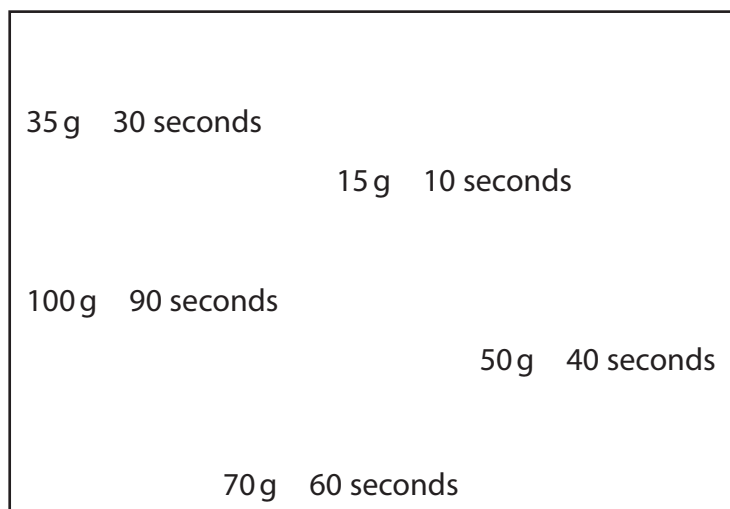
Handwriting practice area with 15 horizontal dotted lines.

**(Total for Question 2 = 10 marks)**



- 3 A learner measures the time taken for different masses of sodium chloride to dissolve in water.

Figure 4 shows the data that the learner collected.



**Figure 4**

Complete Table 1 using the data from Figure 4.

(3)


**Table 1**

**(Total for Question 3 = 3 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





4 (a) A learner investigates the voltage and current in an electrical circuit.

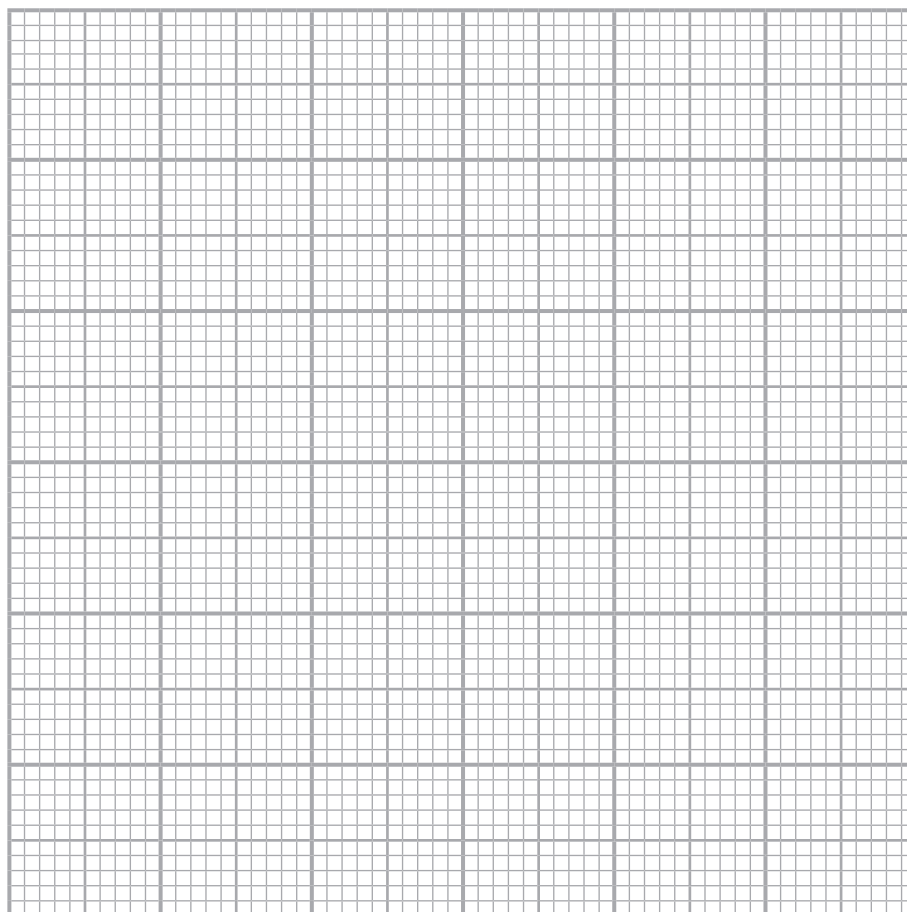
Table 2 shows the learner's results.

voltage (V)	current (A)
0.0	0.0
1.0	0.2
2.0	0.4
3.0	0.6
4.0	0.8
5.0	1.0

**Table 2**

(i) Draw a line graph using the data in Table 2.

(6)



(ii) The learner repeats the experiment using some different voltages.

The experiment is repeated using the same method as before.

Table 3 gives the new data.

voltage (V)	current (A)
0.0	0.0
2.0	0.4
4.0	0.8
6.0	1.2
8.0	0.5
10.0	2.0

**Table 3**

The learner circles an anomaly in the data.

Give **two** things that the learner should do about the anomaly.

(2)

1 .....

.....

2 .....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(b) A learner wants to calculate the current in a lamp.

The resistance of the lamp is 4.5 ohms.

The voltage across the lamp is 11.2 volts.

Calculate the current in the lamp.

Use the equation:

$$\text{voltage (volts)} = \text{current (amps)} \times \text{resistance (ohms)}$$

Give your answer to **one** decimal place.

(3)

Show your working.

current = ..... amps

**(Total for Question 4 = 11 marks)**



5 A learner counts the number of plants in five plant pots.

Table 4 gives their results.

pot	number of plants in pot
1	56
2	34
3	65
4	45
5	20

**Table 4**

(a) Calculate the average number of plants.

(2)

average number of plants = .....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

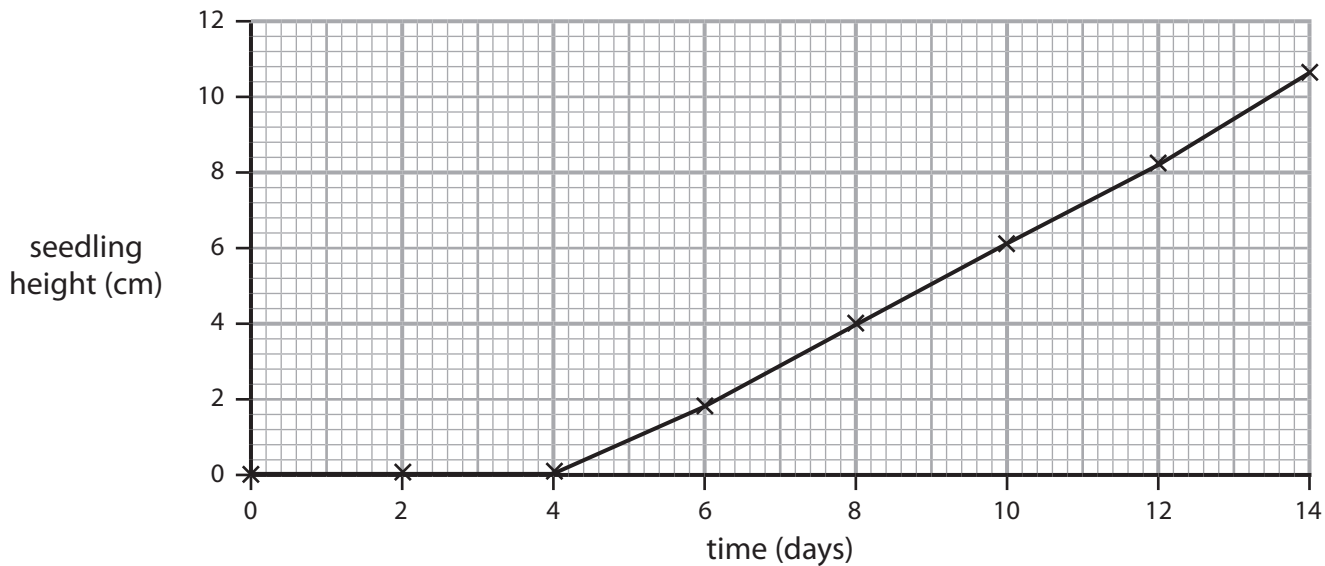
DO NOT WRITE IN THIS AREA



(b) The learner planted a seed.

They measured the height of the seedling every two days for 14 days.

Figure 5 shows a graph of their results.



**Figure 5**

(i) Give the height of the seedling at day 8.

(1)

..... cm

(ii) Describe the pattern shown in Figure 5.

(2)

.....

.....

.....

.....

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



- 6 A learner investigates the relationship between the angle of incidence and the angle of reflection of a ray of light from a plane mirror.

Figure 6 shows how the equipment was set up in the investigation.

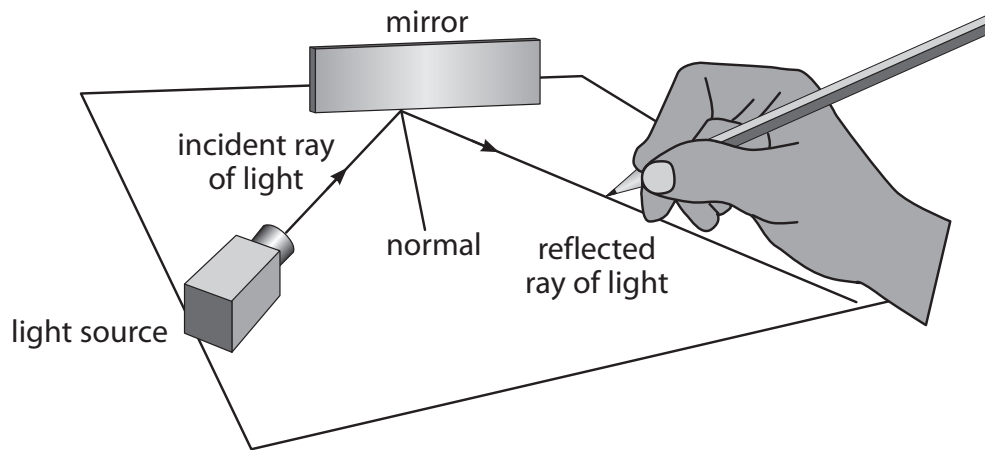


Figure 6

The learner uses a protractor to measure the angle of incidence from the normal, for different incident rays of light.

The learner also measures the angle of reflection for each reflected ray of light.

The learner plots a graph of the measured angles of incidence and reflection.

Figure 7 shows their graph.

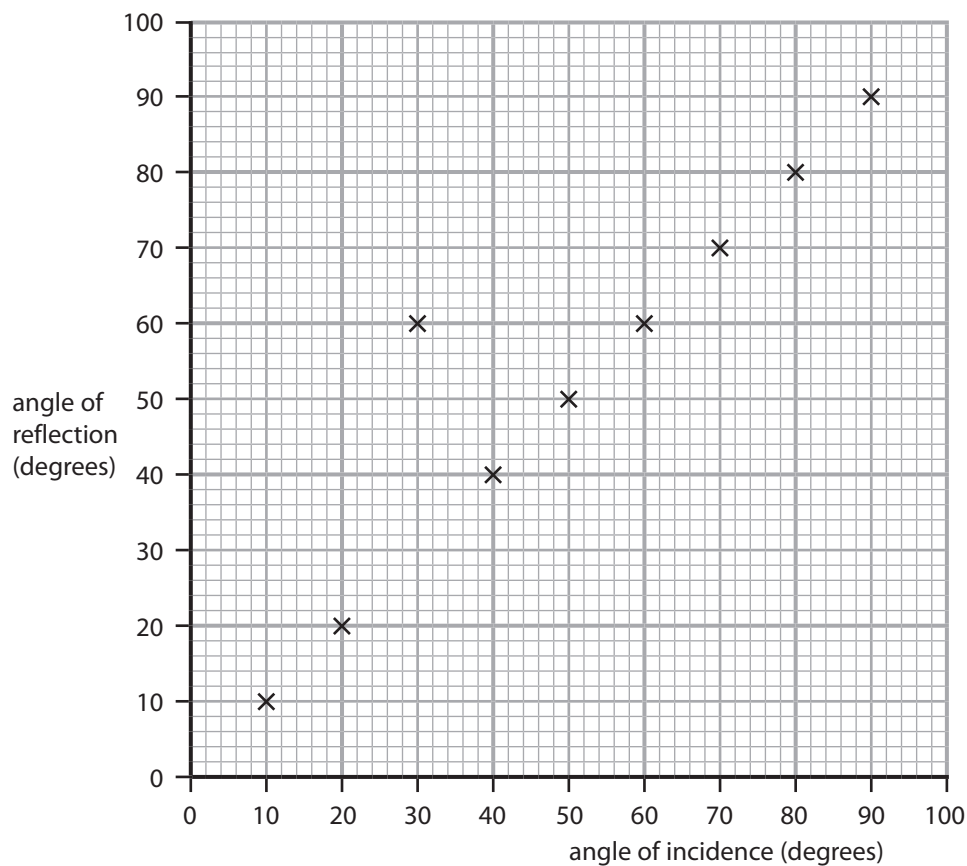


Figure 7



(a) One of the points plotted on Figure 7 does not fit the trend.

Draw a circle around the anomalous point on Figure 7.

(1)

(b) Draw a line of best fit on Figure 7.

(1)

(c) Explain **two** reasons why the anomaly in Figure 7 might have occurred.

(4)

1 .....

.....

.....

.....

2 .....

.....

.....

.....

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

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



7 A beekeeper researches the relationship between the number of bees and the amount of pollen in the local town.

Figure 8 shows the changes in bee population and amount of pollen over two years.

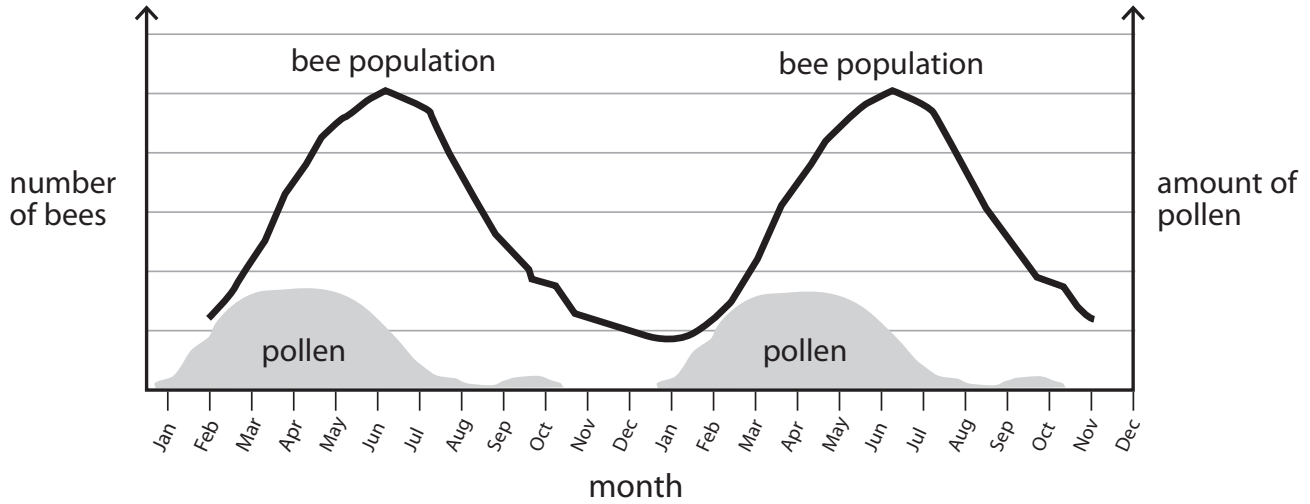


Figure 8

The beekeeper makes **two** conclusions using Figure 8.

Conclusion 1: 'The bee population is always at its lowest in January.'

Conclusion 2: 'The maximum bee population is always greatest when the amount of pollen is greatest.'

Explain whether the evidence in Figure 8 supports the beekeeper's **two** conclusions.

(4)

Conclusion 1 .....

.....

.....

.....

Conclusion 2 .....

.....

.....

.....

(Total for Question 7 = 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA









DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



P 6 7 6 8 0 A 0 1 9 2 0



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**

