# *Whitgift School*

## *13+ Entry Examination*

***Sample Test***

# *SCIENCE*

***Time allowed: 60 minutes***

***To be filled in by pupil:***

***Name:***

***Current School:***

***To be filled in by marker***

***Total Mark:*** ***/86***

***Percentage:***

## Introduction

The following examination paper has been constructed from past SATs papers.

Questions are chosen to test skills in science thinking and application. The context of any question must be based around different areas in science (Biology, Chemistry and Physics) but the majority of marks awarded make use of information given in the question combined with the application of your scientific skills to use this information as well as your own scientific awareness.

There are 14 questions in the test, many with several parts. **If you get stuck with a question move on to look at the others and try to finish as many as you can**. Keep going until you see the message below:

**"The End!**

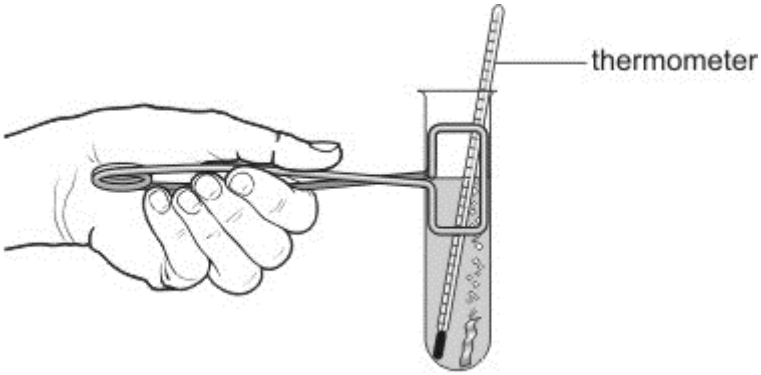
**You have finished!**

**Well done – if you have time go back and check answers or fill in any missing gaps!"**

## Notes:

- **Attached to this sample paper is a mark scheme which indicates how marks will be awarded**
- **We are looking for knowledge, understanding and, most importantly, academic potential in the sciences. In that respect we hope the paper is challenging but also enjoyable!**

**Q1.** Harry mixed zinc with copper sulphate solution in a test-tube.
A displacement reaction took place and the temperature increased.




(a) The word equation for the reaction is shown below.

zinc + copper sulphate → zinc sulphate + copper

Why is this reaction called a displacement reaction?

.....

.....

1 mark

(b) Harry repeated the experiment with two other metals.
He wanted to calculate the temperature rise each time.
His results are shown below.

| metal added to copper sulphate | temperature at the start (°C) | highest temperature reached (°C) | rise in temperature (°C) |
|---|---|---|---|
| zinc | 20.0 | 36.5 | 16.5 |
| iron | 25.5 | 38.5 | 13.0 |
| magnesium | 19.5 | 87.5 | 68.0 |

Harry used different starting temperatures.
Explain why this did **not** affect his results.

.....

.....

1 mark

(c) Part of the reactivity series of metals is shown below.

| | |
|---|---|
| **most reactive** | sodium |
| | calcium |
| | magnesium |
| | aluminium |
| | zinc |
| | iron |
| | lead |
| **least reactive** | copper |

Use the reactivity series above to answer all the questions below.

(i) Why was the highest rise in temperature obtained with magnesium and copper sulphate?

.....

.....

1 mark

(ii) Why was the rise in temperature obtained with zinc and copper sulphate **not** much higher than the rise in temperature obtained with iron and copper sulphate?

.....

.....

1 mark

(iii) In which of the following mixtures would there be a rise in temperature? Write **yes** or **no** in each blank box.

| **mixture** | **Would there be a rise in temperature?** |
|---|---|
| aluminium + sodium chloride | |
| calcium + zinc sulphate | |
| lead + zinc chloride | |
| magnesium + iron chloride | |

2 marks

maximum 6 marks

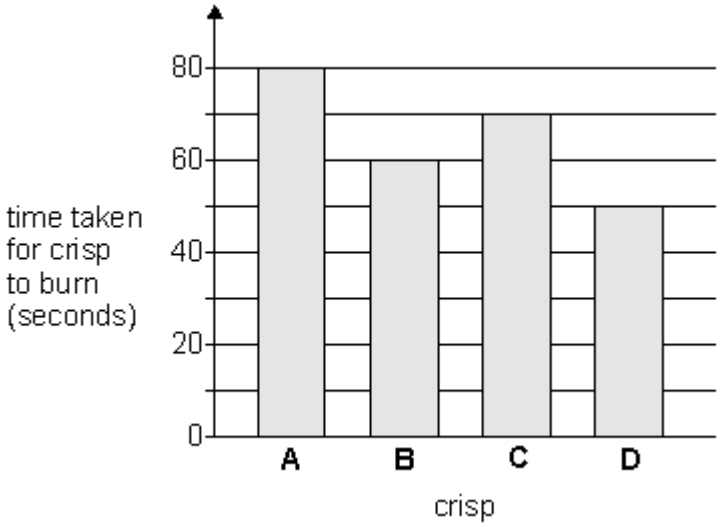
**Q2.** Joanne burnt four different crisps.
She predicted that the bigger the crisp, the longer it will burn.

(a) Look at the picture above. What did Joanne wear to protect herself?

.....

1 mark

(b) Joanne measured the time taken for each crisp to burn completely.
The bar chart shows Joanne's results.

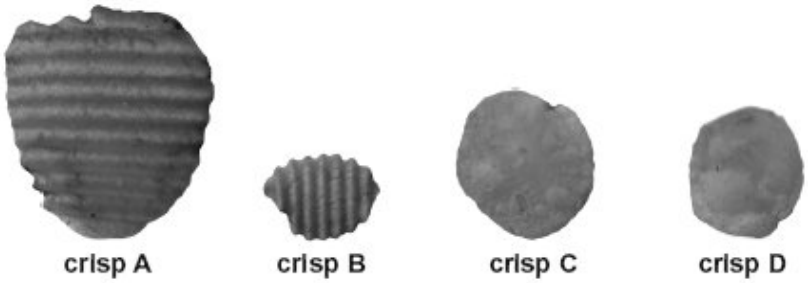



Look at the bar chart.
How much time did crisp D take to burn?

..... seconds

1 mark

(c) The crisps Joanne used in her investigation are shown below.




(i) Joanne predicted that the bigger the crisp, the longer it will burn.
Do the results support Joanne's prediction?
Tick one box.

yes ☐ no ☐

Use Joanne's results to explain your answer.

.....

.....

1 mark

(ii) How can you tell that Joanne did **not** carry out a fair test?

.....

1 mark

(d) Joanne wrote some conclusions for her investigation.

Decide whether each conclusion is **true**, **false**, or you **cannot tell**.
Tick the correct box for each conclusion.

| conclusion | true | false | cannot tell |
|---|---|---|---|
| Two crisps took the same amount of time to burn. | ☐ | ☐ | ☐ |
| The smallest crisp burnt for the shortest time. | ☐ | ☐ | ☐ |
| Two of the crisps burnt with flames of the same size. | ☐ | ☐ | ☐ |

3 marks
maximum 7 marks

**Q3.** Josh has a helium-filled balloon.

(a) He wants to calculate the speed of his balloon as it rises to the ceiling.

(i) What **two** measurements should he take to calculate the average speed of his balloon?

1 .....

2 .....

1 mark

(ii) How can he use these measurements to calculate the speed of his balloon?

.....

.....

1 mark

(b) Josh attached different masses to his balloon. For each mass, he calculated the speed of rise of the balloon. His results are shown below.

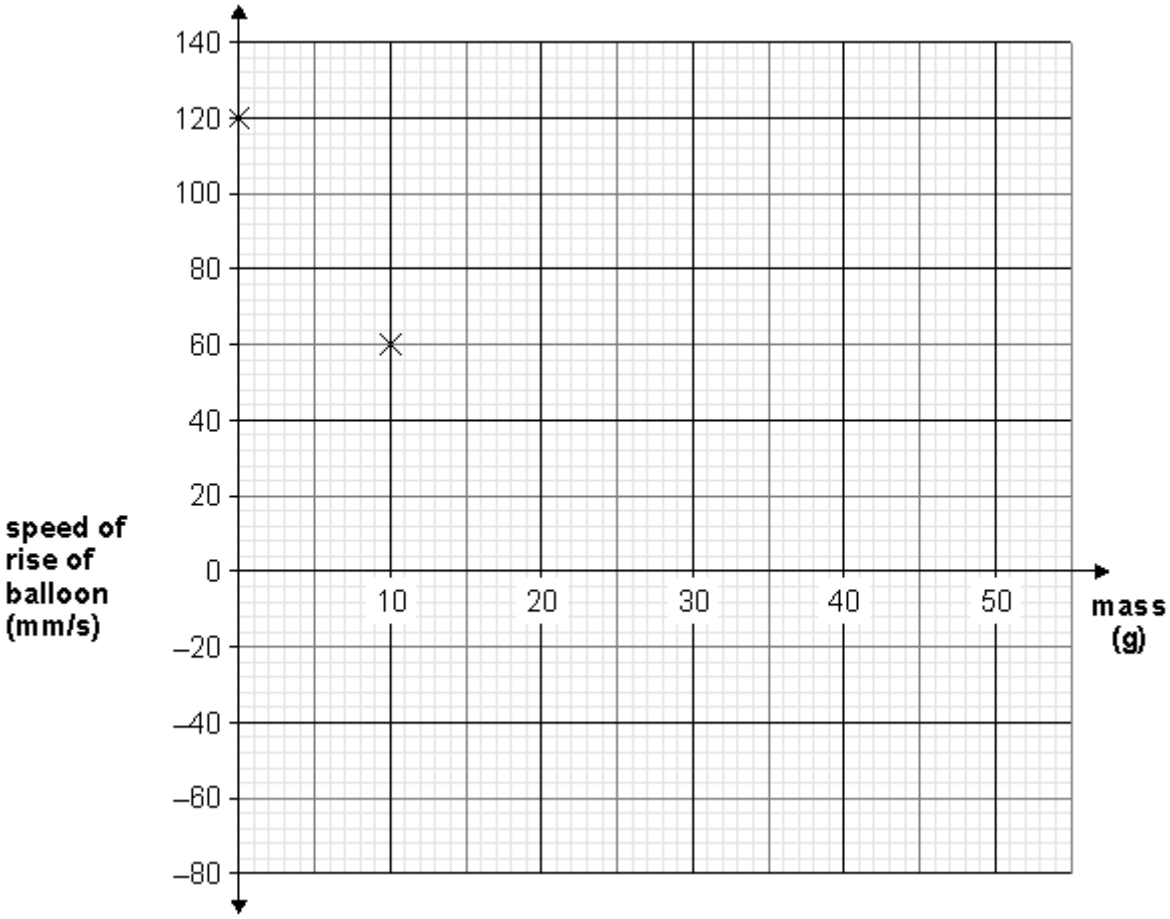
| mass (g) | speed of rise (mm/s) |
|---|---|
| 0 | 120 |
| 10 | 60 |
| 20 | 40 |
| 30 | –20 |
| 40 | –70 |

(i) How does the table show that the balloon went downwards?

.....

1 mark

(ii) Josh plotted two points on the graph as shown.
Complete the graph by plotting the missing points **and** draw a line of best fit.



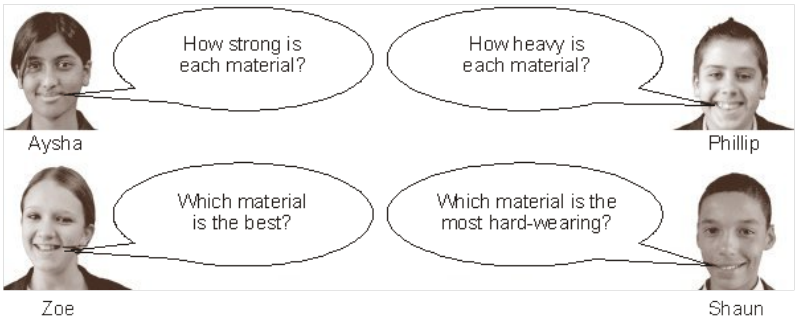

2 marks

(iii) From the graph, find the mass needed to keep the balloon floating in one place.

..... g

1 mark
maximum 6 marks

**Q4.** Some pupils investigated different materials used to make rucksacks.
Here are some of the questions they asked.




(a) Which pupil asked a question that cannot be investigated?
Tick the correct box.

Aysha ☐ Philip ☐ Zoe ☐ Shaun ☐

Give a reason to your answer.

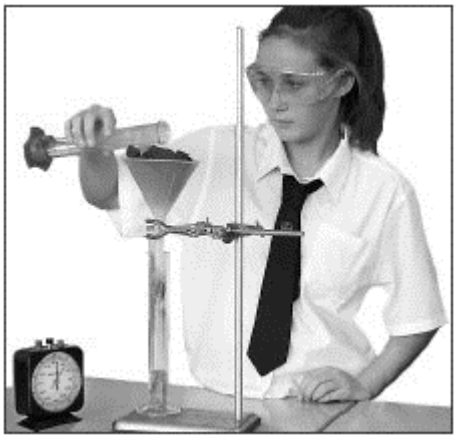
.....

.....

2 marks

(b) Zara took four different rucksack materials and investigated how waterproof they were.

She poured 100 $cm^3$ of water through each material in turn.
She measured the volume of water passing through each material in 30 minutes.



(i) Give **one** way of making Zara's test fair.

.....

1 mark

(ii) Look at the photograph of the investigation. Name one measuring instrument Zara used.

.....

1 mark

(c) The table below shows Zara's results.

| material | volume of water passing through each material ($cm^3$) |
|---|---|
| A | 11 |
| B | 5 |
| C | 20 |
| D | 15 |

Which material was the most waterproof?
Tick the correct box.

A ☐ B ☐ C ☐ D ☐

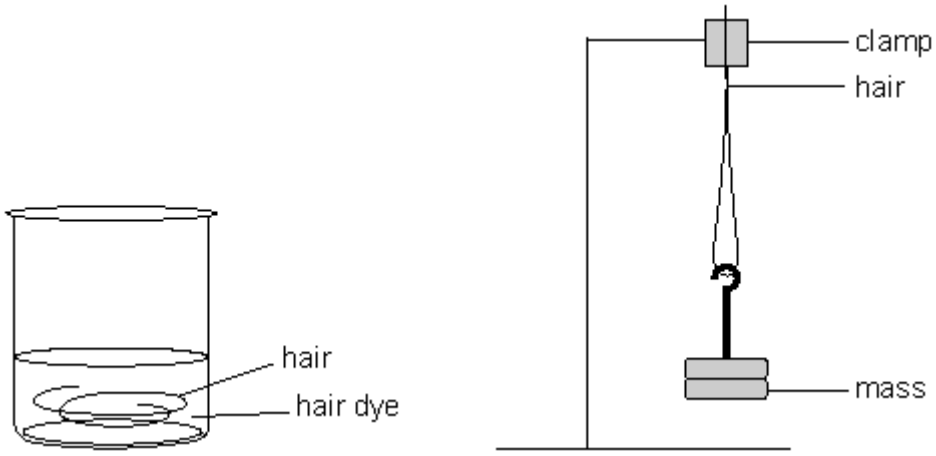
Explain your answer.

.....

.....

2 marks
maximum 6 marks

**Q5.** Jason wanted to find out if hair dye makes hair weaker.
He used 5 hairs of equal length.
He soaked each hair in a different concentration of hair dye for 15 minutes.
He added masses to each hair until it broke.

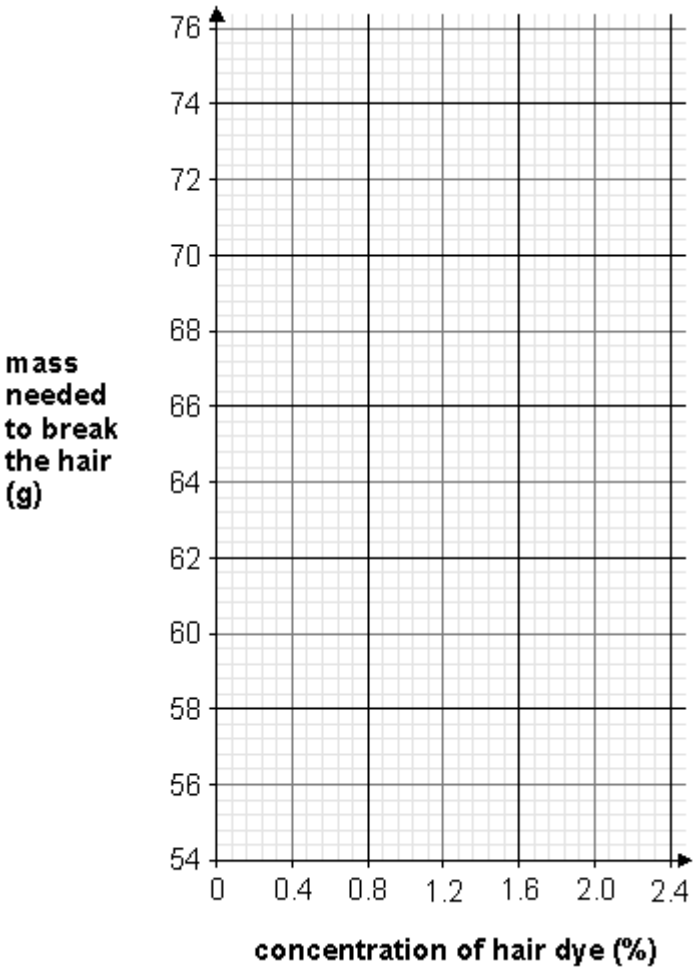



*not to scale*

(a) The table below shows Jason's results.

(i) Plot a graph of Jason's results **and** draw a line of best fit.

| concentration of hair dye (%) | mass needed to break the hair (g) |
|---|---|
| 0.4 | 71 |
| 0.8 | 67 |
| 1.2 | 64 |
| 1.6 | 61 |
| 2.0 | 58 |




3 marks

(ii) Use the graph to work out the mass needed to break hair soaked in water (0% hair dye).

..... g

1 mark

(b) What was the independent variable that Jason **changed** in this experiment?

.....

1 mark

(c) What was the dependent variable that Jason **measured** in this experiment?

.....

1 mark

(d) What is the relationship between the concentration of hair dye and the mass needed to break the hair?

.....

.....

1 mark

(e) Jason wanted to investigate whether soaking hair in dye for different amounts of time affected the strength of the hair.
Jason drew a table for his results.
Add headings **and** units to the table below for Jason's investigation.

| **heading 1** ..... **(.....)** | **heading 2** ..... **(.....)** |
|---|---|
| | |
| | |

4 marks
maximum 11 marks

**Q6.** Richard wanted to find out the best conditions for growing lettuce plants.

He took 4 trays and planted 8 lettuce plants in each.
The results of his investigation are shown below.

| | variables | | | |
|---|---|---|---|---|
| **tray** | **light level** | **air temperature (°C)** | **soil moisture** | **number of plants alive after 7 days** |
| A | medium | 25 | moist | 8 |
| B | medium | 25 | dry | 6 |
| C | medium | 45 | moist | 2 |
| D | medium | 45 | dry | 0 |

(a) How many days did Richard's investigation last?
Use the table to help you.

..... days

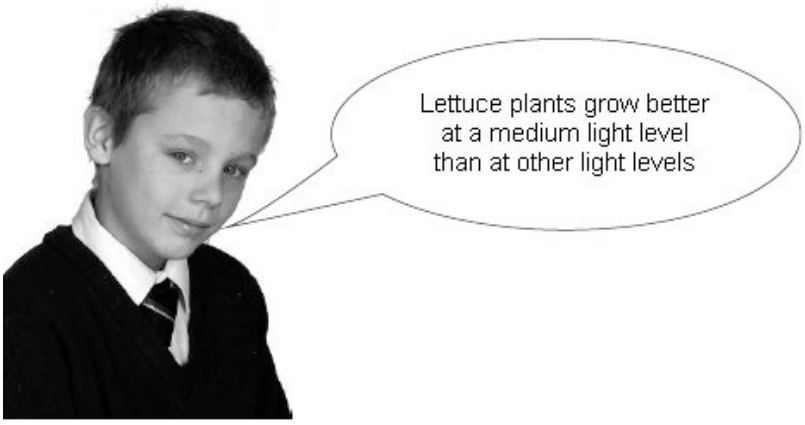
**1 mark**

(b) Look at the table. Which variables did Richard **change** in his investigation?
Tick the correct box.

| | | | |
|---|---|---|---|
| light level and air temperature | ☐ | soil moisture and type of soil | ☐ |
| air temperature and soil moisture | ☐ | type of soil and light level | ☐ |

**1 mark**

(c) Richard said:




Why is Richard **not** able to make this conclusion from his investigation?

.....

.....

**1 mark**

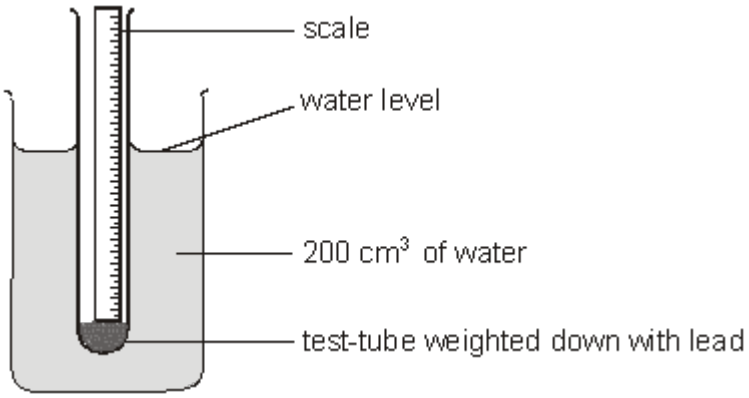
(d) The table below shows the number of lettuce plants alive at the end of day 1 and day 7 of the investigation.

For each tray, A, B, C and D, suggest the number of plants that were alive on **day 4**. Write your answers in the table below.

| | **number of plants alive** | | |
|---|---|---|---|
| **tray** | **day 1** | **day 4** | **day 7** |
| A | 8 | | 8 |
| B | 8 | | 6 |
| C | 8 | | 2 |
| D | 4 | | 0 |

**2 marks**
**maximum 5 marks**

**Q7.** Abi investigated how adding salt to water affects the way an object floats.
She used the apparatus below.



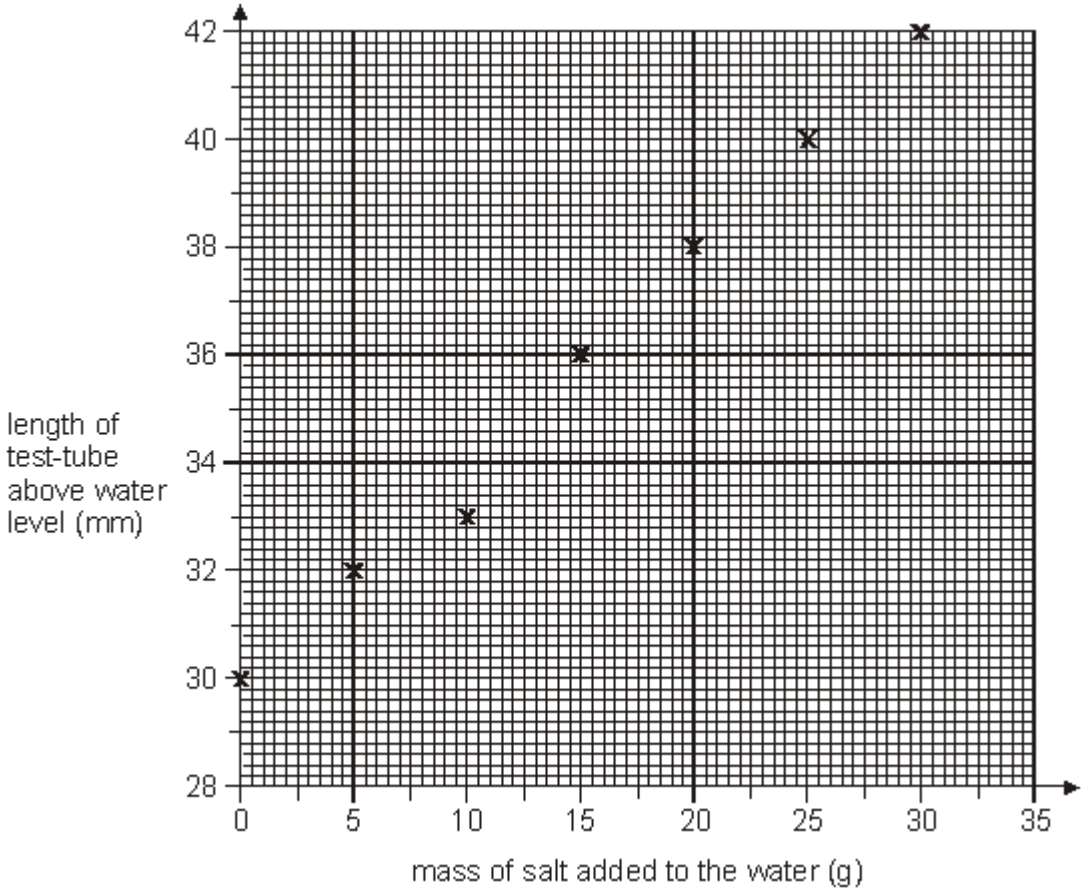

She used a scale inside a test-tube to measure the length of the test-tube above the water level.

(a) What factor did Abi change as she carried out her investigation (the independent variable)?

.....

1 mark

(b) Abi plotted her results on a graph.



(i) **On the graph**, circle the result which does **not** fit the pattern.

(ii) Suggest **one** reason for this result.

.....

.....

2 marks

(c) Abi said she should repeat the measurement that does **not** fit the pattern.
Robert said there is **no** need to repeat this measurement.

Who do you agree with?
Tick **one** box.

Albi... ☐ Robert... ☐

Explain your answer.

.....

.....

.....

1 mark

(d) Abi and Robert wrote the conclusions listed below.

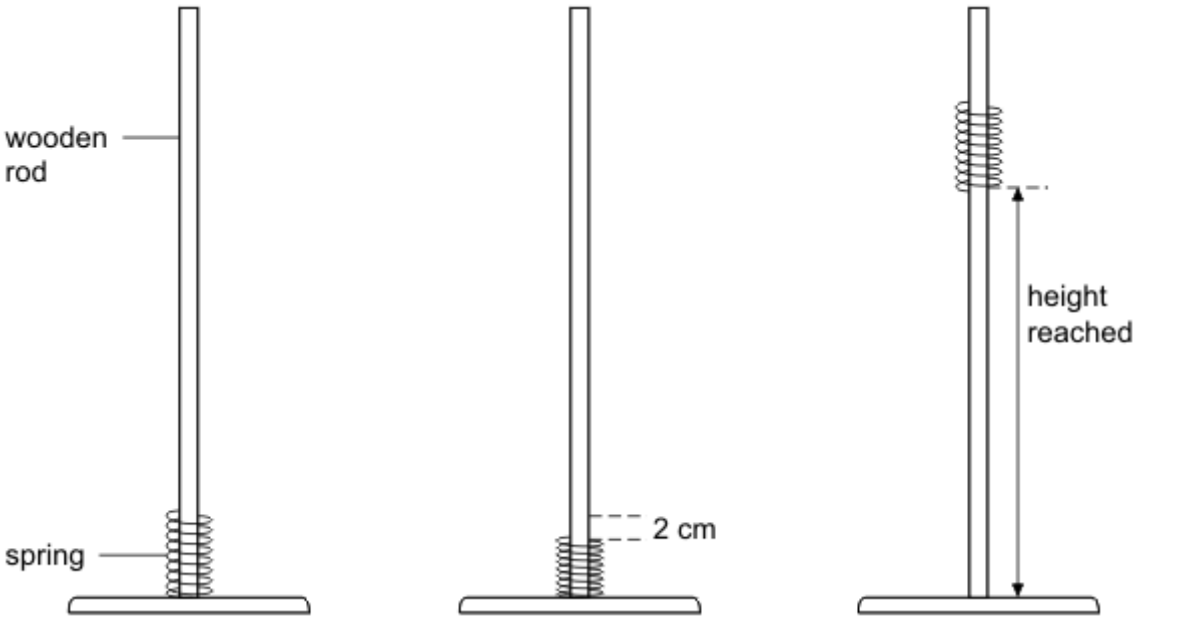
Look at the graph of their results and tick whether each conclusion is **true** or **false** or whether you **cannot tell**.

| conclusions | true | false | cannot tell |
|---|---|---|---|
| The more salt added, the higher the test-tube floats in the water. | ☐ | ☐ | ☐ |
| The length of the test-tube is 8 cm. | ☐ | ☐ | ☐ |
| When 10 g of salt is added, the length of the test-tube above the water will be 34 mm. | ☐ | ☐ | ☐ |
| Doubling the amount of salt doubles the length of the test-tube above the water. | ☐ | ☐ | ☐ |

2 marks
maximum 6 marks

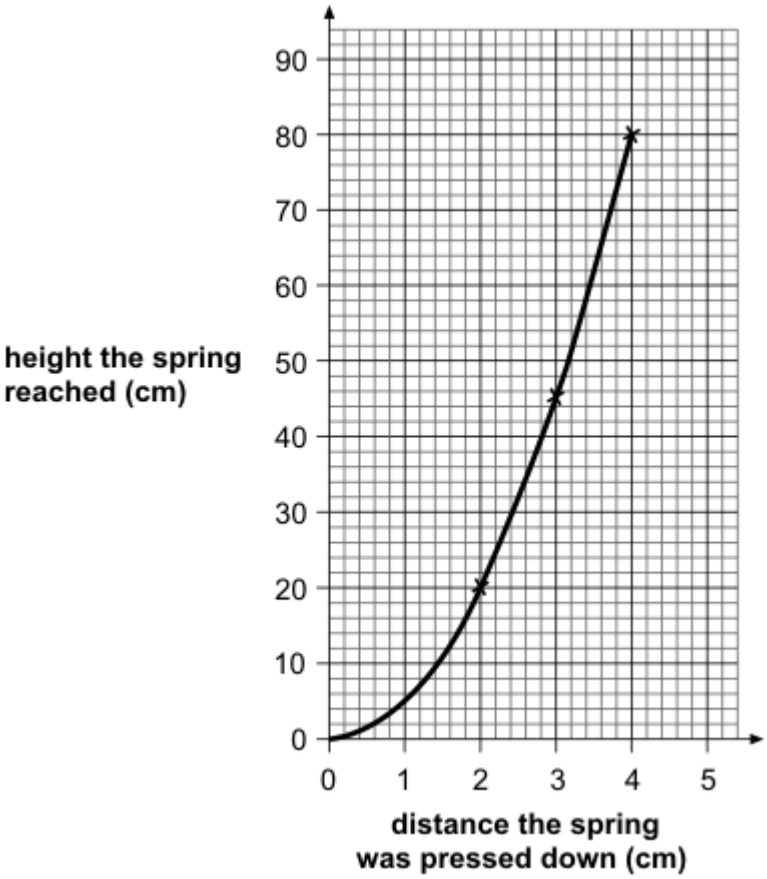
**Q8.** Jenny put a spring over a wooden rod. She pressed the spring down 2cm.

She let go of the spring and measured the height it reached.




*not to scale*

Jenny repeated her experiment. She pressed the spring down more each time.
Her results are shown in the graph below.



(a) Use Jenny's graph to complete the table below.

| distance the spring was pressed down (cm) | height the spring reached (cm) |
|---|---|
| 2 | |
| 3 | |
| 4 | |

1 mark

(b) Jenny said, 'If I double the distance I press the spring down, the height it reaches will also double'.

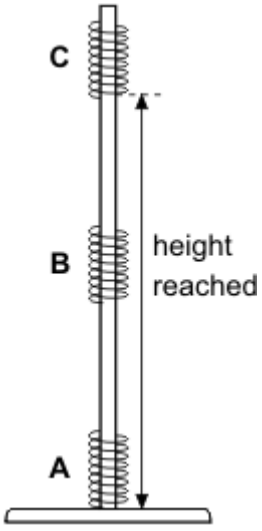
How do the results show she was wrong?

.....

.....

1 mark

(c) This diagram shows the moving spring in three different positions.




Complete the sentences below by choosing words from the box.
You can use each word more than once.

| most | some | least |
|---|---|---|

(i) When the spring is moving at **B** it has kinetic energy and

..... gravitational potential energy.

1 mark

(ii) When the spring reaches **C** it has ..... gravitational potential energy and ..... kinetic energy.

1 mark

(iii) When the spring stops at **A** it has ..... kinetic energy and ..... gravitational potential energy.

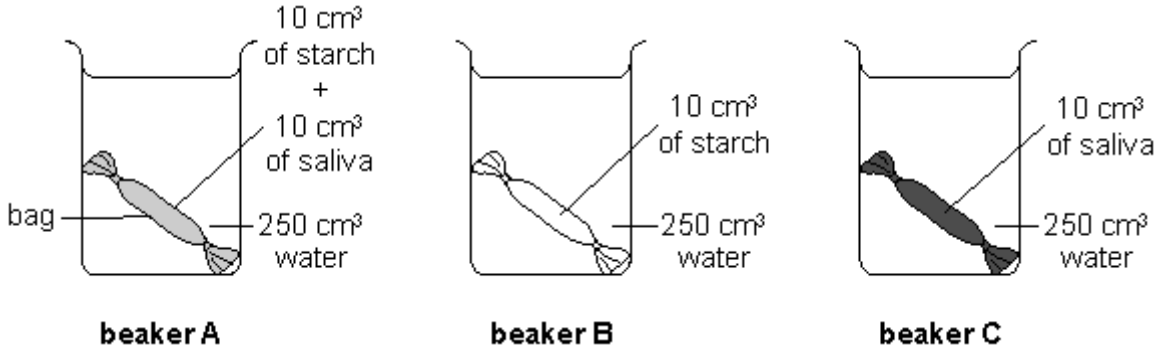
1 mark
maximum 5 marks

**Q9.** Sally investigated how the human body digests and absorbs starch.

She used saliva to digest the starch.

To model digestion she used special bags made from a semi-permeable membrane. These bags have lots of very small holes.

Sally sets up the equipment as shown below. There is one special bag in each beaker.




**beaker A** **beaker B** **beaker C**

She keeps the water in the beakers at 37ºC.
After 20 minutes, Sally tested the contents of each beaker and bag for starch and sugar.
The table below shows Sally's results.

| | Was starch found in the bag? | Was sugar found in the bag? | Was starch found in the water? | Was sugar found in the water? |
|---|---|---|---|---|
| beaker A | ✓ | ✓ | ✗ | ✓ |
| beaker B | ✓ | ✗ | ✗ | ✗ |
| beaker C | ✗ | ✗ | ✗ | ✗ |

(a) Suggest why Sally kept the water at 37ºC.

.....

1 mark

(b) (i) Explain why sugar was found in the bag in beaker A.

.....

1 mark

(ii) Starch was **not** found in the **water** outside the bag in any beaker. Suggest why.

.....

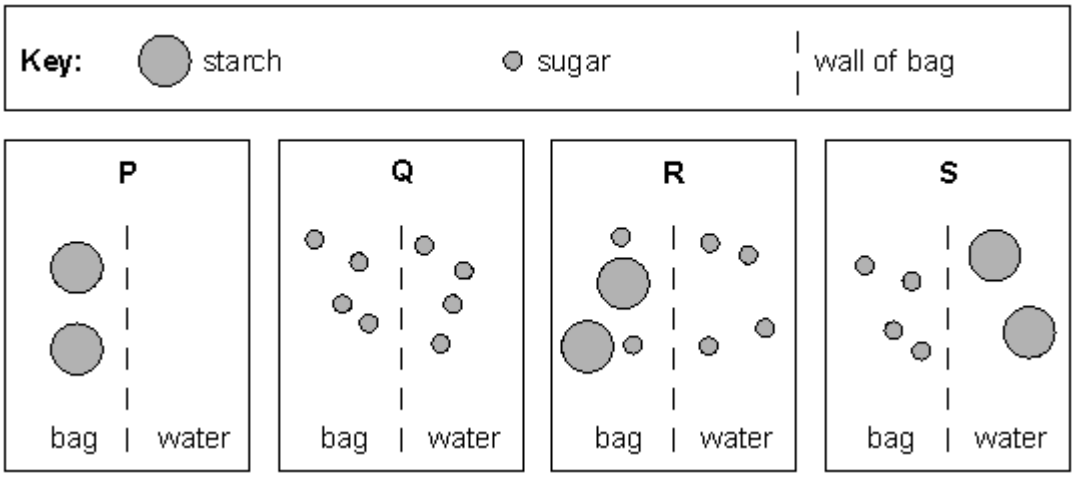
1 mark

(c) Why did Sally set up beaker C? Tick the correct box.

| | | | |
|---|---|---|---|
| for a fair test | ☐ | for accuracy | ☐ |
| for reliability | ☐ | for a control | ☐ |

1 mark

(d) Sally used diagrams to show what happened in her investigation.




Use the diagrams above to answer the following questions.

(i) Which diagram shows the **results** of beaker **B**? Write the letter.

.....

1 mark

(ii) Which diagram shows the **results** of beaker **A**? Write the letter.

.....

1 mark

(e) What does saliva contain that causes starch to change in beaker A?

.....

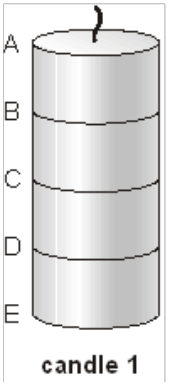
1 mark

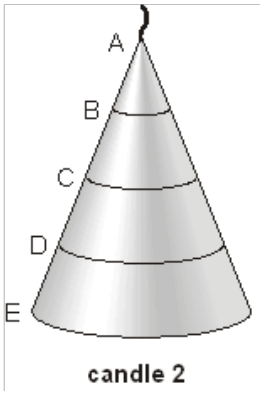
(f) Sally chewed a piece of bread for 5 minutes without swallowing.
What would she notice about the taste of the bread after chewing for 5 minutes?
Use Sally's results to help you.

.....

1 mark
maximum 8 marks

**Q10.** Simon made two candles from the same amount of wax.
He drew lines on both candles.



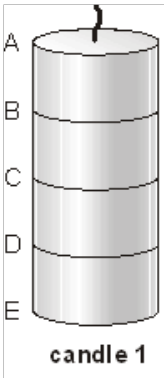




(a) What would Simon use to measure the **distance** between the lines?

.....

1 mark

(b) He timed how long **candle 1** took to burn.
His results are shown below.

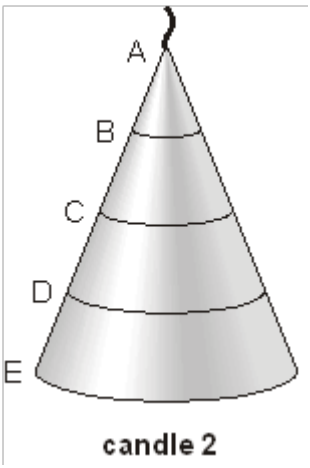



(i) How long would it take for **candle 1** to burn from C to D?
Write your answer in the table.

| part that burned | time for candle 1 to burn (minutes) |
|---|---|
| A to B | 30 |
| B to C | 30 |
| C to D | |
| D to E | 30 |

1 mark

(ii) Simon timed how long **candle 2** took to burn.

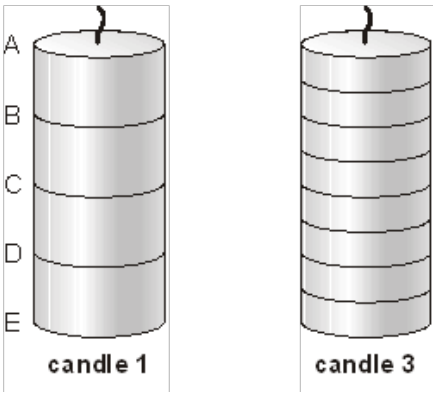



How long would it take for **candle 2** to burn from A to B **and** from D to E?
Write your answers in the table.

| part that burned | time for candle 2 to burn (minutes) |
|---|---|
| A to B | |
| B to C | 20 |
| C to D | 40 |
| D to E | |

2 marks

(c) Simon wanted to use a candle to measure time.
He made **candle 3** the same size as **candle 1**.




Why is **candle 3** more useful than **candle 1** for measuring time?

.....

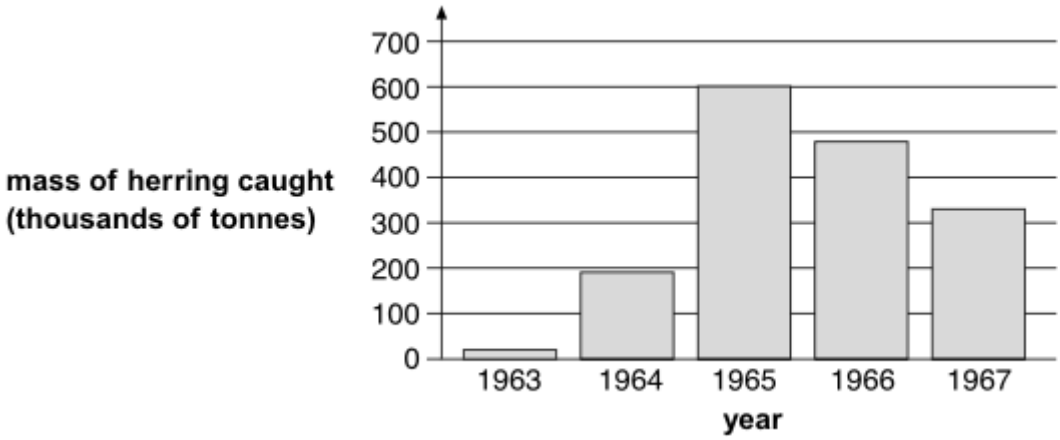
.....

1 mark
maximum 5 marks

**Q11.** The table below shows the number of boats used for catching herring fish in the Norwegian Sea between 1963 and 1967.

| year | number of fishing boats |
|---|---|
| 1963 | 16 |
| 1965 | 284 |
| 1967 | 326 |

The bar chart below shows the total mass of herring caught in the Norwegian Sea between 1963 and 1967.




Use the information above to help you answer parts (a) (i), (ii) and (iii).

(a) (i) Why did the mass of herring caught increase between 1963 and 1965?

.....

.....

1 mark

(ii) Suggest why the mass of herring caught decreased between 1965 and 1967.

.....

.....

1 mark

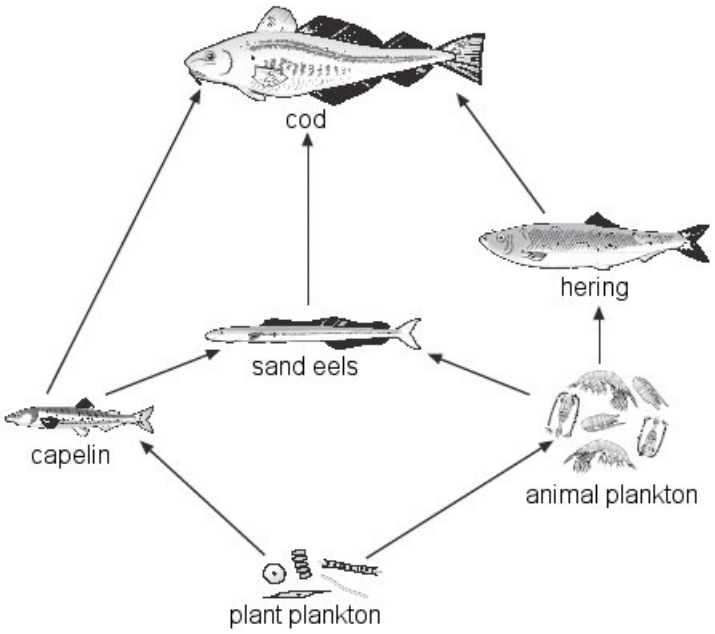
(iii) Herring **cannot** breed until they are four years old.
Fishing for herring was banned in the Norwegian Sea from 1972 to 1976.
Suggest **one** reason why fishing for herring was banned **for this period**.

.....

.....

1 mark

(b) The diagram below shows a food web in the Norwegian Sea.

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(i) How could a decrease in the number of herring cause a **decrease** in the number of sand eels?

.....

.....

1 mark

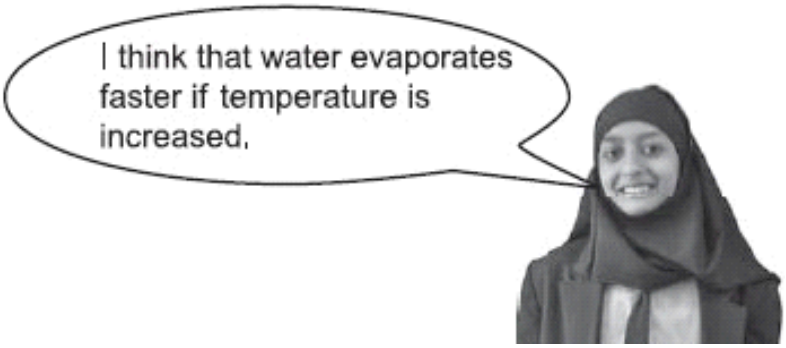
(ii) How could a decrease in the number of herring cause an **increase** in the number of sand eels?

.....

.....

1 mark
maximum 5 marks

**Q12.** Amena described her idea about the evaporation of water.




Amena

(a) Write a plan for an investigation you could carry out in the school laboratory to test Amena's idea.
Assume you have access to all the usual laboratory equipment.

In your plan you must write:

- the one factor you would change as you carry out your investigation (the independent variable)
- the effect you would observe or measure as you carry out your investigation (the dependent variable)
- one factor you would keep the same to help make your test fair.

.....

.....

.....

.....

.....

.....

.....

.....

.....

3 marks

(b) In the box below, draw and label a table that you could use to record your results.

1 mark
maximum 4 marks

**Q13.** Alex makes an electromagnet.
She winds insulated wire around an iron nail.
She connects the wire to a power supply.
She uses the electromagnet to pick up some steel paper-clips.


This is her prediction.

**The more turns of wire around the iron nail the stronger the electromagnet becomes.**

(a) (i) Give the **one** factor she should change as she investigates her prediction.

.....

.....

1 mark

(ii) Give **one** factor she should keep the same.

.....

.....

1 mark

(iii) Describe how she could use the paper-clips to measure the strength of the electromagnet.

.....

.....

1 mark

(b) Alex wrote a report of her investigation.

> **My report.**
>
> My results are accurate because I can't see any odd results.

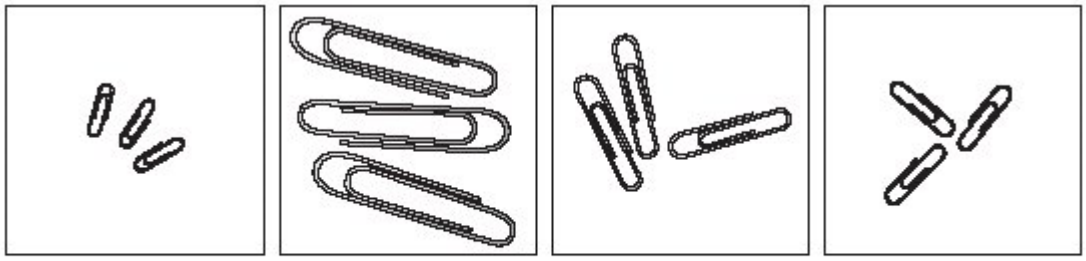
What would an odd result suggest?

.....

.....

1 mark

(c) (i) Which size paper-clips would Alex use to make her results more accurate?
Tick the correct box.



☐ ☐ ☐ ☐

1 mark

(ii) Give a reason for your choice.

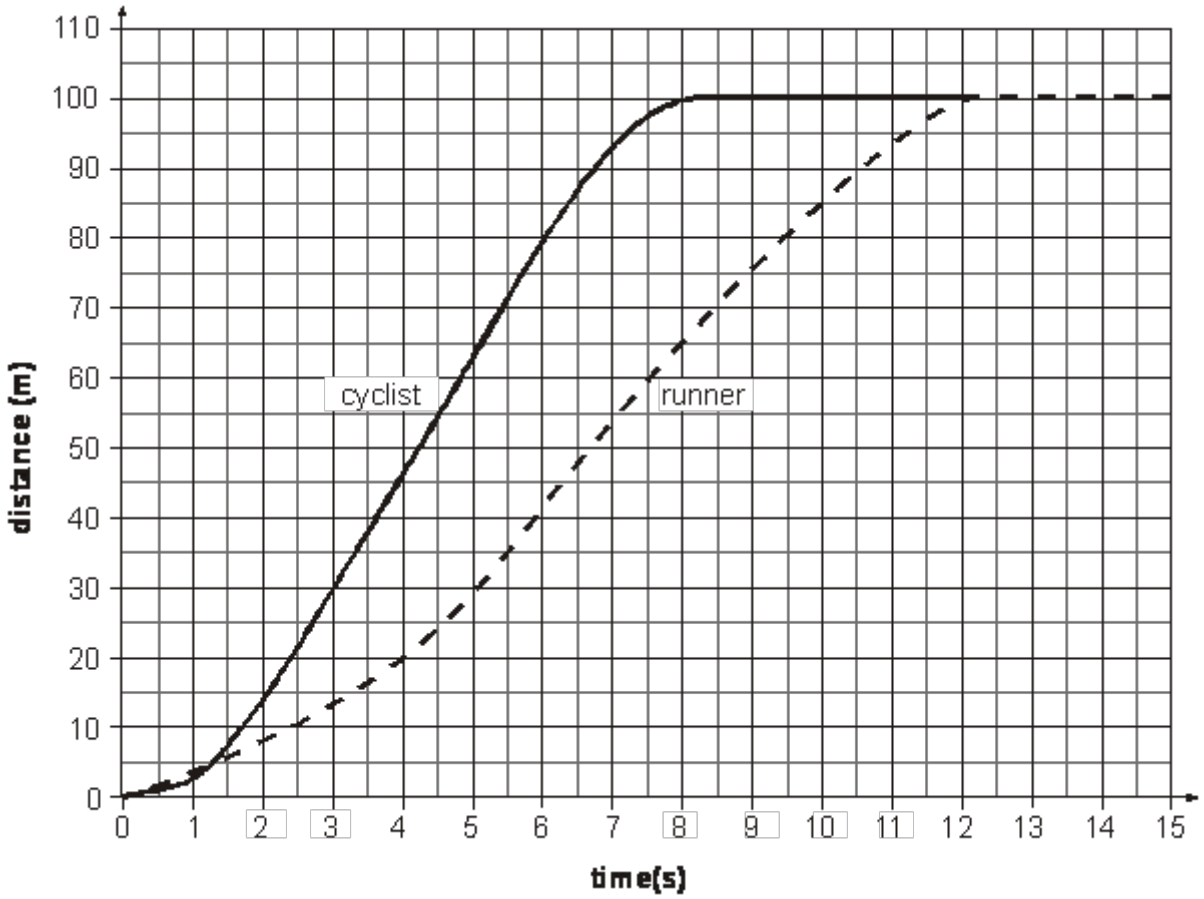
.....

.....

.....

1 mark
maximum 6 marks

**Q14.** A cyclist and a runner have a race.
The distance-time graph for the race is shown below.




Use the graph to answer the following questions.

(a) (i) How much time did it take the cyclist to travel 100 m?

..... s

1 mark

(ii) When the cyclist finished the race how far behind was the runner?

..... m

1 mark

(iii) How much more time did the runner take compared with the cyclist to complete the race?

..... s

1 mark

(b) The cyclist is travelling at a constant speed between 3 seconds and 6 seconds.

How does the graph show this?

.....

.....

1 mark

(c) (i) When the race started, a walker set off at a steady speed of 2m/s.

**Draw a line on the graph** on the opposite page to show the distance covered by the walker in the first 15 seconds. Use a ruler.

1 mark

(ii) Calculate how much time it will take for the walker to walk 100m.

.....

..... s

1 mark

maximum 6 marks

## The End!

## You have finished!

## Well done – if you have time go back and check answers or fill in any missing gaps!

# *Whitgift School*

## *13+ Entry Examination*

***Sample Test***

# *SCIENCE*

***Time allowed: 60 minutes***

## *MARK SCHEME*

**M1.** (a) any **one** from

- zinc displaces copper from the copper sulphate
- zinc changes places with copper

*accept 'copper is displaced by the zinc'*
*accept 'the more reactive metal displaces **or** takes the place of the other one'*
*accept 'zinc takes the sulphate'*

**1 (L6)**

(b) • he only needed to find out the temperature rise **or** change

**1 (L7)**

(c) (i) any **one** from

- magnesium is the most reactive metal used
- the biggest difference in reactivity is between magnesium and copper

*accept 'magnesium is above the others'*
*accept 'magnesium is more reactive than iron and zinc'*

**1 (L7)**

(ii) any **one** from

- the reactivity is nearly the same
- they are next to each other in the reactivity series

*accept 'zinc is slightly more reactive than iron'*
*'zinc is more reactive than iron' is insufficient*

**1 (L7)**

(iii) •

| *mixture* | *Would there be a rise in temperature?* |
|---|---|
| *aluminium + sodium chloride* | no |
| *calcium + zinc sulphate* | yes |
| *lead + zinc chloride* | no |
| *magnesium + iron chloride* | yes |

*award one mark for identifying the two reactions that take place*

*award one mark for identifying the two mixtures of chemicals which do not react*

**2 (L7)**

**[6]**

**M2.** (a) any **one** from

- goggles

  *accept 'safety glasses'*

  *'glasses' is insufficient*

- hairband

  *accept 'hair tied back'*

  *'lab coat' is insufficient*

  *'using tongs' **or** 'a heat-proof mat' is insufficient*

**1 (L3)**

(b) • 50 seconds

**1 (L3)**

(c) (i) ***both** the tick and the matching explanation are required for the mark*

- yes ✓
- crisp A was the biggest and it burnt for 80 seconds

  *accept 'crisp A burnt for the longest time'*

  *accept 'the biggest crisp burnt for 80s'*

  *'crisp A burnt for a long time' is insufficient*

  *'crisp D burnt for the shortest time' is insufficient*

**or**

- no ✓
- crisp B was the smallest and it burnt for longer than crisp D

  *accept 'the smallest crisp did not burn for the least time'*

  *accept 'crisp B did not burn for the shortest time'*

  *accept 'Joanne's test was not fair'*

  *accept 'C and D are the same size but burn for different times'*

**1 (L4)**

(ii) any **one** from

- they were not all the same type **or** make
  *accept 'different shapes'*
  *'the crisps are different sizes' is insufficient*
- two were crinkled crisps
  *accept 'the crisps were from a different packet'*
  *'the crisps were different' is insufficient*

**1 (L4)**

(d)
- false ✓

**1 (L4)**

- false ✓

**1 (L4)**

- cannot tell ✓

**1 (L4)**

*if more than one box is ticked in any row, do not award a mark for that row*

**[7]**

**M3.** (a) (i)
- distance from the (top of the) balloon to the ceiling
  *accept 'distance' **or** 'height to ceiling **or** roof'*

**and**

time for the balloon to rise to the ceiling **or** roof
*accept 'time'*
***both** answers are required for the mark*
*the answers can be in either order*
*'height (of ceiling)' is insufficient as this implies the distance from the floor*
*'how high it goes' is insufficient*
*'metres' is insufficient*
*'seconds' is insufficient*

**1 (L7)**

(ii) • divide the distance by the time

$\frac{distance}{time}$ ' **or** ' $\frac{d}{t}$ '

*accept '* $\frac{distance}{time}$ *' **or** '* $\frac{d}{t}$ *'*

*'how many metres it travelled per minute **or** second' is insufficient*

$\frac{height}{time}$ *' if height is given in part (i)*

*accept '* $\frac{height}{time}$ *' if height is given in part (i)*

*'m/s' is insufficient*

*accept 'distance over time'*

$\frac{metres}{seconds}$ *' is insufficient*

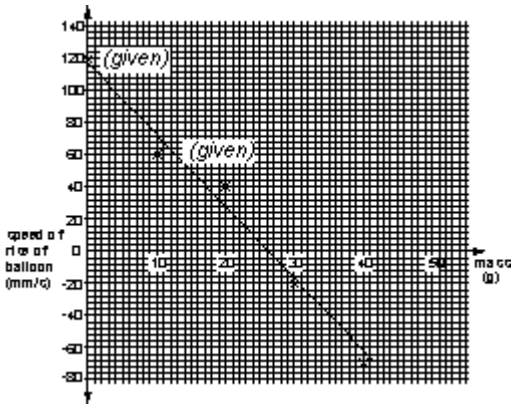
**1 (L7)**

(b) (i) any **one** from

- the negative numbers
- the –20 **and/or** the –70

**1 (L7)**

(ii) • all **three** points plotted correctly as shown below




*accept points plotted within ± ½ small square of the correct answer*

**1 (L6)**

- an appropriate line of best fit as shown above

*accept a line of best fit consistent with the plotted points*

**1 (L7)**

(iii) • 26 *g*

*accept the x axis intercept ± 1 small square from the line of best fit drawn*

**1 (L7)**

**[6]**

**M4.** (a) • Zoe ✓

*if more than one box is ticked, award no mark*

**1 (L3)**

any **one** from

- *best* needs to be defined
  *accept 'best needs to be described'*
  *accept 'you do not know what best means'*
- *best* is not observable **or** measurable
- *best* is subjective
  *accept 'it is not doable'*
  *accept 'best is an opinion **or** judgement'*
  *accept 'best is not clear'*

**1 (L3)**

(b) (i) any **one** from

- use the same area of material each time
- use the same volume of water
  *accept 'same amount of material'*
  *accept 'same size of rucksack'*
  *accept 'same amount of water'*
  *accept 'same liquid'*
  *accept 'same timing'*
  *accept 'allow the water to drip through the material for the same length of time'*
  *accept 'keep the temperature the same'*
  *do **not** accept 'do it more than once'*

**1 (L3)**

(ii) any **one** from

- measuring cylinder
- stopclock **or** stopwatch
  *accept 'measuring beaker'*
  *accept 'clock' or 'timer' or 'watch'*
  *do **not** accept 'cylinder' **or** 'measuring tube' **or** 'measuring jug'*

**1 (L3)**

(c) • B ✓

*if more than one box is ticked, award no mark*

**1 (L4)**

• the smallest volume of water passes through the material

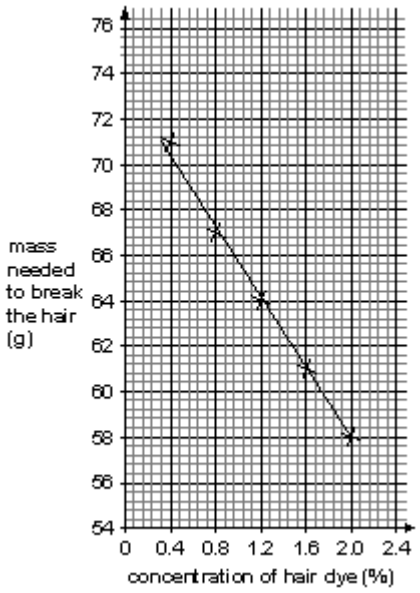
*accept 'only 5 $cm^3$ passed through'*
*accept 'less water passed through'*
*accept 'not as much water gets through'*
***answers must include or imply a comparison***
*'5 $cm^3$ passed through' is insufficient*
*'not much water gets through' is insufficient*

**1 (L4)**

**[6]**

**M5.**

(a) (i) • all five points plotted




*if **five** points are correctly plotted, award two marks*
*if **three** or **four** points are correctly plotted, award one mark*

**2 (L5)**

• a straight line of best fit consistent with plotted points

*accept a curve of best fit consistent with plotted points*

**1 (L5)**

(ii) • 74*g*

*accept any number from 73 to 75 (inclusive)*
*award a mark for a number consistent with a drawn extrapolation of the line of best fit **and** within the range of 72 to 76*

**1 (L6)**

(b) • concentration (of hair dye)

*accept 'conc'*
*'hair dye' is insufficient*
*accept 'strength of hair dye'*
*'strength' is insufficient*
*accept 'percentage'*
*do **not** accept 'force' **or** 'mass' **or** 'weight'*

**1 (L5)**

(c) any **one** from

• mass needed to break the hair

*accept 'force' **or** 'weight'*
*accept 'mass'*

• strength of hair

*'strength' is insufficient*

**1 (L5)**

(d) • the greater the concentration of hair dye
the less mass is needed (to break the hair)

*accept the converse*
*accept 'the stronger the hairdye, the weaker it is'*
*accept 'the stronger, the less weight is needed (to break the hair)'*
*accept 'it is a negative correlation'*
*references to time are neutral*
*'the stronger the weaker' is insufficient*
*'the hair is weaker when he uses more dye' is insufficient*

**1 (L6)**

(e) • soaking time

*accept 'time'*
*column headings may be reversed*
*the unit mark can be awarded only if consistent with the heading*

**1 (L6)**

• minutes **or** seconds **or** hours

*accept unambiguous indications of the units e.g. 'min(s)' **or** 's' **or** 'sec' **or** 'h' **or** 'hrs'*
*'m' is insufficient as it is ambiguous*

**1 (L6)**

• mass (needed to break hair)

*accept 'strength' **or** 'weight' **or** 'force'*

**1 (L6)**

• grams **or** g

*accept 'N' where 'force' is given in place of mass*
*do **not** accept 'n' for 'N'*
*accept 'N' or 'g' for weight*
*do **not** accept 'g' if 'force' is given*

**1 (L6)**

**[11]**

**M6.** (a) • 7 days

**1 (L3)**

(b) • air temperature and soil moisture ✓

*if more than one box is ticked, award no mark*

**1 (L4)**

(c) any **one** from

• he only carried out his experiment at a medium light level

*accept 'he did not try other levels'*
*'it was not a fair test' is insufficient*

• he only used one light level

• he did not change the (amount of) light

**1 (L4)**

(d)

| tray | day 4 | |
|---|---|---|
| *A* | 8 | |
| *B* | 7 | *accept any whole number from 6 to 8* |
| *C* | 5 | *accept any whole number from 2 to 8* |
| *D* | 2 | *accept any whole number from 0 to 4* |

*award two marks for all four correct answers*
*award one mark for any two or three correct answers*

**2 (L4)**

**[5]**

**M7.** (a) any **one** from

• mass of salt (in the solution)

*accept 'amount **or** weight of salt'*
*'salt' is insufficient*

• concentration

**1 (L5)**

(b) (i) • point at (10, 33) circled

**1 (L5)**

(ii) any **one** from

• an incorrect reading

*accept 'she could have read the scale wrongly'*

• a recording error

*accept 'she wrote the wrong result'*
*accept 'she marked the wrong point on the graph'*

- an error during the investigation

  *accept 'the wrong mass was added'*

  *accept 'not enough salt was added'*

  *accept 'too much water'*

  *do not accept 'too much salt'*

**1 (L6)**

(c) **either**

- Abi

  ***both** the answer 'Abi' and the correct explanation are required for the mark*

need to check accuracy **or** correct an error **or**
accept 'to check whether it is right **or** wrong' check an anomaly

*accept 'to check whether it is right **or** wrong'*

*accept 'she might have done it differently'*

*accept 'it's a freak result'*

*'it is a fair test' is insufficient*

**or**

- Robert

you can predict the results from the pattern in the graph

*accept 'you can use the graph'*

*accept 'you can ignore the point'*

*accept 'there is enough evidence'*

***or***

***both** the answer 'Robert' and the correct explanation are required for the mark*

*award a mark if both Abi and Robert are ticked if the reason given explains why both could be correct*

**1 (L6)**

(d) •

| | true | false | cannot tell |
|---|---|---|---|
| | ✓ | | |
| | | | ✓ |
| | ✓ | | |

*if all four rows are correct, award two marks*

*if two **or** three rows are correct, award one mark*

*if more than one box is ticked on any row, award no credit for that row*

**2 (L6)**

**[6]**

**M8.** (a) •

| | |
|---|---|
| 2 | 20 |
| 3 | 45 **or** 46 |
| *4* | 80 |

***all three*** *answers are required for the mark*

**1 (L5)**

(b) any **one** from

- the height for 4 cm is 4 times the height for 2 cm
  *accept 'for 2 cm it went 20 cm but for 4 cm it went 80 cm'*
  *a mark may be awarded for other correct figures*
  *accept 'if I double the distance it goes four times as high'*
  *'when she doubled the distance it did not double the height' is insufficient*
- the graph is a curve
  *accept 'the graph is not a straight line'*
- the height for 2 cm is not twice the height for 1 cm
  *accept 'if it goes from 2 to 3 cm, the height more than doubles'*
- the height should have been 40 cm when he pressed it down 4 cm
  *accept appropriate arguments for other values*

**1 (L6)**

(c) (i) • some
some
*both answers are required for the mark*

**1 (L6)**

(ii) • most
least
*both answers are required for the mark*
*answers must be in the correct order*

**1 (L6)**

(iii) • least
least
*both answers are required for the mark*

**1 (L6)**

**[5]**

**M9.** (a) • (37 °C is) body temperature

*accept 'so the saliva **or** enzymes would work'*
*accept 'it is a good **or** optimum temperature for digestion'*
*'to make it a fair test' is insufficient*
*'so they are all the same' is insufficient*

**1 (L5)**

(b) (i) • the starch is broken down **or** digested

*'there is a reaction between starch and saliva' is insufficient*

**1 (L6)**

(ii) any **one** from

• starch could not pass through the bag

*accept 'starch could not get through the holes'*
*'the bag is semi-permeable' is insufficient*

• starch is too big

*'the bag holds it in' is insufficient*

**1 (L6)**

(c) • for a control ✓

*if more than one box is ticked, award no mark*

**1 (L6)**

(d) (i) • P

*if more than one letter is given, award no mark*

**1 (L6)**

(ii) • R

*if more than one letter is given, award no mark*

**1 (L6)**

(e) • enzymes

*accept 'amylase' **or** 'carbohydrase'*

**1 (L6)**

(f) any **one** from

• sweeter **or** sugary

*accept 'sugar' **or** 'sweet'*

• it tastes of sugar (L6)

**1**

**[8]**

**M10.** (a) • a ruler

*accept 'a metre rule'*
*accept 'a tape measure'*
*'cm' is insufficient 'a measuring stick' is insufficient*

**1 (L3)**

(b) (i) • 30

*do **not** accept '30 seconds'*

**1 (L3)**

(ii) • *A to B*: any number from 5 to 15

*accept a range such as '5 to 10'*

**1 (L4)**

• *D to E*: any number from 45 to 80

*accept a range such as '50 to 60'*

**1 (L4)**

(c) any **one** from

• you can measure smaller intervals of time

*accept 'each section burns for a shorter time'*
*accept 'it is more precise **or** accurate'*
*'it is easier to read' is insufficient*

• the lines are closer

*accept 'the lines are close'*
*accept 'the lines are further apart on candle 1'*
*accept 'the lines are 1 cm apart on candle 1 and 0.5 cm apart on candle 3'*
*accept 'there are more lines **or** smaller spaces **or** smaller segments'*
*accept 'more sections **or** rings'*
*'the lines are smaller' is insufficient*

**1 (L4)**

**[5]**

**M11.** (a) (i)

- more fishing boats
  *accept 'more people were fishing'*
  *accept 'more fishing'*
  *accept 'more boats'*
  *'more being caught' is insufficient* **1 (L5)**

(ii) any **one** from

- overfishing
  *accept 'too many fish were caught'*
  *'lots of fish were caught' is insufficient*
  *accept 'few fish or herring were left in the sea'*
  *do **not** accept 'no herring **or** fish left'*
  *do **not** accept 'too many boats'*
- fish were caught before they could breed
- fish were not allowed time to breed
  *accept 'fish were smaller'*
  *'the herring are too young' is insufficient*
  *'less being caught' is insufficient* **1 (L5)**

(iii) any **one** from

- to allow numbers to recover **or** increase
  *do **not** accept 'they were becoming extinct'*
- to allow more herring to breed
  *accept 'so the herring would be old*
  *'to allow herring to be born' is insufficient*
- to allow more herring to mature
  *enough **or** mature enough to breed'*
  *accept 'it is the breeding time'*
  *'there were fewer herring left' is insufficient* **1 (L5)**

(b) (i) any **one** from

- cod eat sand eels instead of herring
  *'cod have to eat something else' is insufficient*
- cod eat more sand eels
  *'cod eat sand eels' is insufficient*
- cod eat capelin instead of herring so there is less food for sand eels
  *accept 'cod would eat more capelin'*
  *accept 'cod would eat the sand eels' food'*
  *'less food for sand eels' is insufficient as it implies that sand eels eat herring*
  *'because the cod only had two choices' is insufficient* **1 (L6)**

(ii) any **one** from

- there would be more animal plankton
  *accept 'more plankton'*
  *'they will have more to eat **or** more food' is insufficient*

- fewer cod
  *'the animal plankton would get bigger' is insufficient*
  *'less food for cod' is insufficient*

**1 (L6)**

**[5]**

**M12. Markers should read the answers to parts a and b before marking this question parts a and b should be marked together**

(a) • temperature of the water

*accept 'temperature'*

*accept 'room temperature'*

*do **not** accept responses that describe rates of heating.*

**1 (L7)**

any **one** from

• rate of evaporation

*accept 'the time for it to evaporate'*

*answers must refer to both time taken and amount of water lost*

• time taken for all the water to evaporate

*accept 'measure how much water is left after a certain time'*

*'time taken' is insufficient*

• volume **or** mass **or** amount of water lost in a fixed time

**1 (L7)**

any **one** from

• starting volume of water

*accept 'the amount of water'*
*accept a specified volume of water*

*'same heater' and 'same starting measurement' are insufficient*

• shape of container

• same ambient conditions

*accept 'room temperature' if the independent variable is 'water temperature'*

**1 (L7)**

(b) a column **or** row indicating temperature **and** a column **or** row indicating time **or** volume lost **or** volume remaining

*accept a column **or** row indicating 'rate of evaporation'*
*accept 'amount lost' **or** 'amount remaining'*

***both** headings are required for the mark*
*the units of measurement are not necessary for the mark*
*the second column **or** row should be consistent with the dependent variable identified in part **a***
*ignore other columns in the table*

**1 (L7)**

**[4]**

**M13.** (a) (i) the number of turns **or** coils of wire

*accept 'the coils'*

*accept 'the turns'*

**1 (L5)**

(ii) any **one** from

- the current
- the length **or** thickness **or** material of the wire **or** coil

  *accept 'the voltage **or** power'*

  *accept 'the wire'*
- the circumference of the coil
- the size of paper-clips

  *accept 'the paper-clips'; 'position of the coil on the nail'; 'tightness of the coil'; accept 'distance between turns'; 'the nail'*

  *do **not** accept 'the number of paper-clips'*

**1 (L5)**

(iii) any **one** from

- count the paper-clips picked up

  *accept 'number of paper-clips'; 'count them'*
- measure their mass

  *accept 'weigh them'; 'the more clips the stronger the magnet';*
  *'measure the distance at which a magnet will just pick up a paper-clip'*

**1 (L5)**

(b) any **one** from

- an inaccuracy in results

  *accept a description of inaccuracies, such as 'she counted the number of clips wrongly'*
- a problem with the data **or** results
- a problem with the method

  *accept 'something wrong with the tests'*

  *accept 'she used different sized paper-clips'*

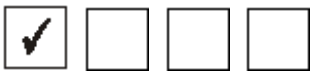
  *accept 'the paper-clips were already magnetised'*

  *accept 'she did something wrong'*

  *'the test is unfair' is insufficient*

**1 (L6)**

(c) (i)



*if more than one box is ticked, award no mark*

**1 (L6)**

(ii) any **one** from

- with bigger paper-clips she might miss the precise point at which the electromagnet stopped picking up paper-clips

  *accept 'she would pick up differences between the number of turns of the coil'*

  *accept 'she might not see a change with big paper-clips **or** she would see a change with smaller paper-clips'*

  *'it will pick up a few large paper-clips but a lot of small paper-clips' is insufficient*

- the smaller paper-clips might help to identify the precise point at which the electromagnet stopped picking up paper-clips

  *accept 'it is more precise **or** more sensitive'*

  ***award a mark for a response identifying that greater precision is possible with smaller increments***

  *'they are smaller' is insufficient*

**1 (L6)**

**[6]**

**M14.** (a) (i) a number from 8.0 to 8.2 *s* (inclusive)

**1 (L6)**

(ii) a number from 34 to 36 *m* (inclusive)

**1 (L7)**

(iii) 4 *s*

*accept response in the range 3.7–4.3*

**1 (L7)**

(b) the slope or gradient is constant

*accept 'it is a straight line'*
*do **not** accept 'the line is flat'*
*accept 'steady increase'*

**1 (L7)**

(c) (i) points (0, 0) and (15, 30) joined by a straight line

*accept points drawn to ± 1 mm*

**1 (L7)**

(ii) 50

*accept* $\frac{'100'}{2}$

**1 (L7)**

**[6]**