

Sc

KEY STAGE

3

TIER

5–7

Science test

Paper 2

First name _____

Last name _____

School _____

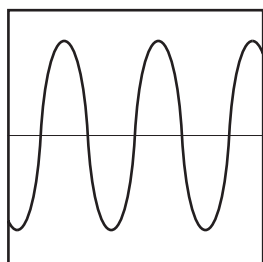
Remember

- The test is 1 hour long.
- You will need: pen, pencil, rubber, ruler, protractor and calculator.
- The test starts with easier questions.
- Try to answer all of the questions.
- The number of marks available for each question is given below the mark boxes in the margin. You should not write in this margin.
- If you are asked to plan an investigation, there will be space for you to write down your thoughts and ideas.
- Do not use any rough paper.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

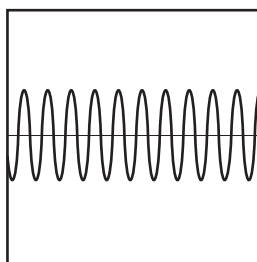
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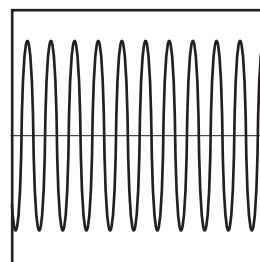
1. (a) The diagrams below show the patterns produced on an oscilloscope by three different sound waves.



A



B



C

- (i) Which **two** waves have the same loudness?
Write the letters.

_____ and _____

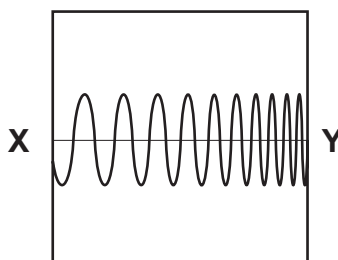
How do the diagrams show this?

- (ii) Which **two** waves have the same pitch?
Write the letters.

_____ and _____

How do the diagrams show this?

- (iii) Shuli is listening to a sound that produces the pattern below.



Describe how the sound that Shuli **hears** changes between X and Y.



1ai

1 mark



1aia

1 mark



1aiii

1 mark

- (b) The table below shows the maximum time a person can listen to music at different sound levels without damage to the ear.

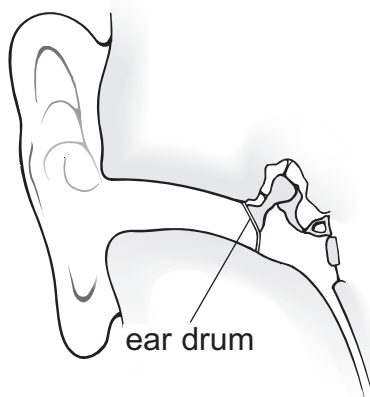
sound level (decibels)	maximum time (hours)
86	8
88	4
90	2
92	1
94	0.5

Estimate the maximum time a person could listen to a sound of 87 decibels.

_____ hours

1b
1 mark

- (c) The diagram below shows part of the human ear.

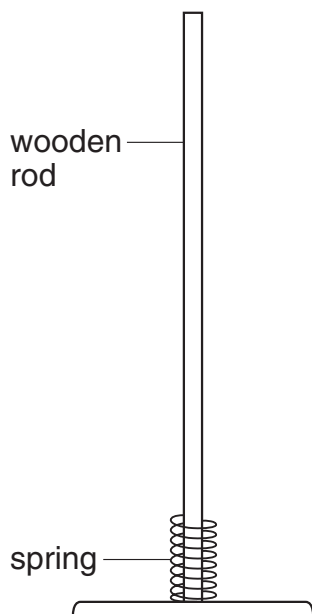


What happens to the ear drum as a sound gets louder?

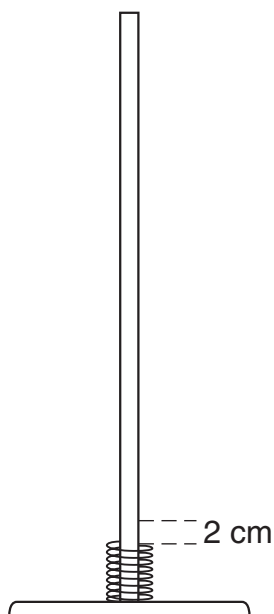
1c
1 mark

maximum 5 marks

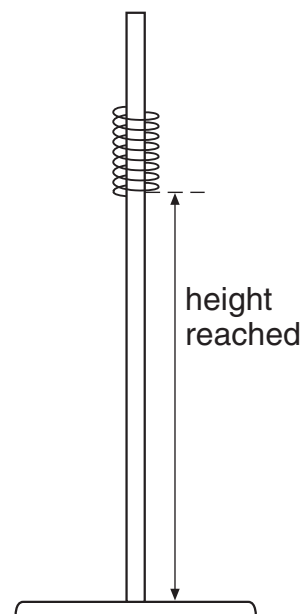
2. Jenny put a spring over a wooden rod.



She pressed the spring down 2 cm.

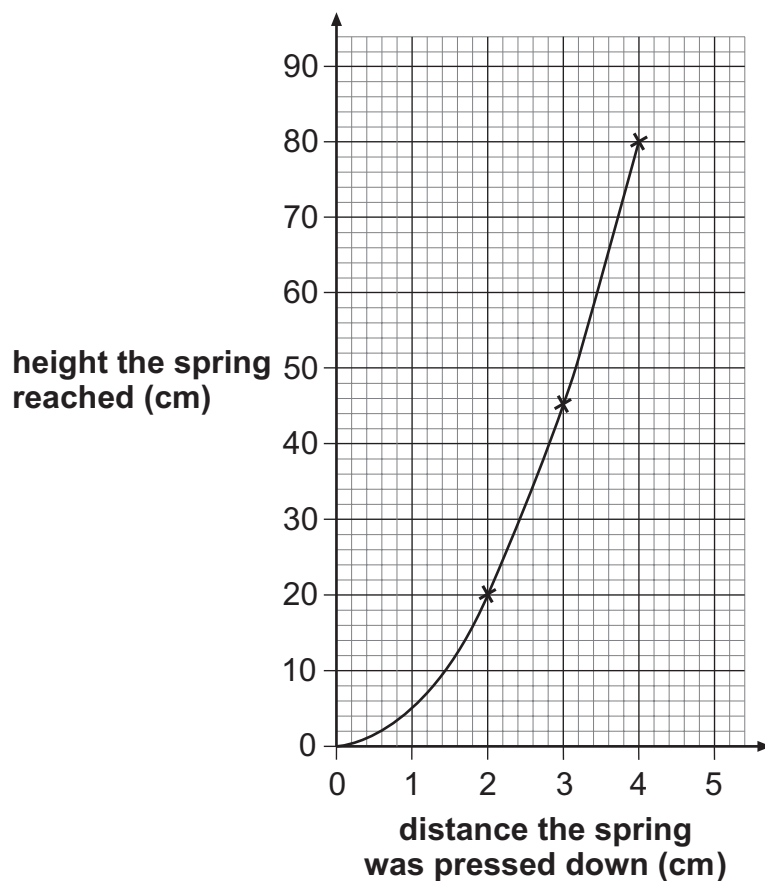


She let go of the spring and measured the height it reached.



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	

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

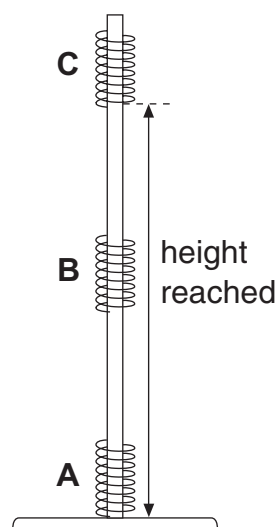
How do the results show she was wrong?

- (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.

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

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

maximum 5 marks

2a
1 mark

2b
1 mark

2ci
1 mark

2cii
1 mark

2ciii
1 mark

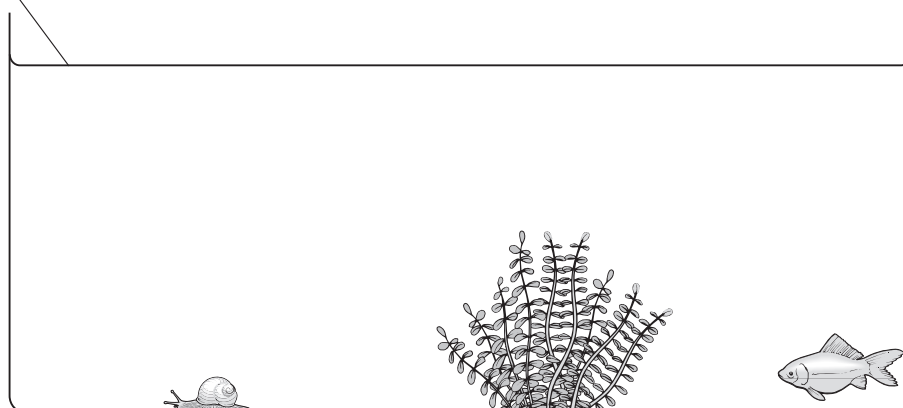
Total
5

3. (a) The diagram below shows a fish tank.

The surface of the water acts like a mirror.

The fish can see the snail reflected in the surface of the water.

surface
of water
(mirror)



Draw a ray of light which passes from the snail, and reflects from the surface, to show how the fish can see the snail. Use a ruler.

Put arrows on the ray of light.



3a

1 mark



3a

1 mark

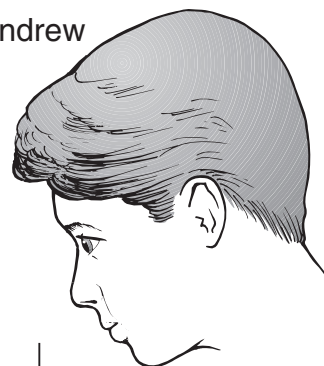


3a

1 mark

(b) Andrew is looking at the snail.

Andrew



When a ray of light passes from water to air it changes direction.

- (i) Draw a ray of light from the snail to Andrew to show how Andrew can see the snail. Use a ruler.

Put arrows on the ray of light.

- (ii) What is the name given to this change in the direction of a ray of light?



3bi

1 mark



3bi

1 mark



3bii

1 mark

maximum 6 marks

4. Paul had four substances:

citric acid

copper sulphate

indigestion tablet

sugar

He dissolved 1 g of each substance in 20 cm³ of distilled water.

He used universal indicator to find the pH of each solution.

(a) (i) Sugar solution does **not** change the colour of green universal indicator.

What does this tell you about sugar solution?

Tick the correct box.

It is an acid.

☐

It is an alkali.

☐

It is neutral.

☐

It is sweet.

☐

(ii) Suggest the pH of citric acid.

(iii) Indigestion tablets neutralise acid in the stomach.

What does this tell you about indigestion tablets?

☐

4ai

1 mark

☐

4aii

1 mark

☐

4aiii

1 mark

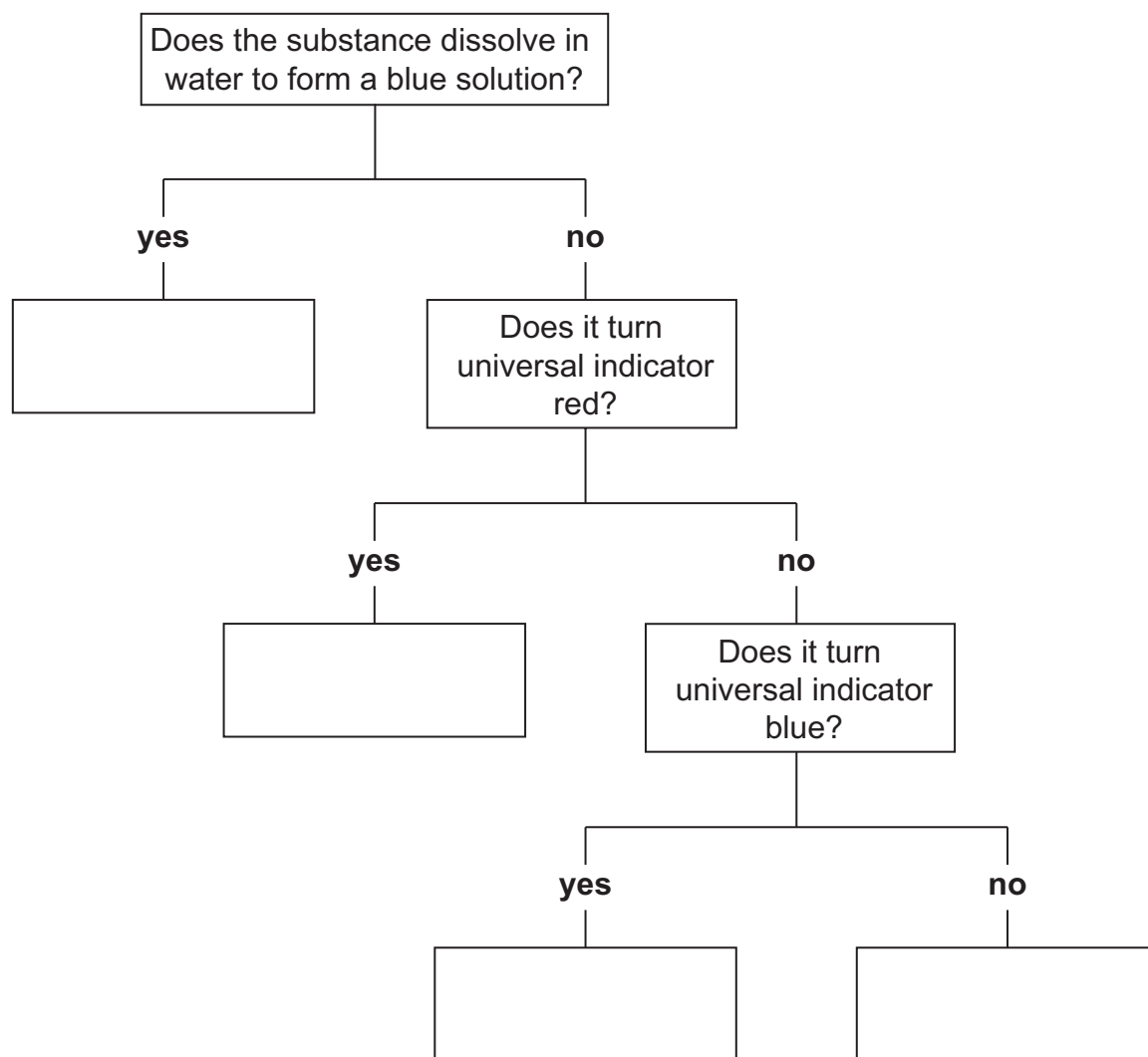
(b) Complete the flow chart below with the names of the substances in the boxes.

citric acid

copper sulphate

indigestion tablet

sugar



1 mark 4b

1 mark 4b

1 mark 4b

maximum 6 marks

5. The drawing below shows a gemstone set in a gold ring.



Crystals of gemstones are found in different rocks.

- (a) There are three groups of rocks:

igneous

metamorphic

sedimentary

- (i) Crystals can be found in rocks that have been changed into different rocks by high temperature and high pressure.

Which group of rocks is formed in this way?

- (ii) Crystals can be found in rocks formed by the cooling of hot magma.

Which group of rocks is formed in this way?

- (b) How does the rate at which magma cools affect the size of the crystals formed?



5ai

1 mark



5a(ii)

1 mark



5b

1 mark

- (c) Gemstones called rubies are made from an aluminium compound with the formula Al_2O_3 .

The chemical symbol for aluminium is Al.

- (i) Give the name of the element that is combined with aluminium in this compound.

5ci
1 mark

- (ii) Suggest the name of the compound with the formula Al_2O_3 .

5cii
1 mark

- (iii) How many atoms are there in the formula Al_2O_3 ?

5ciiii
1 mark

- (d) (i) The gemstone in the drawing is set into a gold ring.
Gold is an element that is found in rocks.
Gold is never found combined with other elements.

Part of the reactivity series of metals is shown below.

more reactive	aluminium
	zinc
	lead
less reactive	copper

Where should gold be placed in this reactivity series?

5di
1 mark

- (ii) The more reactive metals react with acids.

Complete the word equation for the reaction of zinc with hydrochloric acid.

zinc + hydrochloric acid \longrightarrow _____ + _____

5dii
1 mark

5dii
1 mark

maximum 9 marks

6. The table below shows the mass of six nutrients in 100 cm³ of three types of milk.

nutrient	100 cm³ of human milk	100 cm³ of cows' milk	100 cm³ of milk made from baby-milk powder
carbohydrate (g)	7.4	5.0	7.2
fat (g)	4.2	3.7	3.6
protein (g)	1.1	3.5	1.5
calcium (mg)	35.0	120.0	49.0
iron (mg)	0.075	0.05	0.9
vitamin C (mg)	3.8	1.5	6.9

- (a) A scientist compared the three types of milk.

Why was it a fair comparison?

- (b) Both human milk and milk made from baby-milk powder contain more sugar than cows' milk.

Which data in the table supports this?



6a

1 mark



6b

1 mark

(c) Why do we need calcium in our diet?

☐ 6c
1 mark

(d) (i) Baby-milk powder is made from cows' milk.

What evidence is there in the table that iron is added when making baby-milk powder?

☐ 6di
1 mark

(ii) Why do we need iron in our diet?

☐ 6dii
1 mark

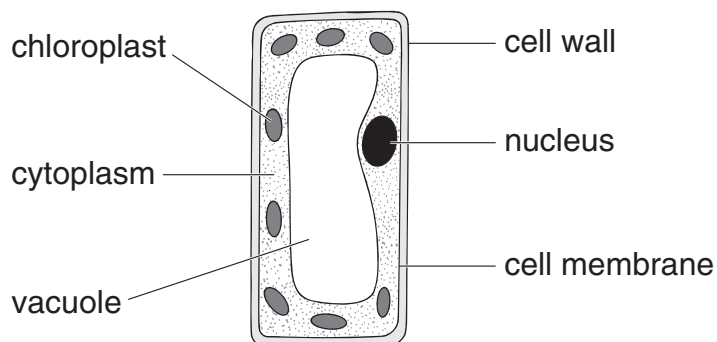
(e) A pupil said, 'There is more vitamin C than protein in human milk'.

How can you tell from the table that the pupil was wrong?

☐ 6e
1 mark

maximum 6 marks

7. The diagram below shows a plant cell.



(a) In which part of a plant would you find this type of cell?

(b) (i) Give the function of the nucleus.

(ii) Give the function of the chloroplasts.

(iii) Give the function of the cell wall.

(c) Give the names of **two** labelled parts that are **not** present in animal cells.

1. _____

2. _____

- (d) Tick **one** box in each row to show whether the statement is true for photosynthesis **or** for respiration.

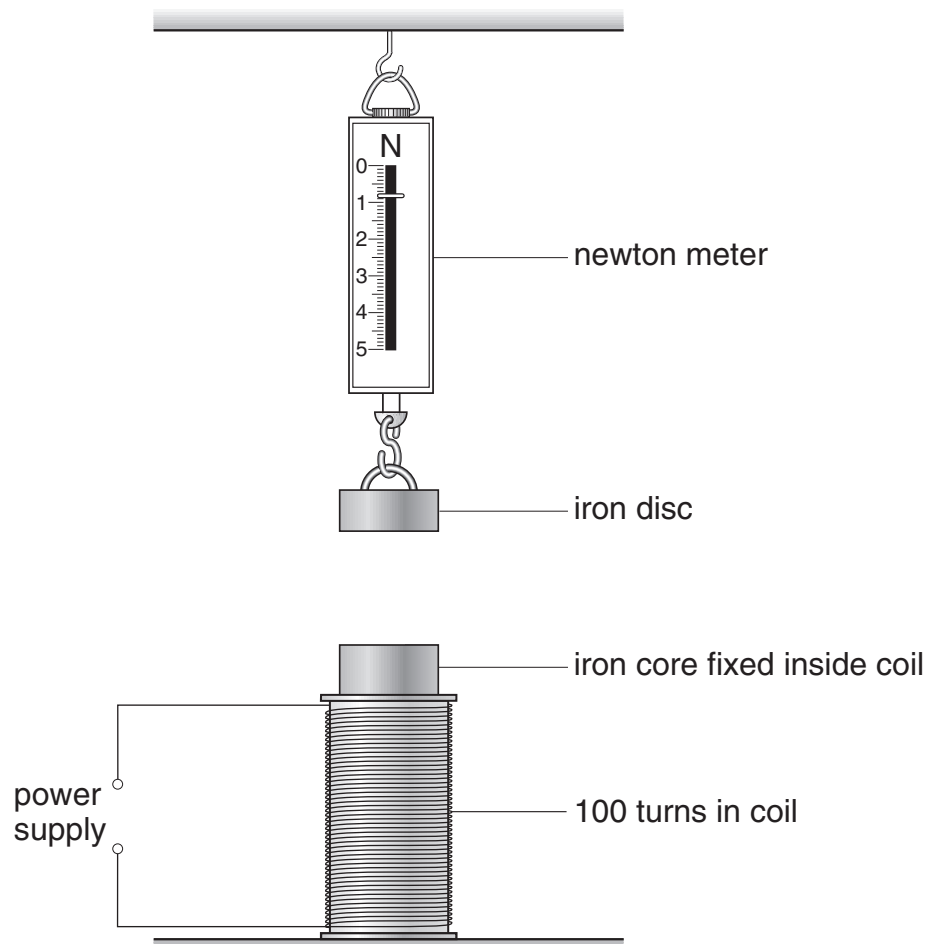
statement	photosynthesis	respiration
carbon dioxide is produced		
light is needed		
it occurs in plants and animals		
oxygen is produced		

☐ 7d
1 mark

☐ 7d
1 mark

maximum 8 marks

8. Mary used the apparatus below to test the strength of an electromagnet. She used the reading on the newton meter to measure the force of the magnet on the iron disc.



- (a) Explain why the reading on the newton meter increases when a current passes through the coil.

- (b) When a current passes through the coil, some of the electrical energy is changed to thermal energy. What would happen to the coil if the current passing through it was too large?



8a

1 mark



8a

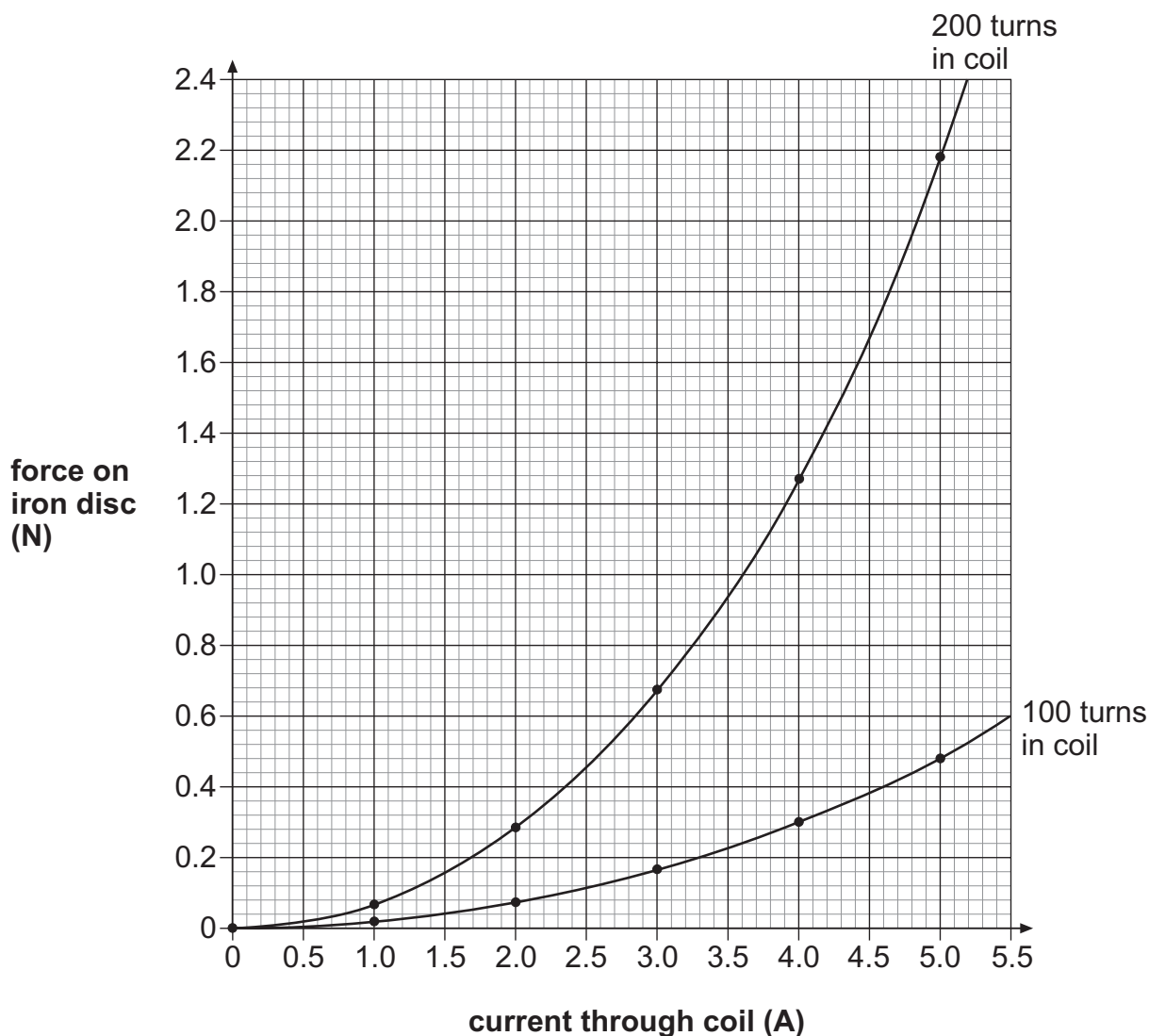
1 mark



8b

1 mark

- (c) Mary made two electromagnets, one with 100 turns of wire in the coil and one with 200 turns. She varied the current through the coil of each electromagnet. She measured the force of each electromagnet on the iron disc. The graph shows her results.

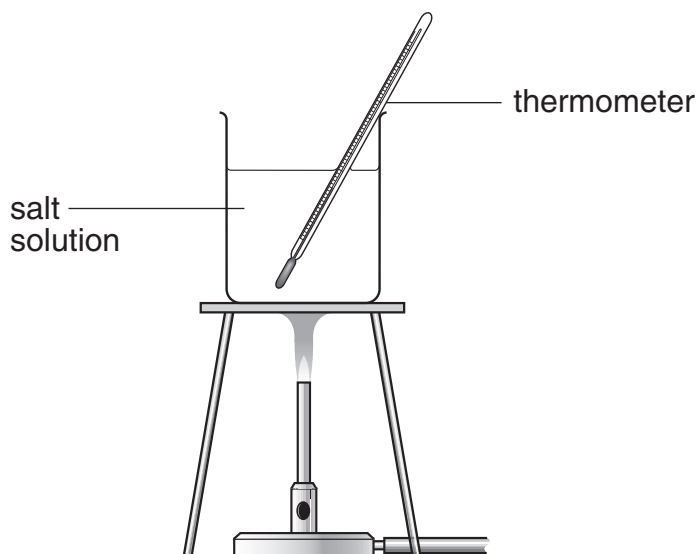


Write **two** conclusions that Mary could make from these results.

1. _____
- _____
2. _____
- _____

maximum 5 marks

9. Neera and Tom dissolved different masses of salt in 500 cm³ of water. They measured the temperature at which each salt solution boiled.



- (a) They wrote down the variables that might affect the investigation.

temperature of the
laboratory

mass of salt
dissolved in water

starting temperature
of the water

boiling point of
salt solution

volume of water

type of salt used

- (i) What is the independent variable (the variable they changed) in their investigation?

- (ii) What is the dependent variable (the variable they measured) in their investigation?

- (iii) Which variable above would affect the experiment the least?



9ai

1 mark



9aii

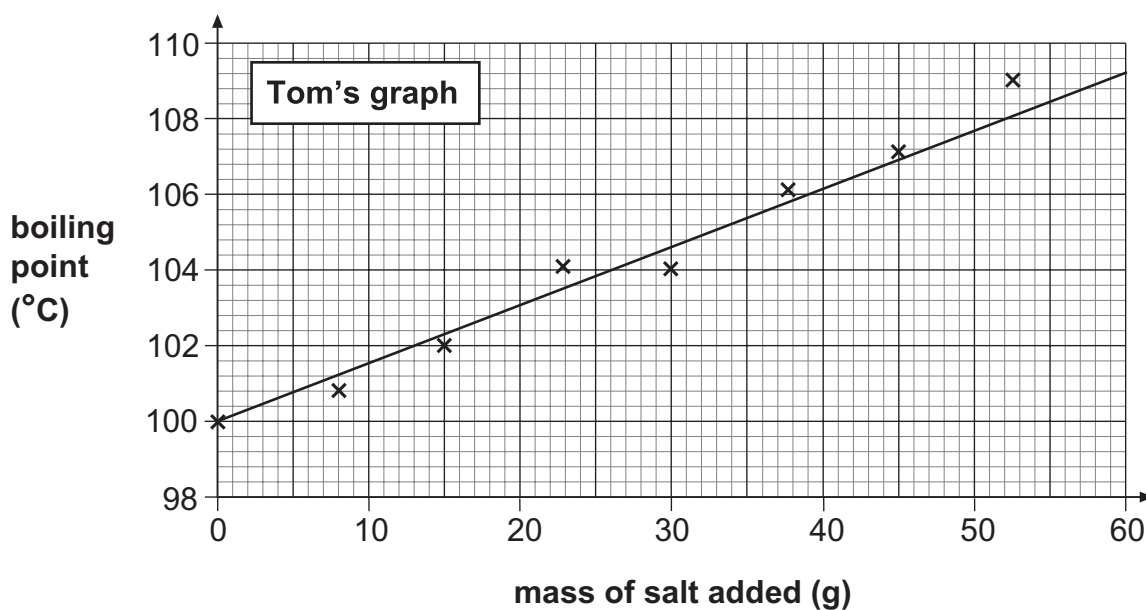
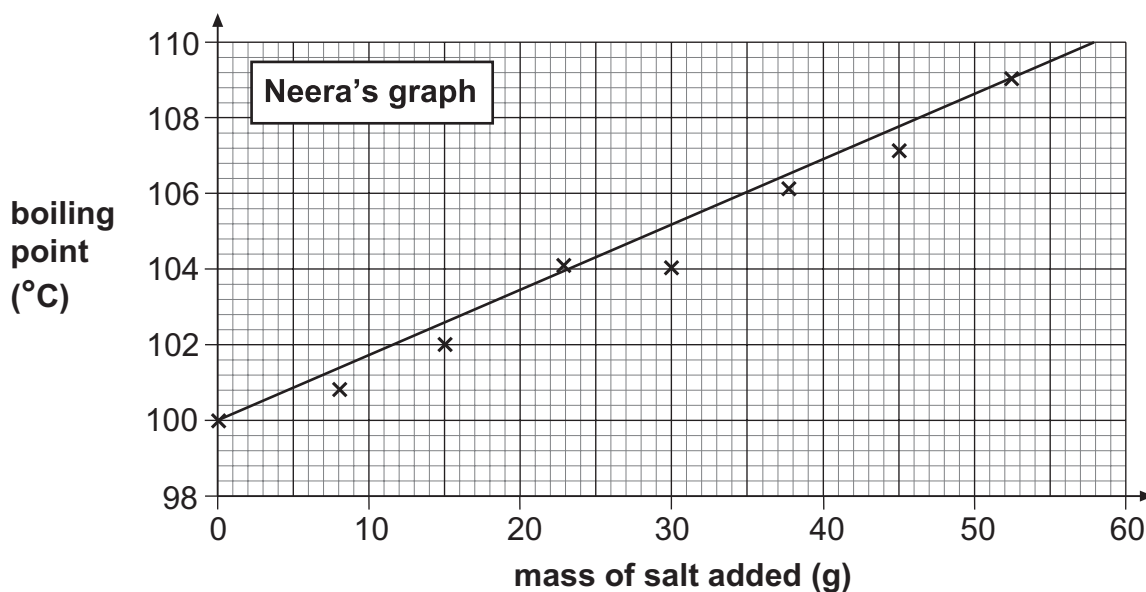
1 mark



9aiii

1 mark

(b) Neera and Tom plotted their results and drew the graphs shown below.

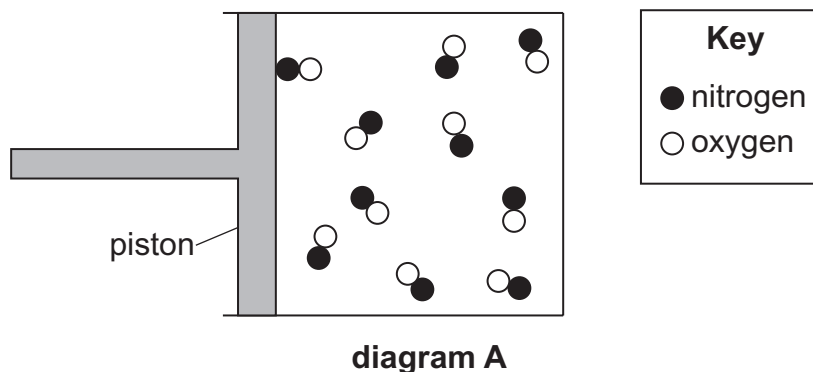


(i) How can you tell from the graphs that Neera and Tom started with pure water?

(ii) Why is Tom's line of best fit better than Neera's line of best fit?

maximum 5 marks

10. Diagram **A** represents a gas in a container.
The gas can be compressed by moving the piston to the right.



- (a) (i) How can you tell that the substance in the container is a gas?

10ai

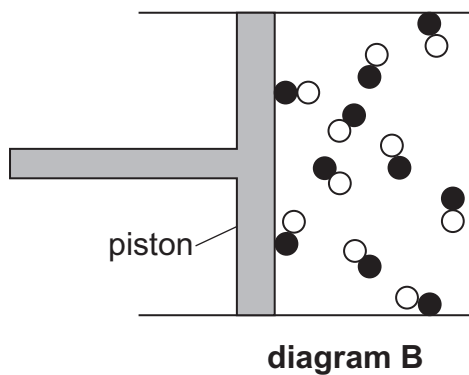
1 mark

- (ii) How can you tell from the diagram that the gas is pure?

10aai

1 mark

- (b) The piston is moved to the right as shown in diagram **B**.



How can you tell, from diagram **B**, that the pressure of the gas has increased?

10b

1 mark

- (c) Diagram **C** shows what happened to the molecules after the gas was compressed more.

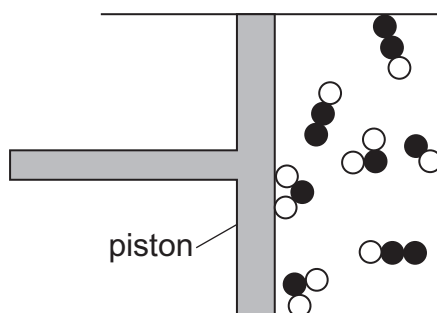


diagram C

- (i) How can you tell that a chemical reaction happened when the gas was compressed?



10ci

1 mark

- (ii) The mass of the gas in both diagrams **B** and **C** was 0.3 g.

Why did the mass of the gas **not** change when it was compressed?



10cii

1 mark

- (iii) Complete the table below with the correct chemical formula of each substance. Use the key to help you.

substance	formula

Key
nitrogen
oxygen



10ciii

1 mark

- (iv) What is the **name** of the substance represented by the symbol ?

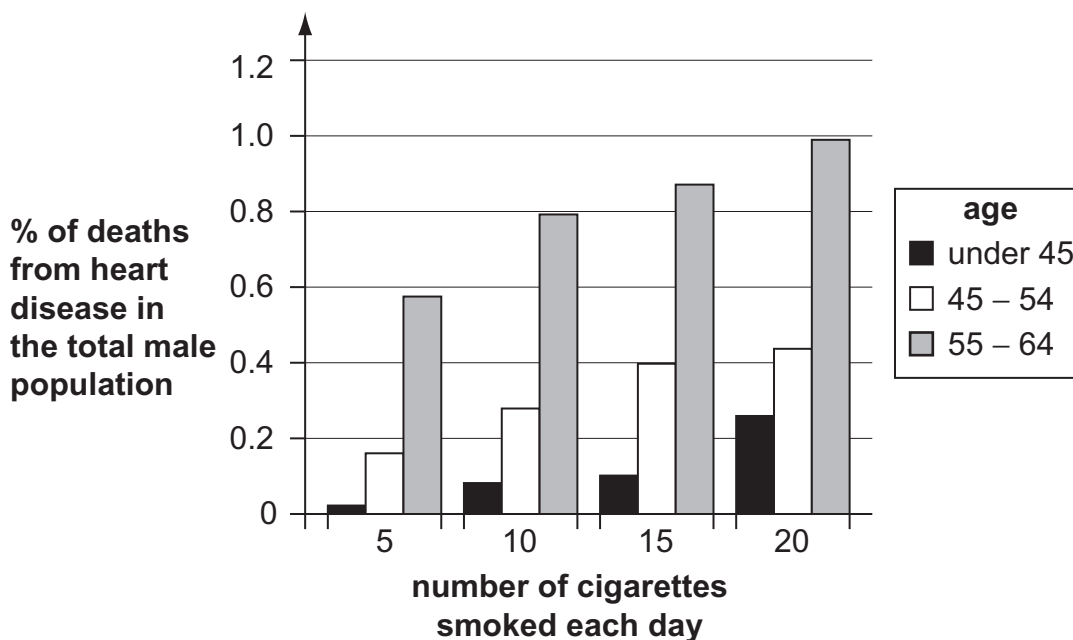


10civ

1 mark

maximum 7 marks

11. The bar chart below shows how the number of cigarettes smoked is linked to the percentage of deaths from heart disease in the total male population.



- (a) Use the information in the bar chart to write **two** conclusions about the relationship between smoking and the number of male deaths from heart disease.

1. _____

2. _____

- (b) Smoking can cause fat to be deposited in the arteries to the heart muscle.

Explain how this could prevent the heart muscle from working properly.

11a
1 mark

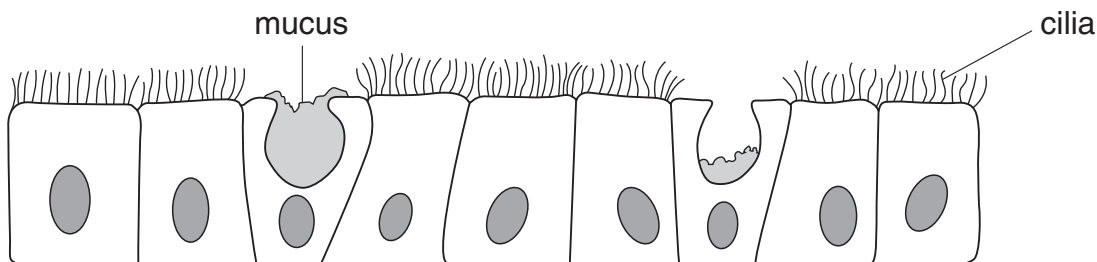
11a
1 mark

11b
1 mark

11b
1 mark

11b
1 mark

- (c) The drawing below shows part of the lining of the airway leading into the lungs.



- (i) Describe how mucus and cilia help to keep the airway free of dust and bacteria.

mucus _____

cilia _____

- (ii) Cigarette smoke contains tar.

What effect does tar have on the cilia?



11ci



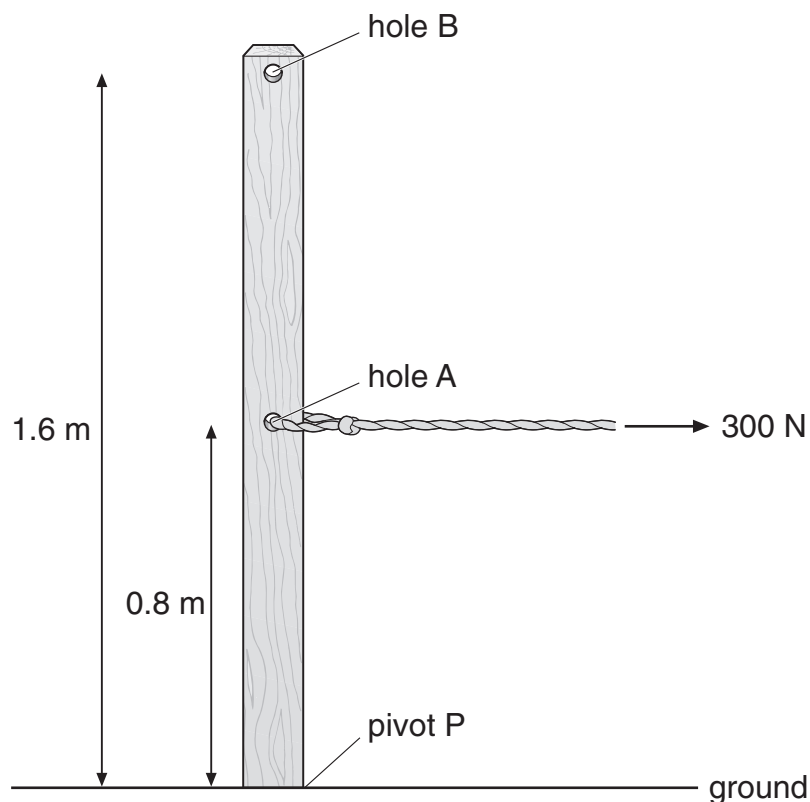
11ci



11ci

maximum 8 marks

12. A builder tried to remove a wooden post from the ground by pulling with a rope.



- (a) (i) The builder attached a rope to hole A, 0.8 m above the ground. He pulled with a horizontal force of 300 N.

Calculate the turning moment about the pivot P.
Give the unit.



12ai

1 mark



12ai

1 mark

- (ii) He then attached a rope to hole B, 1.6 m above the ground. He pulled with a horizontal force.

What force would produce the same turning moment as before?

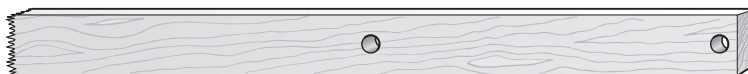


12aii

1 mark

 N

- (b) The post breaks off and falls on the ground as shown.



The weight of the broken post is 120 N.
The area in contact with the ground is 0.2 m².

Calculate the pressure of the broken post on the ground.
Give the unit.

☐

12b

1 mark

☐

12b

1 mark

END OF TEST

maximum 5 marks

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