Sc

KEY STAGE 3

TIER 5–7

2005

Science test

Paper 1

Please read this page, but do not open the booklet until your teacher tells you to start. Write your name and the name of your school in the spaces below.

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.

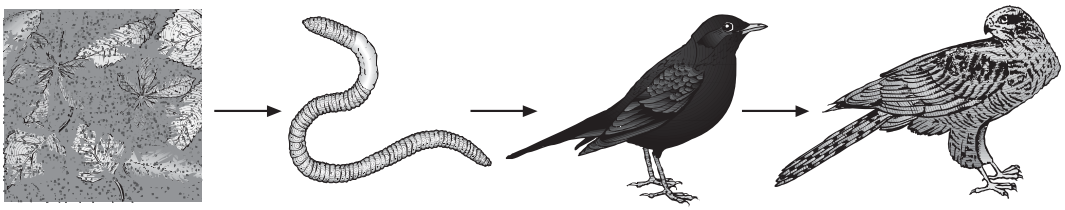
For marker's use only

Total marks	

QCA/05/1419

1. Copper and arsenic are present in the soil near copper mines.
When earthworms eat this soil they change from brown to bright yellow.
The copper and arsenic are **not** poisonous to earthworms.

(a) Earthworms are part of the food chain shown below.



soil containing plant remains → **earthworm** → **blackbird** → **sparrowhawk**

not to scale

(i) Use the food chain to suggest how copper and arsenic get into the body of a sparrowhawk.

_____

_____

_____

1ai

1 mark

(ii) Mary suggested that blackbirds are more likely to catch bright yellow earthworms than brown earthworms.

Give **one** reason why this might be true.

_____

_____

1aii

1 mark

(b) Mary wanted to count the bright yellow earthworms and the brown earthworms in the soil at different distances from the mines.

What important information about the soil could she get from her results?

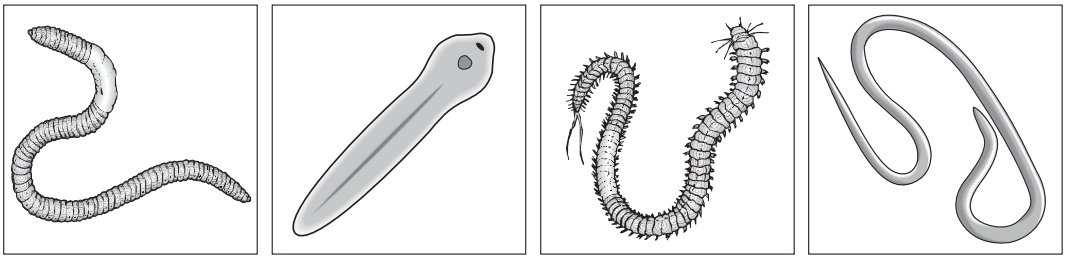
_____

_____

1b

1 mark

(c) The drawings below show an earthworm and three other worms.



earthworm **flatworm** **ragworm** **roundworm**

not to scale

The ragworm belongs to the same group as the earthworm.

How can you tell this from the drawings?

_____

_____

1c

1 mark

(d) The roundworm and some flatworms are parasites.

What does this mean?
Tick the correct box.

They feed only on insects.	☐	They live in a burrow.	☐
They feed on other living things and harm them.	☐	They live in the sea.	☐

1d

1 mark

maximum 5 marks

Total

5

2. (a) Carbon monoxide, nicotine and tar get into the lungs when a person smokes.

Draw a line from each substance to the effect of the substance on the body.
Draw only **three** lines.

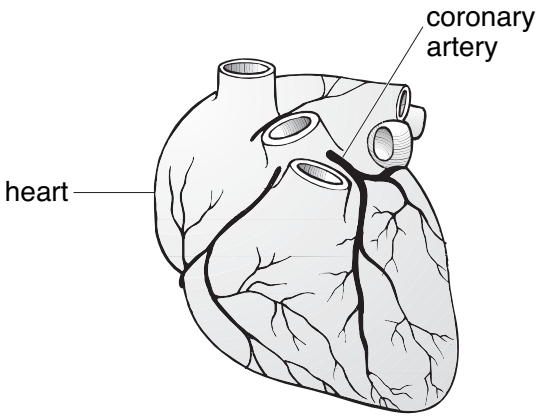
substance	**effect of the substance**
carbon monoxide	causes addiction to smoking
nicotine	causes influenza (flu)
tar	causes lung cancer
	causes red blood cells to carry less oxygen

2a 1 mark

2a 1 mark

2a 1 mark

(b) The coronary arteries carry blood to the heart muscle.
The drawing below shows the heart and coronary arteries.



(i) Diagram 1 shows a section through a coronary artery.

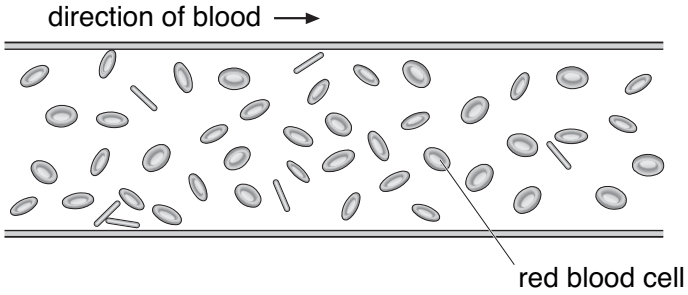


diagram 1

Smoking can cause damage to the coronary artery.
Diagram 2 shows a section through part of a damaged artery.

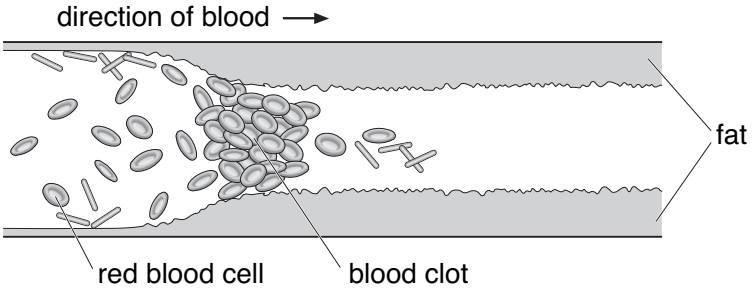


diagram 2

not to scale

Look at diagram 2. A blood clot has formed.

Give **one** other change in the coronary artery.

_____

_____

2bi
1 mark

(ii) Respiration takes place in the muscle cells of the heart.

Explain why a blood clot in the coronary artery prevents these cells respiring normally.

_____

_____

_____

_____

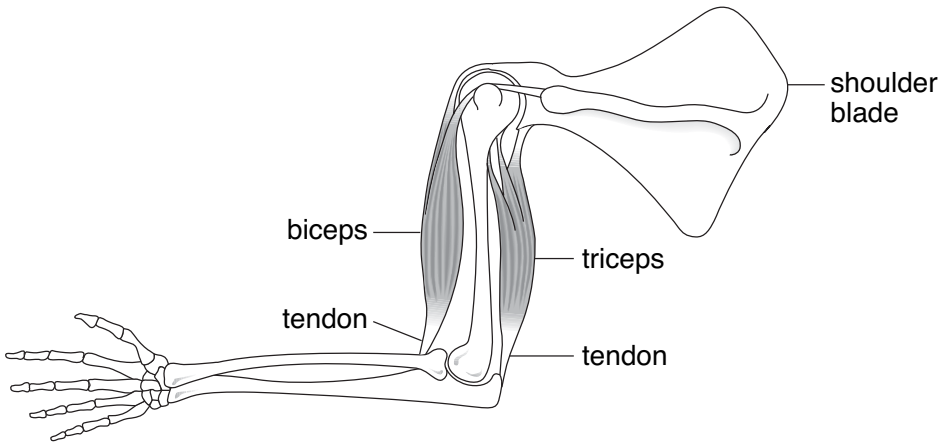
2bii
1 mark

2bii
1 mark

maximum 6 marks

Total
6

3. The diagram below shows muscles and bones of a human arm.



(a) Why is it important that the tendons do **not** stretch?

_____

_____

3a

1 mark

(b) The biceps and triceps are an antagonistic pair of muscles. Explain what this means.

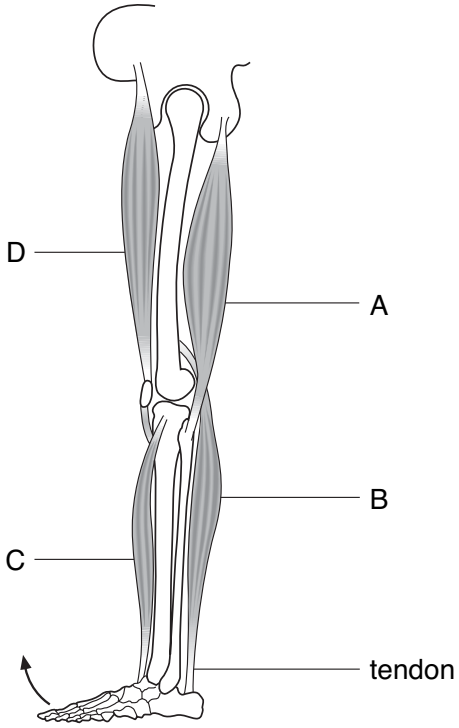
_____

_____

3b

1 mark

(c) The diagram below shows muscles and bones of a human leg.



(i) Which muscle contracts to move the foot in the direction shown by the arrow?
Give the letter.

_____ 3ci

1 mark

(ii) Which **two** pairs of muscles are antagonistic pairs?
Tick the **two** correct boxes.

A and B ☐

B and C ☐

C and D ☐ 3cii

1 mark

D and A ☐ 3cii

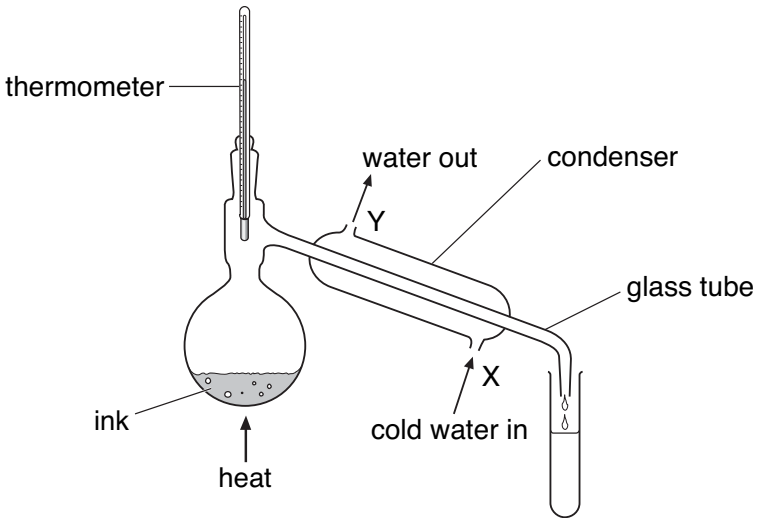
1 mark

maximum 5 marks

Total

5

4. Rema used the apparatus below to distil 100 cm^3 of water-soluble ink.



apparatus A

not to scale

(a) Which processes occur during distillation?
Tick the correct box.

condensation then evaporation	☐
evaporation then condensation	☐
melting then boiling	☐
melting then evaporation	☐

☐ 4a
1 mark

(b) Give the name of the colourless liquid that collects in the test-tube.

_____

☐ 4b
1 mark

(c) What would the temperature reading be on the thermometer when the ink has been boiling for two minutes?

_____°C

☐ 4c
1 mark

(d) (i) Water at 15°C enters the condenser at X.
Predict the temperature of the water when it leaves the condenser at Y.

_____°C

Explain this change of temperature.

_____

_____

4di
1 mark

(ii) Give **two** ways in which the water vapour changes as it passes down the glass tube in the condenser.

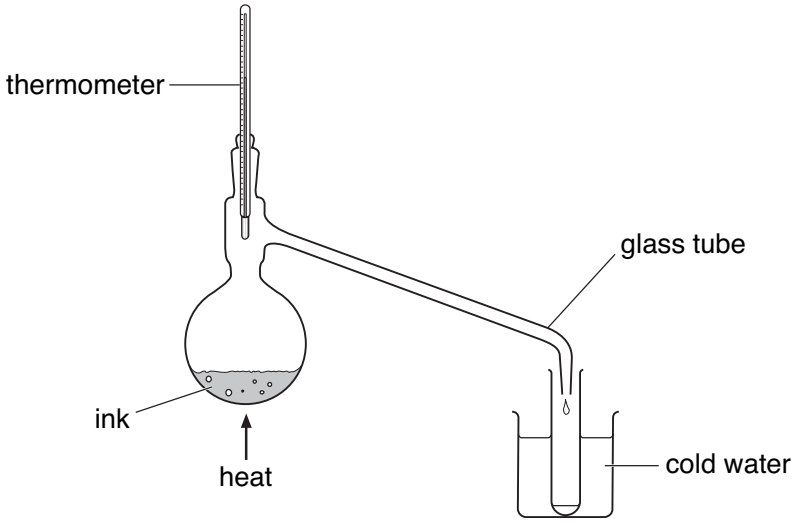
1. _____

2. _____

4dii
1 mark

4dii
1 mark

(e) Peter used the apparatus below to distil 100 cm^3 of water-soluble ink.



apparatus B

not to scale

Why is the condenser in **apparatus A** better than the glass tube and beaker of water in **apparatus B**?

_____

_____

4e
1 mark

maximum 7 marks

Total
7

5. Burning fossil fuels causes air pollution.

(a) (i) Give the names of **two** fossil fuels.

5ai
1 mark

_____ and _____

(ii) Some fossil fuels contain sulphur.

Complete the word equation for the reaction between sulphur and oxygen in the air.

5aii
1 mark

sulphur + oxygen → _____

(b) Burning fossil fuels leads to the formation of acid rain.
Acid rain has collected in this lake.
A helicopter is dropping calcium hydroxide into the lake.

 Photograph by kind permission of Kjell Weppling

Calcium hydroxide dissolves in water to form an alkaline solution.

(i) What effect does an alkali have on the pH of an acidic lake?

_____

5bi
1 mark

(ii) When calcium hydroxide reacts with sulphuric acid in the lake a calcium salt is formed.

What is the name of this salt?
Tick the correct box.

calcium carbonate	☐	calcium chloride	☐
calcium nitrate	☐	calcium sulphate	☐

5bii
1 mark

(c) The photograph below shows trees damaged by acid rain.

(i) The trees have lost their leaves and have died.
Explain why leaves are needed for a tree to grow.

_____

_____

5ci
1 mark

(ii) What effect does acid rain have on buildings made from limestone?

_____

_____

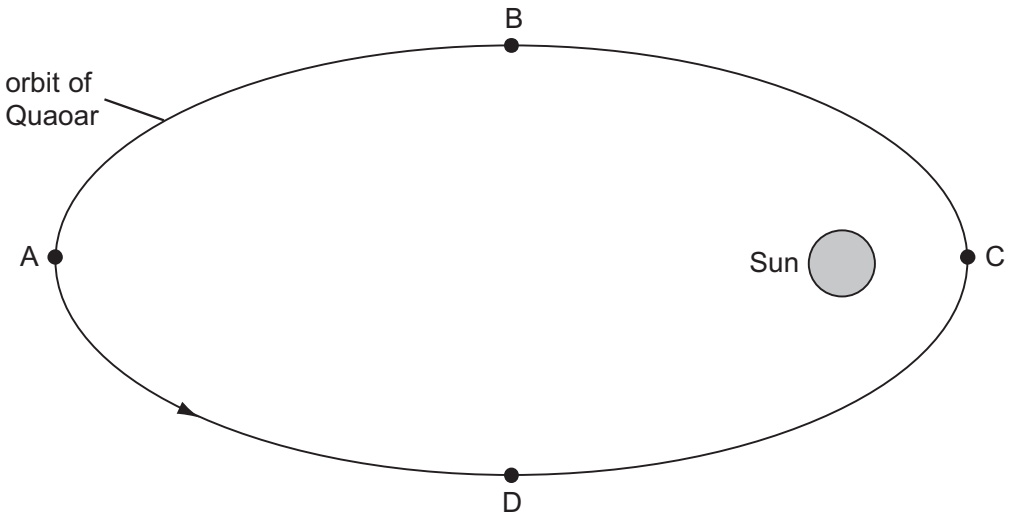
5cii
1 mark

maximum 6 marks

Total
6

6. (a) In 2002 a large asteroid was discovered orbiting the Sun.
It was named Quaoar.

The diagram below shows Quaoar in four positions in its orbit.



not to scale

(i) In which of the four positions, A, B, C or D, is the effect of the Sun's gravity on Quaoar the greatest?

_____

Explain your answer.

_____

_____

6ai
1 mark

(ii) **On the diagram above**, draw arrows to show the direction of the Sun's gravity on Quaoar in each of the positions A, B, C and D.

6aii
1 mark

(iii) At which position, A, B, C or D, is Quaoar travelling most slowly?

_____

Explain your answer.

_____

_____

6aiii
1 mark

(b) The table below gives information about three of the planets in our solar system.

planet	average distance from Sun (millions of km)	time for one orbit (Earth years)	average surface temperature of planet (°C)
Saturn	1427	30	−180
Uranus	2870	84	−210
Pluto	5900	248	−230

(i) The time for one orbit of the planet Neptune is 165 Earth years.

Estimate the average distance of Neptune from the Sun.
Use information in the table to help you.

_____ millions of km

6bi
1 mark

(ii) How does the surface temperature of these planets vary with distance from the Sun?
Use information in the table to help you.

_____

_____

6bii
1 mark

(iii) Explain why the temperature varies with distance from the Sun in this way.

_____

_____

6biii
1 mark

maximum 6 marks

Total
6

(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?

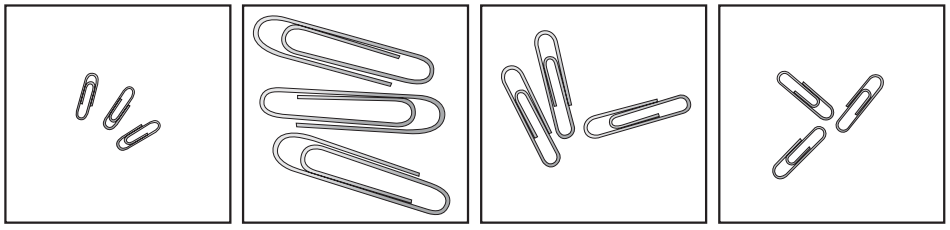
_____

_____

7b

1 mark

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



☐ ☐ ☐ ☐

7ci

1 mark

(ii) Give a reason for your choice.

_____

_____

_____

7cii

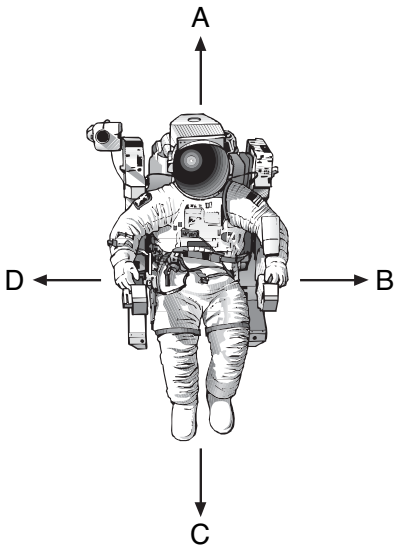
1 mark

maximum 6 marks

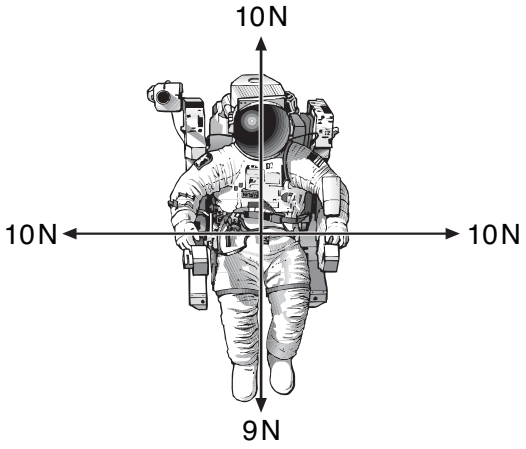
Total

6

8. The drawing below shows an astronaut in space.
He has four small jets attached to his space suit.
These jets produce forces on the **astronaut** in the directions A, B, C and D.



(a) The drawing below shows the size and direction of four forces acting on the astronaut.



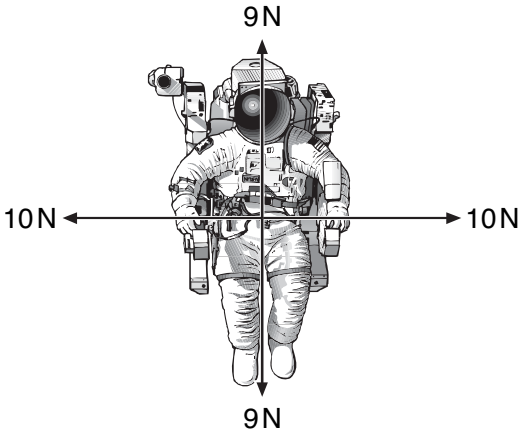
In which direction, A, B, C or D, will the astronaut move?
Give the letter.

_____

8a

1 mark

(b) The drawing below shows the size and direction of four different forces acting on the astronaut.



What will happen to the astronaut when the jets produce these four forces?

_____

8b
1 mark

Explain your answer.

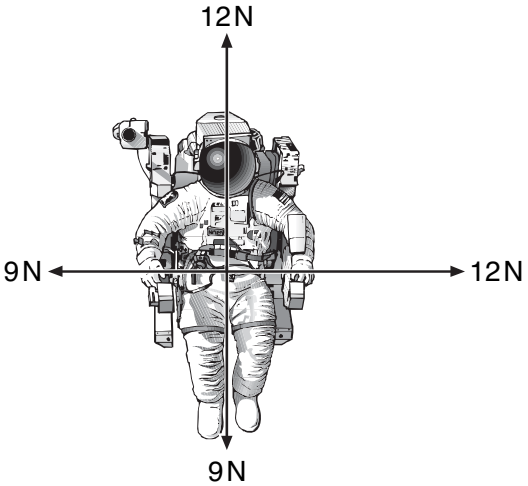
_____

_____

8b
1 mark

(c) The drawing below shows the size and direction of four different forces acting on the astronaut.

Draw an arrow on the diagram below to show the direction in which he will move.

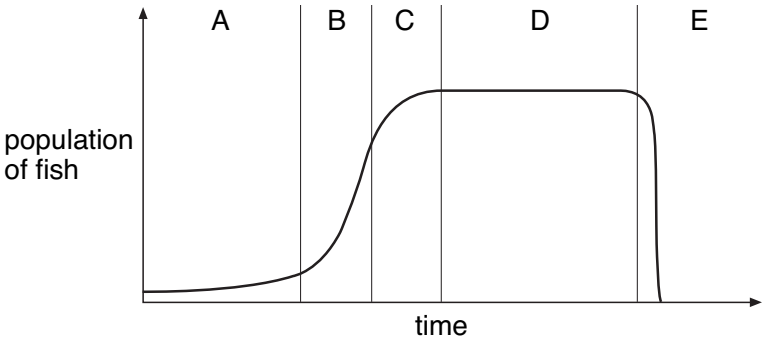


8c
1 mark

maximum 4 marks

Total
4

9. The graph below shows how a population of fish in a lake changed over a period of time.



(a) In which time interval, A, B, C, D or E, did the population of fish increase most quickly?

_____

How can you tell this from the graph?

_____

_____

9a

1 mark

(b) Which part of the graph shows when the fish **began** to compete with each other for food?
Give the letter.

_____

How can you tell this from the graph?

_____

_____

9b

1 mark

(c) What does part D of the graph show about the birth rate and the death rate of the fish?

_____

How can you tell this from the graph?

_____

_____

9c

1 mark

(d) Part E of the graph shows a population crash when all the fish died.

Suggest **two** reasons why a population might crash in this way.

1. _____

_____

2. _____

_____

9d

1 mark

9d

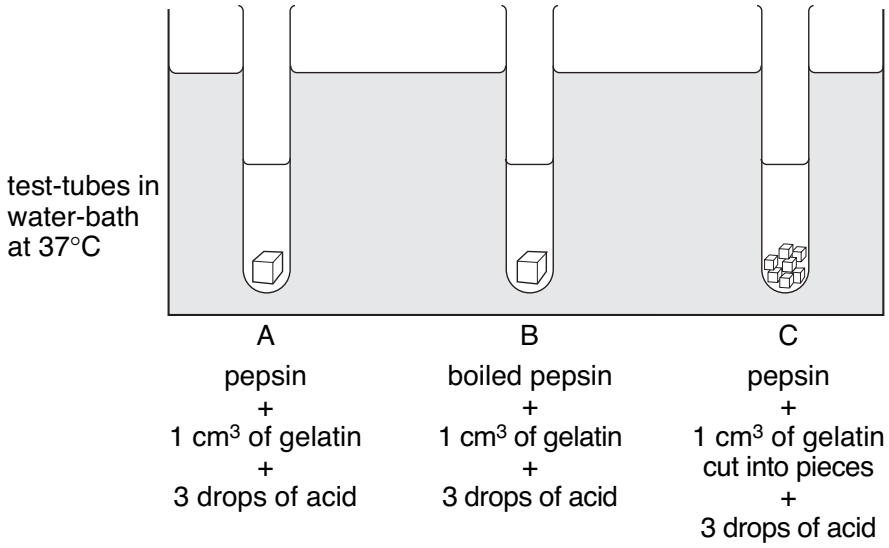
1 mark

maximum 5 marks

Total

5

10. Andy investigated the digestion of a protein called gelatin.
He used an enzyme called pepsin from the human stomach, and three cubes of gelatin each 1 cm^3.
He set up the experiment shown below and put the test-tubes in a water-bath at 37°C.
He measured the time for the digestion of the gelatin.



(a) Why did Andy choose a temperature of 37°C for the water-bath?

_____

_____

10a

1 mark

(b) In test-tube C, the cube of gelatin that had been cut into pieces was digested more quickly than the whole cube in test-tube A.

Give the reason for this.

_____

_____

10b

1 mark

(c) The boiled pepsin in test-tube B did **not** digest the gelatin.

Why did boiling this enzyme stop it working?

_____

_____

10c
1 mark

(d) Protein is needed for growth and repair.
The digestion of protein begins in the stomach and is completed in the small intestine.

(i) What are the products of the digestion of protein?
Tick the correct box.

amino acids	☐	energy	☐
sugars	☐	vitamins	☐

10di
1 mark

(ii) Why is it necessary to digest protein before it can be used for growth and repair?

_____

_____

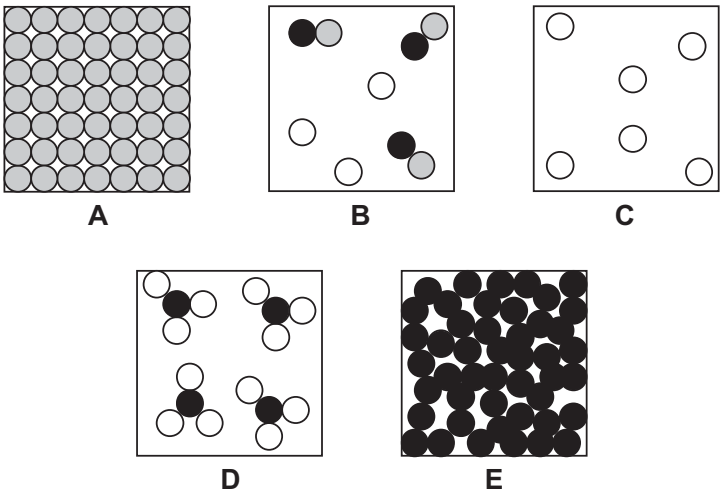
10dii
1 mark

maximum 5 marks

Total
5

11. (a) The diagrams below show the arrangement of atoms or molecules in five different substances A, B, C, D and E.

Each of the circles ○, ○ and ● represents an atom of a different element.



Give the letter of the diagram which represents:

(i) a mixture of gases;

_____ 11ai

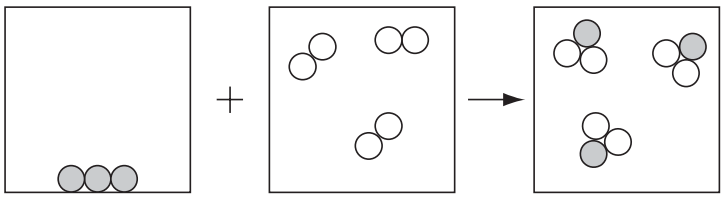
1 mark

(ii) a single compound.

_____ 11aii

1 mark

(b) The diagram below shows a model of a chemical reaction between two substances.



substance P **substance Q** **substance R**

(i) How can you tell from the diagram that a chemical reaction took place between substance P and substance Q?

_____

_____

11bi

1 mark

(ii) Substance P is carbon.

Suggest what substances Q and R could be.

substance Q _____

substance R _____

11bii

1 mark

(iii) How does the diagram show that mass has been conserved in this reaction?

_____

_____

11biii

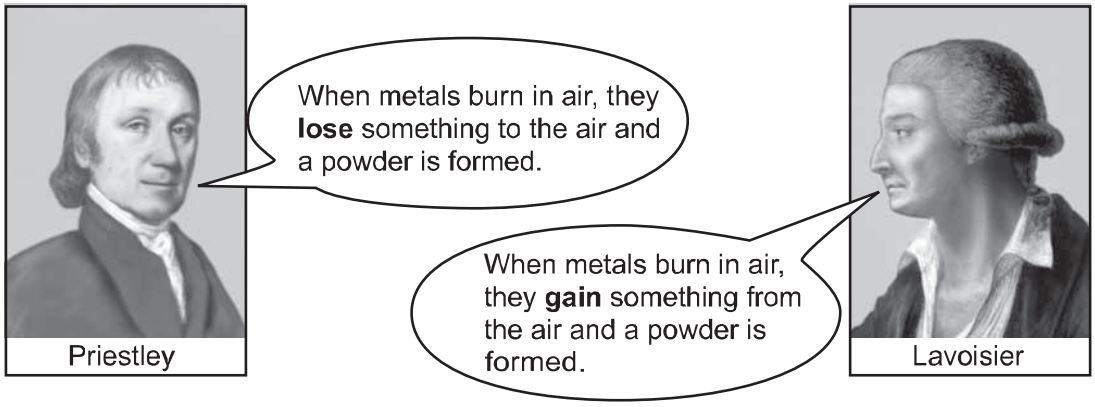
1 mark

maximum 5 marks

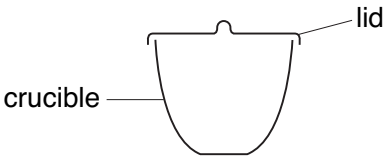
Total

5

12. In the eighteenth century, scientists had different ideas about what happens when metals burn in air.



(a) Imagine you want to investigate the ideas of Priestley and Lavoisier.
Assume you have been given three pieces of different metals.
In a laboratory, metals are heated to high temperatures in crucibles.



You would also have access to all the usual laboratory equipment.

In your plan you must give:
- the **one** factor you would change as you carry out your investigation (the independent variable);
- **one** factor you would observe or measure to collect your results (the dependent variable);
- **one** of the factors you would keep the same as you carry out your investigation;
- the **evidence** that would support Lavoisier's idea.

_____

_____

_____

_____

_____

_____

12a
1 mark

12a
1 mark

12a
1 mark

12a
1 mark

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

12b

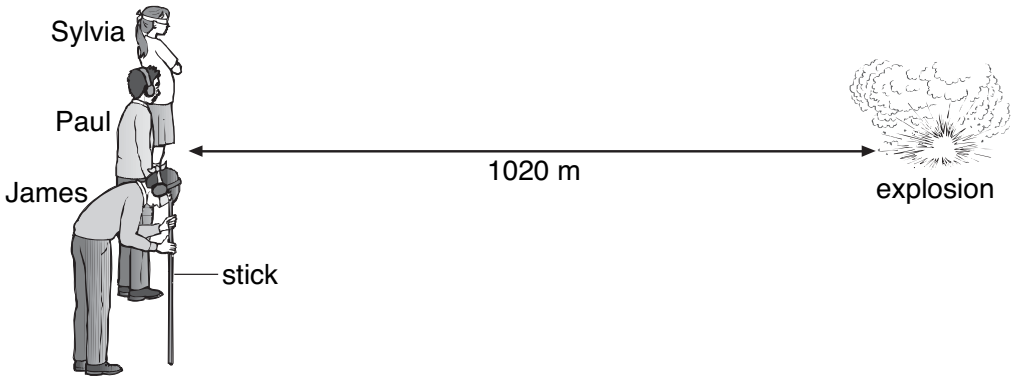
1 mark

maximum 5 marks

Total

5

13. Three pupils took part in an investigation into the speed of sound.
All three pupils stood 1020 m from an explosion.



- Sylvia wore a blindfold.
- Paul wore ear defenders.
- James wore a blindfold **and** ear defenders. He rested his head on a wooden stick pushed into the ground so that he could feel vibrations.

The explosion produced sound and light at the same time.
The table shows the speed of sound in two different materials.

material	speed of sound (m/s)
air	340
soil	3200

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

(i) In which order would the pupils notice the explosion?

first _____

second _____

third _____

13ai

1 mark

(ii) From the information given opposite, calculate the time it would take for the sound to travel through the air to Sylvia.

_____

_____ **s**

13aii
1 mark

(b) Another pupil, Nasah, stood 2000 m away from the explosion.

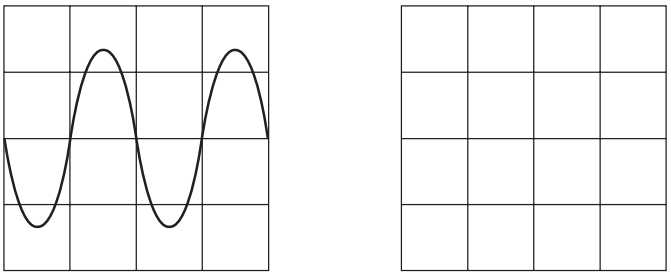
(i) The sound heard by Nasah was quieter than the sound heard by Sylvia.
The further sound travels the quieter it becomes.
Give the reason for this.

_____

_____

13bi
1 mark

(ii) The oscilloscope trace below represents the sound Sylvia heard.



Sylvia Nasah

The sound Nasah heard was quieter but the pitch was the same.

On the right-hand grid, draw the trace to show the pattern of the sound Nasah heard.

13bii
1 mark

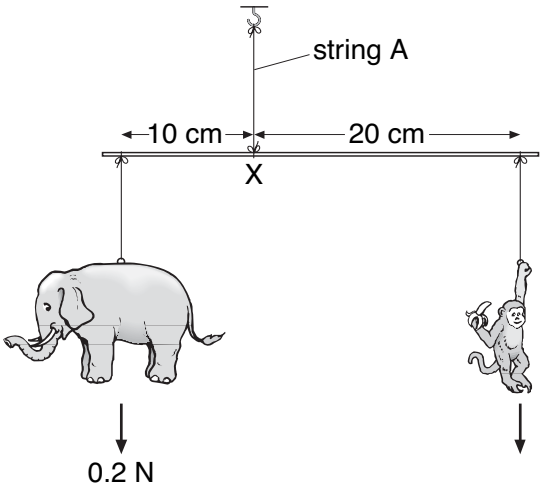
13bii
1 mark

PLEASE TURN OVER FOR THE LAST QUESTION

maximum 5 marks

Total
5

14. A father makes a simple mobile for his young son. He uses plastic animals as shown below.



(a) (i) The elephant weighs 0.2 N.

What is the turning moment produced by the elephant about point X? Give the unit.

14ai
1 mark

_____

_____

14ai
1 mark

(ii) What is the turning moment produced by the monkey about point X?

14aii
1 mark

_____

_____

(iii) What is the weight of the monkey?

14aiii
1 mark

_____ N

(b) What is the size of the tension (force) in string A?

14b
1 mark

_____ N

maximum 5 marks

Total
5