Sc

KEY STAGE
3

TIER
5–7

2004

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

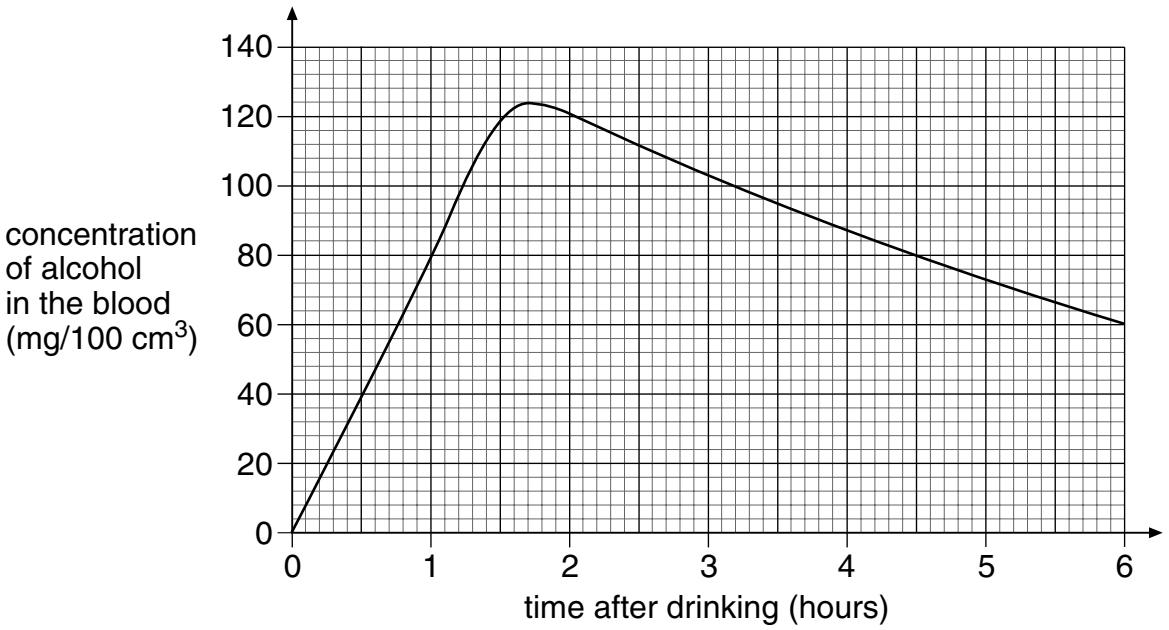
- The test is 1 hour long.
- You will need: pen, pencil, rubber, ruler, protractor and calculator.
- The test starts with easier questions.
- Try to answer all of the questions.
- The number of marks available for each question is given below the mark boxes in the margin. You should not write in this margin.
- 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/04/1210

1. (a) The graph below shows how the concentration of alcohol in a person's blood changed after drinking alcoholic drinks.



It is illegal to drive if the concentration of alcohol in the blood is higher than 80 mg/100 cm^3.

Use the graph to find out how long the concentration of alcohol in this person's blood was higher than 80 mg/100 cm^3.

_____ hours

1a

1 mark

(b) Why does alcohol in the blood increase the chance of having an accident? Tick the correct box.

It causes slurred speech.	☐	It dulls the senses of taste and smell.	☐
It increases the size of the pupil in the eye.	☐	It increases the time taken to react.	☐

1b

1 mark

(c) Alcohol is absorbed into the bloodstream from the stomach.
Digested food is absorbed into the blood from a different part of the digestive system.
Give the name of this part.

_____

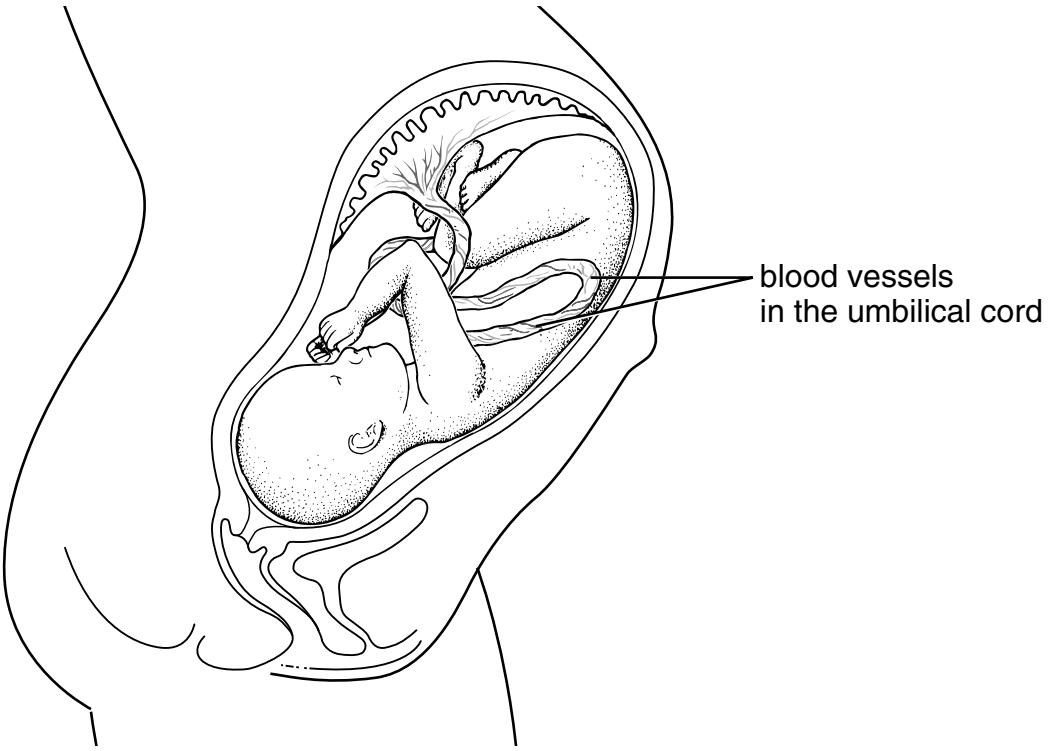
1c
1 mark

(d) Give the name of **one** organ that is damaged by drinking a lot of alcohol over a long period of time.

_____

1d
1 mark

(e) The drawing below shows a foetus in its mother's uterus.



If a pregnant woman drinks large quantities of alcohol, the blood vessels in the umbilical cord may get very narrow for a while.

Give **one** way this could affect the foetus.

_____

_____

1e
1 mark

maximum 5 marks

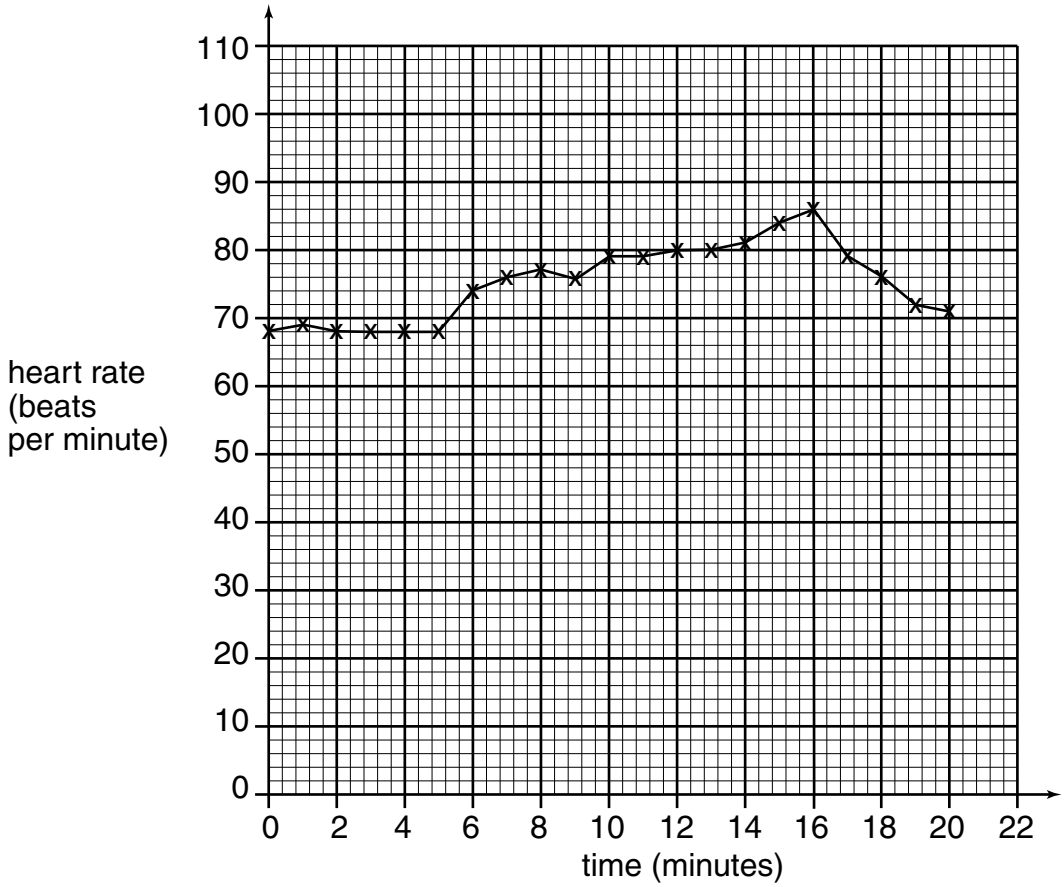
Total
5

2. Harry investigated the effects of fizzy cola drink on his heart rate.

First he measured his heart rate every minute for 5 minutes when sitting down. Then he drank some cola.

He continued to measure his heart rate at regular intervals.

This is a graph of his results.



(a) Why did Harry measure his heart rate every minute for 5 minutes before drinking his cola?

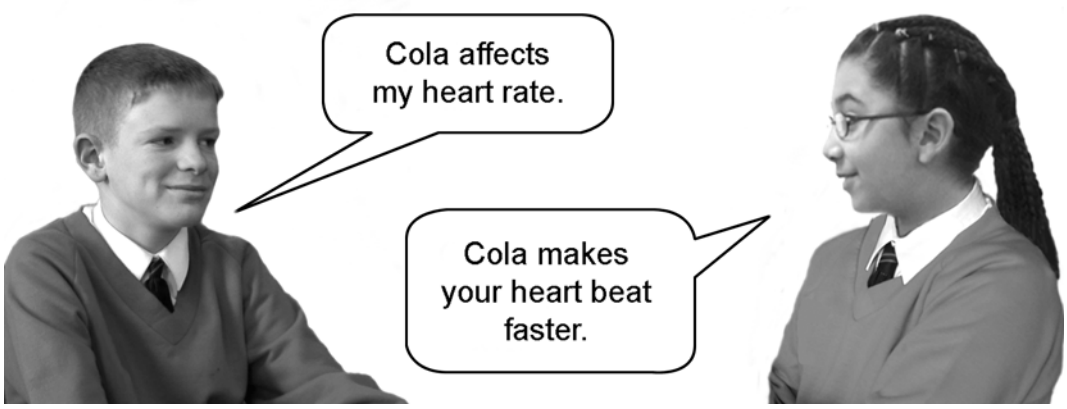
2a
1 mark

(b) Harry says cola affects his heart rate.

What evidence is there in the graph to support his idea that cola affects his heart rate?

2b
1 mark

(c) Harry and Yasmin came to the following conclusions.



Harry Yasmin

Explain why Yasmin's conclusion is better than Harry's conclusion.

2c
1 mark

(d) Yasmin said, "We should also measure Harry's heart rate after he drinks fizzy water".

How would measuring Harry's heart rate after he drinks fizzy water improve the investigation?

2d
1 mark

maximum 4 marks

Total
4

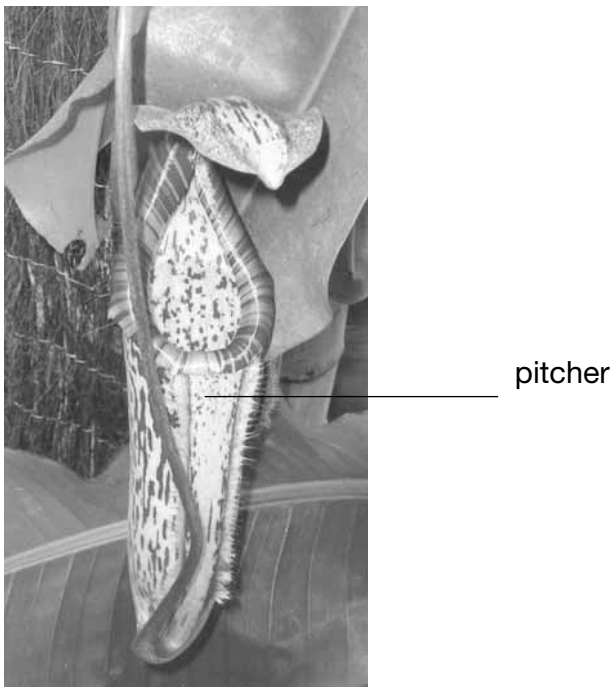
3. (a) Plants need nitrogen compounds for growth.
Give the name of the type of plant cell that absorbs water and nitrogen compounds from the soil.

3a

1 mark

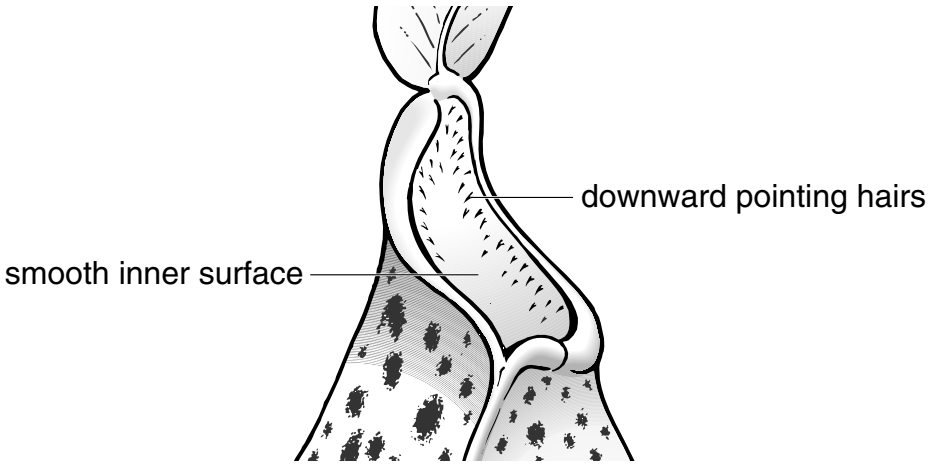
_____

(b) The photograph shows a pitcher plant.
Pitcher plants get nitrogen compounds from insects.
They digest insects in leaves shaped like containers called pitchers.



In the bottom of the pitcher there is a liquid. Insects are attracted to the plant. They fall into the liquid.

The inner surface of the pitcher is very smooth and slippery with downward pointing hairs as shown below.



Suggest the function of the smooth, slippery surface with downward pointing hairs.

_____

_____

3b
1 mark

(c) There are useful bacteria living in the liquid. They produce enzymes to help digest the insects.
Both the bacteria and the pitcher plant absorb some of the products of digestion.

How does the number of insects that fall into the liquid affect the number of these useful bacteria?

_____

_____

3c
1 mark

(d) Pitcher plants also have ordinary green leaves where photosynthesis takes place.

(i) Complete the word equation for photosynthesis.

_____ + water → glucose + _____

3di
1 mark

(ii) Glucose is a carbohydrate.

Why are carbohydrates needed by living things?
Tick the correct box.

to provide energy	☐	to provide liquid	☐
to provide immunity	☐	to provide minerals	☐

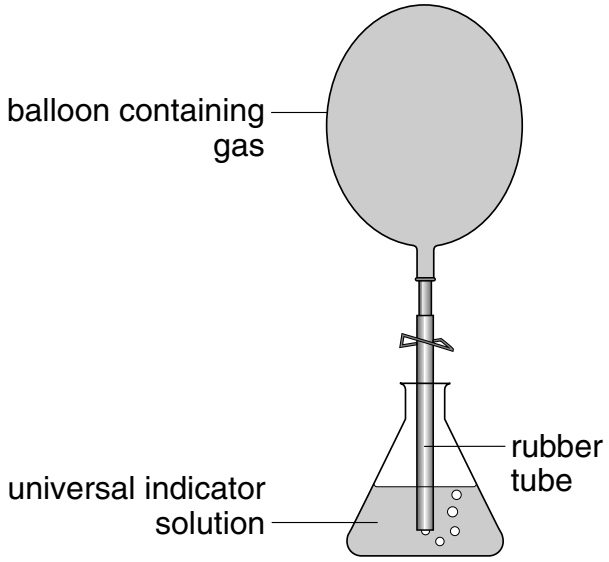
3di
1 mark

3dii
1 mark

maximum 6 marks

Total
6

4. A scientist compared the acidity of four gases to see which gas might cause acid rain.
She used four balloons to collect the gases.
She then bubbled the gases, in turn, through a fresh sample of green, neutral, universal indicator solution.



(a) Three of the gases caused the indicator to change colour.
The scientist added drops of alkali to the indicator until the indicator changed back to green.
Her results are shown in the table below.

gases collected	**change in colour of indicator**	**number of drops of alkali needed to change the indicator back to green**
exhaust gases from a car	green to red	31
carbon dioxide	green to red	160
air	no change	0
human breath	green to yellow	10

Use information in the table opposite to answer part (i) and part (ii) below.

(i) Which gas dissolved to form the most acidic solution?

_____

Explain your choice.

_____

_____

4ai
1 mark

(ii) Which gas formed a neutral solution?

_____

Explain your choice.

_____

_____

4aii
1 mark

(iii) What effect does an alkali have on an acid?

_____

4aiii
1 mark

(b) Some metals react with acids in the air.
Complete the word equation for the reaction between zinc and hydrochloric acid.

zinc + hydrochloric acid → _____ + _____

4b
1 mark

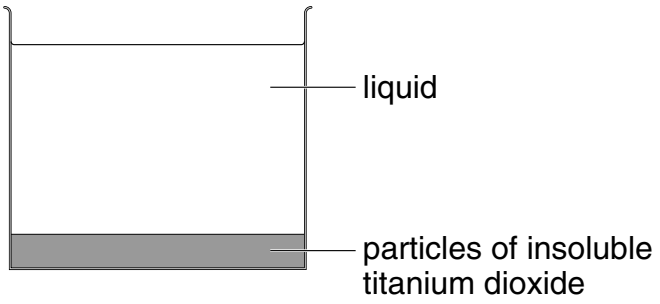
4b
1 mark

maximum 5 marks

Total

5

5. (a) Samantha opened a tin of white paint. The paint consisted of a liquid and particles of titanium dioxide that are insoluble in the liquid.
The paint had separated into two layers, as shown below.



(i) What type of substance is the paint?
Tick the correct box.

5ai
1 mark

a compound ☐ an element ☐ a mixture ☐

(ii) What type of substance is titanium dioxide?
Tick the correct box.

5aii
1 mark

a compound ☐ an element ☐ a mixture ☐

(iii) Why did the particles of insoluble titanium dioxide sink to the bottom?

5aiii
1 mark

(b) Samantha stirred the paint and used it to paint a window frame.
She got some of the paint on the glass.

Samantha could **not** get the paint off the glass with water.
When she used a different liquid called white spirit the paint came off.

Why could she remove the paint with white spirit but **not** with water?

_____

_____

5b

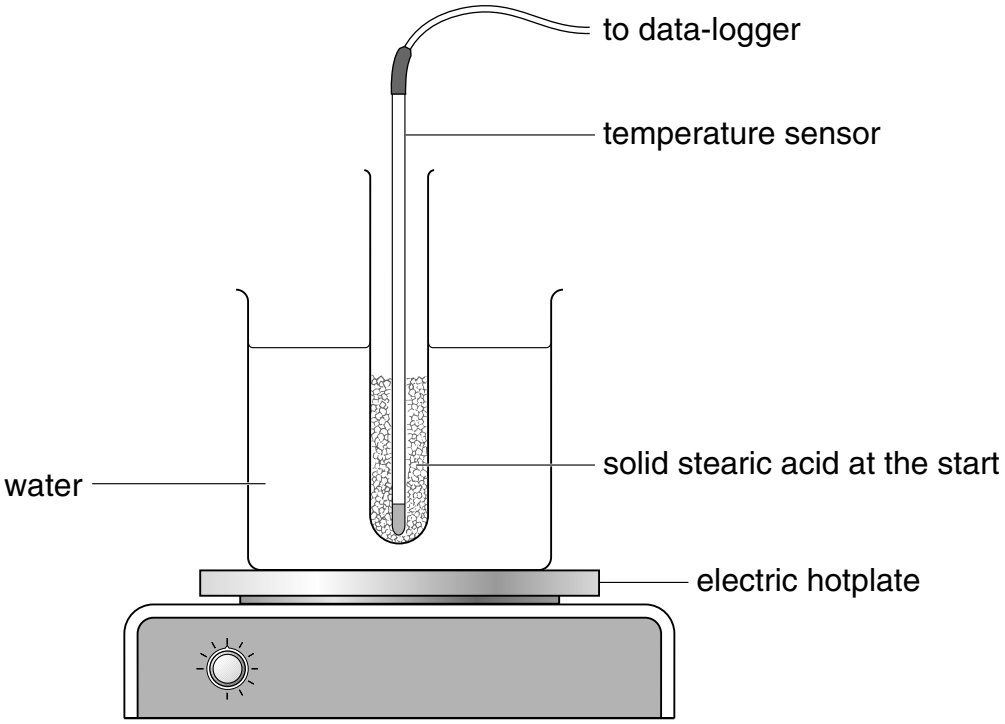
1 mark

maximum 4 marks

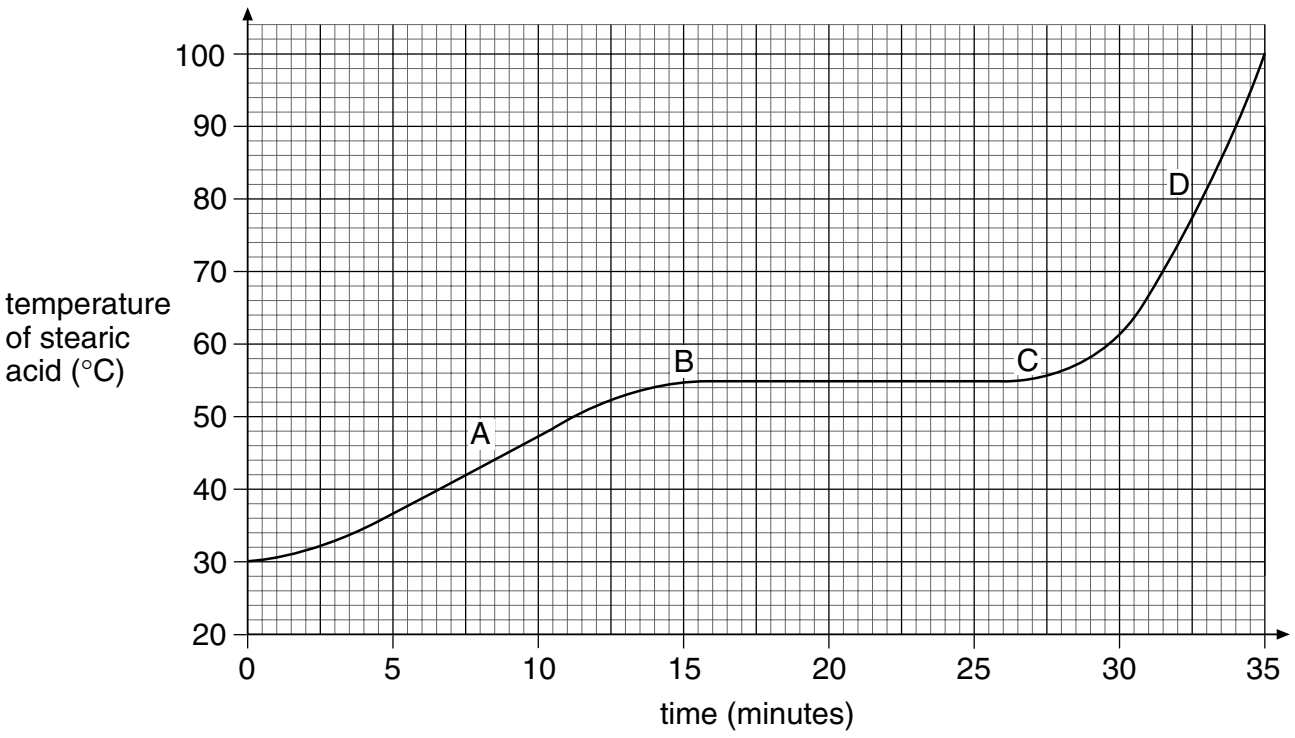
Total

4

6. Alan put a test-tube containing solid stearic acid into a beaker of cold water.
He heated the water until it boiled.



He used a temperature sensor attached to a data-logger to record the temperature of the stearic acid over a period of 35 minutes.
A graph of the results is shown below.



Stearic acid is a solid at room temperature.

(a) (i) Which **letter** on the graph opposite shows the point at which the stearic acid began to change state?

_____

6ai
1 mark

(ii) Use the graph to find the **temperature** at which the stearic acid began to change state.

_____ °C

6aii
1 mark

(iii) Look at the graph. What was the physical state of the stearic acid:

at point A? _____

at point D? _____

6aiii
1 mark

6aiii
1 mark

(b) The test-tube transfers thermal energy from the water to the stearic acid.

By what method is most of the thermal energy transferred?
Tick the correct box.

conduction	☐	evaporation	☐
convection	☐	radiation	☐

6b
1 mark

(c) Stearic acid boils at 360°C.
The stearic acid could **not** boil in this experiment.
Give the reason for this.

_____

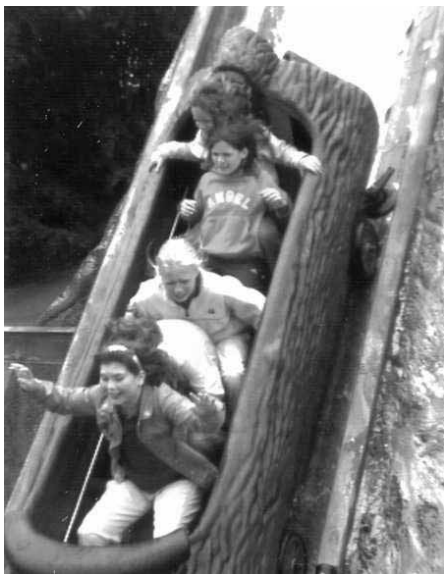
_____

6c
1 mark

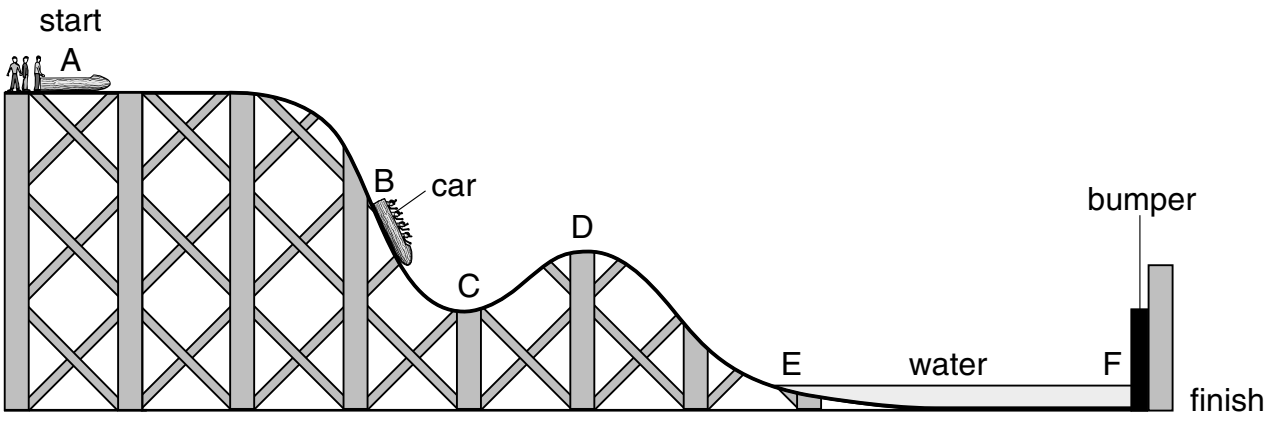
maximum 6 marks

Total
6

7. The photograph shows some pupils in a log car on a theme-park ride.



The drawing below shows the ride.
The letters A, B, C, D, E and F show different points along the track.



The car starts from A and travels to F, where it stops by hitting a bumper.
At E the car enters a trench filled with water.

(a) (i) At which **two** points does the car have **no** kinetic energy?
Give the **two** correct letters.

_____ and _____

7ai
1 mark

(ii) At which point does the car have the **most** gravitational potential energy?
Give the correct letter.

_____

7aii
1 mark

(iii) At which point does the car have **some** kinetic energy and the **least** gravitational potential energy?
Give the correct letter.

_____

7aiii
1 mark

(b) (i) The cars are **not** powered by a motor.
What force causes the cars to move along the track from B to C?

_____

7bi
1 mark

(ii) When a car splashes through the water at E, it slows down.
What force acts on the car to slow it down?

_____

7bii
1 mark

(c) Complete the sentence below by choosing from the following words.

chemical	**gravitational potential**	**kinetic**
light	**sound**	**thermal**

When the car hits the bumper at F, its _____ energy

is transferred into _____ energy and

_____ energy.

7c
1 mark

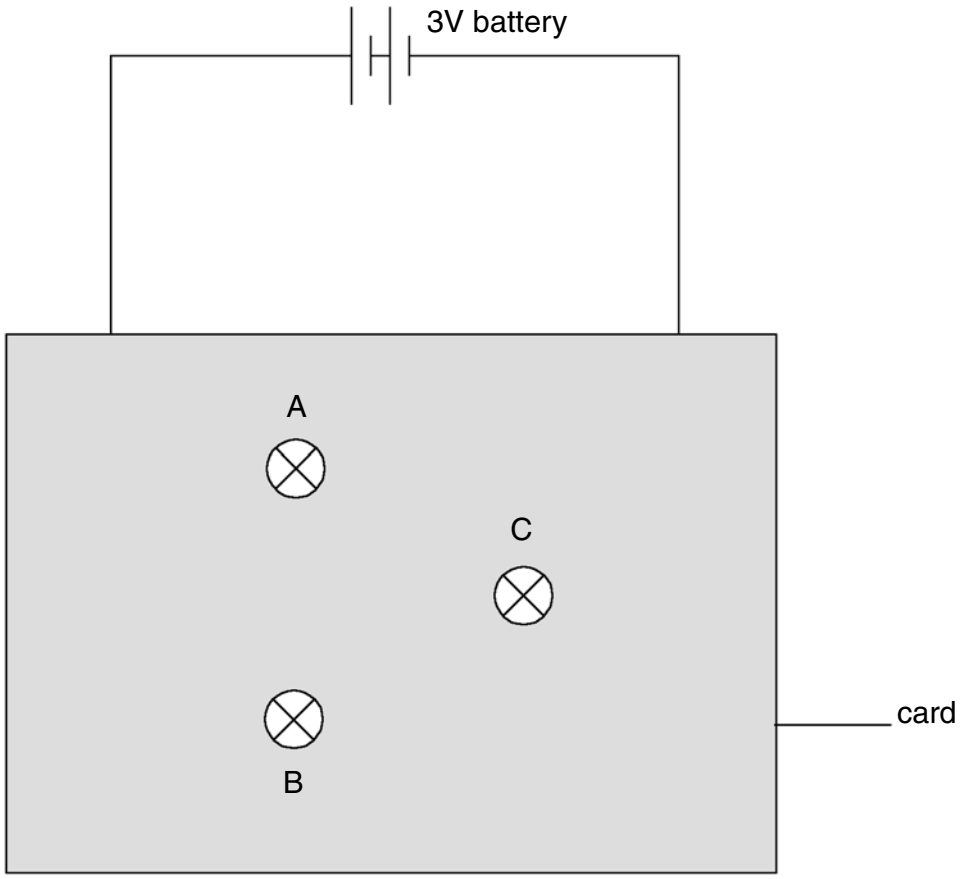
7c
1 mark

7c
1 mark

maximum 8 marks

Total
8

8. Imran built a puzzle circuit with three identical bulbs and a 3V battery.
He covered the connections to the bulbs with a piece of card as shown below.
The bulbs could be seen through holes in the card.

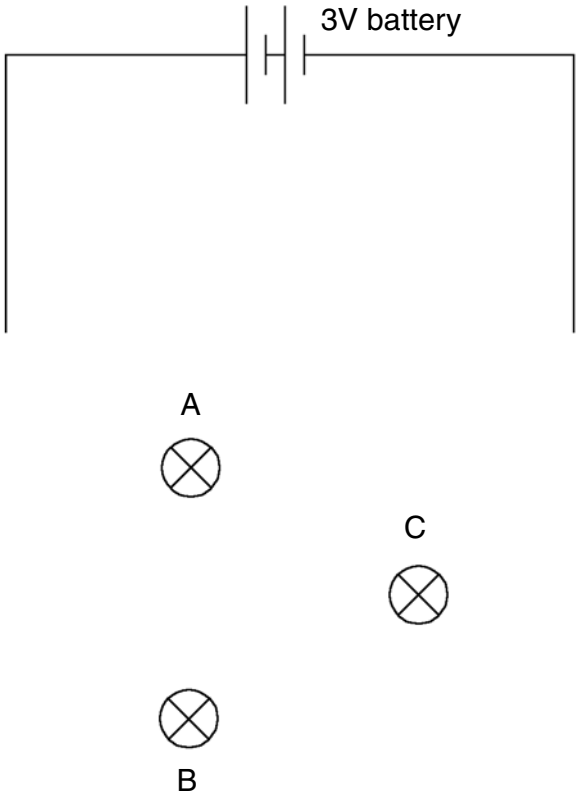


All the bulbs were on but their brightness was different.

Lucy removed bulbs A, B and C in turn. Before connecting each bulb back into the circuit she observed the effect on the other two bulbs.
She recorded her observations in the table below.

bulb removed	**observations**
A	B and C stayed on
B	C went off A stayed on
C	B went off A stayed on

(a) Complete the circuit diagram below to show how the three bulbs could be connected.
Use your knowledge of series and parallel circuits, and the observations in the table to help you.



8a
1 mark

8a
1 mark

(b) Imran used three identical bulbs but their brightness was different.

Which bulb was the brightest? Give the letter.

_____

Give the reason for your choice.

_____

_____

8b
1 mark

(c) Imran added a switch to the circuit so that he could turn all three bulbs on and off at the same time.

Place a letter **S** on your circuit diagram where this switch could be placed.

8c
1 mark

maximum 4 marks

Total

4

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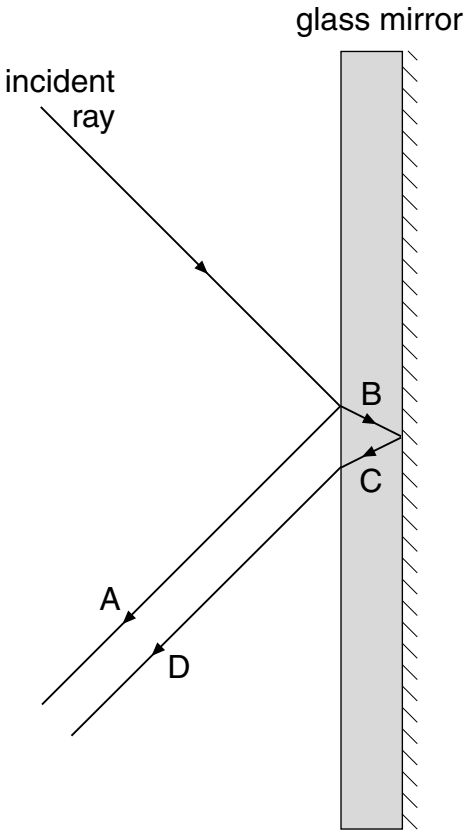
9. The diagram shows a ray of light hitting the surface of a mirror made from thick glass.
The incident ray is both reflected and refracted.



(a) (i) Give the letters of the **two** reflected rays.

_____ and _____

9ai
1 mark

(ii) Give the letter of **one** refracted ray.

_____

9aii
1 mark

(b) The incident ray is brighter than ray A.
Give **one** reason for this.

_____

_____

9b
1 mark

maximum 3 marks

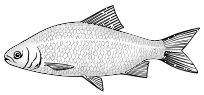
Total
3

10. Scientists measured the concentration of the insecticide, DDT, in three animals and a microscopic plant called chlamydomonas.

(a) The food chain for these four organisms is shown below.

chlamydomonas → daphnia → fish → heron





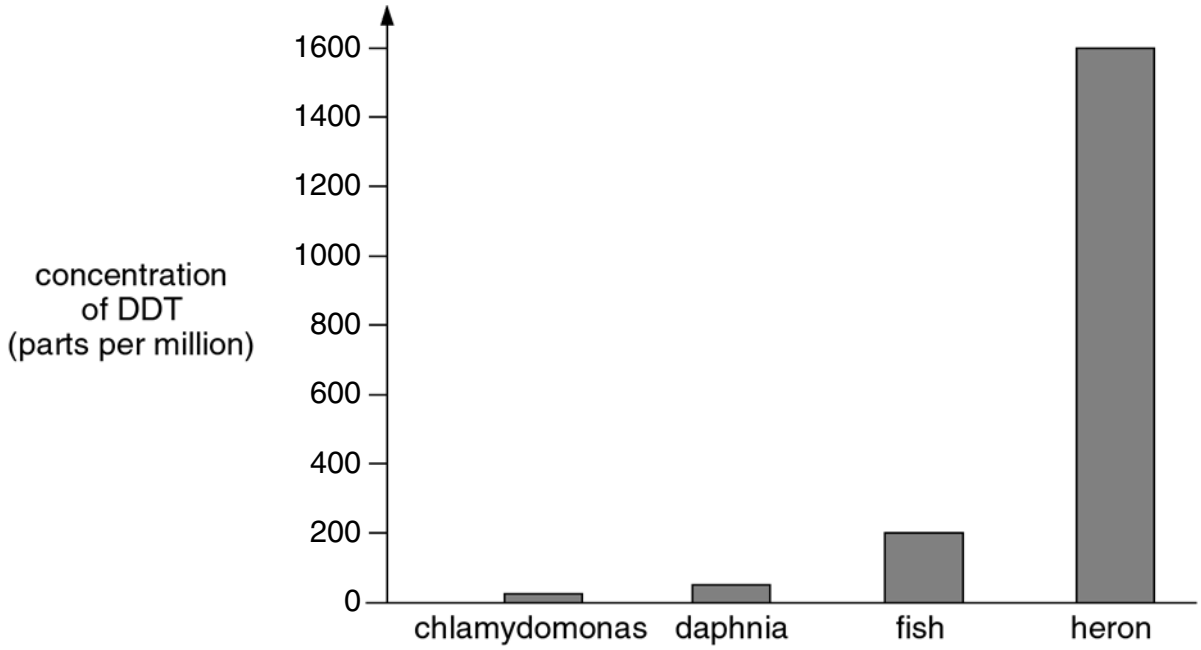

not to scale

(i) **In the space below**, draw the pyramid of numbers for this food chain. Write the name of the correct organism next to each section of the pyramid.

10ai

1 mark

(ii) The bar chart shows the concentration of DDT in the four organisms.



Give **one** reason for the difference in the concentration of DDT in these organisms.

10aii
1 mark

(b) In 1970 the average concentration of DDT in the tissues of sea lions in California was 760 parts per million.
Nearly half the sea lion pups born in that year died because of high levels of DDT in their tissues.

How does DDT get from the body of a mother sea lion into the body of her pup:

(i) **before** the pup is born?

10bi
1 mark

(ii) **after** the pup is born?

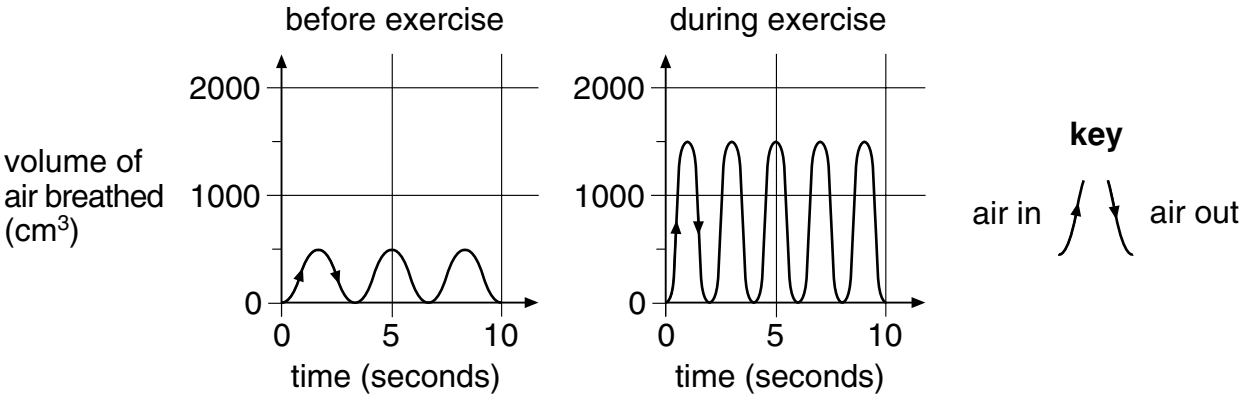
10bii
1 mark

maximum 4 marks

Total
4

11. Joanne measured the volume of air she breathed in and out of her lungs. She used the machine shown in the photograph below.

The graphs represent the volume of air Joanne breathed in and out with each breath **before** and **during** exercise.



(a) During exercise Joanne breathed more air in and out of her lungs than before exercising.

(i) How much **more** air did Joanne breathe in with each breath during exercise?

_____ cm^3

11ai

1 mark

(ii) Explain fully why Joanne needed to breathe in more air during exercise.

11aii
1 mark

11aii
1 mark

11aii
1 mark

(b) (i) As Joanne exercised, the volume of air she breathed in and out increased.
Give **one** other way Joanne's breathing changed during exercise.

11bi
1 mark

(ii) How does the graph show this other change?

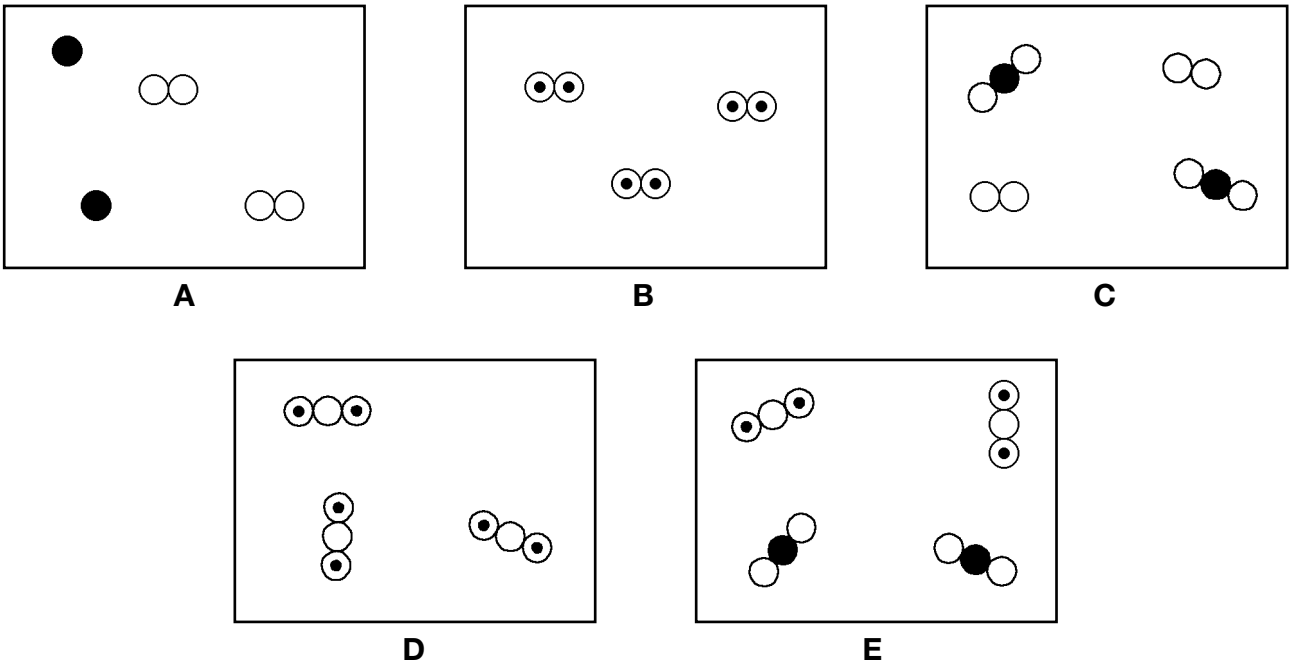
11bii
1 mark

maximum 6 marks

Total
6

12. In the 19th Century, a scientist called John Dalton used symbols to represent atoms. The symbols he used for atoms of three different elements are shown below.

The diagrams below show different combinations of these atoms.



(a) (i) Give the letter of the diagram which shows a mixture of **two** elements.

12ai

1 mark

_____

(ii) Give the letter of the diagram which shows a mixture of **two** compounds.

12aii

1 mark

_____

(iii) Give the letter of the diagram which shows a mixture of an element and a compound.

12aiii

1 mark

_____

(b) Give **one** difference between a compound and a mixture.

_____

_____

_____

12b

1 mark

(c) (i) Suggest a name and formula for the substance represented in diagram B.

name _____

formula _____

12ci

1 mark

(ii) Suggest a name and formula for the substance represented in diagram D.

name _____

formula _____

12cii

1 mark

maximum 6 marks

Total

6

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13. The chemical name for pure limestone is calcium carbonate. When calcium carbonate is heated to a temperature above 825°C it produces calcium oxide and carbon dioxide.

(a) Complete the symbol equation for this reaction.

$CaCO_3 \rightarrow$ _____ + _____

13a
1 mark

13a
1 mark

(b) The photograph shows a limestone statue that has been changed by acid rain.

Some gases which pollute the air dissolve in rainwater to form acids.

(i) Give the name of a gas which dissolves in rainwater, leading to the formation of sulphuric acid.

_____

13bi
1 mark

(ii) Complete the word equation for the reaction between calcium carbonate and sulphuric acid.

calcium carbonate + sulphuric acid $\rightarrow$ _____ + _____ + water

13bii
1 mark

13bii
1 mark

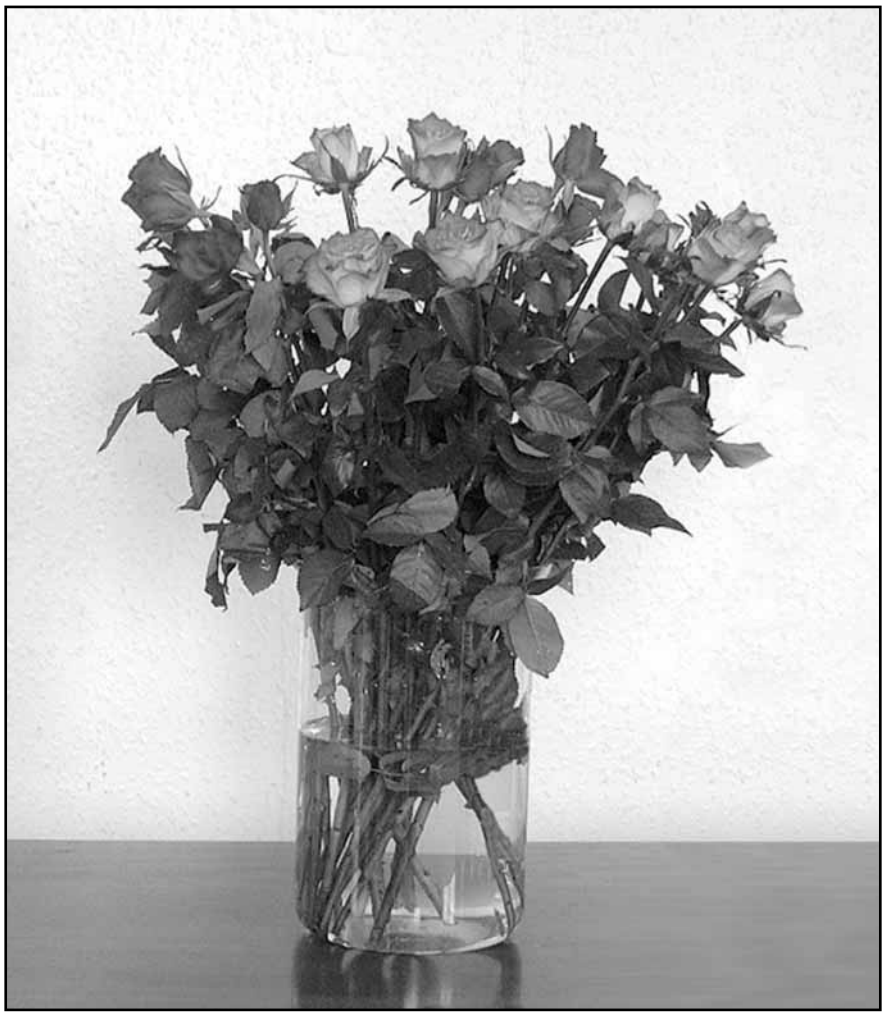
maximum 5 marks

Total
5

14.

'Wilting roses are a thing of the past.'

Scientists at the University of Leeds have found a way to modify the genes of flowering plants.
They claim that flowers from modified plants remain fresh in a vase of water for up to six months longer than flowers from unmodified plants.



Plan an investigation you could carry out in the school laboratory to test the claim that flowers from modified plants last for much longer than flowers from unmodified plants.

You will be provided with flowers from modified plants and from unmodified plants.

In your plan give:

- the **one** factor you will change as you carry out your investigation;
  (This is the independent variable.)
- the factor you will measure;
  (This is the dependent variable.)
- **one** of the factors you should control to ensure a fair test;
- the time scale for the investigation.

14 1 mark

14 1 mark

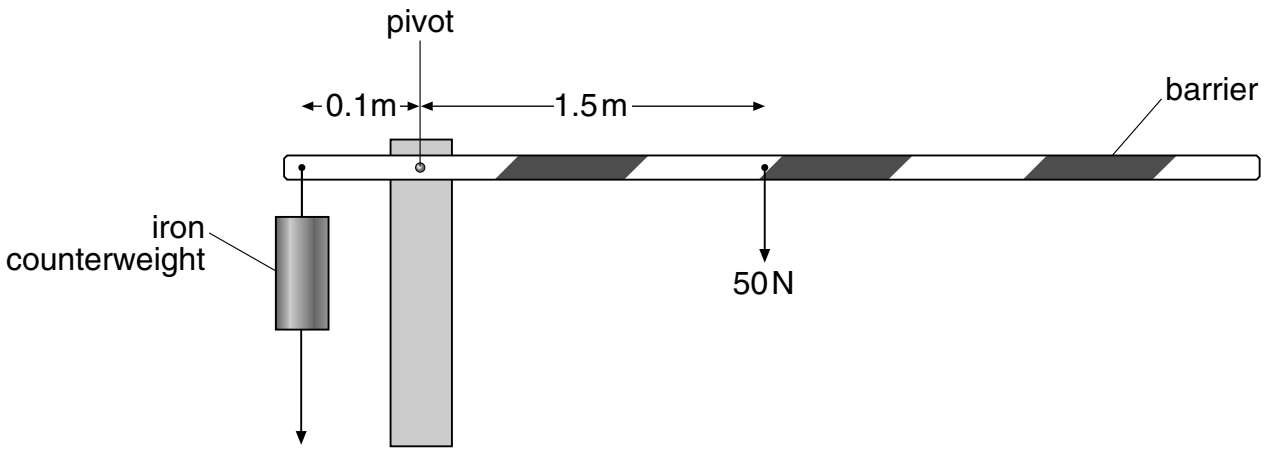
14 1 mark

14 1 mark

maximum 4 marks

Total 4

15. (a) The diagram below shows a car park barrier.



(i) Calculate the turning moment produced by the barrier about the pivot.
Give the unit.

15ai
1 mark

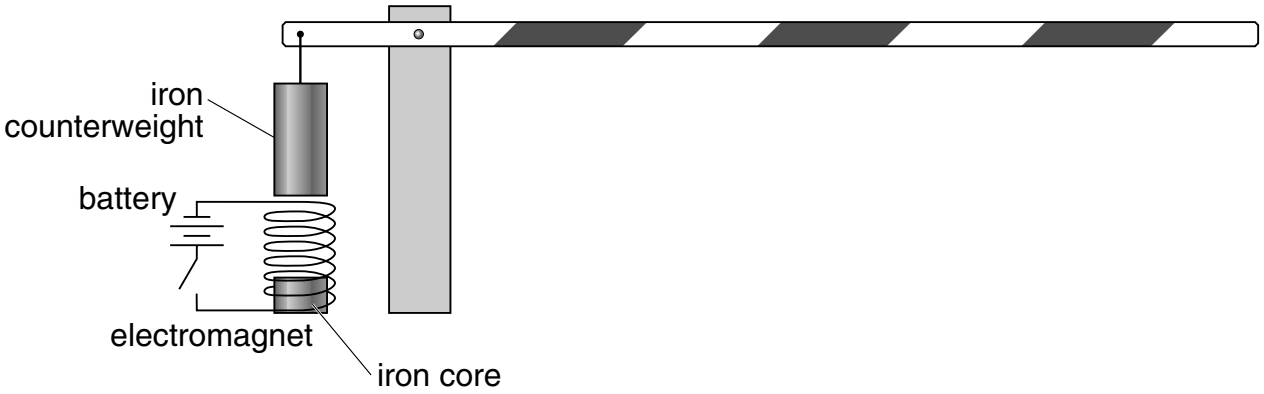
15ai
1 mark

(ii) The barrier is horizontal.
The weight of the barrier is balanced by an iron counterweight.
Calculate the downward force produced by the counterweight.

15aii
1 mark

N

(b) An electromagnet is placed beneath the iron counterweight as shown below.



When the switch is closed the barrier rises.
Explain how the electromagnet can be used to raise the barrier.

15b
1 mark

15b
1 mark

maximum 5 marks

Total
5

END OF TEST

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