

Sc

KEY STAGE

3

TIER

5–7

## Year 9 science test

# Paper 1

First name \_\_\_\_\_

Last name \_\_\_\_\_

Class \_\_\_\_\_

Date \_\_\_\_\_

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

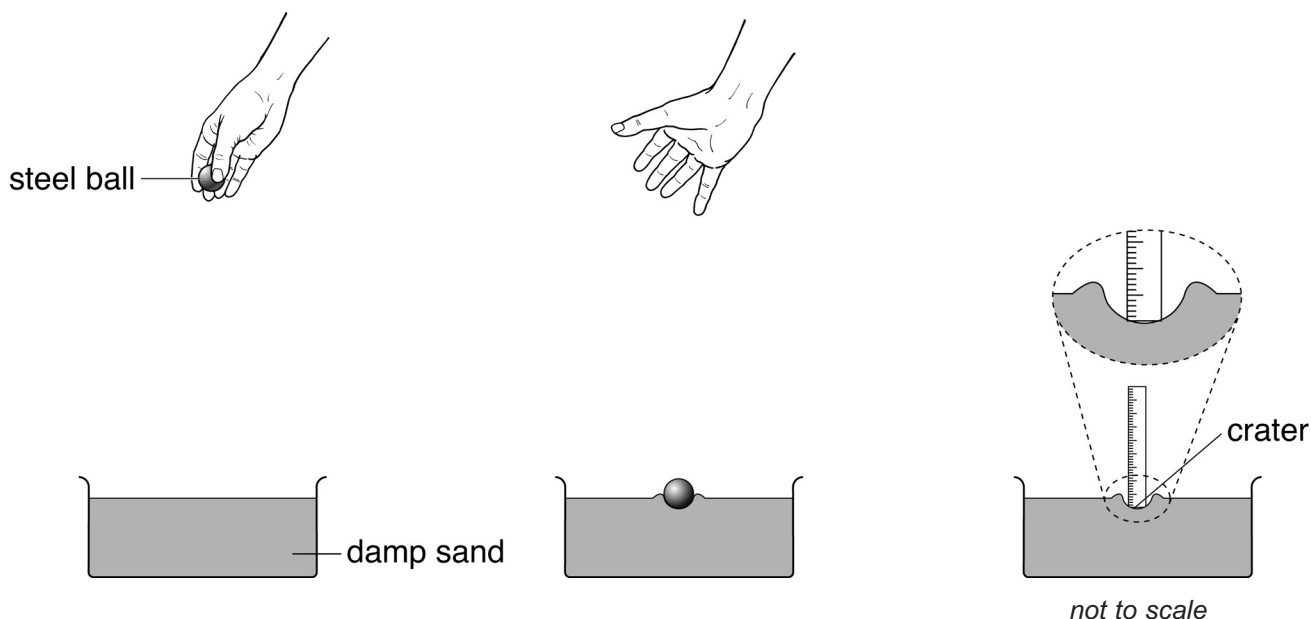
### Remember:

- The test is 1 hour long.
- You will need a pen, pencil, rubber and ruler. You may find a protractor and a calculator useful.
- 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.
- Show any rough working on this paper.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

\_\_\_\_\_

|             |  |
|-------------|--|
| TOTAL MARKS |  |
|-------------|--|

1. Jack and Aneesa dropped a steel ball into trays of damp sand. They measured the depth of the craters made by the steel ball.



Their results are shown in the table below.

| height the ball was dropped from (cm) | depth of crater (cm) |     |                  |
|---------------------------------------|----------------------|-----|------------------|
|                                       | Jack's results       |     | Aneesa's results |
| 10                                    | 1.1                  | 1.2 | 0.8              |
| 20                                    | 1.4                  | 1.5 | 1.4              |
| 30                                    | 1.6                  | 1.6 | 1.5              |
| 40                                    | 1.8                  | 1.7 | 1.8              |
| 50                                    | 2.0                  | 2.1 | 2.1              |

(a) Use information in the table to answer the questions below.

- (i) What was the independent variable that Jack and Aneesa changed in their investigation?

1ai  
1 mark

- (ii) Why was Jack's investigation better than Aneesa's?

1aia  
1 mark

- (b) Look at the results in the table.  
What is the relationship between the height the ball was dropped from and the depth of the crater?

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1b  
1 mark

- (c) Aneesa said that they made sure the investigation was fair.

Suggest **two** variables they must have kept the same to make their investigation fair.

1. 

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2. 

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1c  
1 mark

1c  
1 mark

- (d) (i) Jack removed the steel ball using his fingers. Then he measured the depth of the crater.  
Aneesa said he should use a magnet instead of his fingers.

Explain why using a magnet to remove the ball would improve the investigation.

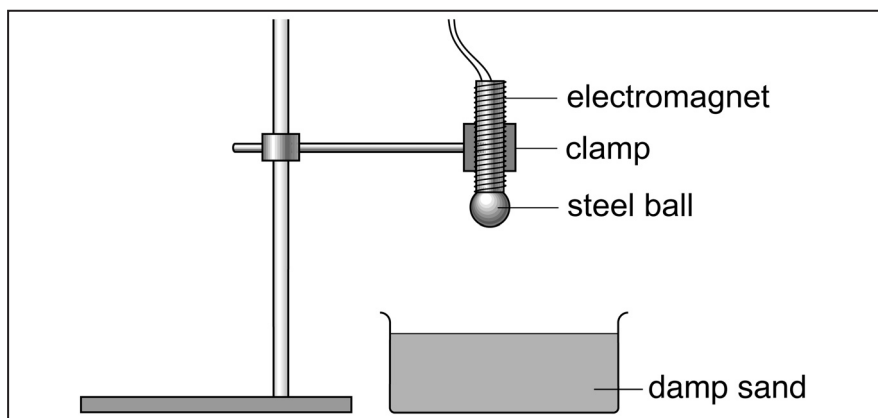
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1di  
1 mark

- (ii) Jack said that the ball could be dropped using an electromagnet instead of dropping it by hand.



Explain why this would improve the investigation.

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1dii  
1 mark

*maximum 7 marks*

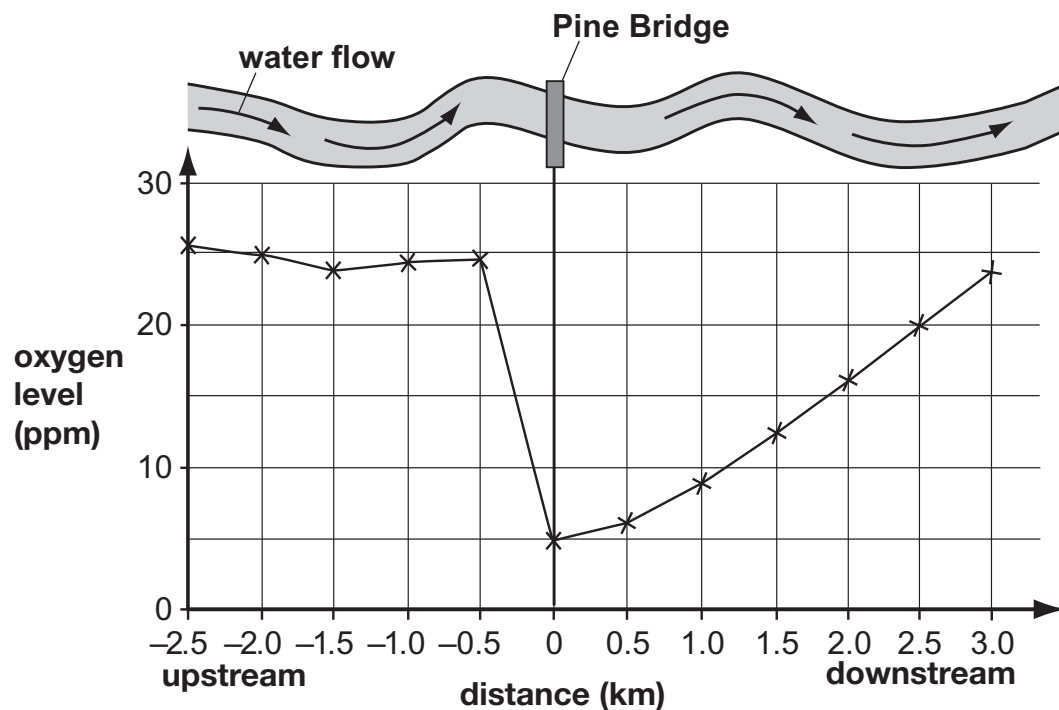
2. The information below comes from a newspaper report.

## River Pollution

Scientists from the Environment Agency were called to investigate a river.

Local fishermen reported that they had not caught trout in the river at Pine Bridge for many months. There were more algae growing in the river and it had a bad smell.

Scientists measured the oxygen levels in the water upstream and downstream from Pine Bridge. The results are shown below.



- (a) (i) What was the oxygen level in the river at Pine Bridge?

\_\_\_\_\_ ppm

- (ii) Describe what happens to the oxygen level in the river as you travel **downstream** from Pine Bridge.

\_\_\_\_\_

- (b) Trout only live in water with oxygen levels higher than 20 ppm. How far **downstream** from Pine Bridge would you be likely to find trout? Write the unit.

\_\_\_\_\_

2ai  
1 mark

2aii  
1 mark

2b  
1 mark

- (c) The scientists collected samples of the river animals found at different places.

| animals collected  | distance from Pine Bridge (km) |      |      |      |   |     |     |     |     |
|--------------------|--------------------------------|------|------|------|---|-----|-----|-----|-----|
|                    | -2.0                           | -1.5 | -1.0 | -0.5 | 0 | 0.5 | 1.0 | 1.5 | 2.0 |
| stonefly nymphs    | ✓                              | ✓    | ✓    | ✓    |   |     |     |     |     |
| mayfly nymphs      | ✓                              | ✓    | ✓    | ✓    |   |     |     |     |     |
| freshwater shrimps | ✓                              | ✓    | ✓    | ✓    |   |     |     |     | ✓   |
| caddis fly larvae  | ✓                              | ✓    | ✓    | ✓    |   |     |     |     |     |
| rat-tailed maggots |                                |      |      |      | ✓ | ✓   |     |     |     |
| sludge worms       |                                |      |      |      | ✓ | ✓   | ✓   |     |     |
| water lice         |                                |      |      |      |   |     | ✓   | ✓   | ✓   |
| bloodworms         |                                |      |      |      |   |     | ✓   |     |     |

Trout only live in water with oxygen levels higher than 20 ppm.  
Give the name of one **other** animal that **only** lives in oxygen levels above 20 ppm.  
Use the table above and the information opposite to help you.

\_\_\_\_\_

2c  
1 mark

- (d) Use the information above and opposite.  
Name **two** animals that are **only** found when the oxygen level is below 10 ppm.

1. \_\_\_\_\_ 2. \_\_\_\_\_

2d  
1 mark

2d  
1 mark

- (e) In the river, trout are predators. Near Pine Bridge, the number of trout decreased.

Suggest **one** reason why pollution may cause the trout population to decrease.

\_\_\_\_\_  
\_\_\_\_\_

2e  
1 mark

*maximum 7 marks*

3. A gannet is a type of sea bird.



- (a) When a gannet flies at a **constant height** above the sea, there is a downward force of 30 N on the gannet.

What is the size of the upward force on the gannet?  
Tick the correct box.

less than 30 N

☐

exactly 30 N

☐

more than 30 N

☐

need more information

☐☐

3a

1 mark

- (b) To catch food, the gannet dives down into the sea.  
What is the useful energy transfer when the gannet dives?  
Choose words from the box below.

thermal

gravitational potential

sound

kinetic

light

When the gannet dives, \_\_\_\_\_ energy is  
transferred to \_\_\_\_\_ energy.

☐

3b

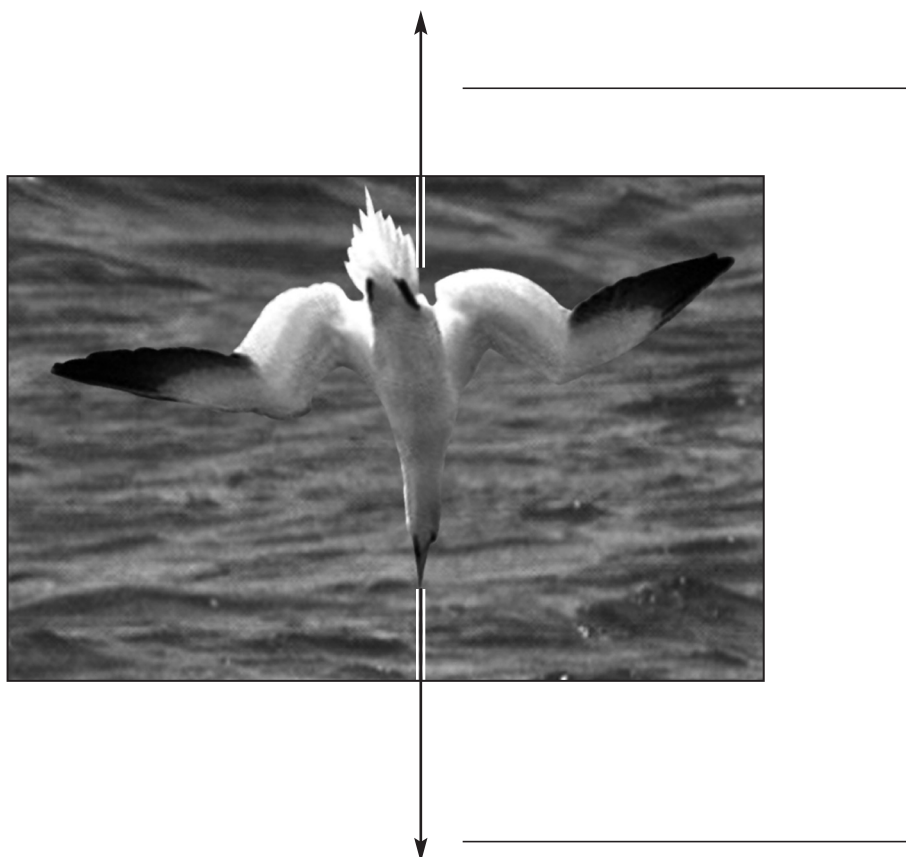
1 mark

☐

3b

1 mark

- (c) Label the arrows to show the **names** of the forces acting on the gannet as it dives.



1 mark 3c

- (d) Gannets have pockets of air between their muscles and their skin. Suggest how this is a good adaptation for gannets when they hit the water at fast speeds.

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1 mark 3c

- (e) The gannet releases energy through respiration. An aeroplane also releases energy when fossil fuels burn.

Write **two** other ways that respiration and burning are similar.

1. \_\_\_\_\_

2. \_\_\_\_\_

1 mark 3d

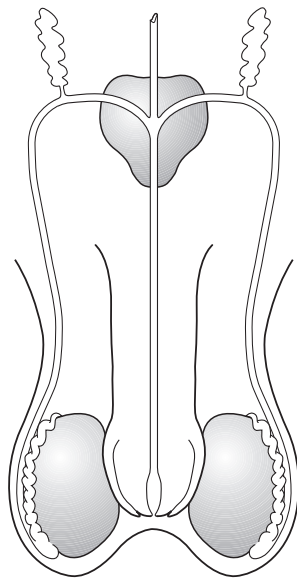
1 mark 3e

1 mark 3e

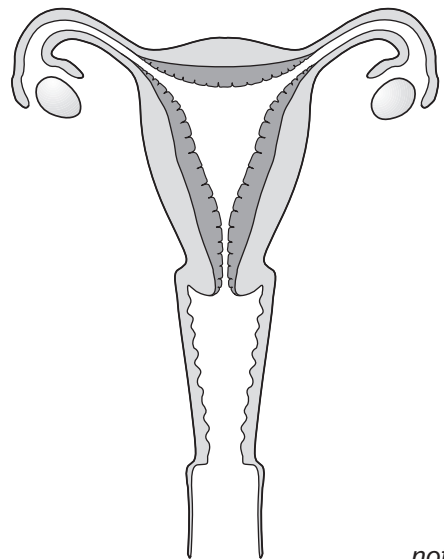
*maximum 8 marks*

4. The diagrams below show the male and female human reproductive systems.

**male and female reproductive systems**



**male**



**female**

*not to scale*

- (a) The table below contains descriptions of parts of the human reproductive system. Complete the table to give the name of each part.

| name of part | description                                |
|--------------|--------------------------------------------|
|              | the tube that carries an egg to the uterus |
|              | the organ that produces sperm              |
|              | the organ that produces the egg            |

4a

1 mark

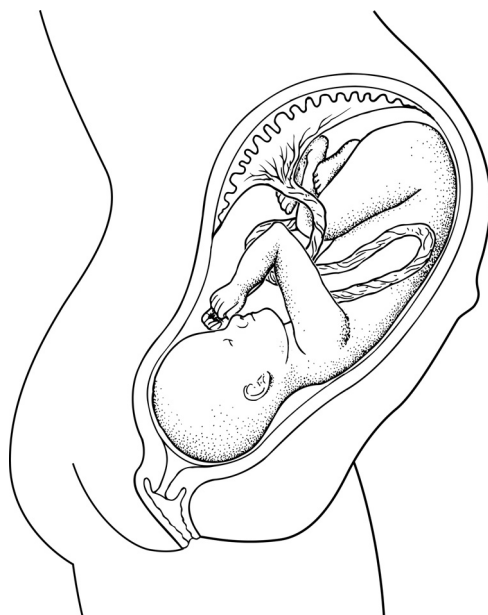
4a

1 mark

4a

1 mark

(b) The diagram below shows an unborn baby.



Complete the sentences below by filling in the gaps.

In humans, normal pregnancy lasts for \_\_\_\_\_ months.

When the foetus is ready to be born, muscles in the uterus wall start to \_\_\_\_\_.

After the baby is born, the \_\_\_\_\_ connecting the foetus to the mother is cut.

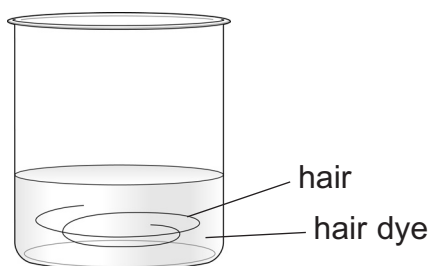
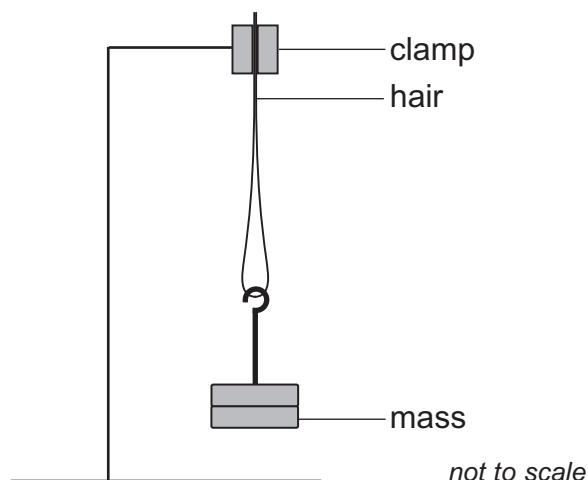
1 mark 4b

1 mark 4b

1 mark 4b

*maximum 6 marks*

5. 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.

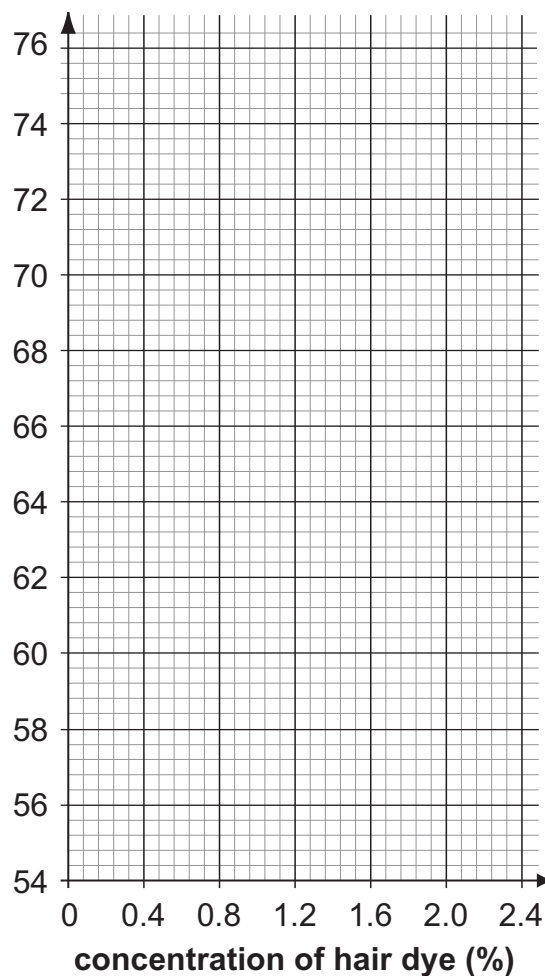


(a) The table below shows Jason's results.

(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                                |

mass needed to break the hair (g)



5ai  
1 mark

5ai  
1 mark

5ai  
1 mark

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

\_\_\_\_\_ g

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

\_\_\_\_\_

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

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

- (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 |
|-----------|-----------|
| _____ ( ) | _____ ( ) |
|           |           |
|           |           |

5aii  
1 mark

5b  
1 mark

5c  
1 mark

5d  
1 mark

5e  
1 mark

5e  
1 mark

5e  
1 mark

5e  
1 mark

*maximum 11 marks*

6. Matthew measured the pH of different soils.

(a) Tick **one** box in each row to show if each soil is acidic, neutral **or** alkaline.

| soil     | pH of soil | acidic | neutral | alkaline |
|----------|------------|--------|---------|----------|
| <b>A</b> | 4.5        |        |         |          |
| <b>B</b> | 5.5        |        |         |          |
| <b>C</b> | 6.3        |        |         |          |
| <b>D</b> | 7.0        |        |         |          |
| <b>E</b> | 7.8        |        |         |          |



6a

1 mark



6a

1 mark

(b) A hydrangea is a flowering plant. Matthew notices that the colour of hydrangea flowers is different for plants grown in different places.

He records the colour of the flowers on each plant.

His results are shown in the table below.



hydrangea flower

| soil     | pH of soil | colour of flowers |        |            |           |
|----------|------------|-------------------|--------|------------|-----------|
|          |            | blue              | violet | light pink | dark pink |
| <b>A</b> | 4.5        | ✓                 |        |            |           |
| <b>B</b> | 5.5        |                   | ✓      |            |           |
| <b>C</b> | 6.3        |                   | ✓      |            |           |
| <b>D</b> | 7.0        |                   |        | ✓          |           |
| <b>E</b> | 7.8        |                   |        |            | ✓         |

Look at Matthew's results.

Do his results support the statement that the colour of hydrangea flowers depends on pH?

yes

☐

no

☐

Explain your answer.

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- (c) Matthew measured the pH of the soil near hydrangea plants found in different places.

Suggest one **other** variable Matthew could **not** control in his investigation.

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- (d) Matthew wants to find out if the colour of blue hydrangea flowers depends on inherited factors **or** environmental factors.  
The flowers were growing in soil of pH 4.5.  
He plants them in soil of pH 6.3.

Complete the table below to show the colours of the new flowers in soil of **pH 6.3**

- (i) if the colour is due to inheritance  
(ii) if the colour is due to the environment

Use the table on the opposite page to complete the table below.

|                                                  | colour |
|--------------------------------------------------|--------|
| starting colour of hydrangea flowers             | blue   |
| colour of new flowers if only due to inheritance |        |
| colour of new flowers if only due to environment |        |

*maximum 6 marks*

6b  
1 mark

6c  
1 mark

6d  
1 mark

6d  
1 mark

Total  
6

7. 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. \_\_\_\_\_

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

\_\_\_\_\_  
\_\_\_\_\_

(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<br>(g) | speed of rise<br>(mm/s) |
|-------------|-------------------------|
| 0           | 120                     |
| 10          | 60                      |
| 20          | 40                      |
| 30          | -20                     |
| 40          | -70                     |



7ai

1 mark



7aii

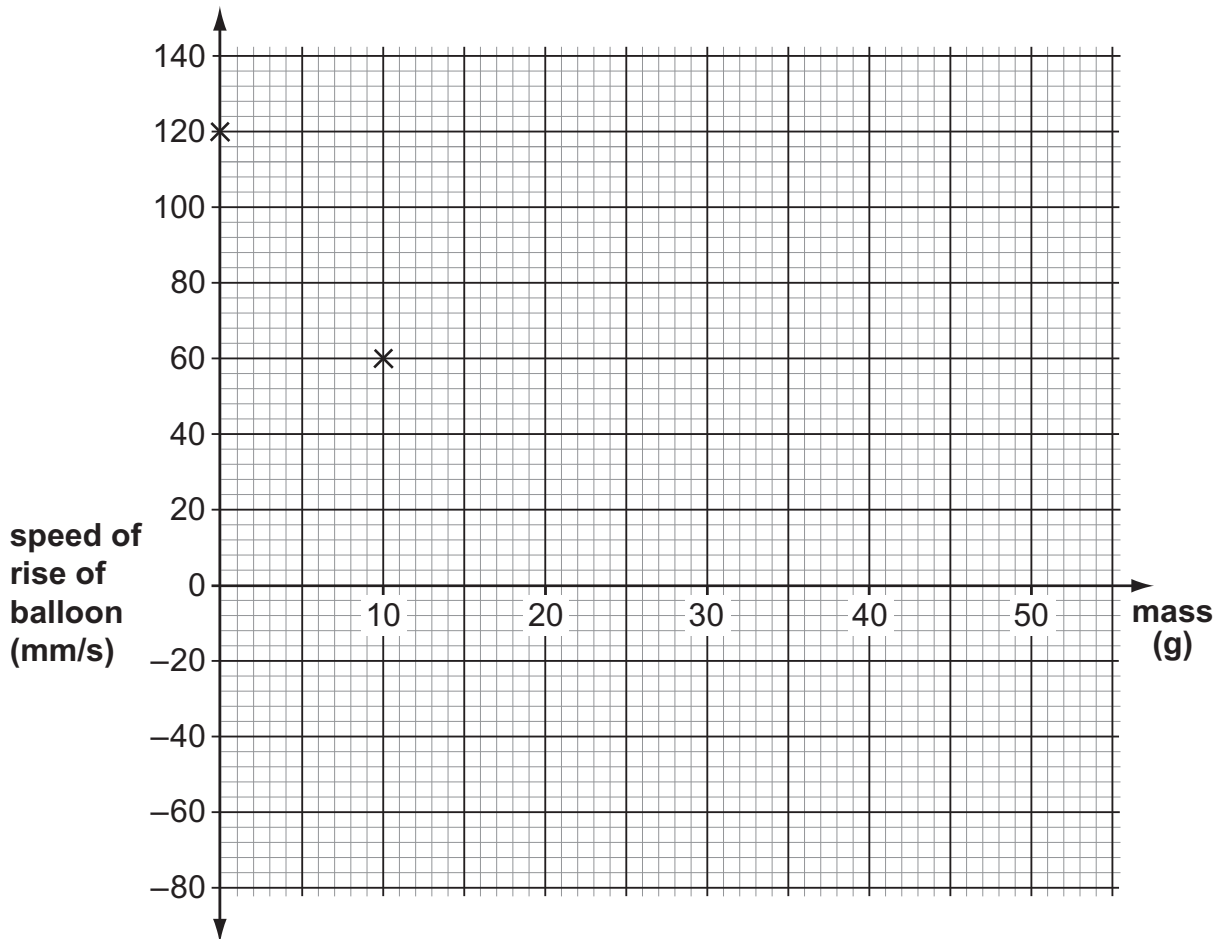
1 mark

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

\_\_\_\_\_

1 mark 7bi

(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.



1 mark 7bii

1 mark 7bii

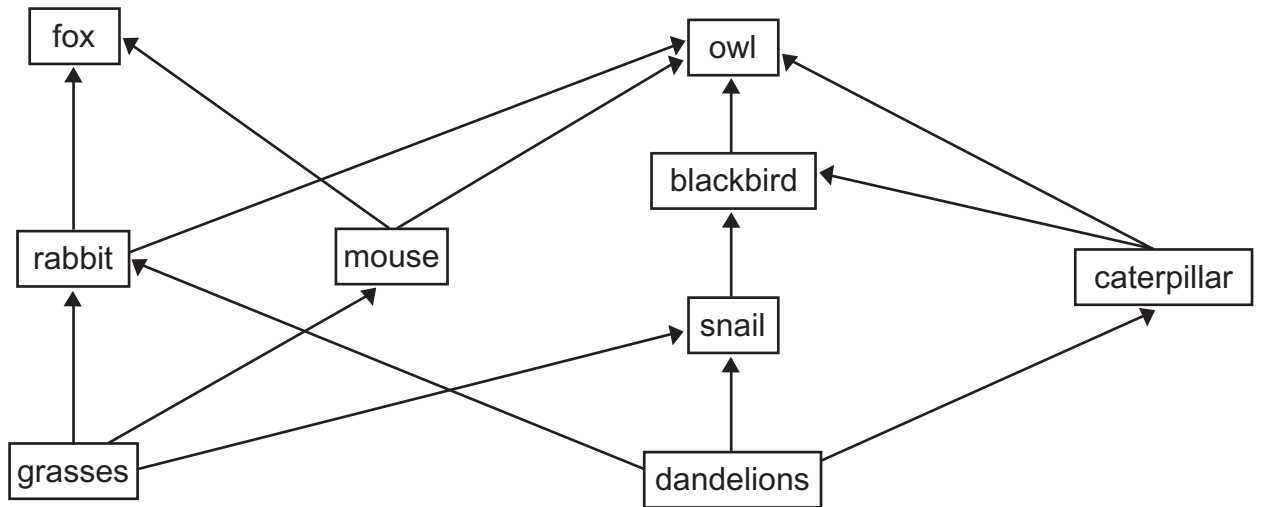
(iii) From the graph, find the mass needed to keep the balloon floating in one place.

\_\_\_\_\_ g

1 mark 7biii

maximum 6 marks

8. The diagram below shows part of a grassland food web.



(a) One year the snail population increased in the grassland area.

How could an increase in the number of snails cause the caterpillar population to **increase**?

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(b) Snail poison can be used to control the number of snails. After some time, each owl contains more poison than each snail. Explain why each owl contains more poison than each snail.

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- (c) A scientist wants to record the number of dandelion plants in the grassland area.

Describe how they could use a 1 m<sup>2</sup> quadrat to estimate the number of dandelions growing in the grassland area.

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8c

1 mark

8c

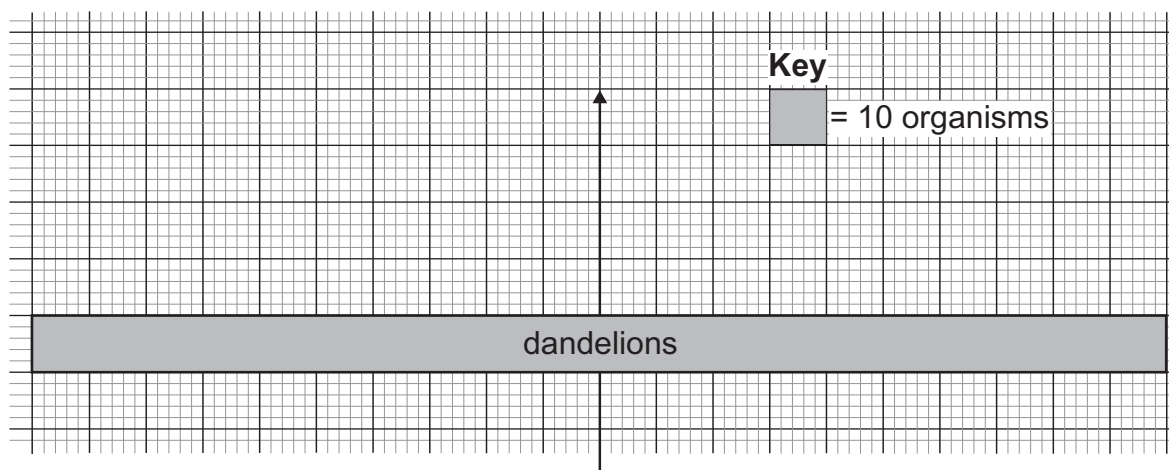
  

1 mark

- (d) The table below shows the population numbers for one food chain from the food web.

| organism   | number |
|------------|--------|
| dandelions | 200    |
| rabbits    | 20     |
| foxes      | 4      |

Complete the pyramid of numbers on the graph paper below to represent this food chain. Label the pyramid to show each animal.



8d

1 mark

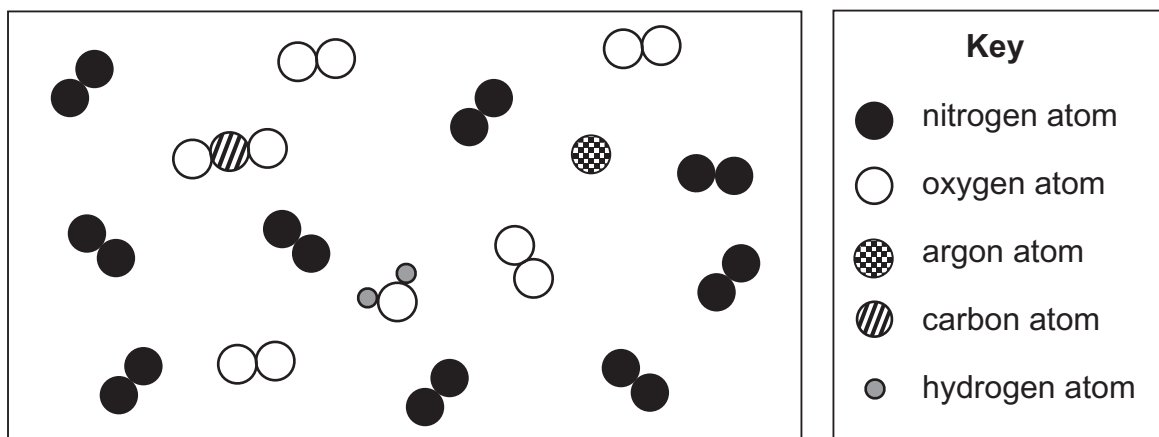
8d

1 mark

*maximum 7 marks*

9. The diagram below represents the particles found in air.



(a) Complete the following table. Use the diagram and key above to help you.

| name     | symbol | chemical formula |
|----------|--------|------------------|
| argon    |        | Ar               |
| nitrogen |        |                  |
| oxygen   |        | O <sub>2</sub>   |
|          |        |                  |

(b) Air is a **gas** at room temperature.  
What evidence in the diagram above shows this?

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9a  
1 mark

9a  
1 mark

9a  
1 mark

9b  
1 mark

- (c) A sample of air in a balloon is cooled.  
Complete the sentences below using words from the box.  
You may use each word more than once.

|                  |                  |                       |
|------------------|------------------|-----------------------|
| <b>increases</b> | <b>decreases</b> | <b>stays the same</b> |
|------------------|------------------|-----------------------|

When the air is cooled, the volume of the air \_\_\_\_\_ and  
the mass of the air \_\_\_\_\_.

When the air is cooled, the density of the air \_\_\_\_\_.

- (d) In 1902, the scientist Carl von Linde cooled air to produce **liquid oxygen**.

The table below shows the melting points and boiling points of four substances that are found in air.

| substance | melting point (°C) | boiling point (°C) |
|-----------|--------------------|--------------------|
| argon     | −189               | −186               |
| oxygen    | −218               | −183               |
| nitrogen  | −210               | −196               |
| water     | 0                  | 100                |

Before Linde, scientists tried to produce **liquid air** by cooling it to  $-190^{\circ}\text{C}$ .  
Give a reason why liquid air was not produced.

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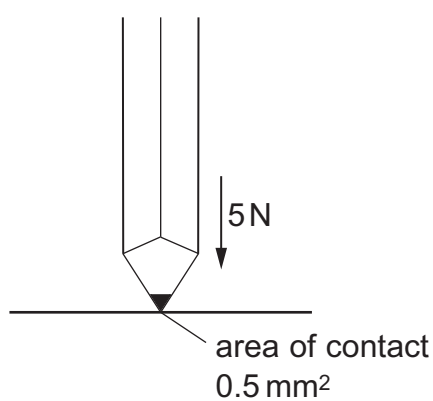
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*maximum 6 marks*

10. Jenny is doing her homework.



(a) When Jenny writes, the pencil exerts a force of 5 N on the paper.



*not to scale*

The area of the pencil in contact with the paper is  $0.5 \text{ mm}^2$ .

Calculate the pressure of the pencil on the paper.  
Give the unit.

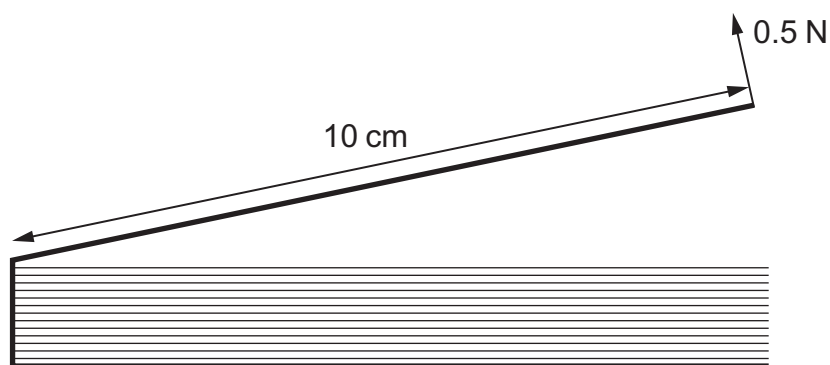
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10a  
1 mark

10a  
1 mark

- (b) Jenny puts a book on her desk.  
She lifts the cover up with her finger, using a force of 0.5 N.  
The cover is 10 cm wide.



Calculate the turning moment on the cover of the book.  
Give the unit.

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- (c) Jenny's book has an area of  $200 \text{ cm}^2$ .  
It exerts a pressure of  $0.05 \text{ N/cm}^2$  on the desk.

What is the weight of the book?  
Use the space below to show your working.

\_\_\_\_\_ N

☐ 10b  
1 mark

☐ 10b  
1 mark

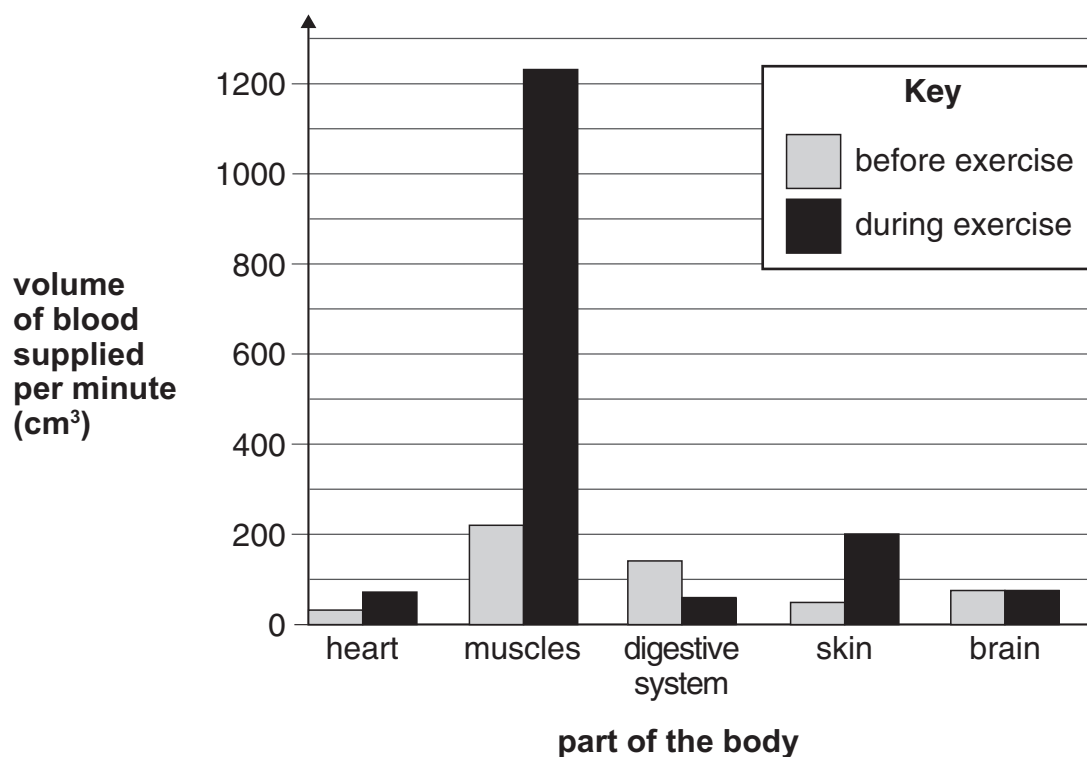
☐ 10c  
1 mark

☐ 10c  
1 mark

*maximum 6 marks*

11. When people exercise, the volume of blood per minute needed to supply different parts of the body changes.

This is shown in the bar chart below.



- (a) Explain why muscles need **more** blood during exercise. Give **three** reasons.

11a  
1 mark

11a  
1 mark

11a  
1 mark

- 
- (b) Look at the bar chart.  
Suggest why you should not go for a long run just after eating a meal.

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☐ 11b  
1 mark

- (c) Why is it important that the blood supply to the brain stays constant?

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☐ 11c  
1 mark

**END OF TEST**

*maximum 5 marks*

