

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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# GCSE ADDITIONAL SCIENCE

# F

Foundation Tier Unit 5

Friday 9 June 2017

Morning

Time allowed: 1 hour 30 minutes

### Materials

For this paper you must have:

- a ruler
- a calculator
- the Chemistry Data Sheet and Physics Equations Sheet Booklet (enclosed).

### Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 14 should be answered in continuous prose.  
In this question you will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.

### Advice

- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
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9	
10	
11	
12	
13	
14	
15	
16	
<b>TOTAL</b>	

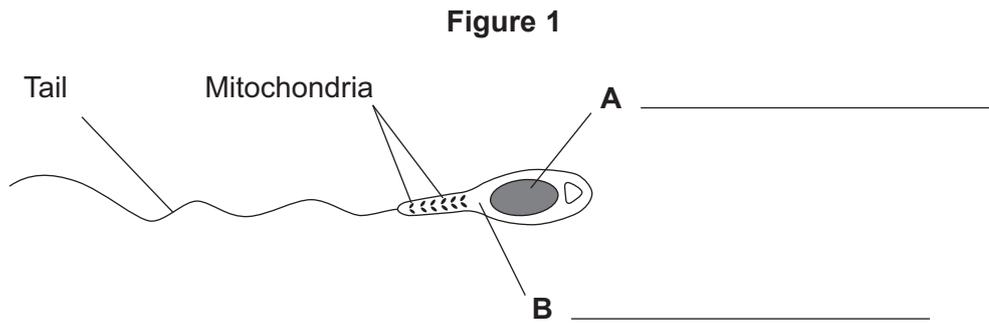


Answer **all** questions in the spaces provided.

### Biology Questions

1 **Figure 1** shows a sperm cell.

A sperm cell is an animal cell.



1 (a) (i) Use words from the box to label parts **A** and **B** on **Figure 1**.

[2 marks]

Cell membrane	Cell wall	Cytoplasm	Nucleus
---------------	-----------	-----------	---------

1 (a) (ii) Sperm cells contain many mitochondria.

The mitochondria help the sperm cell to swim.

What is the function of mitochondria?

[1 mark]

Tick (✓) **one** box.

Mitochondria release energy.

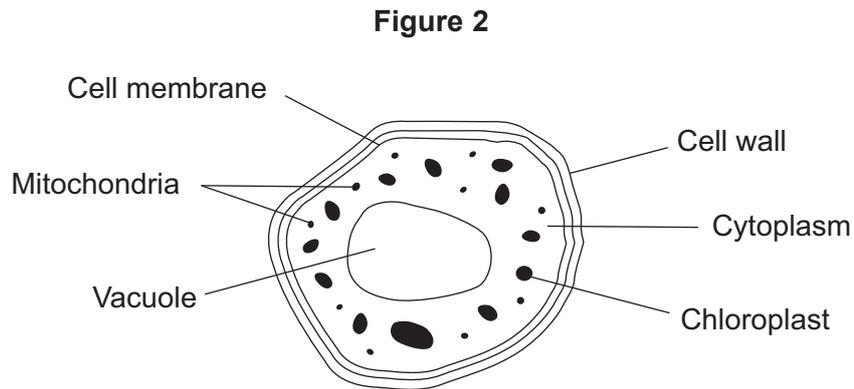
Mitochondria make proteins.

Mitochondria fertilise egg cells.

Mitochondria protect the cell.



1 (b) Figure 2 shows a plant cell from a leaf.



Give the names of **two** parts of the plant cell which are **not** found in a sperm cell.

[2 marks]

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_

1 (c) Cells in a leaf use light to make food by photosynthesis.

Where in a plant cell does photosynthesis happen?

[1 mark]

\_\_\_\_\_

6

Turn over for the next question

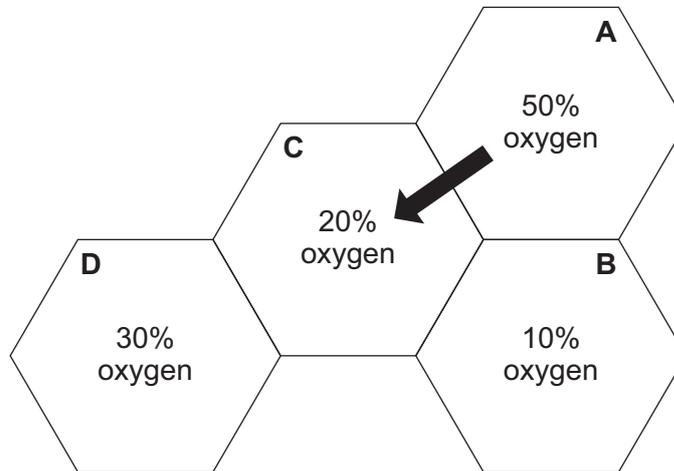
Turn over ►



2 **Figure 3** shows four cells, **A**, **B**, **C** and **D**.

The concentration of oxygen in each cell is shown.

**Figure 3**



2 (a) The arrow on **Figure 3** shows the direction oxygen moves from cell **A** to cell **C**.

How does oxygen move from cell **A** to cell **C**?

[1 mark]

Draw a ring around the correct answer.

**diffusion**

**photosynthesis**

**respiration**

2 (b) (i) Draw **three** more arrows on **Figure 3** to show the direction oxygen will move between:

- cell **A** and cell **B**
- cell **B** and cell **C**
- cell **C** and cell **D**.

[2 marks]



**2 (b) (ii)** Between which **two** cells will the rate of oxygen movement be the fastest?

**[2 marks]**

Tick (✓) **one** box.

Between cell **A** and cell **B**

Between cell **A** and cell **C**

Between cell **B** and cell **C**

Between cell **C** and cell **D**

Give the reason for your answer.

---

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5

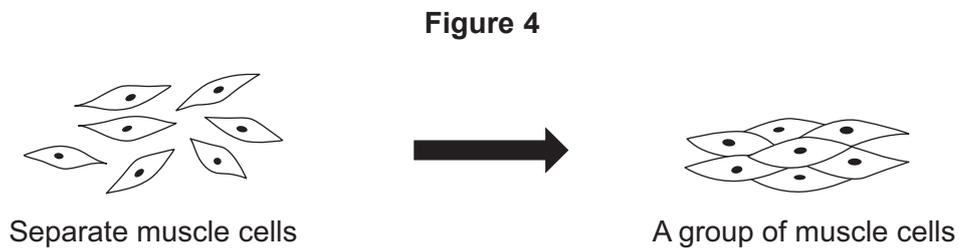
**Turn over for the next question**

**Turn over ►**



3 In large multicellular organisms the cells are organised into groups.

3 (a) (i) **Figure 4** shows the organisation of separate muscle cells.



Use the correct answer from the box to complete the sentence.

[1 mark]

an organism

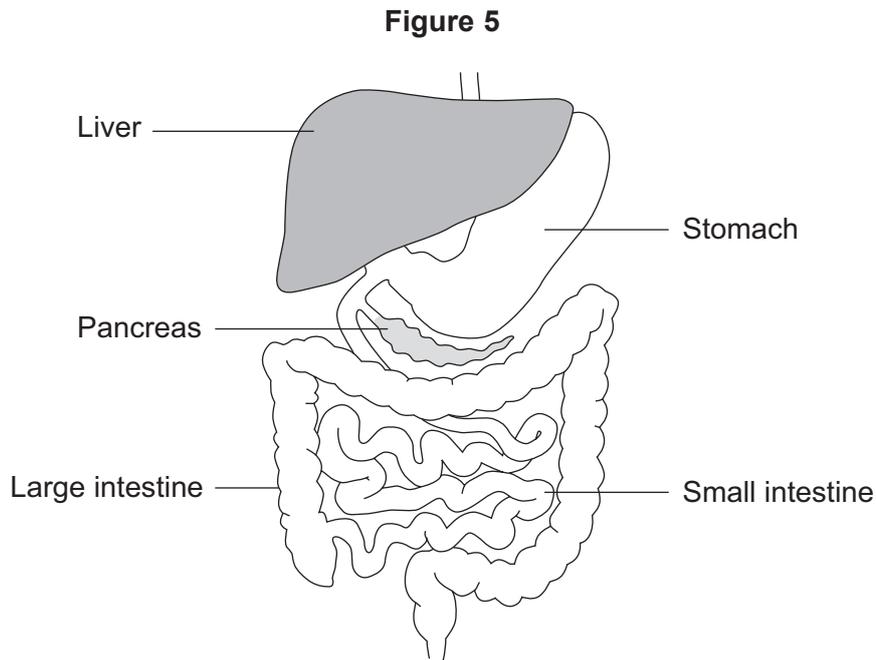
an organ

a tissue

A group of cells working together is called \_\_\_\_\_.



3 (a) (ii) **Figure 5** shows five organs in the body.



Complete the sentence.

[1 mark]

The organs in **Figure 5** are grouped together to form  
the digestive \_\_\_\_\_ .

3 (b) Plants contain specialised cells called xylem and phloem.

What is the function of xylem and phloem?

[1 mark]

Tick (✓) **one** box.

To cover the plant

To carry out photosynthesis

To transport substances

3

Turn over ►



**4 (a)** Photosynthesis uses carbon dioxide.

Where do plants get the carbon dioxide from?

[1 mark]

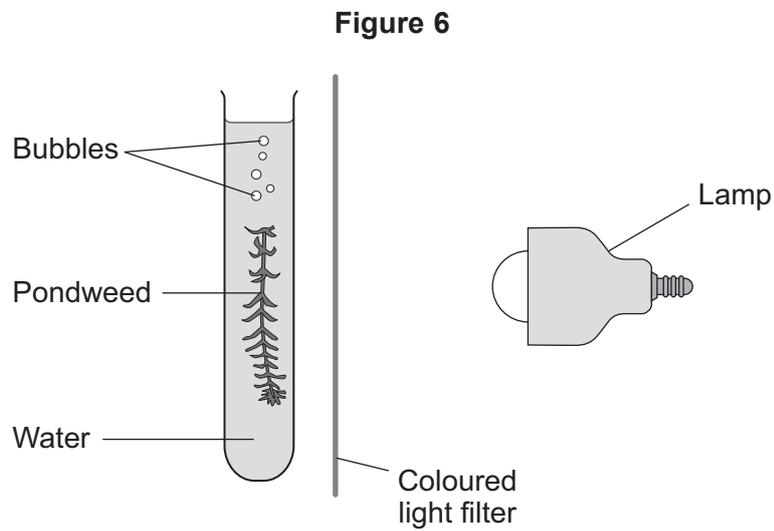
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**4 (b)** Students investigated the effect of the colour of light on the rate of photosynthesis.

**Figure 6** shows the apparatus the students used.

The students used different coloured light filters.



**4 (b) (i)** What is the independent variable in this investigation?

[1 mark]

---



**4 (b) (ii)** The students counted the number of bubbles released by the pondweed in two minutes.

Which equation should they use to calculate the rate of photosynthesis?

[1 mark]

Tick (✓) **one** box.

rate = number of bubbles  $\times$  time

rate =  $\frac{\text{number of bubbles}}{\text{time}}$

rate =  $\frac{\text{time}}{\text{number of bubbles}}$

**4 (b) (iii)** To get valid results the students kept the same light intensity in each part of the investigation.

Suggest how they did this.

[1 mark]

---

---

**Question 4 continues on the next page**

**Turn over ►**



4 (c) Table 1 shows the students' results.

Table 1

Colour of light filter	Rate of photosynthesis in arbitrary units			
	1st trial	2nd trial	3rd trial	Mean
Blue	22	25	24	24
Green	5	4	4	4
Red	19	16	17	17
Yellow	8	6	10	

4 (c) (i) Calculate the mean rate of photosynthesis when the yellow filter was used.

[1 mark]

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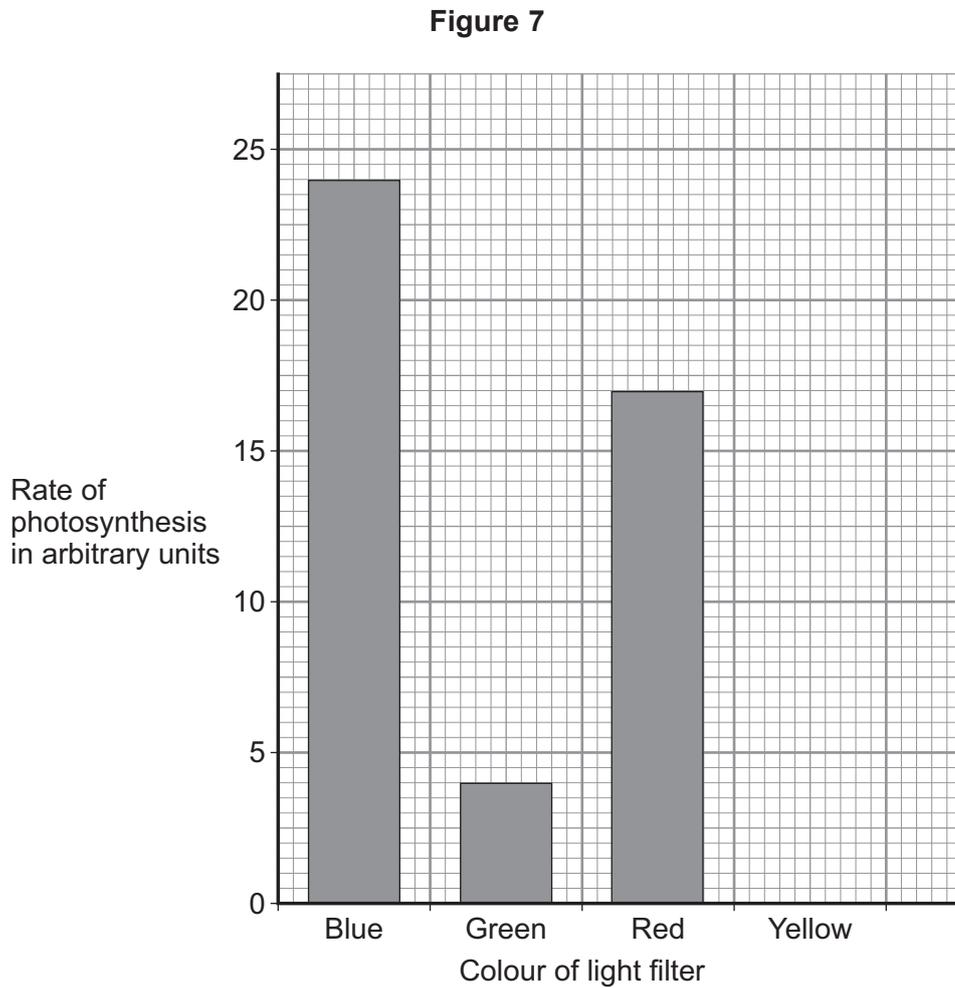
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Mean rate of photosynthesis = \_\_\_\_\_ arbitrary units



4 (c) (ii) Complete **Figure 7** by plotting your answer to part (c)(i) on the bar chart.

[1 mark]



4 (c) (iii) Which colour of light is most useful for photosynthesis?

[1 mark]

---

7

Turn over for the next question

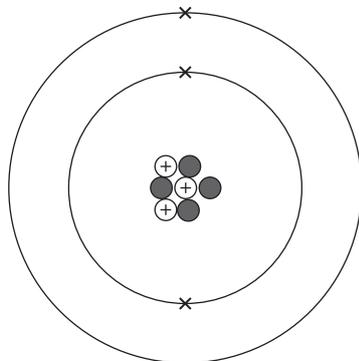
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## Chemistry Questions

5 **Figure 8** shows a lithium atom.

**Figure 8**



5 (a) (i) Name the particle in the atom that has a positive charge.

[1 mark]

\_\_\_\_\_

5 (a) (ii) Name the particle in the atom that has the smallest mass.

[1 mark]

\_\_\_\_\_

5 (a) (iii) Use the correct number from the box to complete each sentence.

[2 marks]

3	4	7	10
---	---	---	----

The mass number of the lithium atom is \_\_\_\_\_.

The number of neutrons in the lithium atom is \_\_\_\_\_.



**5 (b)** What are lithium atoms with different numbers of neutrons called?

[1 mark]

Tick (✓) **one** box.

Compounds

Ions

Isotopes

Molecules

**5 (c)** Which group of the periodic table is lithium in?

[1 mark]

---

6

**Turn over for the next question**

**Turn over ►**

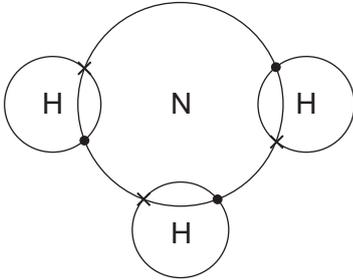


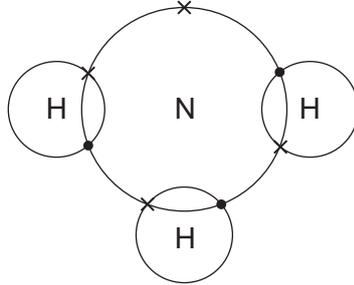
6 This question is about ammonia ( $\text{NH}_3$ ).

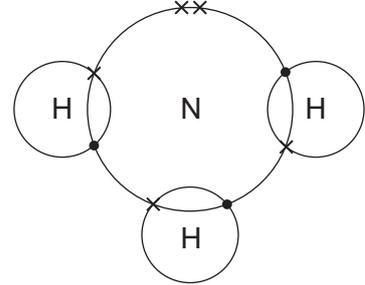
6 (a) (i) Which diagram represents the structure of ammonia?

[1 mark]

Tick (✓) **one** box.








6 (a) (ii) How many different elements are in one molecule of ammonia?

[1 mark]

\_\_\_\_\_

6 (a) (iii) What is the total number of atoms in one molecule of ammonia?

[1 mark]

\_\_\_\_\_



**6 (b)** Ammonia is a simple molecule.

Give **two** properties of simple molecules.

[2 marks]

Tick (✓) **two** boxes.

Do **not** conduct electricity

Form giant structures

High melting points

Low boiling points

Strong electrostatic forces

**6 (c)** Ammonia is produced from nitrogen and hydrogen.

The equation for the reaction is:



28 kg of nitrogen was reacted with 6 kg of hydrogen.

The maximum theoretical yield is 34 kg.

Only 17 kg of ammonia was produced.

Use the correct answer from the box to complete the sentence.

[1 mark]

<b>greater than</b>	<b>equal to</b>	<b>less than</b>
---------------------	-----------------	------------------

The percentage yield was \_\_\_\_\_ 50%.

<b>6</b>

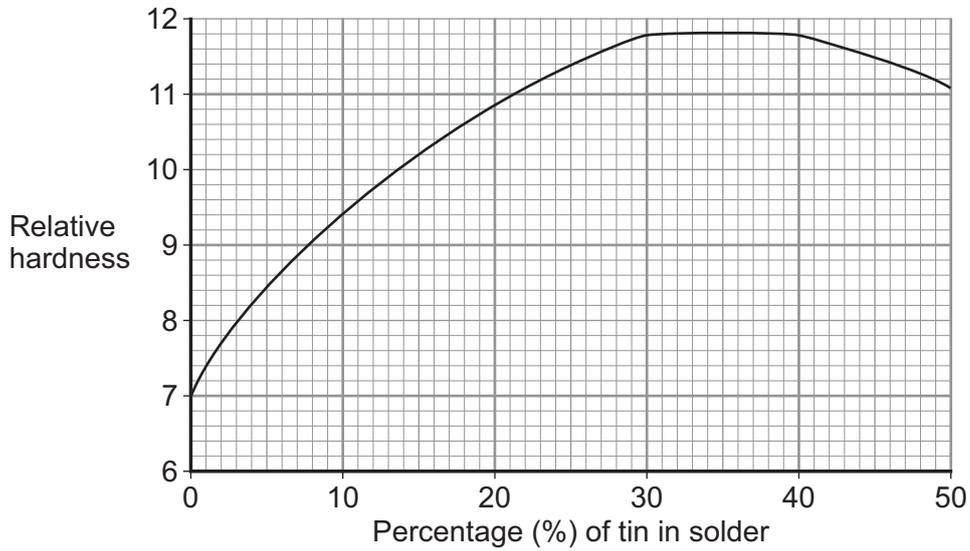
Turn over ►



7 Solder is an alloy of tin and lead.

The graph in **Figure 9** shows how the percentage of tin affects the relative hardness of solder.

**Figure 9**



7 (a) What is the relative hardness of solder containing 15% tin?

Use information from **Figure 9**.

[1 mark]

Relative hardness \_\_\_\_\_

7 (b) Give **two** conclusions you can make from **Figure 9**.

Include data from **Figure 9** in your answer.

[2 marks]

1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



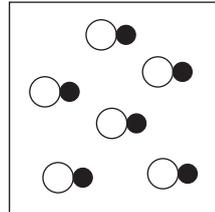
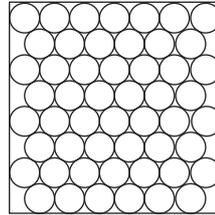
- 7 (c) Draw **one** line from each substance to the diagram showing the arrangement of its atoms.

[2 marks]

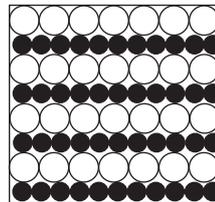
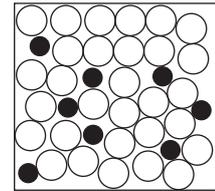
Substance

Arrangement of atoms

Solid lead



Solid solder



5

Turn over for the next question

Turn over ►



**8** This question is about potassium chloride.

**8 (a)** Calculate the percentage of potassium in potassium chloride (KCl).

**[1 mark]**

Use the equation below to help you answer the question.

$$\text{percentage (\%)} \text{ of potassium} = \frac{\text{relative atomic mass of potassium}}{\text{relative formula mass of potassium chloride}} \times 100$$

Relative formula mass ( $M_r$ ) of potassium chloride = 74.5

Relative atomic masses ( $A_r$ ): potassium = 39, chlorine = 35.5

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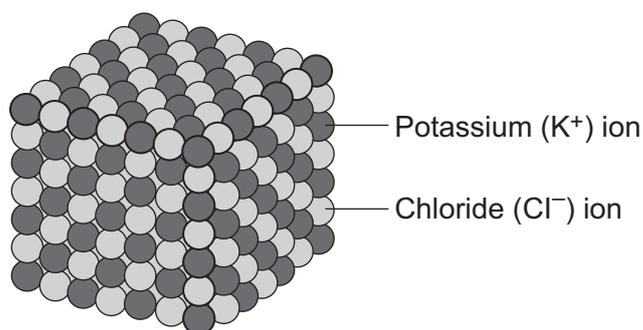


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Percentage of potassium = \_\_\_\_\_ %

**8 (b)** **Figure 10** shows the structure of solid potassium chloride.

**Figure 10**



Describe how potassium ions and chloride ions are held together in solid potassium chloride.

**[2 marks]**

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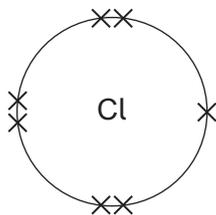
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**8 (c)** When potassium reacts with chlorine, the chlorine atoms change into chloride ions.

**Figure 11** shows the outer electrons of a chlorine atom.

**Figure 11**



Describe how a chlorine atom (Cl) becomes a chloride ion (Cl<sup>-</sup>).

**[1 mark]**

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4

**Turn over for the next question**

**Turn over ►**



### Physics Questions

**9 (a)** A car driver sees the traffic lights change to red and applies the brakes.

Use the correct answer from the box to complete each sentence.

**[2 marks]**

<b>braking</b>	<b>resultant</b>	<b>speeding</b>	<b>thinking</b>
----------------	------------------	-----------------	-----------------

The distance travelled while the driver reacts is called

the \_\_\_\_\_ distance.

The distance travelled while the brakes are applied is called

the \_\_\_\_\_ distance.

**9 (b)** **Figure 12** shows the stopping distances of a car at different speeds.

**Figure 12**

**Speed of car**



**9 (b) (i)** Use the correct answer from the box to complete the sentence.

**[1 mark]**

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

When the speed of the car increases

the stopping distance \_\_\_\_\_.



**9 (b) (ii)** Give **three** factors other than speed that will affect the stopping distance of the car.

**[3 marks]**

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

3 \_\_\_\_\_

\_\_\_\_\_

**9 (c)** The brakes of the car are applied.

The brakes provide a frictional force to slow the car down.

The kinetic energy of the car is transferred into other forms of energy.

What is the effect of the energy transfers on the surroundings?

**[1 mark]**

\_\_\_\_\_

\_\_\_\_\_

7

**Turn over for the next question**

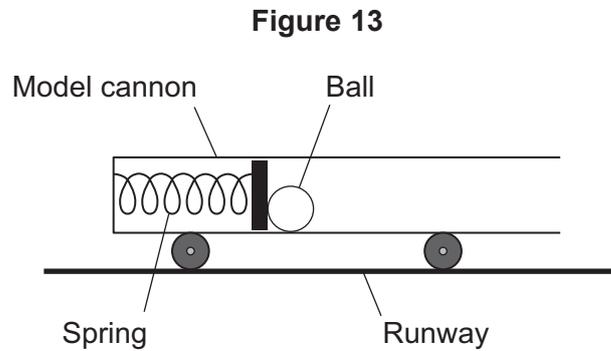
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**10** A student uses a model cannon to fire a ball.

The cannon can move on wheels.

**Figure 13** shows the cannon and the ball before firing.



**10 (a)** The cannon is stationary at the start.

What is the total momentum of the cannon and ball before the cannon is fired?

Give a reason for your answer.

**[2 marks]**

Total momentum \_\_\_\_\_

\_\_\_\_\_

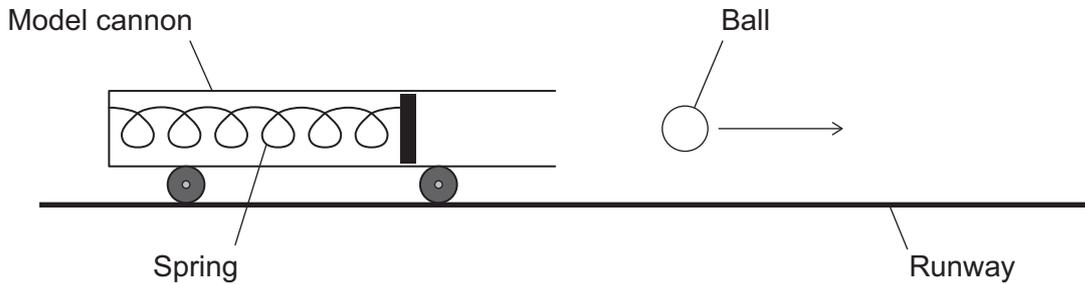
Reason \_\_\_\_\_

\_\_\_\_\_



10 (b) Figure 14 shows the cannon and the ball after the cannon is fired.

Figure 14



The ball has a velocity of 7 m/s as it leaves the cannon.

The mass of the ball is 0.2 kg.

Calculate the momentum of the ball as it leaves the cannon.

[3 marks]

Use the correct equation from the Physics Equations Sheet.

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Momentum of ball = \_\_\_\_\_

Draw a ring around the correct unit.

kg m/s

kJ

m/s<sup>2</sup>

5

Turn over for the next question

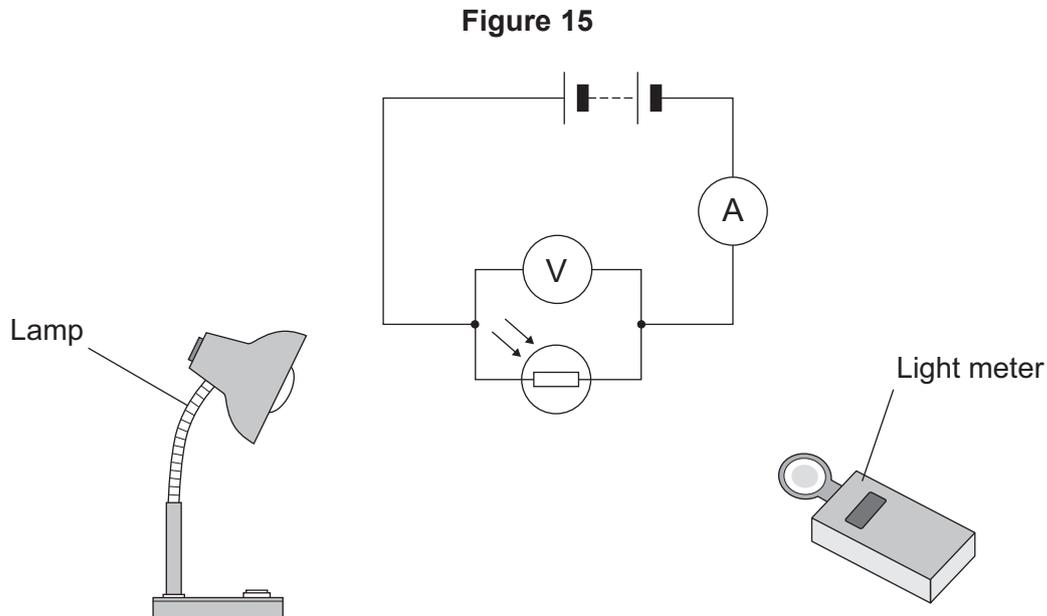
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- 11 A student investigated the resistance of a light-dependent resistor (LDR) at different light intensities.

The independent variable in this investigation was light intensity.

Figure 15 shows the equipment he used.



The student used readings from the ammeter and the voltmeter to calculate the resistance of the LDR.

- 11 (a) Use the correct answer from the box to complete the sentence.

[1 mark]

<b>decreased</b>	<b>increased</b>	<b>stayed the same</b>
------------------	------------------	------------------------

As the light intensity increased, the resistance of  
the LDR \_\_\_\_\_ .



**11 (b)** During the investigation the student needed to control certain variables to get valid results.

Give **two** control variables for this investigation.

**[2 marks]**

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

**11 (c)** Which **two** actions will increase the chance of an anomalous result in this investigation?

**[2 marks]**

Tick (✓) **two** boxes.

Moving the ammeter to the other side of the circuit

Covering the LDR with a hand while taking readings

Reading the ammeter and voltmeter at exactly the same time

Moving the light meter around during the investigation

Checking there are no zero errors on the meters

5

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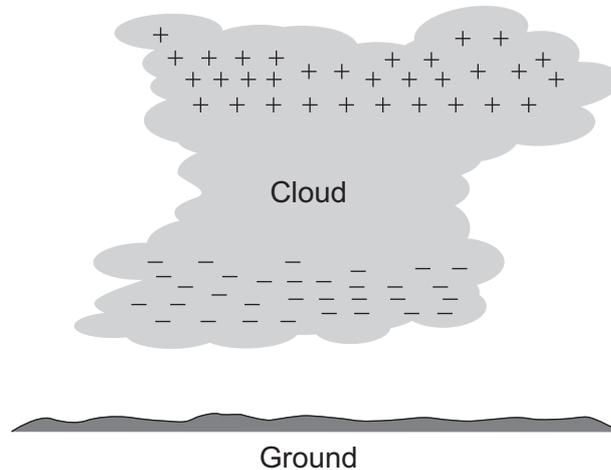
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- 12** Thunderstorms are caused by a build-up of electrical charge between the top and the bottom of a cloud.

**Figure 16** shows a cloud and the charges built up during a thunderstorm.

**Figure 16**



- 12 (a)** During a lightning strike negative charge flows to the ground.

Name the type of particle which flows from the cloud to the ground during a lightning strike.

[1 mark]

---

- 12 (b)** Current is a flow of electric charge.

During a lightning strike 45 000 C of charge flows to the ground in 0.5 s.

How would you calculate the current during a lightning strike?

Use the correct equation from the Physics Equations Sheet.

[1 mark]

Tick (✓) **one** box.

$$45\,000 \times 0.5$$

$$\frac{45\,000}{0.5}$$

$$\frac{0.5}{45\,000}$$



**12 (c)** Scientists take measurements during thunderstorms to learn more about storms.

Suggest **two** reasons why school students could **not** carry out a practical investigation into thunderstorms.

**[2 marks]**

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

4

**Turn over for the next question**

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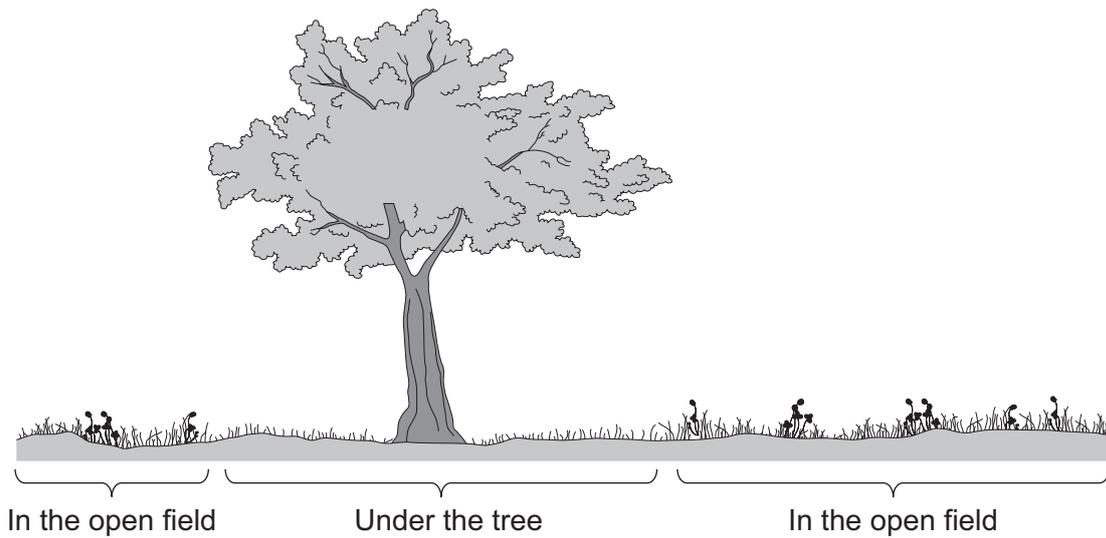


**Biology Questions**

- 13 Some students were investigating the types of plant that grow in a field.

**Figure 17** shows the plants growing under a tree in the field are different from the plants growing in the open field.

**Figure 17**

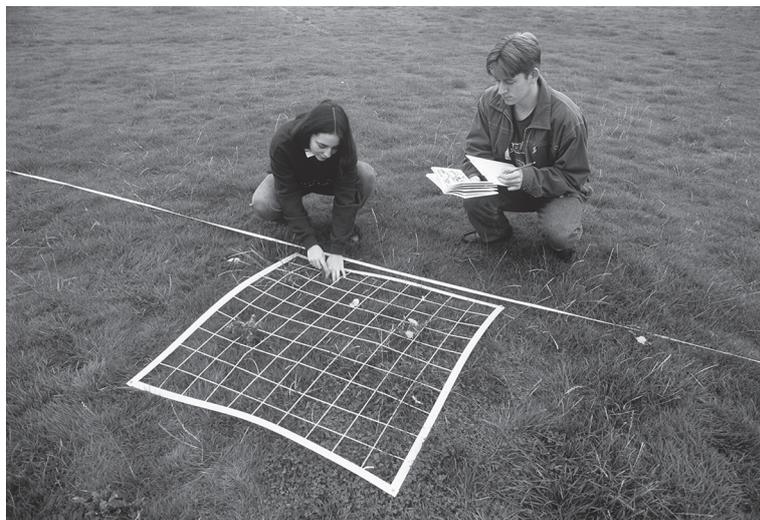


One student made a hypothesis:

**'Light intensity affects which plants grow in different parts of the field.'**

- 13 (a) **Figure 18** shows the students doing part of the investigation to test the hypothesis.

**Figure 18**





**13 (b) (i)** The students investigated the effect of light intensity on which plants grow in different parts of the field.

Suggest **two** other environmental factors that affect plants growing under trees.

Do **not** give answers in terms of light.

**[2 marks]**

1 \_\_\_\_\_

2 \_\_\_\_\_

**13 (b) (ii)** Choose **one** of the environmental factors you gave in part **(b)(i)**.

Give the reason why the factor might be different under the tree from in the open field.

**[1 mark]**

Factor \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

9



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ANSWER IN THE SPACES PROVIDED**

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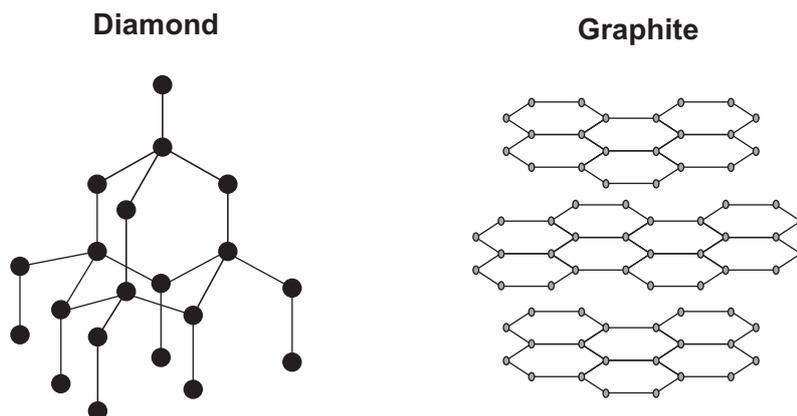
**Chemistry Questions**

- 14** In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Diamond and graphite are different forms of the same element.

**Figure 19** shows the structures of diamond and graphite.

**Figure 19**





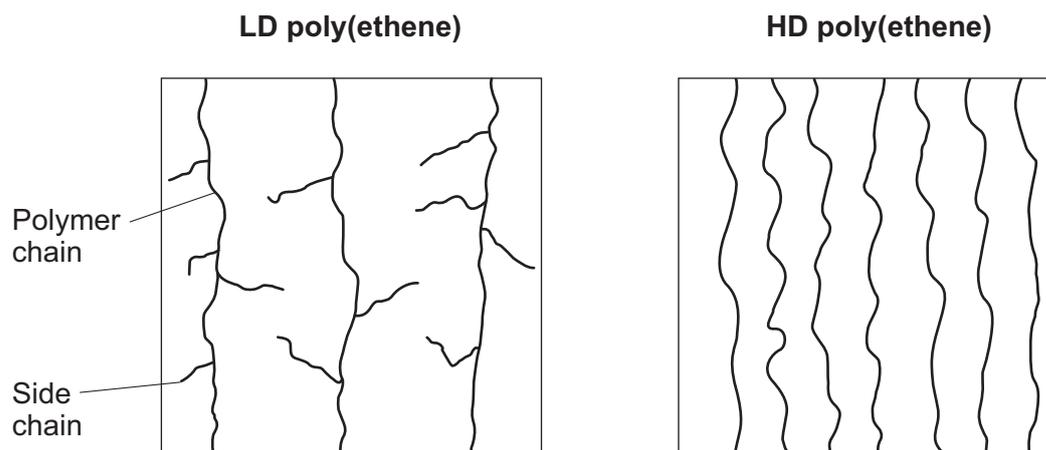
15 This question is about polymers.

**Figure 20** shows the structures of low density (LD) poly(ethene) and high density (HD) poly(ethene).

Both of these polymers are thermosoftening.

The polymer chains in LD poly(ethene) have side chains.

**Figure 20**



15 (a) HD poly(ethene) has a higher density than LD poly(ethene).

Suggest an explanation for the difference in density.

[2 marks]

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15 (b) Both LD poly(ethene) and HD poly(ethene) are thermosoftening polymers.

They are **not** thermosetting polymers.

Give **one** reason why.

[1 mark]

Use **Figure 20** to help you.

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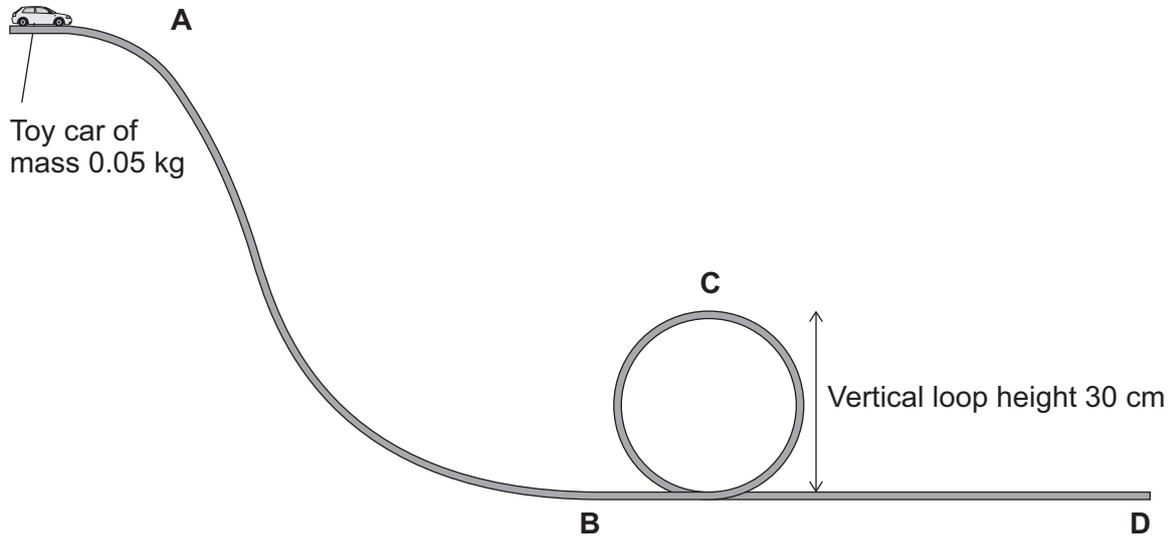


3 5

## Physics Questions

- 16 Figure 21 shows a toy ramp with a vertical loop section.

Figure 21



- 16 (a) (i) A child releases the car and it travels down the ramp from **A** to **B**.

Which **two** statements correctly describe the energy changes as the car travels from **A** to **B**?

[2 marks]

Tick (✓) **two** boxes.

The car has decreasing thermal energy.

The car has decreasing gravitational potential energy.

The car has increasing kinetic energy.

The car has increasing chemical energy.

The car has increasing elastic potential energy.



**16 (a) (ii)** Suggest **one** change that could be made to the ramp to increase the speed of the car at **B**.

[1 mark]

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**16 (a) (iii)** After passing **B** the car goes round the loop, past **C** and goes off the ramp at **D**.

The change in height between **B** and **C** is 30 cm.

The mass of the car is 0.05 kg.

$g = 10 \text{ N/kg}$

Calculate the change in gravitational potential energy of the car as it moves between **B** and **C**.

[3 marks]

Use the correct equation from the Physics Equations Sheet.

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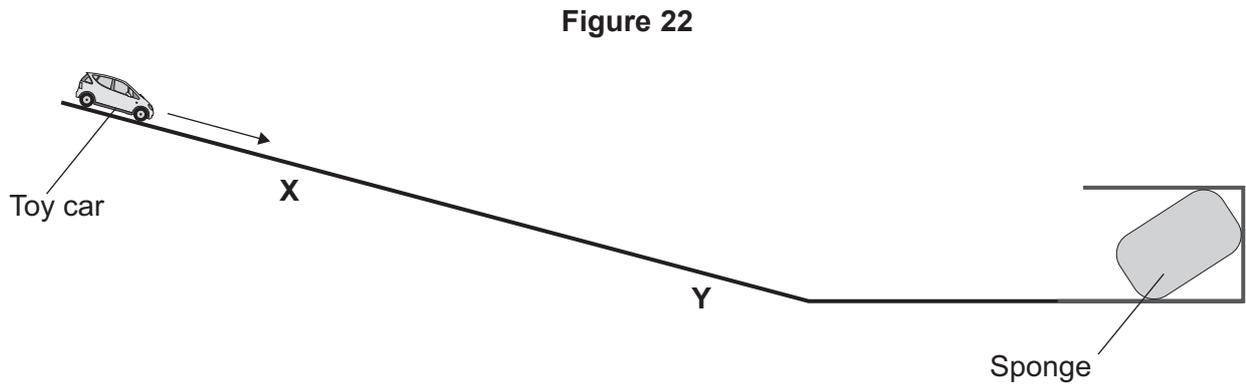
Change in gravitational potential energy = \_\_\_\_\_ J

**Question 16 continues on the next page**

**Turn over ►**



16 (b) Figure 22 shows a different ramp.



16 (b) (i) The car travels down the ramp.

Explain, in terms of forces, why the car travels at a steady speed between X and Y.

**[2 marks]**

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**16 (b) (ii)** A sponge is used to stop the car at the end of the ramp.

The sponge compresses in the same way as a spring.

What is the main energy transfer that takes place as the car comes to a stop?

**[1 mark]**

Tick (✓) **one** box.

From kinetic energy of the car to gravitational potential energy of the sponge

From kinetic energy of the car to chemical energy of the sponge

From kinetic energy of the car to sound energy of the sponge

From kinetic energy of the car to elastic potential energy of the sponge

9

**END OF QUESTIONS**



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ANSWER IN THE SPACES PROVIDED**

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