

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
APPLIED SCIENCE: DOUBLE AWARD**

**J649  
B482/02**

Unit 2: Science for the needs of society (Higher Tier)

Candidates answer on the question paper.  
A calculator may be used for this paper.

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)

**Wednesday 15 June 2011  
Morning**

**Duration: 1 hour**



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- The marks allocated and the spaces provided are a good indication of the length of answers required.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

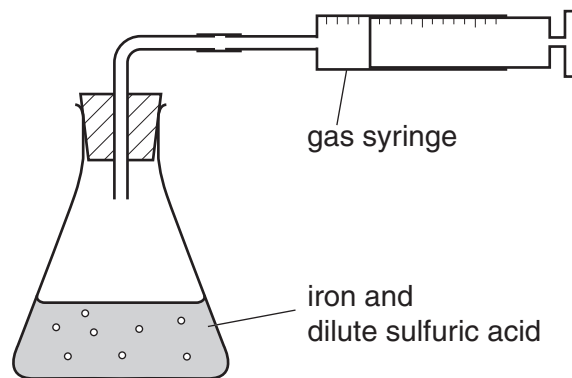
- 1 Joe looks at the label on a bottle containing iron tablets.

Iron tablets can be taken as a medicine.



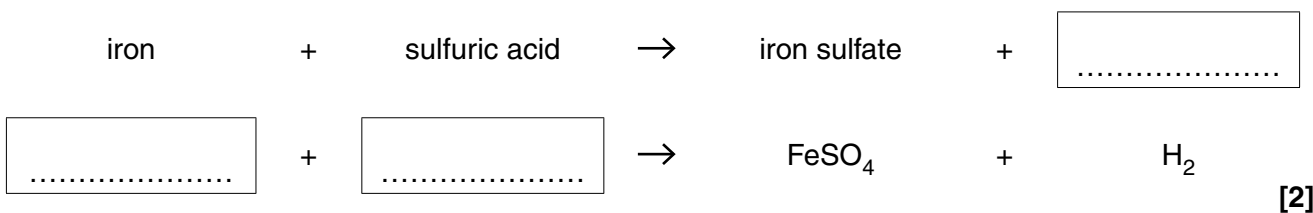
Joe makes some iron sulfate in a school laboratory.

He adds iron to dilute sulfuric acid and collects the gas that is given off.



- (a) The reaction also produces a solution of iron sulfate.

- (i) Complete the word and symbol equations for the reaction.



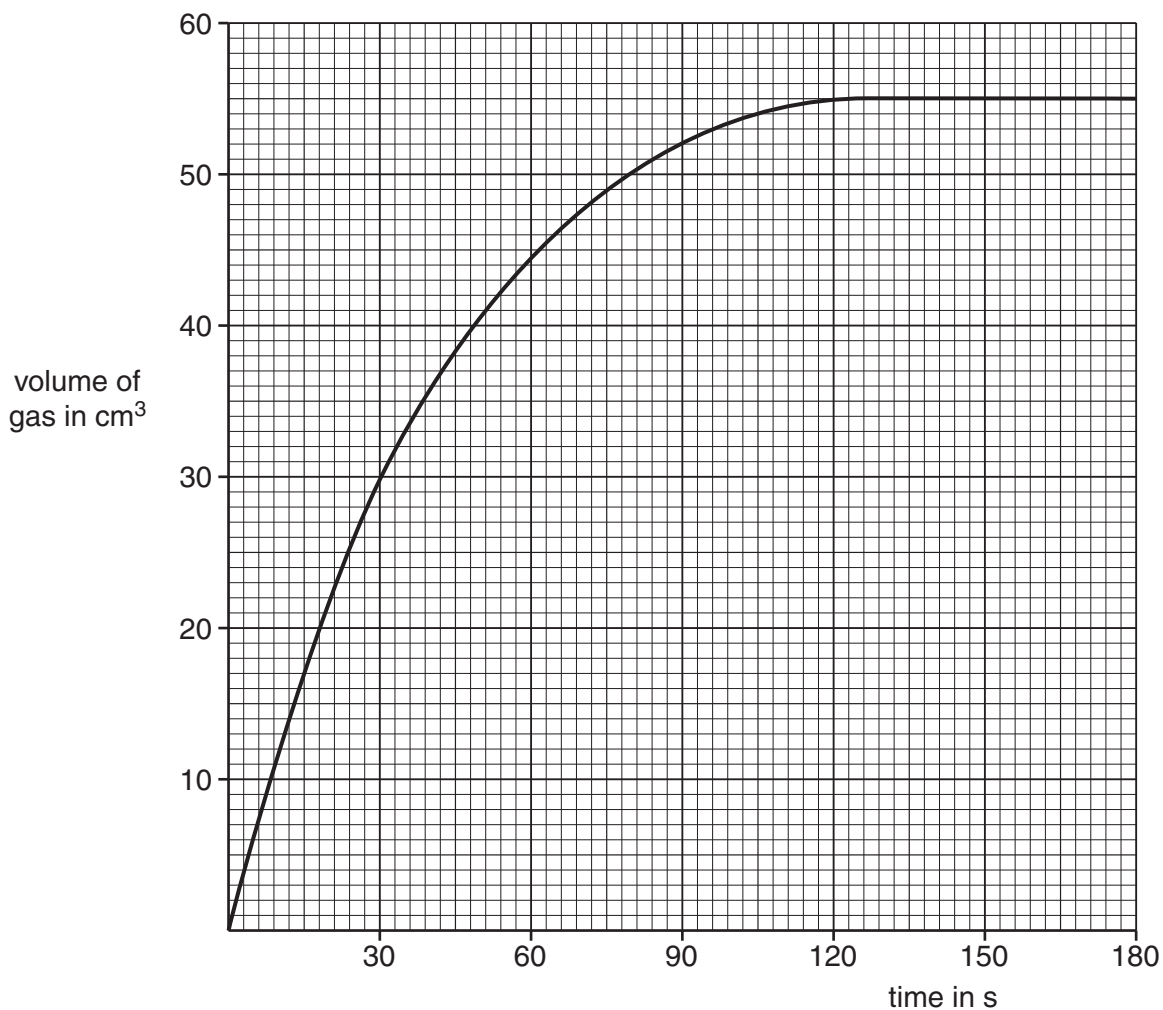
[2]

- (ii) Put a tick (✓) in one box in each row to show what each chemical is; an element, a compound or a mixture.

chemical	element	compound	mixture
iron			
dilute sulfuric acid			
iron sulfate solution			
H <sub>2</sub>			

[2]

- (b) Joe draws a graph to show the rate of the reaction.



- (i) Put a cross on the graph to show when the reaction is happening at the fastest rate. [1]
- (ii) How long did it take for the reaction to finish?  
 .....

[1]

- (iii) What volume of gas was given off at the end of the reaction?

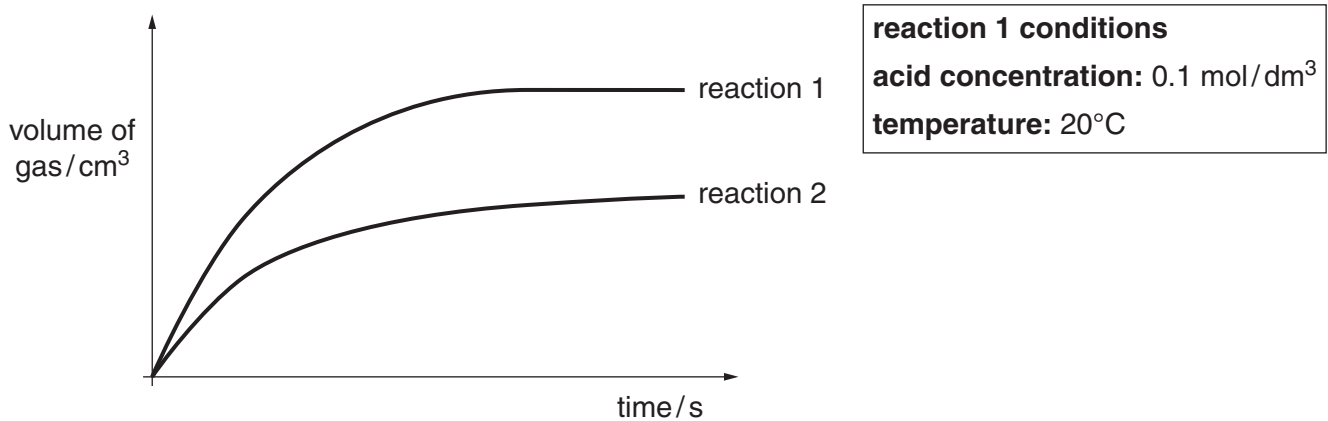
..... cm<sup>3</sup>

[1]

(c) Joe carries out a second reaction.

He changes the reaction conditions.

The graph shows the results for **reaction 1** and **reaction 2**.



Suggest what different condition Joe used for **reaction 2** compared to **reaction 1**.

..... [1]

(d) Joe knows the iron sulfate he has made is not safe to take as a medicine.

Iron sulfate tablets made in factories go through several stages.

These make sure the tablets are safe to be taken as a medicine.

Which of the following stages help make sure that the tablets are safe to take?

Put ticks (✓) in the boxes next to the **three** correct stages.

- |                                  |                          |
|----------------------------------|--------------------------|
| purification                     | <input type="checkbox"/> |
| packaging                        | <input type="checkbox"/> |
| quality control                  | <input type="checkbox"/> |
| advertising                      | <input type="checkbox"/> |
| measurement of dosage per tablet | <input type="checkbox"/> |
| monitoring factory waste         | <input type="checkbox"/> |

[2]

[Total: 10]

2 Maria works for a company that makes duvets.

Her job is to test the duvets. She measures how well the duvets insulate.

(a) Which of the following is a scientific description of how insulation works?

Put a tick (✓) next to the correct **scientific** description.

keeps things warm

increases the flow of energy

keeps cold out

reduces energy transfer

[1]

(b) The structure of the duvet makes it a good insulator.

Different features of the duvet reduce the transfer of heat.

Use straight lines to connect each **method of heat transfer** to the **feature of the duvet** that reduces the transfer of heat.

**method of heat transfer**

**feature of the duvet**

conduction

many air gaps

convection

surface of duvet is white

radiation

fibres are long

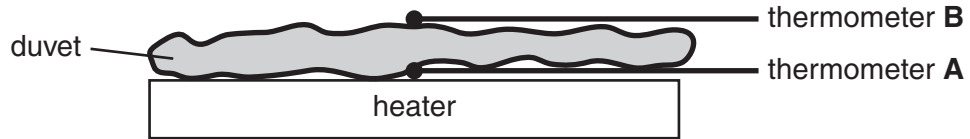
air gaps are small

[3]

- (c) Maria uses a heater and two thermometers to make her measurements of how well duvets insulate.

She works out the temperature difference between **A** and **B**.

She sets the heater to provide 1 watt per metre squared.



The insulation of a duvet is measured in Togs.

**The Tog value is 10 times the temperature difference when the flow of heat is 1 watt for each metre squared of duvet.**

- (i) Using 1 watt per metre squared, Maria works out a temperature difference of  $1.25^{\circ}\text{C}$ .

What is the Tog value for the duvet?

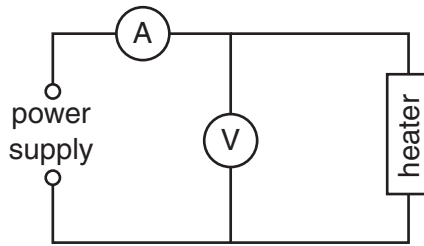
Tog value = ..... [1]

- (ii) With a duvet of 4.0 Togs and her heater using 1 watt per metre squared Maria reads thermometer **A** and thermometer **B**.

What is the temperature difference between the thermometers?

temperature difference = .....  $^{\circ}\text{C}$  [1]

(d) Maria checks her heater is producing the right amount of power using this circuit.



(i) What is the formula that links power, voltage and current?

[1]

(ii) What is the power when the current is 0.2A and the voltage is 6V?

You must show your working.

power = ..... unit ..... [2]

(e) Duvets used in the warm summer are usually 4.0 Tog.

Duvets used in the cold winter are usually 14 Tog.

Explain why duvets with a higher Tog value are used in the cold winter.

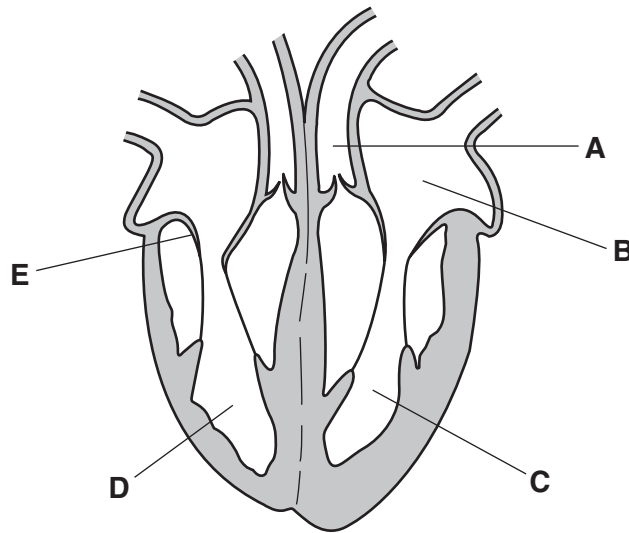
.....

.....

..... [2]

[Total: 11]

3 (a) Look at the diagram showing the heart and its main blood vessels.



- (i) Which part of the heart pumps blood to the lungs, **A, B, C, D** or **E**? ..... [1]
- (ii) Which part is the left atrium, **A, B, C, D** or **E**? ..... [1]
- (iii) What is the function of the part labelled **E**?  
 .....  
 ..... [1]
- (iv) Explain why the muscles are thicker on one side of the heart than the other.  
 .....  
 ..... [2]



(v) The two sides of the heart are part of a double circulatory system.

Which is the best explanation of the advantage of having a double circulatory system?

Put a tick (✓) in the box next to the best answer.

one circuit carries oxygenated blood,  
one circuit carries deoxygenated blood

one circuit links all the arteries,  
one circuit links all the veins

capillaries link the two circuits together

one circuit delivers blood at lower pressure,  
one circuit delivers higher pressure blood

one circuit carries blood to the brain,  
one circuit carries blood to the heart

[1]

(b) The rest of the circulatory system is made up of different types of blood vessel.

Join the type of **blood vessel** to its **adaptation** and then join the **adaptation** to its **function**.

blood vessel	adaptation	function
artery	valves present	carries blood under high pressure
capillary	wall is one cell thick	is highly permeable
vein	thick muscular and elastic walls	carries blood under low pressure

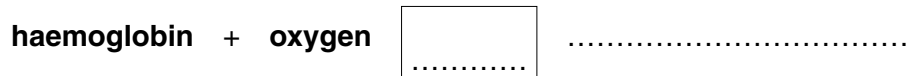
[4]

(c) One of the main functions of blood is to transport oxygen around the body.

It does this using haemoglobin in the red blood cells.

Complete the word equation for the reaction of oxygen with haemoglobin.

You must include the reaction symbol **and** the product.



[2]

[Total: 12]

Turn over

4 By 1915 Wegener had proposed his theory of continental drift.

(a) (i) He used two pieces of evidence to support his theory:

- the continents on each side of the Atlantic ocean fit together like jigsaw pieces
- fossils of the same species of animals could be found on both sides of the Atlantic.

Explain how this evidence supports Wegener’s theory of continental drift.

.....  
.....  
..... [1]

(ii) Wegener’s theory was not accepted when first proposed.

Which of the following are reasons for Wegener’s theory **not** being accepted when it was **first** proposed?

Put ticks (✓) in the boxes next to the correct answers.

- No known force could explain how continents move.
- Earthquakes happen in the middle of the oceans.
- There was no evidence of a land bridge joining Africa and South America.
- Rock types match up on the coasts of different continents.
- Wegener was not a geologist.
- Continents moved too slowly to measure.

[3]

(b) Wegener's theory was accepted as correct in the 1960s.

Continental drift is now a part of the theory of plate tectonics.

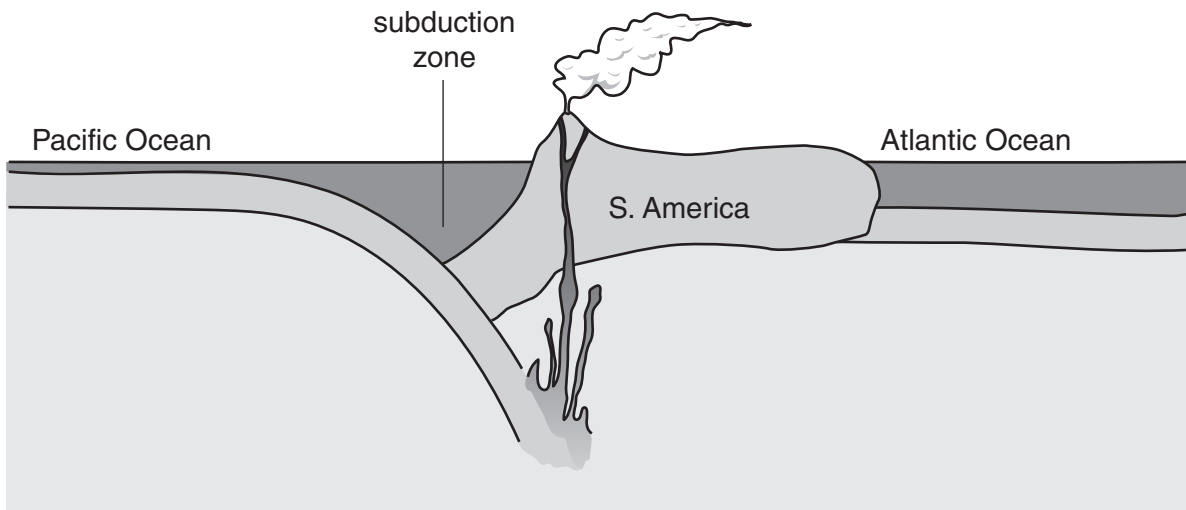
(i) What is a tectonic plate?

.....  
..... [2]

(ii) In the theory of plate tectonics, two of the forces that move the plates are convection currents and gravity.

On the diagram draw **labelled arrows** to show:

- the direction each plate is moving
- the forces due to convection and gravity that cause the movement.

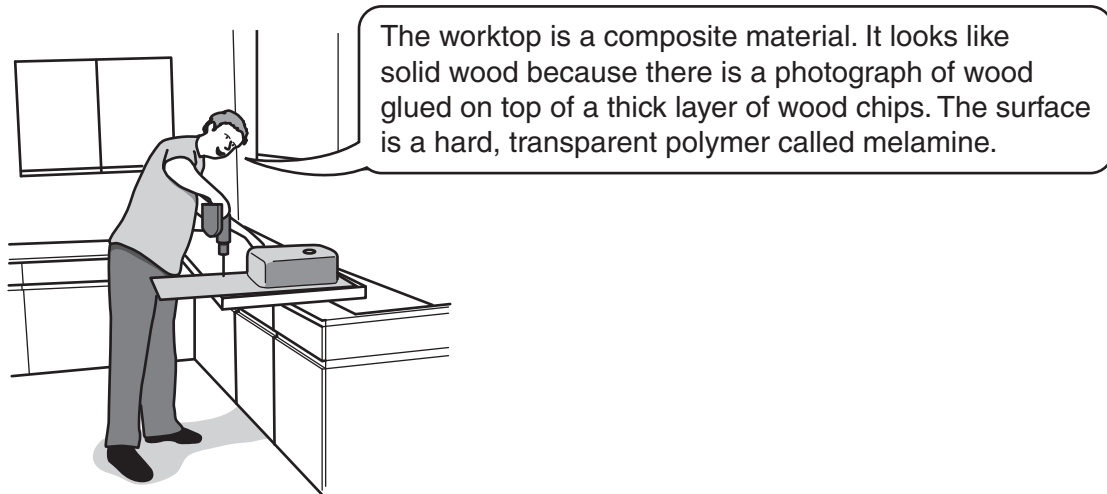


[3]

[Total: 9]

5 Marty works fitting kitchens.

He tells a customer about the worktop he is fitting.



(a) Marty says that the worktop is a **composite** material.

(i) What is a composite material?

.....  
..... [2]

(ii) What are the advantages of using composites instead of natural materials, such as solid wood, for worktops.

Write down **two** advantages, other than appearance and cost.

.....  
..... [2]

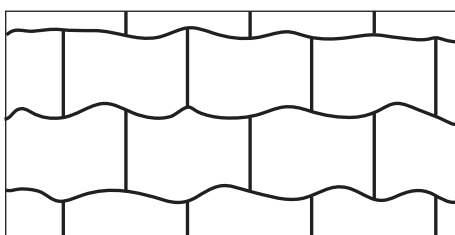
(b) Marty's customer is worried about the fire risk of having a polymer worktop in the kitchen.

Marty tells his customer not to worry.



Melamine is different to many polymers. It will not melt, even if you put a hot pan on it, and it doesn't burn. Even if your kitchen caught fire, the melamine would only turn black and char on the surface.

(i) The diagram shows the arrangement of molecules in melamine.



Explain why melamine does not melt when it gets hot.

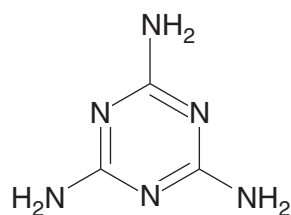
.....  
 ..... [2]

(ii) What is the name given to polymers that do not melt when they get hot?

..... [1]

- (c) One of the reasons that melamine does not burn is that it gives off two unreactive gases when it is heated in air.

The diagram shows the structure of a molecule in melamine.



Which two gases does melamine give off when it is heated?

Put **rings** around the **two** correct answers.

**carbon dioxide CO<sub>2</sub>**

**carbon monoxide CO**

**nitrogen N<sub>2</sub>**

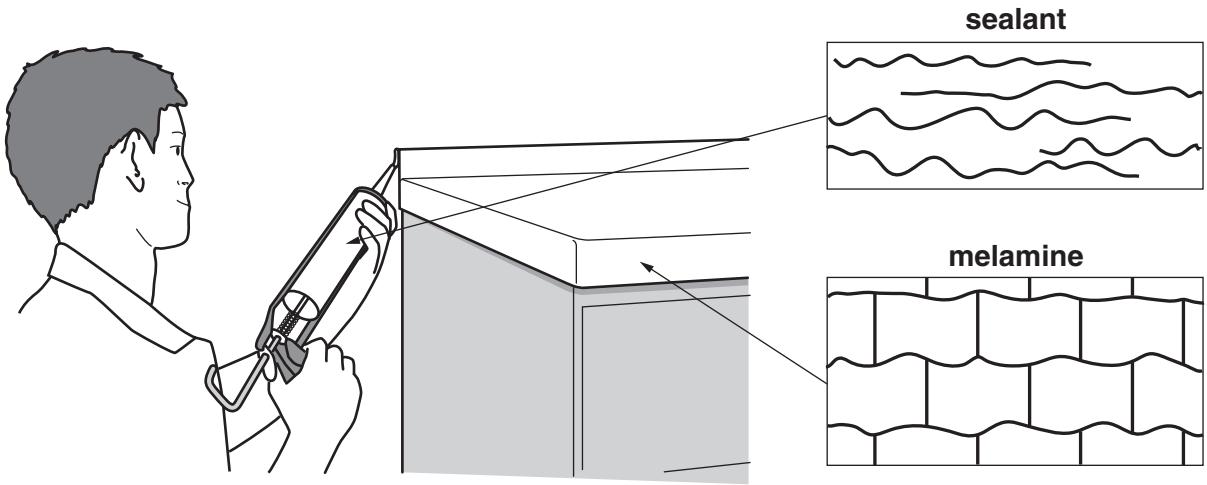
**oxygen O<sub>2</sub>**

**water vapour H<sub>2</sub>O**

[2]

(d) Marty seals the worktop in place using a plastic sealant.

The diagrams show the arrangement of molecules in the sealant and melamine.



Give one similarity and one difference between the structure of the sealant and the structure of melamine.

similarity .....

difference ..... [2]

[Total: 11]

6 Fertilisers are used in farming to provide minerals for crop plants.

(a) Complete the sentences about how plants take up minerals.

Energy is needed to move the minerals from areas of low concentration to areas of high concentration.

This process is called .....

This energy comes from the process of ..... in the root cells. [2]

(b) Draw a straight line to join each of the **minerals** to its correct **function** in plants.

minerals	function
nitrates	to make chlorophyll
magnesium	to make proteins to use in cell growth
potassium	for good root growth
phosphates	for healthy growth and flowering

[3]

(c) A way to improve the yield of crops and make farming more efficient is to use selective breeding.

Explain how selective breeding can improve yields.

.....

.....

..... [2]

[Total: 7]

**END OF QUESTION PAPER**



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