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|-------------|---------------|------------------|
| Surname     | Centre Number | Candidate Number |
| Other Names |               | 0                |

**GCSE**

4471/01



W15-4471-01

**ADDITIONAL SCIENCE/BIOLOGY****BIOLOGY 2  
FOUNDATION TIER**

A.M. WEDNESDAY, 7 January 2015

1 hour

| For Examiner's use only |              |              |
|-------------------------|--------------|--------------|
| Question                | Maximum Mark | Mark Awarded |
| 1.                      | 5            |              |
| 2.                      | 5            |              |
| 3.                      | 9            |              |
| 4.                      | 8            |              |
| 5.                      | 9            |              |
| 6.                      | 8            |              |
| 7.                      | 7            |              |
| 8.                      | 3            |              |
| 9.                      | 6            |              |
| <b>Total</b>            | <b>60</b>    |              |

**ADDITIONAL MATERIALS**

In addition to this paper you may require a calculator and a ruler.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

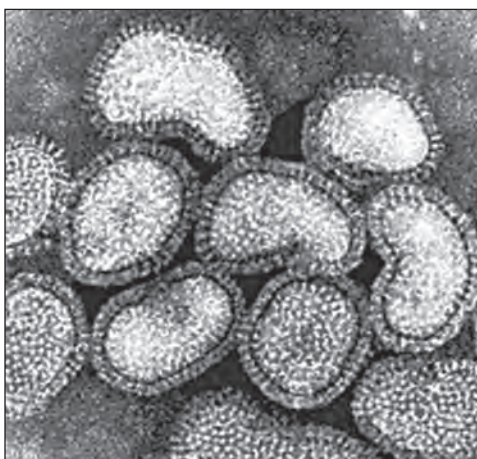
You are reminded that assessment will take into account the quality of written communication (QWC) used in your answer to question 9.

Answer **all** questions.

1. (a) Complete the table below which shows features of some microorganisms. Place a tick (✓) for the features which are present and a cross (x) for the features which are absent. *The first row has been done for you.* [3]

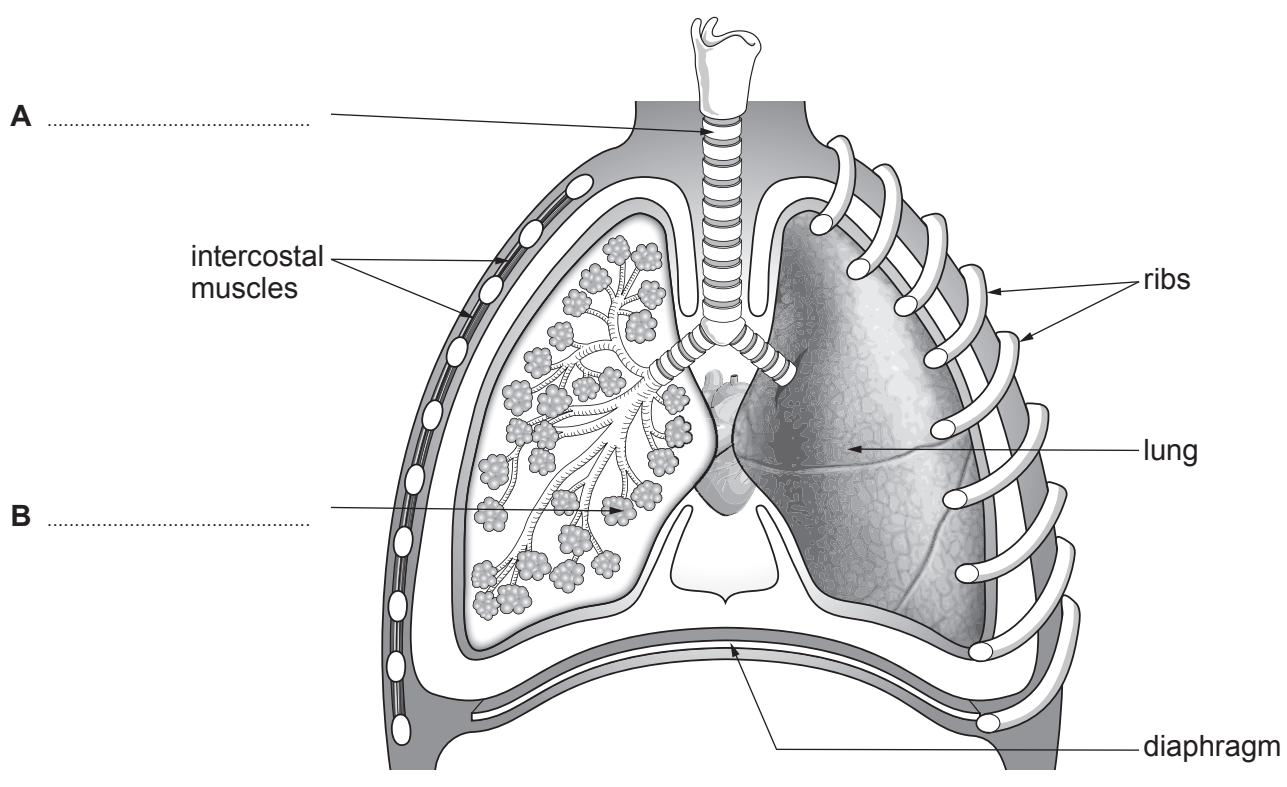
| features                | bacteria | algae | yeast |
|-------------------------|----------|-------|-------|
| cell wall               | ✓        | ✓     | ✓     |
| nucleus                 |          |       |       |
| chloroplast             |          |       |       |
| reproduction by budding |          |       |       |

- (b) The photograph below shows some viruses at a very high magnification.



- (i) How does the size of a virus compare with that of a bacterium? Underline your answer. [1]
- Viruses are smaller than bacteria.
- Viruses are larger than bacteria.
- Viruses are equal in size to bacteria.
- (ii) Give **one** reason why a virus is *not* thought to be a living cell. [1]
- .....

2. The diagram shows a section through the chest of a human.



(a) Label **A** and **B** on the diagram above. [2]

(b) While a person is breathing in, the volume of the lungs increases.

(i) Describe the movements of the diaphragm and ribs as they bring about the increase in volume. [2]

Diaphragm .....

.....

Ribs .....

.....

(ii) How does the *pressure* in the lungs change when the volume increases? [1]

.....

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3. (a) (i) Which part of a living cell contains chromosomes?

[1]

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(ii) Complete the table below about cell division in human cells by writing on the dotted lines. [4]

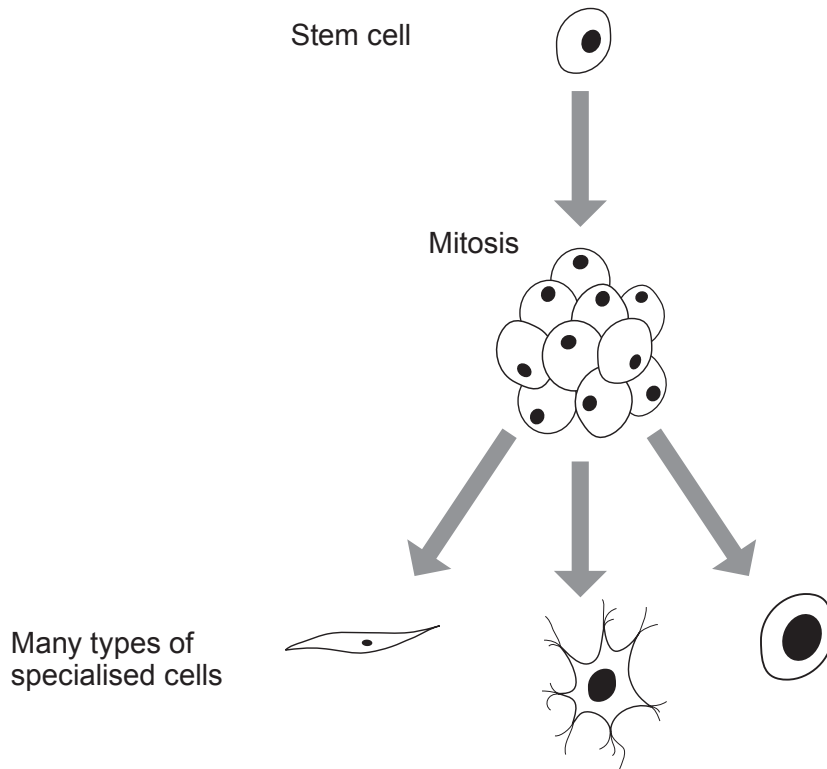
| Type of division               | MITOSIS                                   | MEIOSIS                                   |
|--------------------------------|---|---|
| Number of chromosomes in cells | <p>Original cell<br/>46<br/>new cells</p> | <p>Original cell<br/>46<br/>new cells</p> |
| Function of division           | .....                                     | formation of sex cells                    |
| Genes in new cells             | identical                                 | .....                                     |

(iii) What is the scientific term used for sex cells such as sperm and eggs?

[1]

.....

(b) Stem cells divide by mitosis and new specialised cells develop.



(i) Suggest **one** way doctors can use stem cells to treat patients. [1]

.....

(ii) Stem cells from embryos can be used in medical research. Explain why some people object to this. [2]

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4. (a) Complete the sentence using some of the words below.

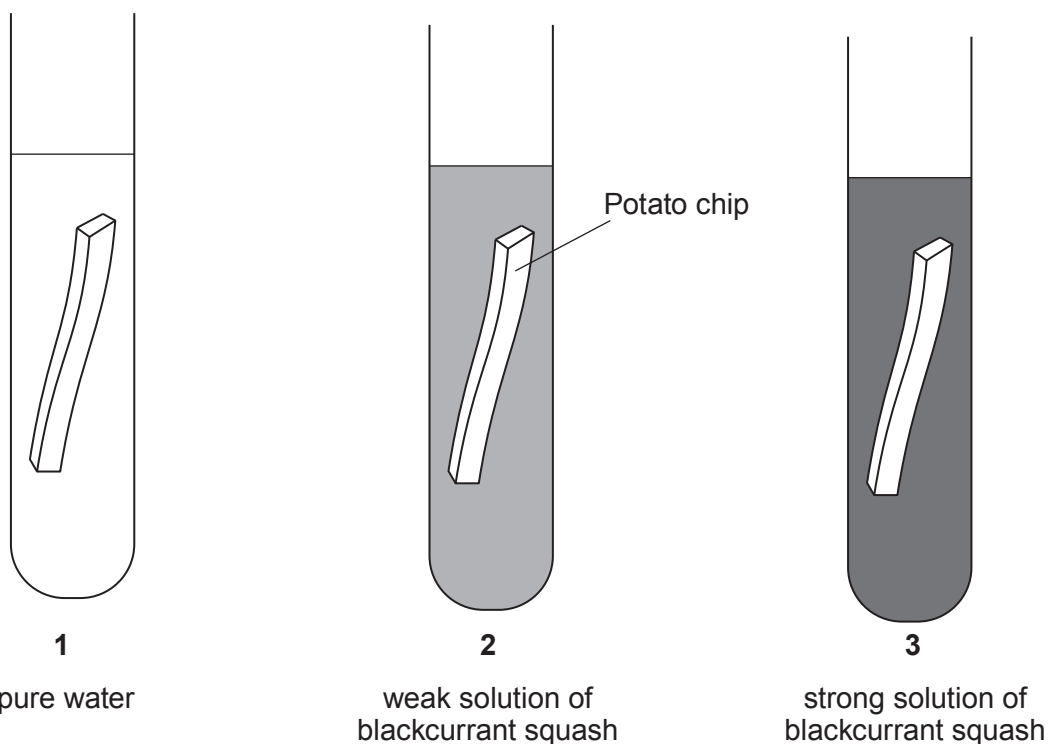
[2]

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**low**                      **fully permeable**                      **high**                      **semi-permeable**

During osmosis, water moves from a region where it is in a ..... concentration to a region where it is in a ..... concentration, through a ..... membrane.

- (b) Ceri and Sajid investigated osmosis in potato chips. They set up three test tubes containing blackcurrant squash and water as shown in the diagram below. Blackcurrant squash contains sugar. A potato chip of exactly the same size and mass was added to each tube.



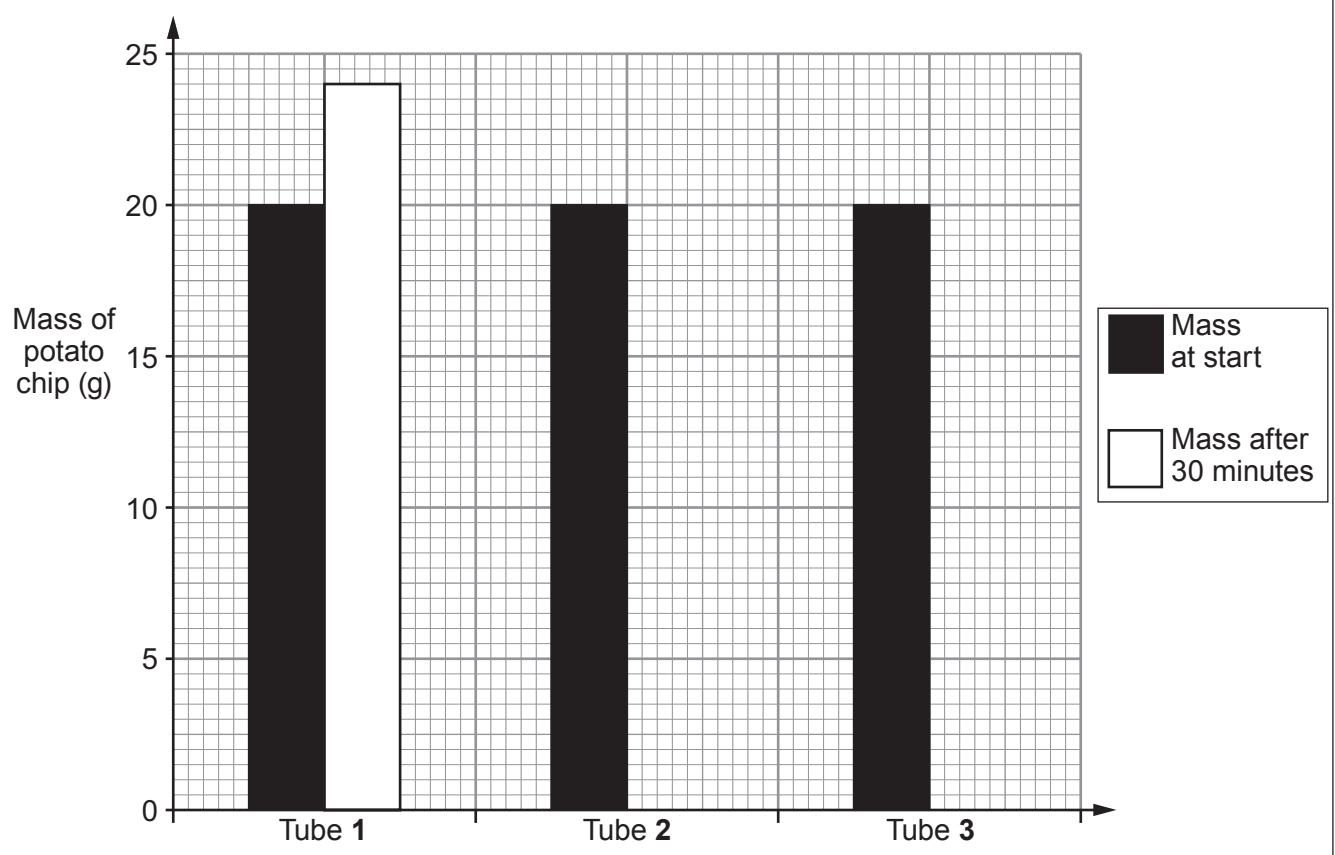
- (i) State the number of the tube which contained the **lowest** concentration of **water**.

[1]

.....

After 30 minutes they removed the potato chips and recorded the mass of each.

| Tube | Mass of potato chips at start (g) | Mass of potato chips after 30 minutes (g) |
|------|-----------------------------------|---|
| 1    | .....                             | .....                                     |
| 2    | .....                             | 20  |
| 3    | .....                             | 15  |



- (ii) Use the bar chart to **complete** the results table above. [1]
- (iii) **Complete** the bar chart for tubes 2 and 3. [1]
- (iv) State the number of the tube in which the concentration of water in the chips was the **same** as that in the solution, giving a reason for your answer. [1]

Number of tube .....

Reason .....

.....

- (v) Explain why the potato chip in tube 1 gained mass. [2]
- .....
- .....
- .....

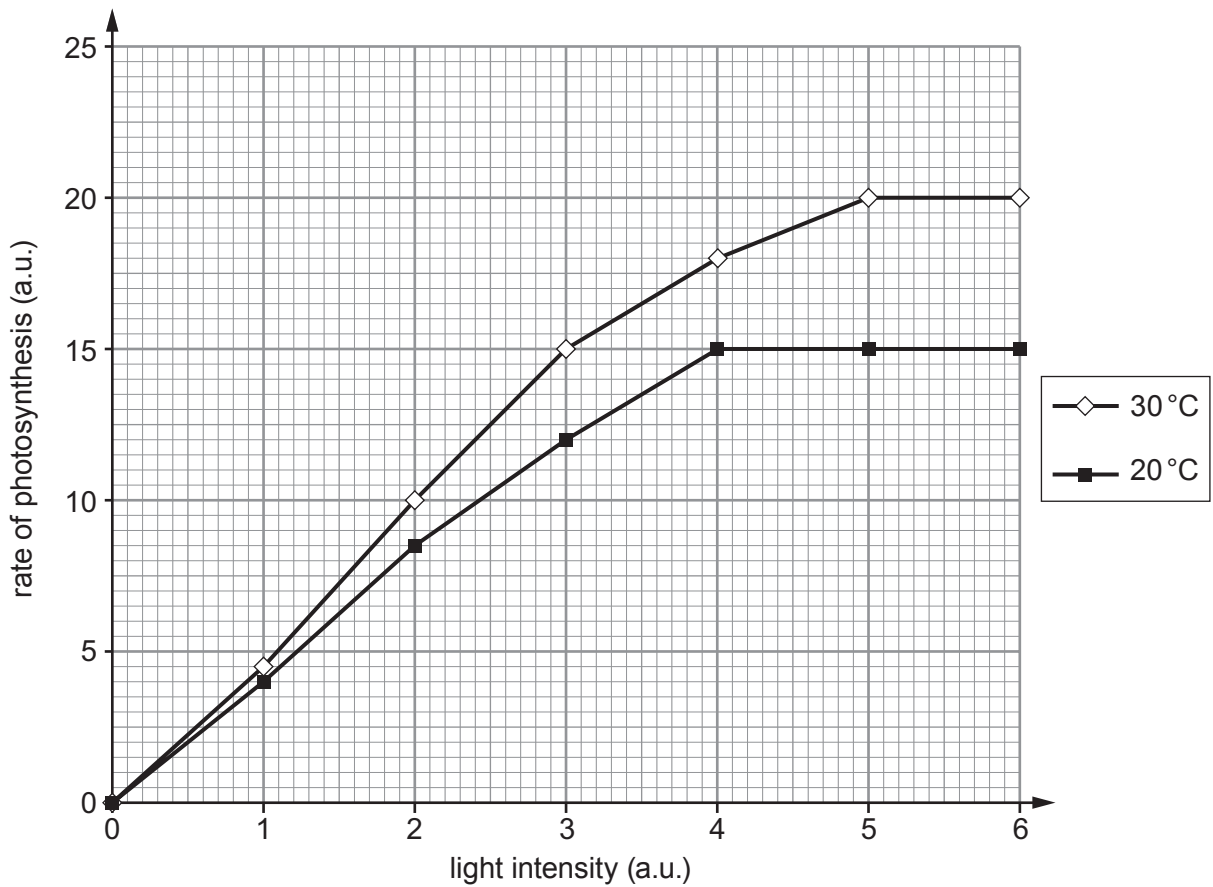
5. (a) (i) Complete the following equation for photosynthesis in green plants.



(ii) Name the chemical substance which absorbs the light needed for photosynthesis. [1]

.....

(b) A scientist investigated the rate of photosynthesis at different light intensities and temperatures. The results are shown in the graph.



Use the graph to:

(i) Describe in detail how light intensity affected the rate of photosynthesis at **20°C**. [2]

.....  
 .....



- (ii) Calculate the difference in the rate of photosynthesis between 20 °C and 30 °C at a light intensity of 3.5 a.u. [2]

difference in rate of photosynthesis ..... a.u.

- (iii) Name **one other** environmental factor which can affect the rate of photosynthesis. [1]

.....

- (c) Complete the table to show **two** ways in which plants use the glucose produced in photosynthesis. [2]

| substance produced from glucose | how the substance is used in a green plant |
|---------------------------------|--|
| .....                           | storage                                    |
| cellulose                       | .....                                      |

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6. The black-faced lion tamarin (*Leontopithecus caissara*) is a species of monkey living in the rainforests of South America.



- (a) The black-faced lion tamarin is classified as Critically Endangered on the IUCN red list and listed on Appendix 1 of CITES. There are only about 400 individuals remaining in the wild.



- (i) On the sliding scale above suggest what will happen to the black-faced lion tamarin unless measures are taken to conserve the species. [1]

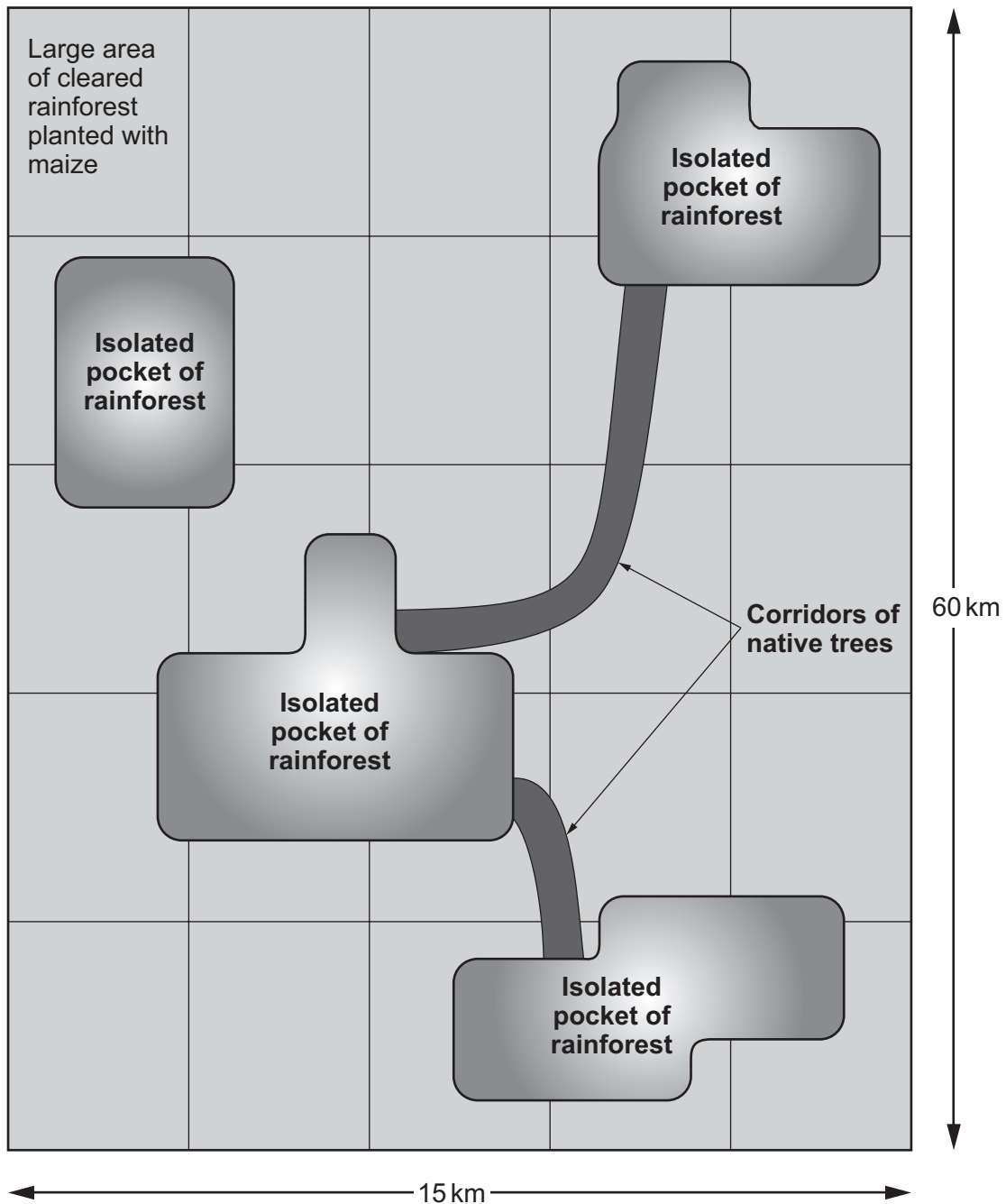
.....

- (ii) If conservation measures fail, state what will happen to the biodiversity of the habitat in which the black-faced lion tamarin lives. [1]

.....

- (b) The rainforest habitat of the black-faced lion tamarin has been cleared to grow maize. Small populations of the monkey now live in isolated pockets of rainforest. The local people are being paid to start local plant nurseries and to plant corridors of native trees which link up the isolated pockets of rainforest.

The diagram shows an aerial view of 900 km<sup>2</sup> of rainforest which has been cleared and planted with maize.



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(i) Suggest **one** reason why the local people are prepared to give up some of their farmland in order to create the corridors of native trees. [1]

.....

(ii) Suggest ways in which the corridor system shown in the diagram opposite can be improved. [2]

.....

.....

.....

(iii) How will the corridor system help conserve and increase the numbers of the black-faced lion tamarin in the rainforest? [2]

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(c) State **one other** way in which endangered species can be conserved. [1]

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## 7. Look, no bubbles!

SCUBA diver wearing a rebreather



In standard SCUBA equipment when you breathe in through the mouthpiece you get a lungful of fresh air from the tank on your back. When you breathe out, the expired air goes out from the equipment into the water in the form of bubbles.

Modern SCUBA equipment contains a rebreather. This allows you to breathe the same air many times and produces no bubbles.

- (a) (i) Complete the following table to show the composition of inspired and expired air. [2]

| gas            | inspired air (%) | expired air (%) |
|----------------|------------------|-----------------|
| oxygen         | .....            | 16              |
| carbon dioxide | .....            | 4               |
| nitrogen       | 79               | .....           |
| water vapour   | varies           | 1               |

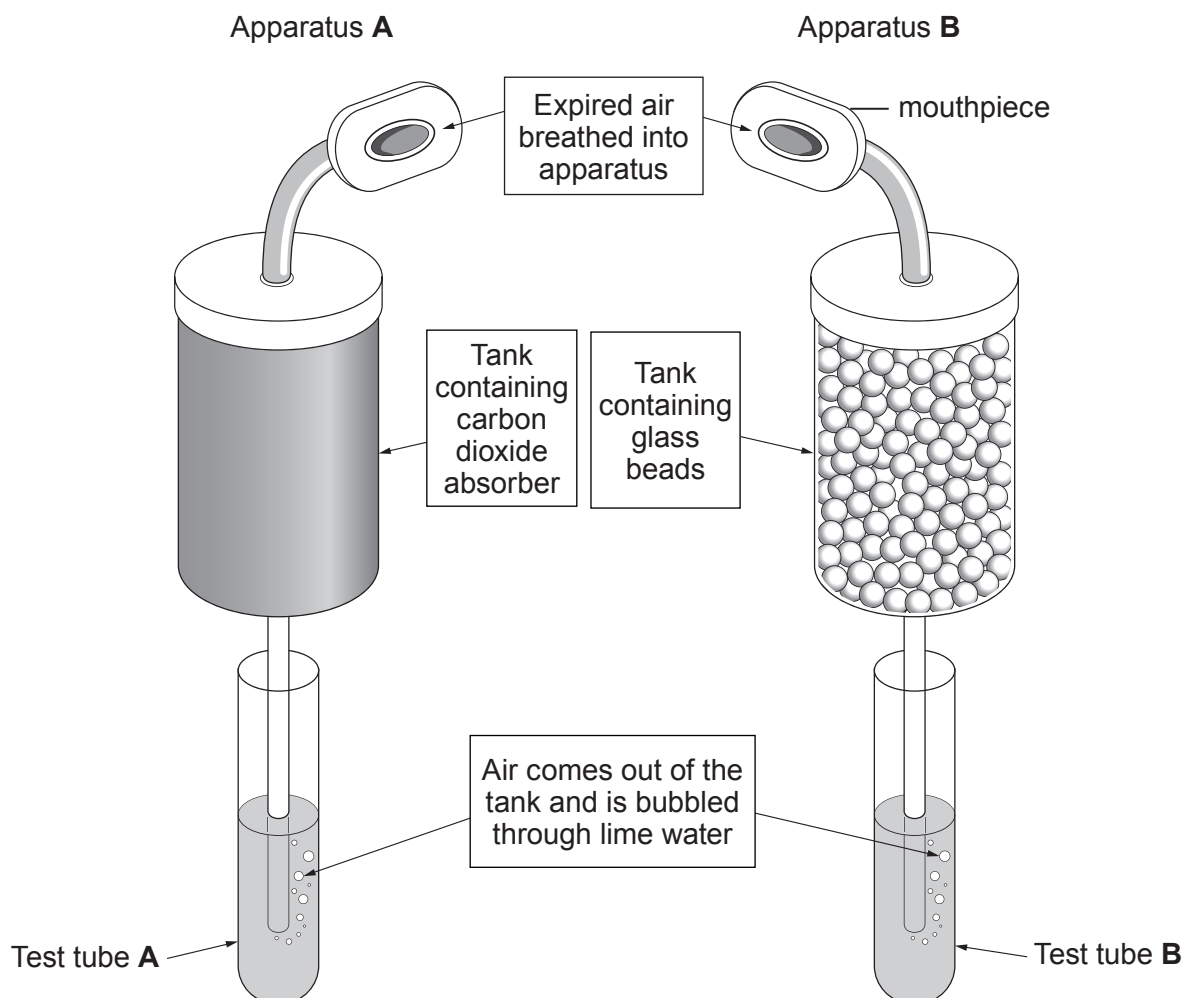
- (ii) Use the table to state why it is possible for a diver to use a rebreather. [1]

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- (iii) Expired air contains 4% carbon dioxide. This concentration of carbon dioxide in air is poisonous. Rebreathers also contain a tank which absorbs the carbon dioxide making the air rebreathable for the diver.  
Suggest the name of the chemical compound which absorbs the carbon dioxide.

[1]

A scientist tested the air coming out of the tank using apparatus **A** and **B** as shown below.



- (b) What result would you expect to see in test tubes **A** and **B** after bubbling the expired air through lime water for 2 minutes? [2]

Test tube **A**

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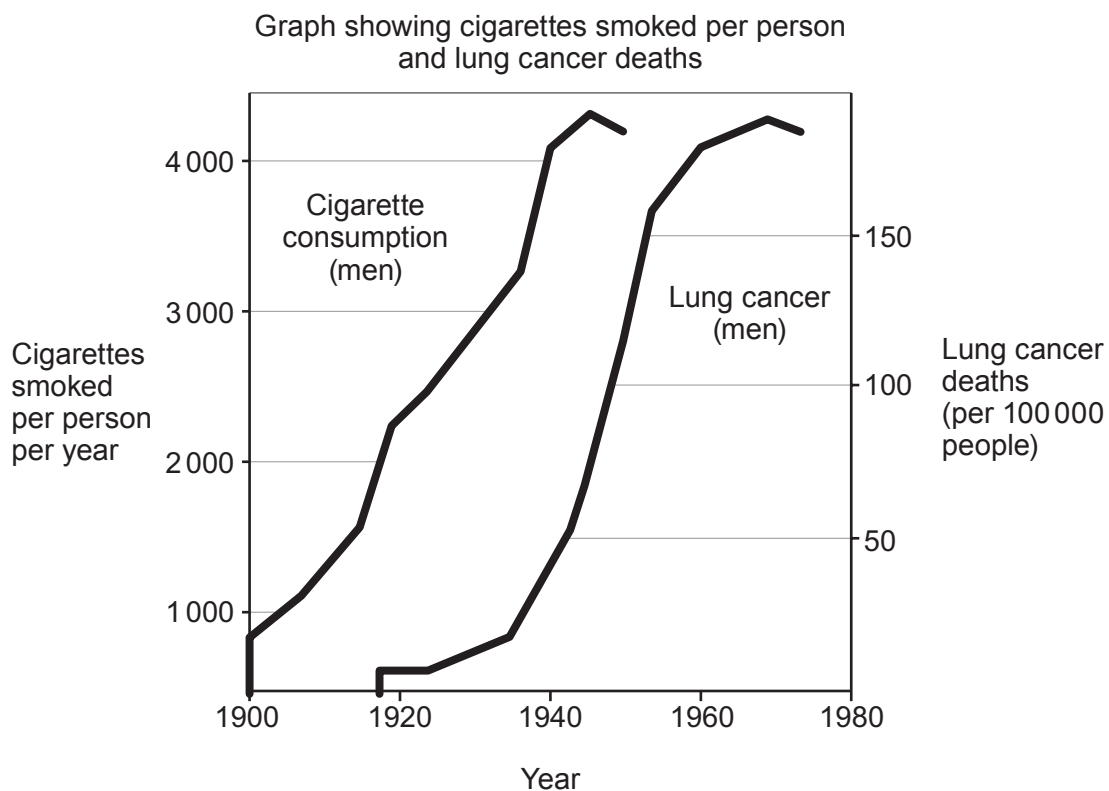
Test tube **B**

.....

- (c) Apart from not producing any bubbles, suggest **one other** advantage to a diver using a rebreather. [1]
- .....

8. The major rise in cigarette smoking amongst the UK population occurred at the start of the 20<sup>th</sup> century.

Examiner only



- (a) From the graph, describe fully the relationship between cigarette smoking and lung cancer deaths in men. [2]

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- (b) The link between smoking and lung cancer was first made by Sir Richard Doll, Professor of Medicine at the University of Oxford. Use the information in the graph to suggest when he first made the public aware of the link between cigarette smoking and lung cancer. [1]

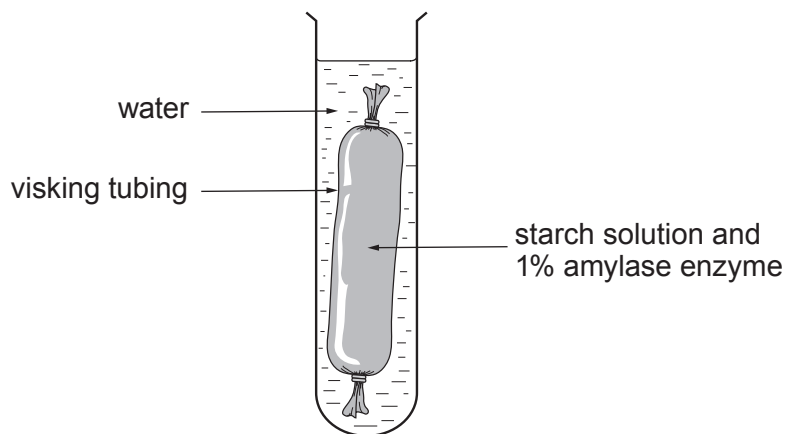
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|   |
| 3 |



Examiner  
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9. An experiment was set up using visking tubing as a model gut. This is shown in the following diagram. The visking tubing was filled with a starch solution and 1% amylase enzyme. After 30 minutes the water surrounding the visking tubing was tested and found to contain glucose but no starch.



Explain why glucose appeared in the water surrounding the visking tubing but no starch was found. Include in your account a description of how the water was tested for glucose using Benedict's solution and for starch using iodine solution giving the expected observations.

[6 QWC]

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