Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

# Double Award Science: Biology

MV18

Unit B1
Higher Tier

**[GSD12]**

**WEDNESDAY 22 FEBRUARY 2017, MORNING**

## Time

1 hour, plus your additional time allowance.

## Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

## Information for Candidates

The total mark for this paper is 70.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **5(a)**.

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**1** Glucose made in photosynthesis can be converted into starch in leaves.

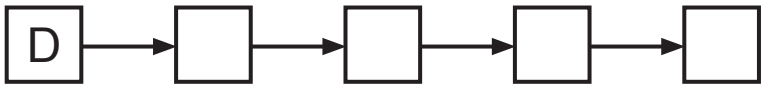
The steps A–E in testing a leaf for starch are given.

The steps are not in the correct order.

| | |
|---|---|
| A | Place the leaf in warm water. |
| B | Add iodine solution to the leaf. |
| C | Spread the leaf on a white tile. |
| D | Place the leaf in boiling water. |
| E | Place the leaf in boiling alcohol. |

**(a)** Use the letters to put the steps in the correct order in the boxes below. [2 marks]

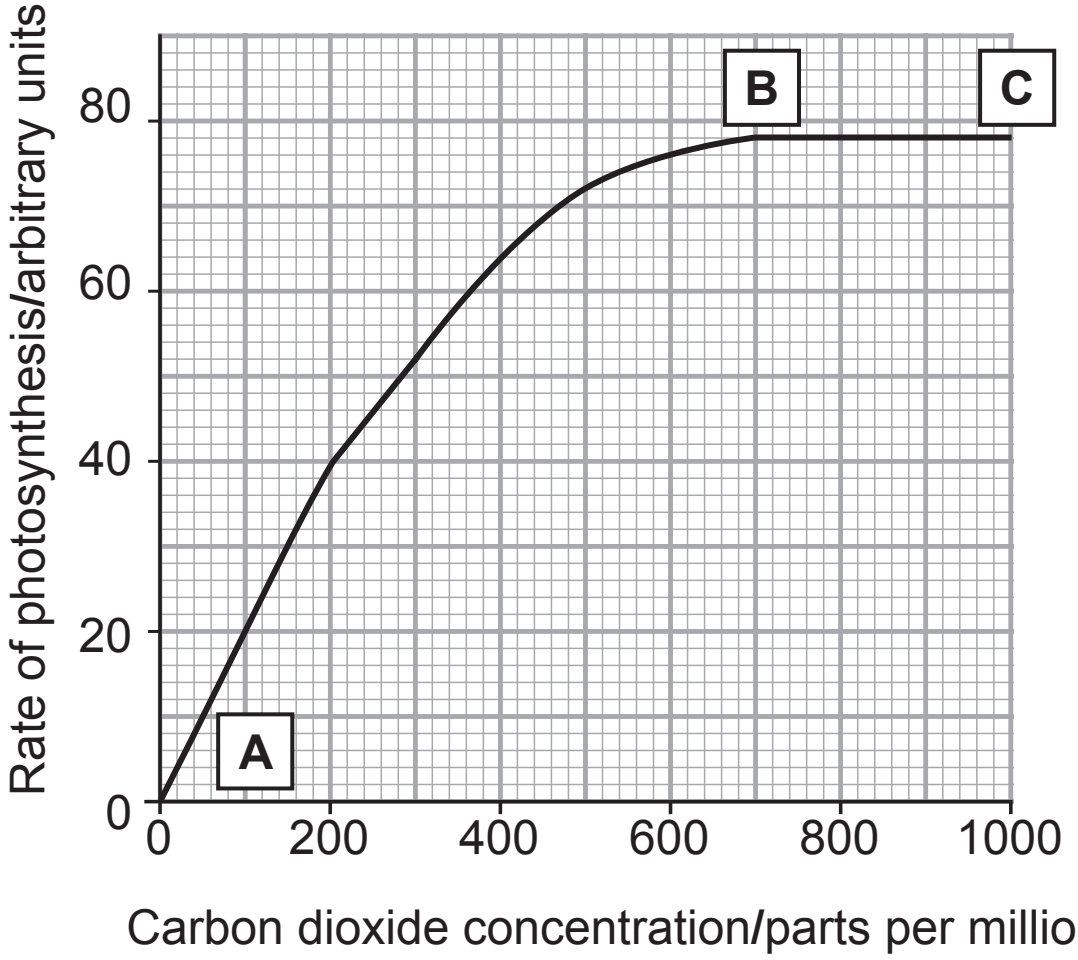
The first step has been given.




**(b)** Apart from being converted into starch in leaves, give **one other** way glucose is used in plants. [1 mark]

_____

**(c)** The graph shows the effect of carbon dioxide concentration on the rate of photosynthesis in tomato plants grown in a glasshouse.




**(i)** What factor limits the rate of photosynthesis between **A** and **B**? [1 mark]

_____

**(ii)** Suggest **one** factor that might limit the rate of photosynthesis between **B** and **C**. [1 mark]

_____

**(d)** There is no advantage in adding extra carbon dioxide in the glasshouse at night.

Explain why. [2 marks]

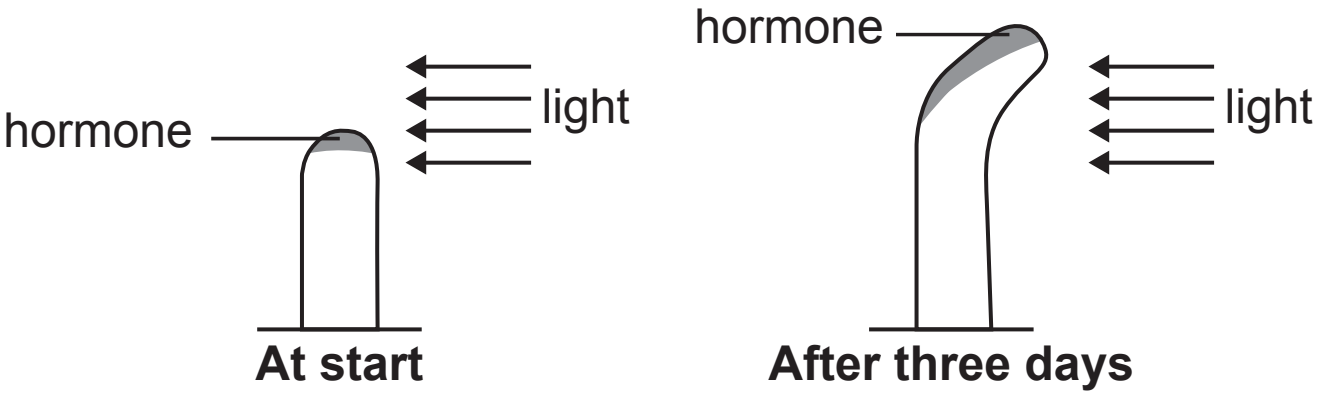
One way of adding extra carbon dioxide to a glasshouse is to burn a fuel such as natural gas.

**(e)** Suggest why it is better to use several small gas burners at different places in the glasshouse rather than one large burner placed at one end. [1 mark]

**2** The diagram shows an experiment where light shines from one direction on two plant seedlings, A and B.

A hormone is made in the tip and moves down the shoot.

**Seedling A**




**Seedling B**

After three days, seedling A had bent towards the light.

**(a)** Name this response. [1 mark]

_____

**(b)** Use the diagram and your knowledge to explain why seedling A had bent towards the light. [2 marks]

_____

_____

_____

_____

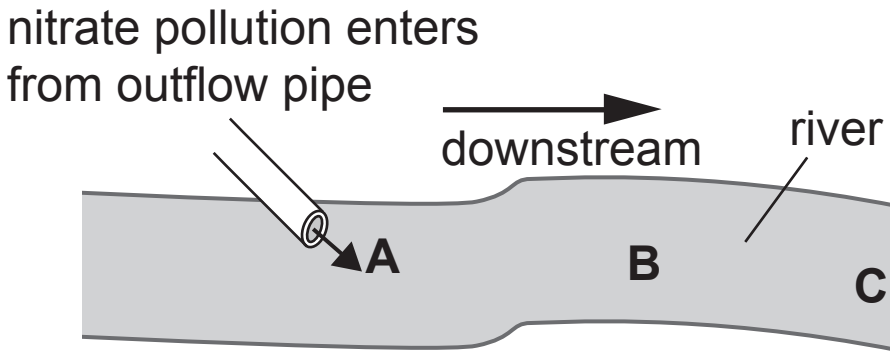
_____

_____

The shoot tip was removed in seedling B.

**(c)** In the space on the diagram **opposite**, draw how seedling B would appear **after three days**. [2 marks]

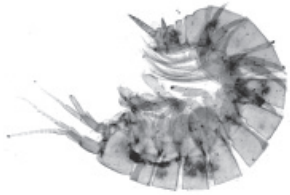
**3** The diagram shows a river where nitrate pollution is entering the water at point A.




The table shows the nitrate levels at three points A, B and C in the river.

| **Point in the river** | **Nitrate level mg/litre** |
|---|---|
| A | 30 |
| B | 15 |
| C | 0 |

The table below gives information on indicator species of water pollution.

| Name of indicator species | Photograph of indicator species | Level of water pollution where indicator species is found in large numbers |
|---|---|---|
| Freshwater shrimp |  | Medium to none |
| Stonefly |  | None |
| Bloodworm |  | High |

**(a)** Use the information given to name and explain which indicator species:

- would be found in **greatest** numbers at point A. [2 marks]

- could be found in **large** numbers at point C.
  [2 marks]

The increased nitrate level in the river at point A stimulates the growth of algae and aquatic plants.

**(b)** Explain how the death of the algae and aquatic plants leads to a reduction in the oxygen level in the river.
[3 marks]

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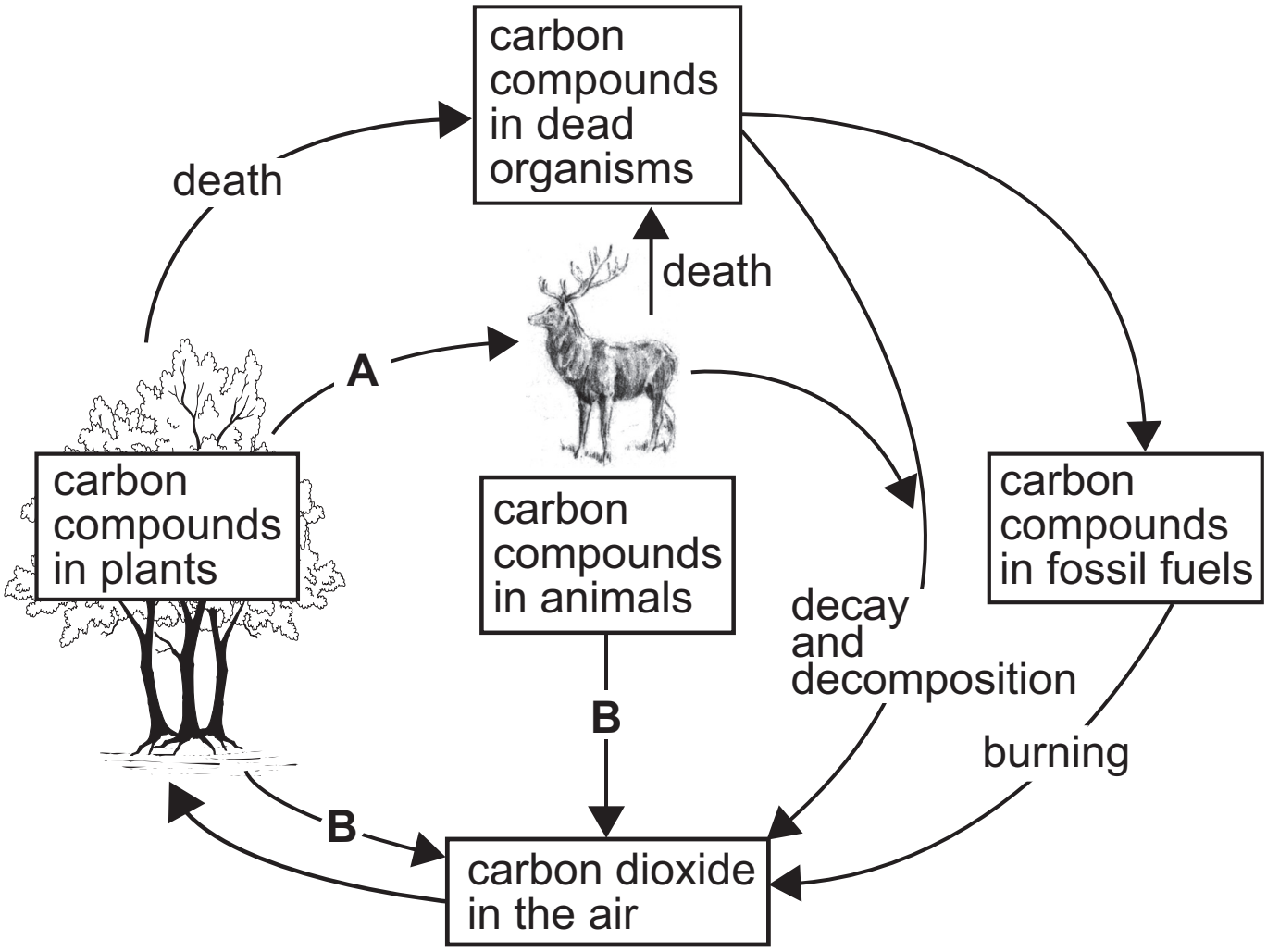
**(Questions continue overleaf)**

**4** **(a)** The diagram shows the carbon cycle.




**(i)** Name process **A**. [1 mark]

_____

**(ii)** Name process **B**. [1 mark]

_____

Deforestation is the cutting down of trees in large numbers to make land available for other uses.

The photograph shows deforestation.

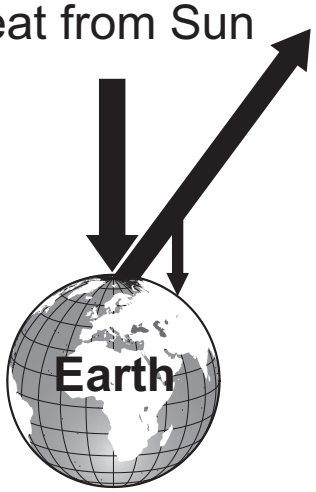
**(b)** Explain why deforestation leads to an increase in atmospheric carbon dioxide levels. [2 marks]

**(c)** Carbon dioxide ($CO_2$) is a greenhouse gas.

The diagram shows what happens to heat from the Sun in unpolluted air and polluted air.

**Unpolluted air**

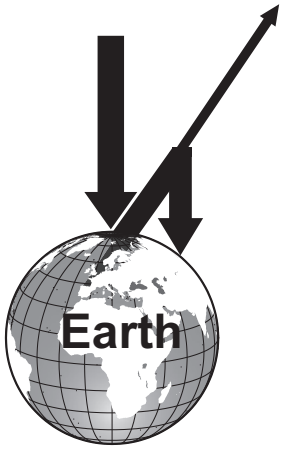
Heat from Sun




normal $CO_2$ levels

**Polluted air**

Heat from Sun




increased $CO_2$ levels

**(i)** Use the diagram and your knowledge to explain how polluted air has caused an increase in global warming. [2 marks]

**(ii)** Give **two** environmental effects of global warming. [2 marks]

1. _____

2. _____

**(d)** The table gives information on carbon dioxide emissions for China and the United States of America (USA) in 2013.

| Country | Average mass of carbon dioxide produced **per person**/tonnes | Percentage of total world emissions of carbon dioxide |
|---|---|---|
| China | 7.2 | 28 |
| USA | 16.4 | 14 |

**(i)** Suggest why the average mass of carbon dioxide produced per person in the USA is greater than that of a person in China. [1 mark]

_____

_____

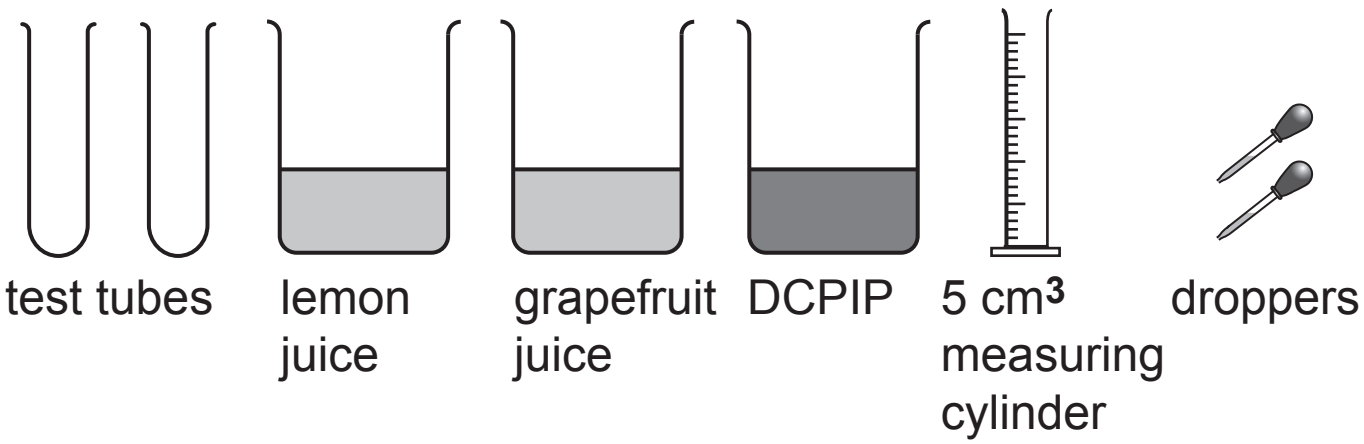
**(ii)** Suggest why the percentage of total world emissions of carbon dioxide is greater for China than the USA. [1 mark]

_____

_____

**5** James carried out an experiment to compare the vitamin C content of lemon juice and grapefruit juice.

The diagram shows the apparatus and materials James used.




Apparatus not to scale

**(a)** Describe the experiment that James carried out.
[6 marks]

**In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.**

James had predicted that lemon juice contains more vitamin C than grapefruit juice.
The results showed that his prediction was **wrong**.

**(b)** Describe the results James obtained. [1 mark]

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**6** **(a)** Meat is a rich source of protein in our diet.

**(i)** Describe how you would carry out a food test to show that a small lump of meat contains protein. [2 marks]

_____

_____

_____

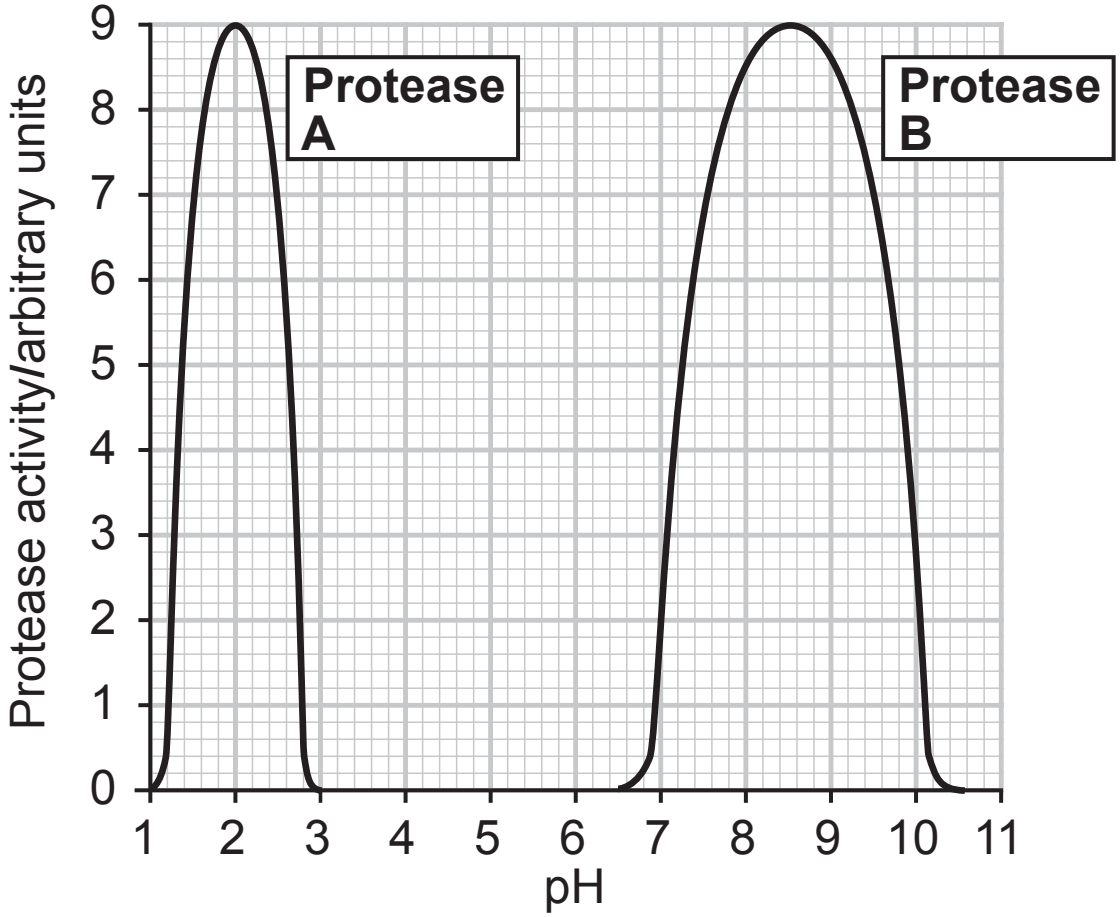
_____

**(ii)** Give the colour change for a positive result for protein. [1 mark]

_____ to _____

Two different protease enzymes break down protein in the digestive system.

The graph shows the activity of the two proteases over different pH ranges.




**(b)** Where in the digestive system would you find

protease **A**? _____

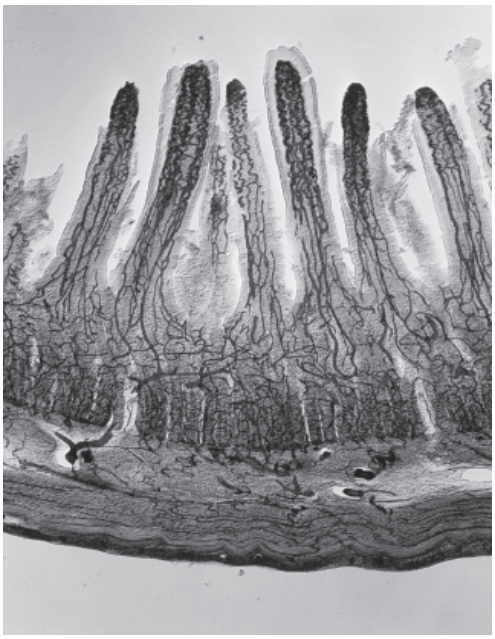
protease **B**? _____ [2 marks]

**(c) (i)** Name the breakdown products of protein digestion. [1 mark]

_____

The breakdown products of protein digestion are absorbed by the villi.

The photograph shows villi.



**(ii)** Give **three** ways the villi are adapted for efficient absorption of the breakdown products of protein digestion. [3 marks]

1. _____

_____

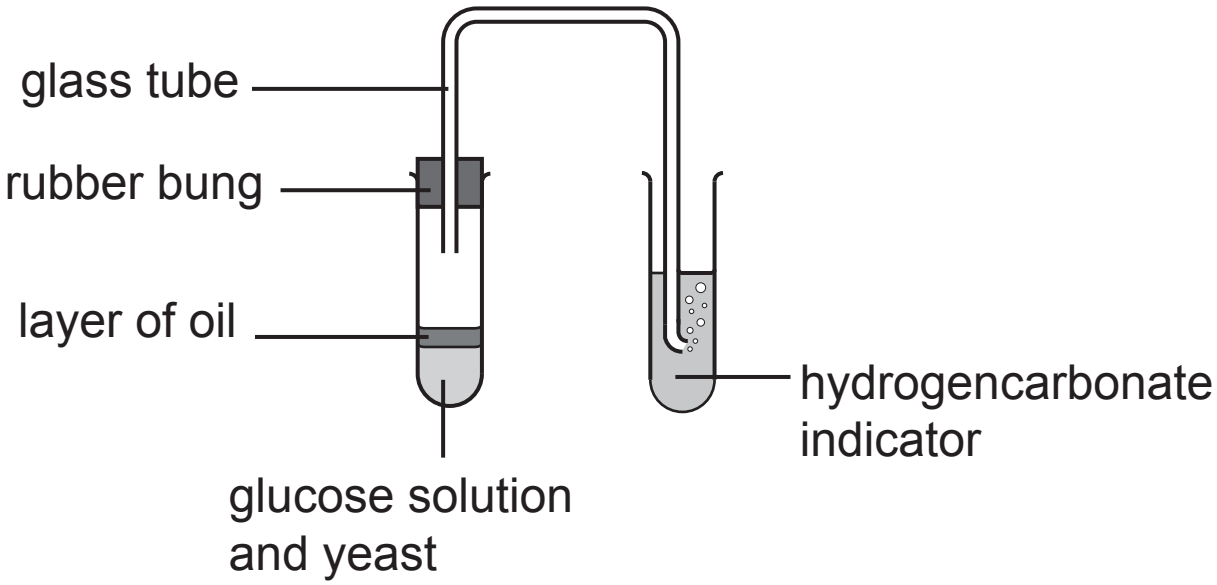
2. _____

_____

3. _____

_____

**7** The diagram shows the apparatus Laura used to investigate anaerobic respiration in yeast.




**(a)** What is the function of the layer of oil? [1 mark]

**(b)** Laura boiled and then cooled the glucose solution before she added the yeast.
Explain why. [2 marks]

Laura left the experiment for one hour.

**(c)** Describe and explain the colour change in the hydrogencarbonate indicator after one hour. [2 marks]

Red to _____

Explanation _____

_____

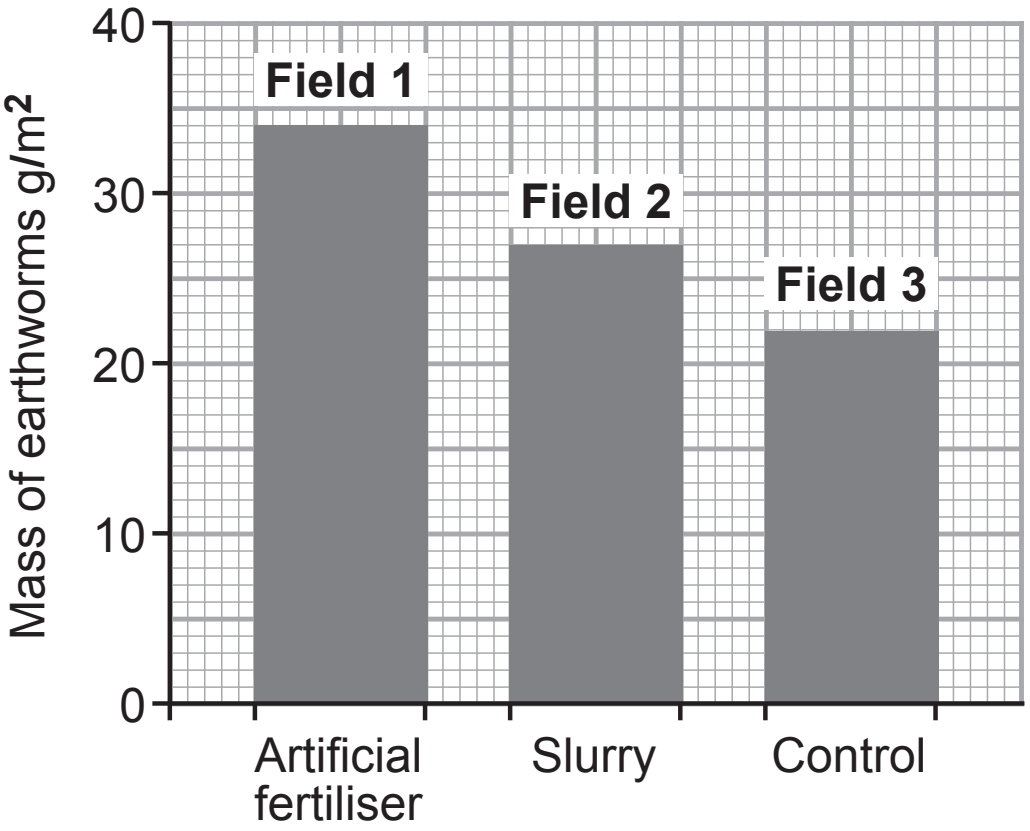
Mammalian muscle can also carry out anaerobic respiration.

**(d)** Complete the equation for this process by writing in the boxes. [2 marks]

**8** **(a)** Scientists investigated the effect of applying artificial fertiliser, natural fertiliser (slurry) and no fertiliser on the mass of earthworms in three different grass fields.

No fertiliser was applied as the control.

The bar graph shows the results.




Use the results in the bar graph to answer the following questions.

**(i)** Explain the role of the control. [1 mark]

_____

_____

**(ii)** Give **two** conclusions that can be drawn from the results of this investigation.
Give **data** to support your answer. [3 marks]

1. _____

_____

_____

2. _____

_____

_____

**(b)** The photograph shows an earthworm burrowing through the soil.

**(i)** Use the photograph to help name the group of animals that the earthworm belongs to. [1 mark]

_____

When earthworms burrow, it increases the oxygen levels in the soil.

**(ii)** Use the information given and your knowledge to explain how earthworms affect the **uptake** of nitrates by plant root hair cells. [2 marks]

The burrowing of earthworms increases the **level** of nitrates in the soil by causing an increase in nitrogen fixation.

**(iii)** Name and describe **one other** process in the nitrogen cycle in which the burrowing of earthworms increases the level of nitrates in the soil. [2 marks]

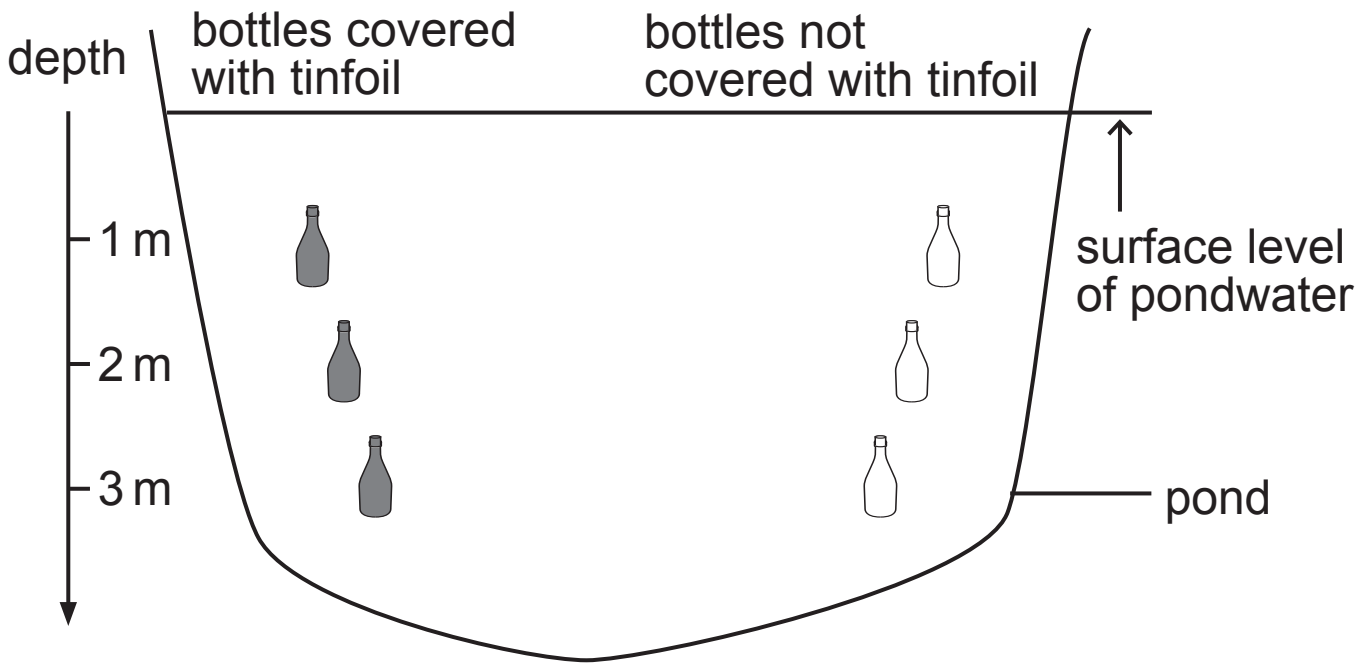
**9** Phytoplankton are microscopic plants.
The photograph shows phytoplankton found in pondwater.

John investigated the effect of light on **photosynthesis** and **respiration** in phytoplankton found in pondwater.

He filled six clear glass bottles of the same size with pondwater containing phytoplankton.

He placed a stopper on each of the six bottles.

The diagram shows how he set up his experiment.



The oxygen concentration in all the bottles was the same when John placed the bottles in the pond at 10 am on a bright summer's day.

He recorded the change in the **oxygen concentration** in the bottles at 2 pm on the same day.

The table shows the results.

| Depth bottle placed in pond/m | Change in **oxygen concentration**/arbitrary units | |
|---|---|---|
| | Bottle **covered** with tinfoil | Bottle **not covered** with tinfoil |
| 1 | –4 | +9 |
| 2 | –4 | +7 |
| 3 | –4 | +5 |

Use the information given and your knowledge to answer the following questions.

**(a)** Explain why the oxygen concentration has decreased in the bottles **covered** with tinfoil. [3 marks]

**(b)** Explain why the oxygen concentration has increased in the bottles **not covered** with tinfoil. [3 marks]

**(c)** The smallest change in oxygen concentration in the bottles **not covered** with tinfoil occurred at 3 m depth. Suggest why. [2 marks]

**THIS IS THE END OF THE QUESTION PAPER**

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Q3.....Source: Principal Examiner

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|---|---|
| **Question Number** | **Marks** |
| 1 | |
| 2 | |
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| **Total Marks** | |