PLATINUM
BUSINESS ACADEMY
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Write your name here

Surname	Other names

Pearson Edexcel Certificate
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Centre Number | | | | | |

Candidate Number | | | | |

Biology

Unit: KBI0/4BI0

Paper: 2B

Monday 16 January 2017 – Afternoon **Time: 1 hour**	Paper Reference **KBI0/2B** **4BI0/2B**

You must have:
Calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions.

1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

How plants breed

Asexual reproduction in animals is rare but it is commonly used in plants. Plants often use asexual reproduction when the conditions are favourable. They use sexual reproduction when environmental conditions are changing. The ability to alter the method of reproduction enables plants to increase their chance of survival.

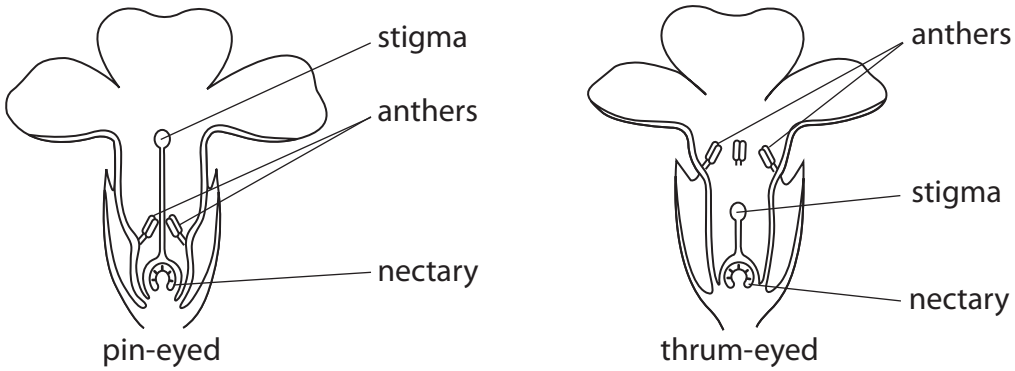
Flowers are the sexual reproductive organs of plants. Most plants have flowers with male and female sex organs. These flowers have stamens and carpels, and are described as bisexual. A unisexual flower is one in which only the stamens or the carpels are present. Dioecy is the condition of having unisexual flowers on different plants. Dioecy may have evolved to ensure that these plants can only reproduce by outbreeding.

Outbreeding involves producing offspring by the fusion of gametes from two different plants. It is the most common method of reproduction among most plants. In outbreeding, pollen is transferred from the anther of a flower on one plant to the stigma in a flower on a different plant.

Some other plants produce both types of gamete and are self-fertilising. This method of reproduction is known as inbreeding.

Pollination, or the transfer of pollen to a stigma, is an important part of both inbreeding and outbreeding. Pollinators, such as insects, birds or bats, first need to be attracted to a flower and then provided with a reason to return or to go to another flower of the same species. Generally, animals are attracted to a flower by a smell or by the colour and shape of the flower. Smells may be faint, sweet, musky or unpleasant. Flowers offer rewards to pollinators, including pollen, nectar or fats and oils.

Some flowers have evolved different structures or forms that prevent self-pollination and so prevent inbreeding. One example is the primrose. This flower exists in two forms, pin-eyed and thrum-eyed.



The lengths of stamens and styles in these flowers are adapted for pollination by different pollinators, or different body parts of the same pollinator. Pollen from a pin-eyed flower will rub off on the stigma of a thrum-eyed flower. Pollen from a thrum-eyed flower will rub off on the stigma of a pin-eyed flower.

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(a) (i) Asexual reproduction is commonly used in plants (line 1).

Give an example of a method of asexual reproduction used by a plant.

(1)

(ii) Suggest why plants alter their method of reproduction from asexual to sexual when environmental conditions are changing (lines 2 and 3).

(1)

(b) Explain how dioecy ensures outbreeding (lines 8 to 10).

(2)

(c) Nectar is often offered as a reward for pollinators (line 22).

The reward contains carbohydrates such as glucose.

Describe how you would compare the glucose content of nectar from two different plant species.

(2)

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(d) Describe how pollen from wind-pollinated flowers is adapted for pollination.

(2)

(e) Describe how you could estimate the population size of pin-eyed and thrum-eyed primroses in an area of woodland.

(4)

(f) Suggest how the structure of the two types of primrose helps to prevent self-pollination.

(2)

(Total for Question 1 = 14 marks)

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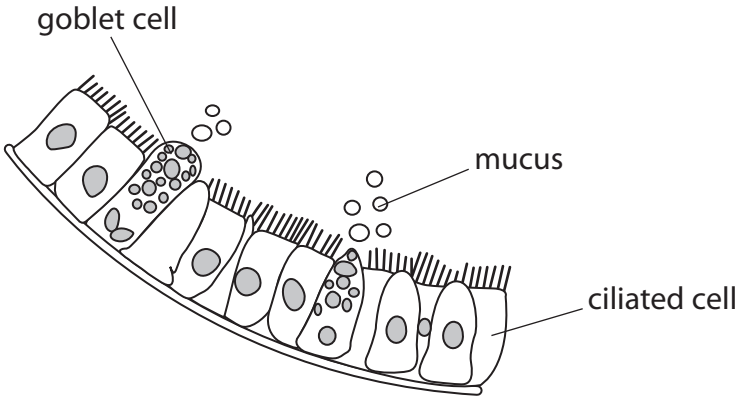
2 The diagram shows some ciliated cells and goblet cells lining the wall of the bronchioles in the lungs.



The small hairs on the surface of the ciliated cells are called cilia.

The goblet cells produce mucus. This mucus is moved by the cilia.

(a) Suggest how ciliated cells and goblet cells protect the lungs from infection.

(2)

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(b) Chemicals in cigarette smoke reduce the movement of the cilia.

Suggest why people who smoke cigarettes often have to cough.

(1)

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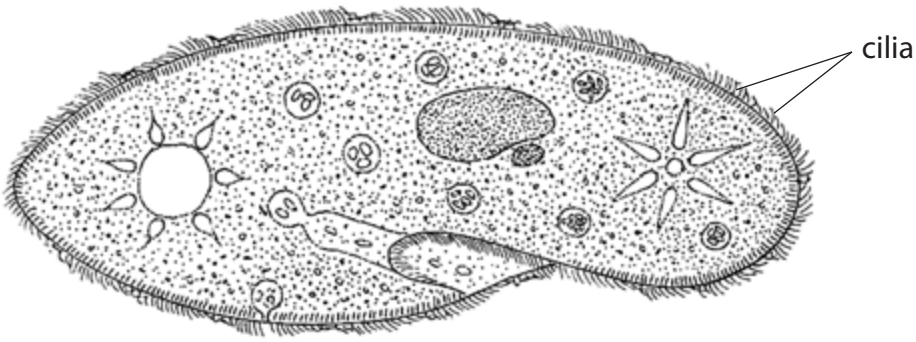
(c) A scientist investigates the effect of two brands of cigarette, brand A and brand B, on the movement of cilia.

He uses a single-celled organism called *Paramecium* as a model for cilia movement.

The diagram shows a *Paramecium*, which uses cilia on the outside of its body to move through water.

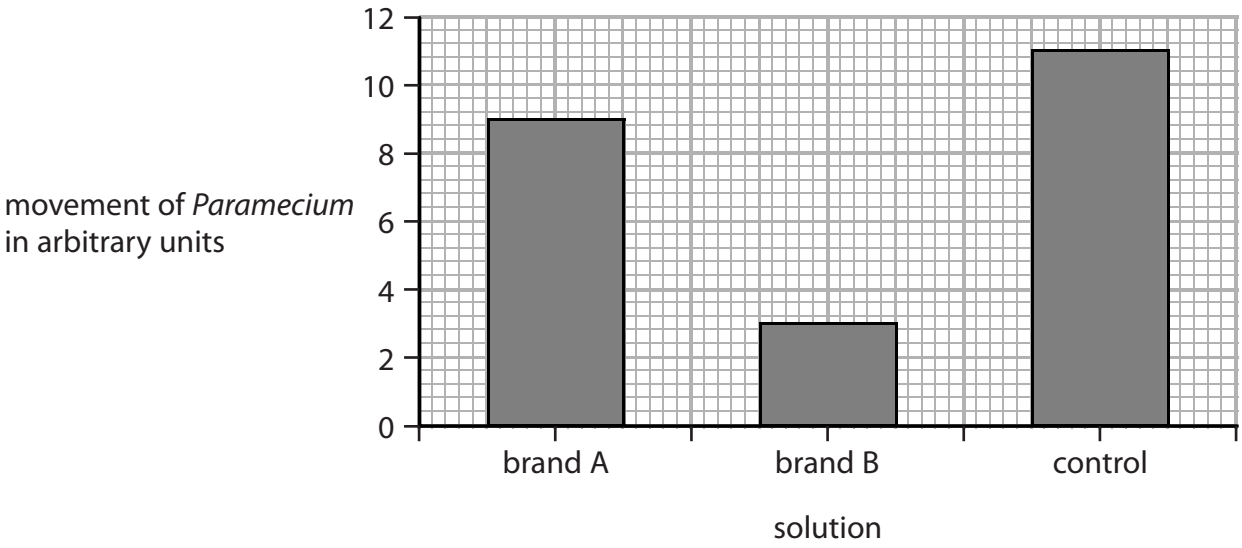


The scientist obtains solutions for each brand of cigarette by placing the tobacco into test tubes of water for 20 minutes.

Chemicals in the tobacco dissolve in the water.

- he places a *Paramecium* in the solution from brand A
- he places a *Paramecium* in the solution from brand B
- he also places a *Paramecium* in a control solution
- he uses a light microscope to observe the movement of the *Paramecium*

The graph shows his results.



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(i) Describe the effects of the solutions on the movement of the cilia.

(2)

(ii) What should the scientist use as a control solution?

(1)

(iii) The scientist concludes that smoking reduces the movement of cilia in human lungs.

Another scientist suggests this may not be a valid conclusion.

Give four reasons why this conclusion may not be valid.

(4)

1

2

3

4

(Total for Question 2 = 10 marks)

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3 The structure of a bacterium differs from the structure of a virus.

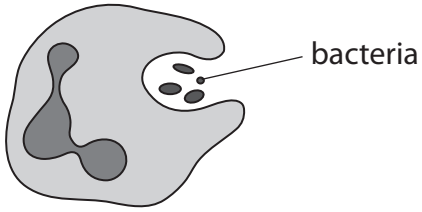
(a) Name two structures found in a bacterium that are not found in a virus.

(2)

1 .....

2 .....

(b) The diagram shows a white blood cell and some pathogenic bacteria.



Explain how this white blood cell helps to prevent the bacteria from causing disease.

(3)

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(c) Explain how bacteria are important in cycles within ecosystems.

(6)

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(d) A student read that in two days a bacterium could produce a colony equal in mass to the entire planet Earth.

Suggest two reasons why this will not happen.

(2)

1 .....

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2 .....

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(Total for Question 3 = 13 marks)

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4 Lipase is an enzyme that digests lipid into fatty acids and glycerol.

(a) Name a part of the digestive system where lipase is released.

(1)

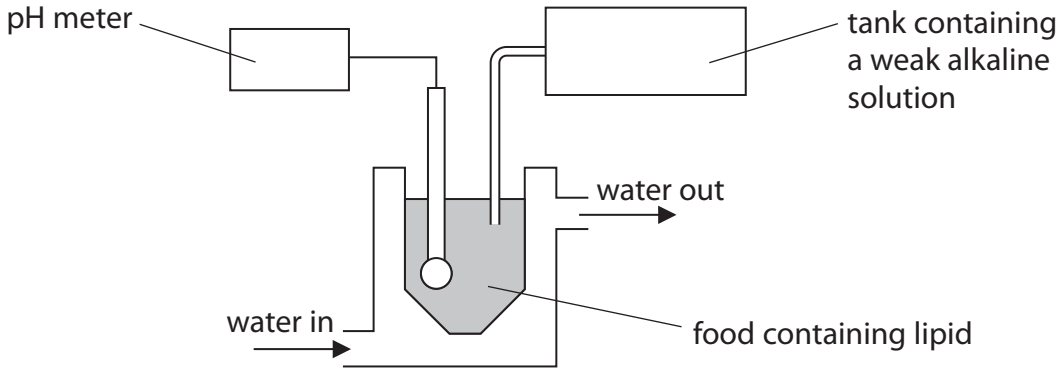
(b) A drug, X, that inhibits lipase is used to help people lose weight.

Explain how inhibition of lipase helps people to lose weight.

(2)

(c) A scientist wants to investigate the inhibition of human lipase using different concentrations of drug X.

The diagram shows the apparatus the scientist uses.



In the investigation one concentration of drug X is added to food containing lipid.

The percentage inhibition of lipase is measured after 10 minutes.

This is repeated using different concentrations of drug X.

Explain which temperature of water should be used in the apparatus throughout the investigation.

(2)

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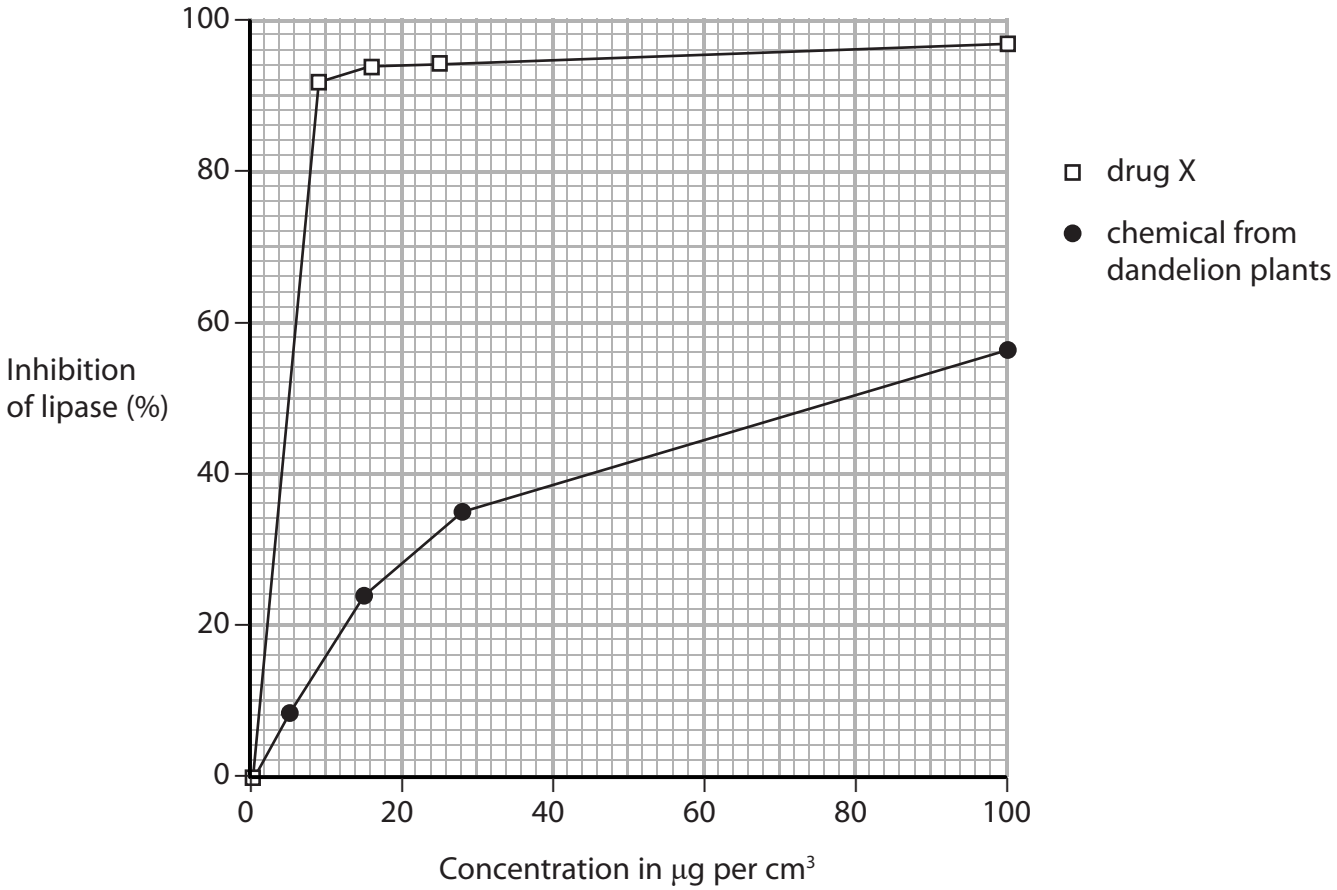
(d) A chemical extracted from dandelion plants also inhibits lipase.

The scientist repeats his experiment using the same range of concentrations of this chemical.

The graph shows the scientist's results for drug X and the chemical from dandelion plants.



(i) Calculate the difference between the concentration of drug X and the concentration of chemical from dandelion plant extract that produces 50% inhibition.

Show your working.

(2)

difference = ... µg per cm^3

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(ii) Explain how the scientist could use the apparatus from part (c) to tell if the lipase had been inhibited.

(3)

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(iii) Why is drug X used at a maximum concentration of 8 μg per cm^3?

(1)

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(Total for Question 4 = 11 marks)

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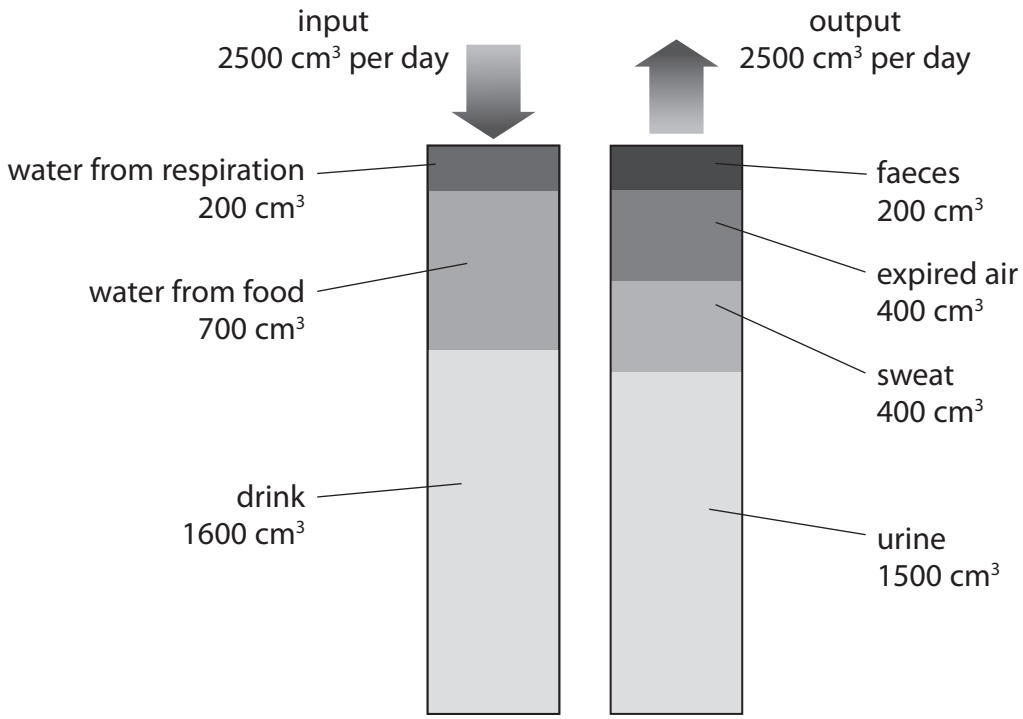
5 Humans need to balance the input and output of water in their bodies.

The diagram shows the various sources and average (mean) volumes of input and output of water.



(a) Give the name of the process by which water balance in the body is maintained.

(1)

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(b) Use the diagram to calculate the percentage of water input that comes from respiration.

Show your working.

(2)

percentage of water input = ... %

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(c) A person moves from a cold place to a hot place.

Explain how this would affect the volume of water the person loses in sweat and the volume of water the person loses in urine.

(4)

(Total for Question 5 = 7 marks)

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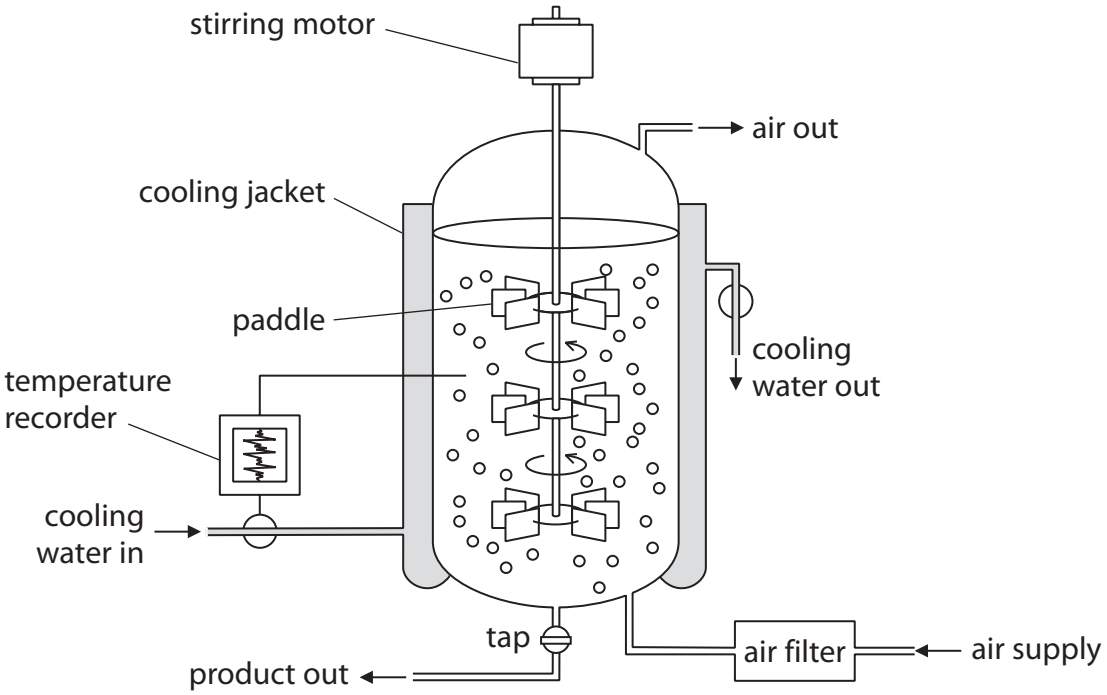
6 The diagram shows a fermenter used to grow microorganisms.



(a) (i) Describe the role of the air supply.

(2)

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(ii) Suggest why the air filter is included in the fermenter.

(1)

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(b) Explain what will happen to the growth of the microorganisms if temperature regulation fails.

(2)

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(Total for Question 6 = 5 marks)

TOTAL FOR PAPER = 60 MARKS

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