Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A334/02

TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A

Agriculture and Food
(Higher Tier)

FRIDAY 12 JUNE 2009: Morning
DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

DC (AC/SW) OV90935 11130/2

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **Write your answer to each question in the space provided, however additional paper may be used if necessary.**

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 36.**

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Answer ALL the questions.

1 Charlie grows rhubarb in her garden.

She harvests the rhubarb and sells it.

(a) Charlie knows that the rhubarb leaves use light to photosynthesise.

Complete the word equation for photosynthesis.

_____ + water ⇨ glucose + _____

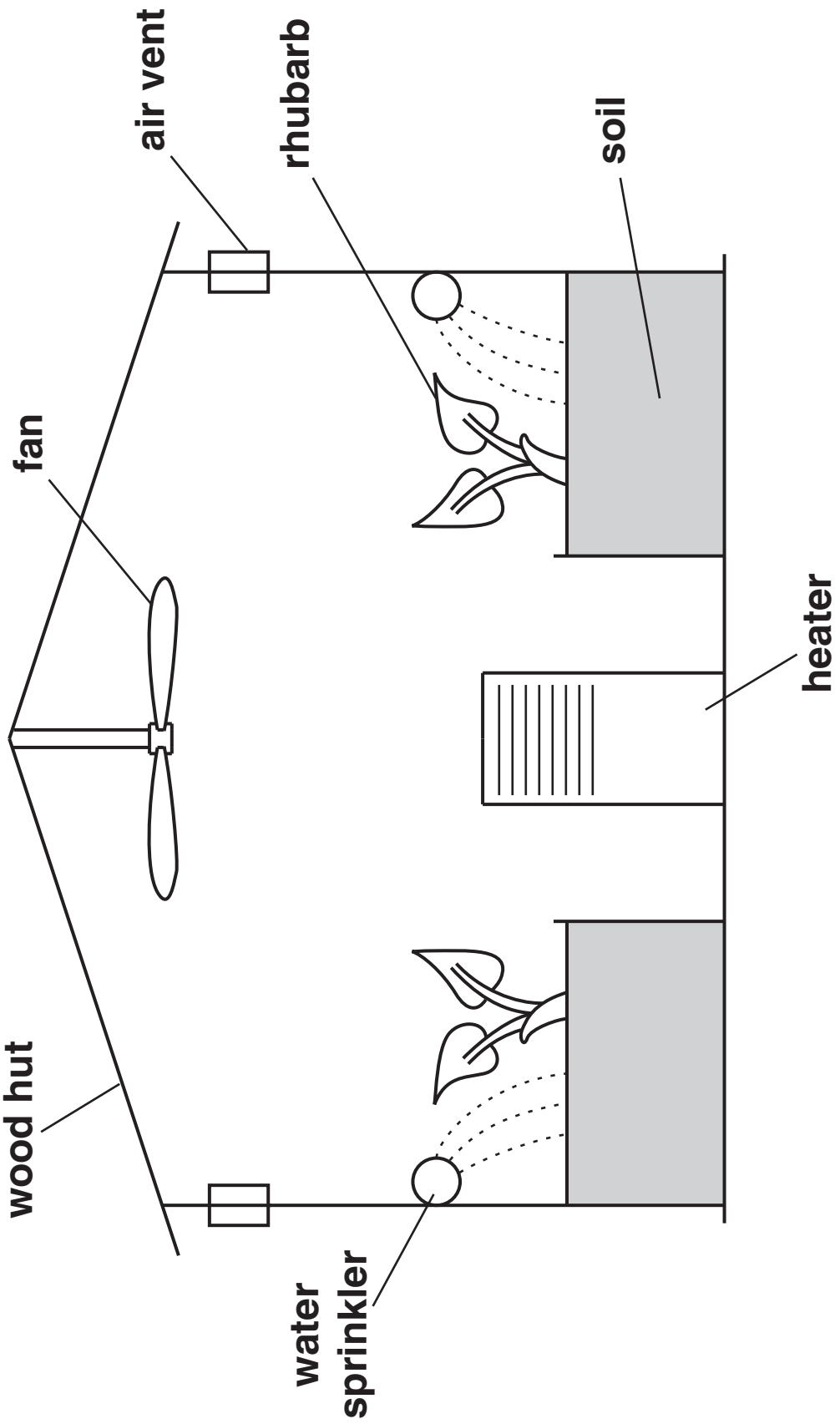
[2]

(b) Charlie does a web search.

She finds out that rhubarb can also be grown in the dark.

The rhubarb stems grow much quicker and are soft and tender.

She uses a hut to grow rhubarb in controlled conditions.



(i) Write down <u>ONE</u> condition, apart from light, that is being controlled.

Describe its effect on the growth of plants such as rhubarb.

condition _____

effect _____

_____ **[2]**

(ii) Charlie does tests as the rhubarb grows.

Draw a straight line from each <u>DESCRIPTION</u> to the correct <u>TYPE OF TEST</u>.

<u>DESCRIPTION</u>	<u>TYPE OF TEST</u>
uses a pH meter to test the soil	semi-quantitative
inspects leaves for mineral deficiency	qualitative
uses pH indicator paper to test the soil	quantitative

[2]

(c) Charlie grows the same number of rhubarb plants in both her garden and her hut.
She compares the two crops every year for three years.

year	mass of rhubarb crop from garden (in kg)	mass of rhubarb crop from hut (in kg)
1	30.5	40.1
2	28.5	44.5
3	23.5	46.2

(i) The crops are measured as wet mass.

Why is this method not very accurate?

_____ **[1]**

(ii) Suggest why the crop yield from the hut is higher than that from the garden.

_____

_____

_____

_____ **[2]**

(iii) Explain why Charlie can charge more for the rhubarb grown in her hut.

_____

_____

_____ **[2]**

[Total: 11]

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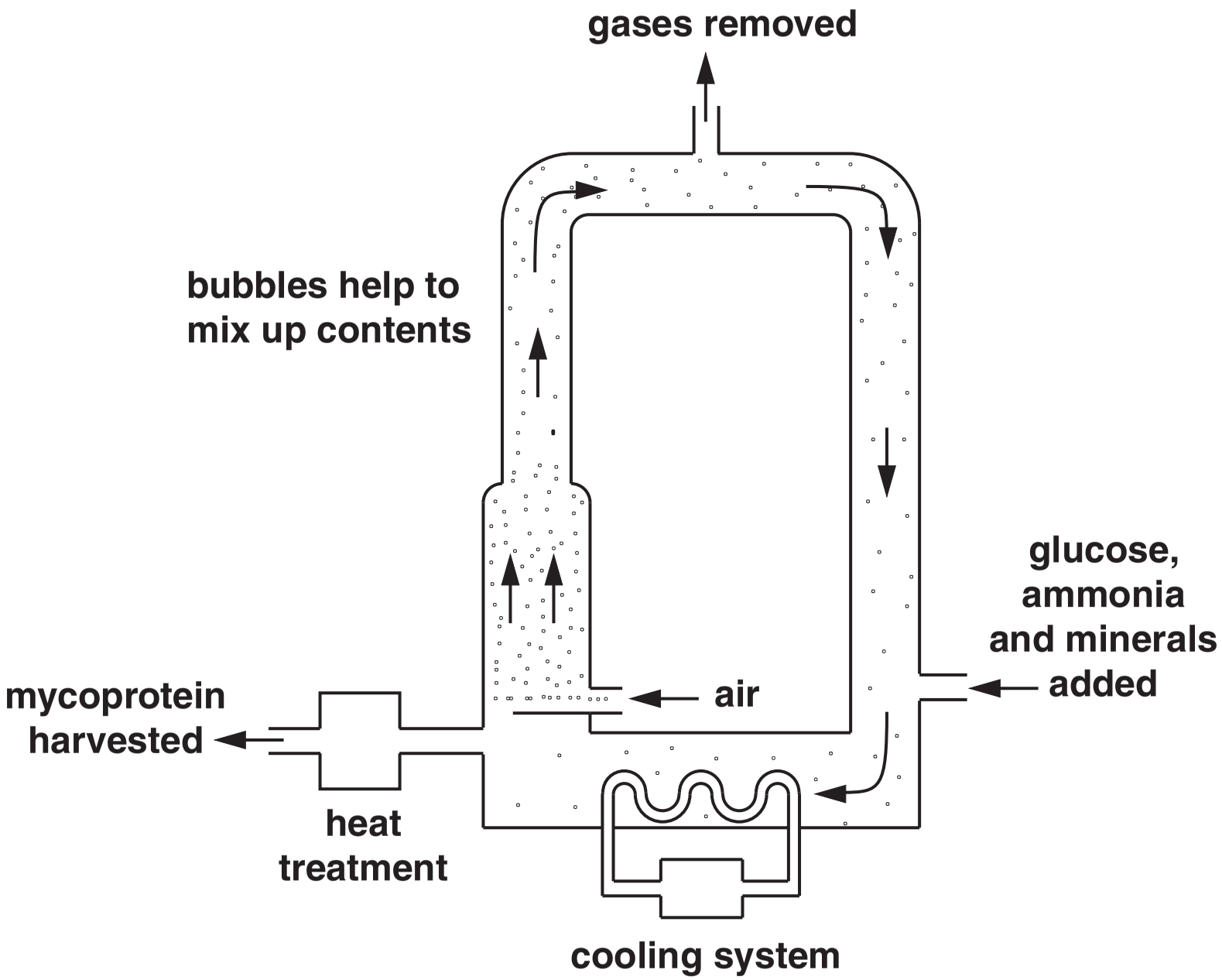
2 Protein is an important part of our diet.

A fungus called *Fusarium* is grown in large fermenters.

The fungus produces large amounts of protein called mycoprotein.

Look at the diagram opposite showing the production of mycoprotein.


gases removed
bubbles help to mix up contents
glucose, ammonia and minerals added
air
mycoprotein harvested
heat treatment
cooling system

(a) Explain why glucose and air are added to the fermenter.

glucose _____

air _____ **[2]**

(b) Suggest why a cooling system is needed.

_____

_____ **[1]**

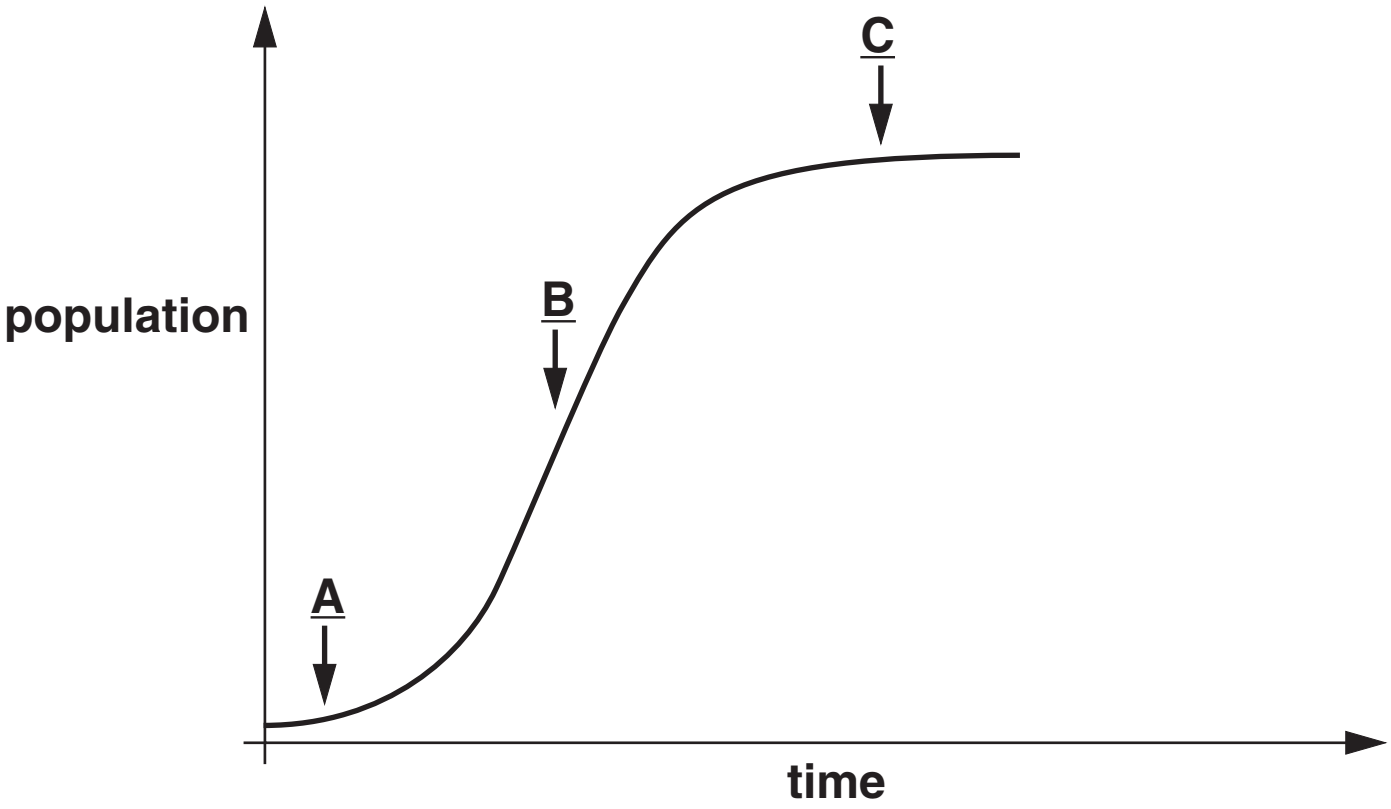
(c) This method of production is called continuous culture.

Write down <u>ONE</u> advantage and <u>ONE</u> disadvantage of using continuous culture.

advantage _____

disadvantage _____ **[2]**

(d) The population growth rate of microorganisms can be recorded.



(i) The graph shows three stages.

STAGE B has been named for you.

Name the stages A and C.

A _____

B rapid growth

C _____ **[1]**

(ii) Continue the graph on page 13 to show what would happen to the population if the supply of glucose was stopped. [2]

(iii) The individual *Fusarium* organisms are difficult to count.

Suggest <u>ONE OTHER</u> method of measuring population growth.

_____

_____ **[1]**

[Total: 9]

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3 Read the newspaper story about a monster pig.

A MONSTER PIG!

A large male pig weighing 477 kg and measuring over three metres long has been hunted and shot in America.

It could produce about 320 kg of sausages!

A spokesperson said, "It's a pity it is dead.

It could have been used in a selective breeding programme."

The technique of artificial insemination would have been used.

(a) Explain how the monster pig would have been used in a SELECTIVE BREEDING programme.

_____

_____

_____ **[2]**

(b) Artificial insemination or embryo implantation can be used as part of a selective breeding programme.

(i) List in the correct order the main stages used in <u>ARTIFICIAL INSEMINATION</u>.

The first one has been done for you.

1 selection of animals

2 _____

3 _____

4 _____ **[3]**

(ii) Explain what is meant by <u>EMBRYO IMPLANTATION</u>.

_____

_____

_____ **[2]**

(iii) Natural breeding programmes have about a 70% chance of a successful pregnancy. Artificial insemination programmes have about a 90% chance of a successful pregnancy.
Embryo implantation programmes have about a 20% chance of a successful pregnancy.

Which method has the greatest chance of success?

Explain why.

_____

_____

_____ **[2]**

[Total: 9]

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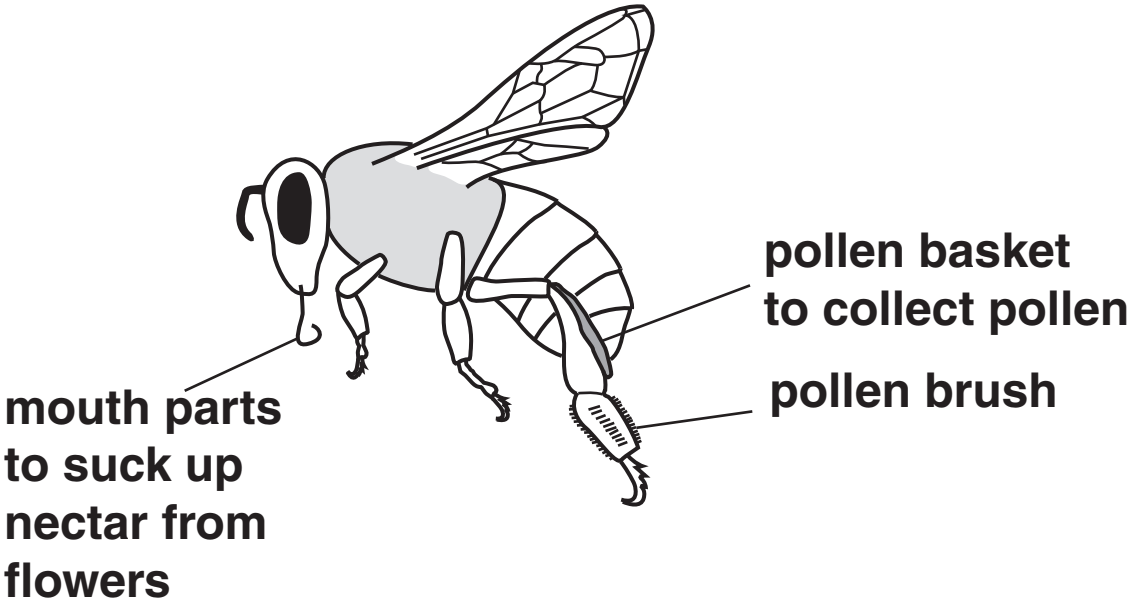
4 In 2007, American dairy and arable farmers were concerned when they discovered that honey bees in about 90% of bee hives had vanished.

a honey bee ready to visit flowers



(a) Suggest why the American farmers were concerned about the vanishing bees.

_____

_____ **[2]**

(b) Scientists thought of a number of possible explanations for the vanishing bees:

- **a mutated virus**
- **genetically modified (GM) crops**
- **parasitic mites**
- **use of pesticides.**

(i) A mutated virus is caused by a change in its DNA.

Why might a change in DNA produce changes to organisms?

_____

_____

_____ **[2]**

(ii) The bees may have reacted to pollen and nectar from genetically modified crops.

What is meant by <u>GENETICALLY MODIFIED</u>?

_____

_____

_____ **[2]**

(iii) Write down one example of the use of genetic modification of a microorganism to make a useful product.

microorganism _____

product _____ **[1]**

[Total: 7]

END OF QUESTION PAPER

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