Write your name here

Surname	Other names

Edexcel Certificate
Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Biology

Unit: KBI0/4BI0
Paper: 2B

Friday 11 January 2013 – 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.
- Keep an eye on the time.
- 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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P 4 1 5 3 7 A 0 1 1 6

PEARSON

Answer ALL questions.

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

Transgenic animals

The term 'transgenic' means the transfer of genetic material from one species to a different species. Cattle, pigs or sheep are made to superovulate and their eggs are collected. The eggs are fertilised and a desired gene is injected into them using a needle. Some of the fertilised eggs take up the gene, which becomes part of one of the animal's chromosomes. The fertilised eggs develop into embryos which are cultured and then implanted into surrogate mothers to complete their development.

In 1993, the world's first transgenic lamb, known as Tracy, was produced from a fertilised egg which had been injected with a human gene. When Tracy became an adult sheep she was able to produce milk containing the human protein AAT. This protein can be used to treat human lung diseases such as emphysema and cystic fibrosis.

Tracy looked like a normal sheep and was able to reproduce. She gave birth to two lambs, one of which inherited her ability to produce AAT milk. Tracy showed that human proteins could be made in other mammals and extracted from their milk. This technique can now be used to obtain milk that contains specific antibodies or blood clotting factors.

Another potential use of transgenic animals is to produce organs for transplanting into humans. This is important because of the decreasing availability of human organ donors and the increasing demand for organs.

Transgenic technology can also be used to transfer genes into cattle for disease resistance, increased meat production and increased ability to digest cellulose.

(a) Explain what is meant by the term **gene** (line 3).

(2)

(b) Suggest what is meant by the term **superovulate** (line 2).

(1)

(c) In which part of the surrogate mother are the embryos implanted (lines 6 to 7)?

(1)

(d) Name the human behaviour that can lead to emphysema (line 11).

(1)

(e) What percentage of eggs produced by Tracy were known to contain transgenic DNA (lines 13 to 14)?

(1)

(f) (i) To be able to work, the blood clotting factors must be extracted from the milk.

Suggest why drinking milk containing blood clotting factors will not help to clot blood (line 17).

(1)

.....

.....

(ii) Suggest why it is an advantage to increase the ability of cattle to digest cellulose (line 22).

(2)

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(g) Suggest the benefits of producing transgenic hearts.

(3)

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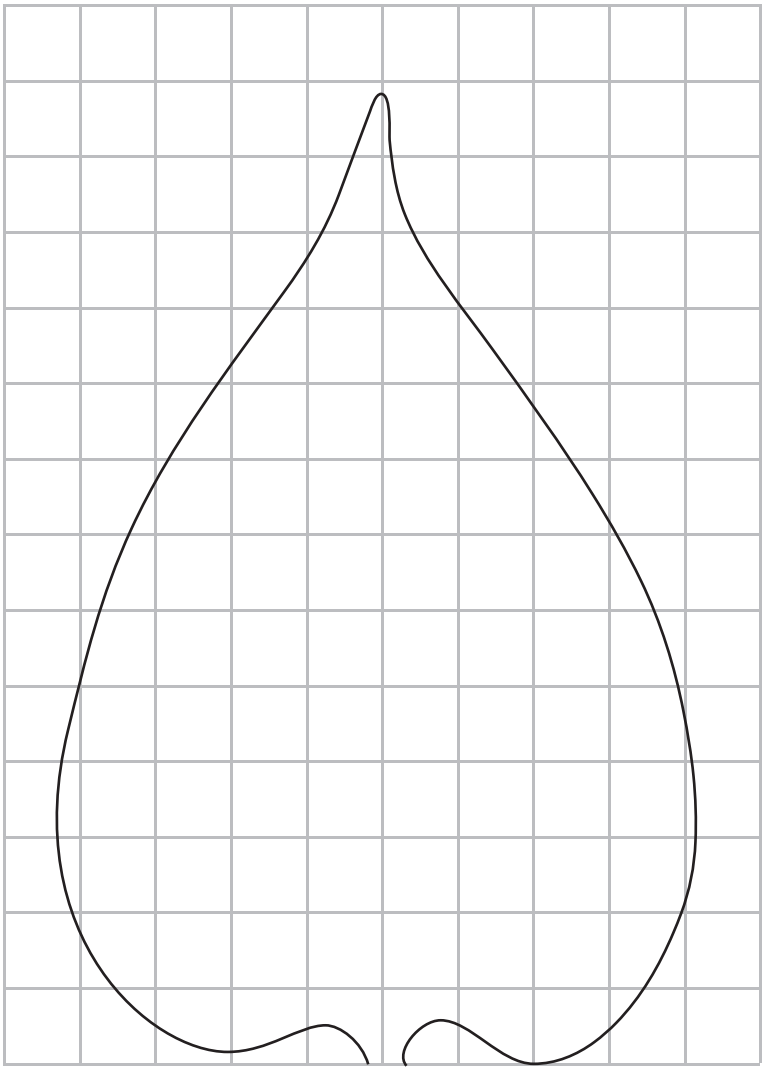
(Total for Question 1 = 12 marks)

2 Bethany wanted to compare the mass of water lost from the upper surface and the lower surface of a leaf.

She set up an experiment using four leaves from the same species of tree. She estimated the surface area of each leaf by drawing around its outline on squared paper as shown in the diagram.



(a) Estimate the total surface area of this leaf in cm^2.

(2)

..... cm^2

(b) She applied a thin layer of petroleum jelly to the leaves as described below.

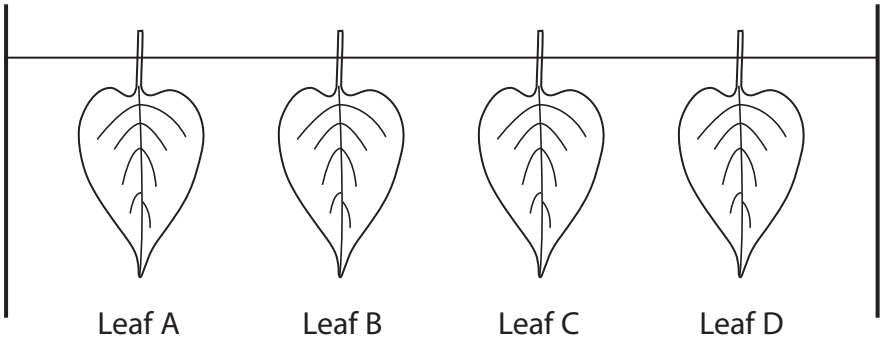
Leaf A no surface covered

Leaf B lower surface covered

Leaf C upper surface covered

Leaf D upper and lower surfaces covered

She then carefully weighed the leaves and recorded their mass. She hung the leaves by their stalks from a wire as shown. She left the leaves for 6 hours and then carefully weighed them again.



Leaf C had a lower surface area of 24 cm^2 and lost 0.2 g in 6 hours.

Calculate the loss of mass from leaf C in g per cm^2 in 1 hour.

(2)

Answer ..... g per cm^2 in 1 hour

(c) Identify the independent variable in this experiment.

(1)

.....

(d) Identify the dependent variable in this experiment.

(1)

.....

(e) State **one** variable that Bethany should control in this experiment.

(1)

.....

(f) (i) Complete the table to show the order in which the leaves A to D are most likely to lose mass.

(2)

Mass lost	Leaf
Most ↓ Least	

(ii) Give an explanation for your answer.

(3)

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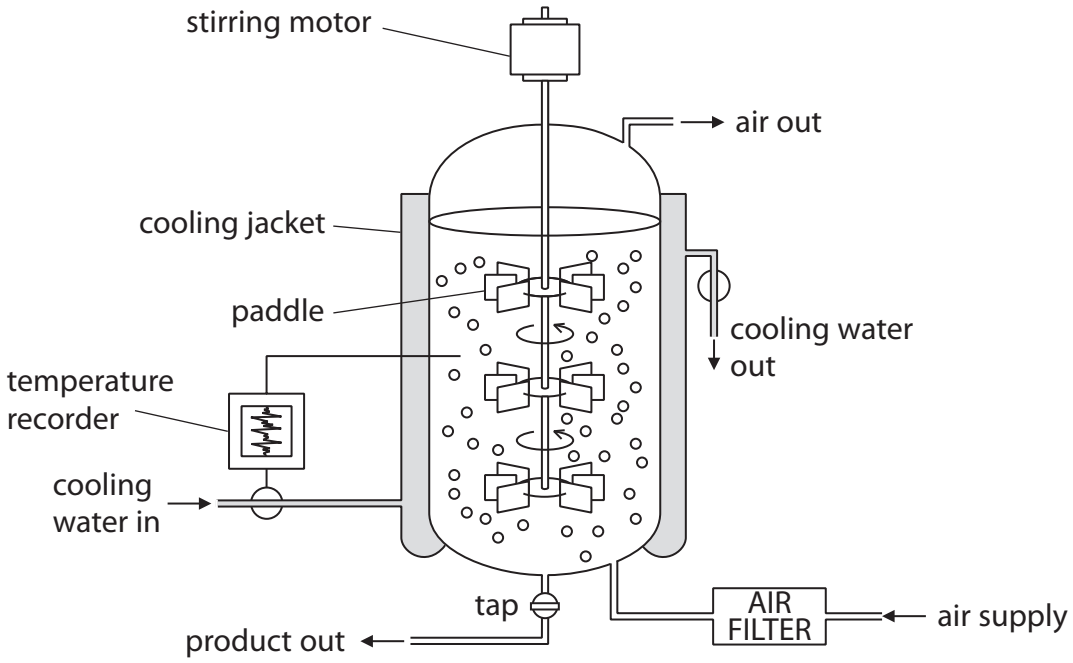
(Total for Question 2 = 12 marks)

3 The diagram shows a fermenter used to grow microorganisms.



(a) Explain how temperature is controlled in the fermenter.

(2)

(b) Explain why temperature must be controlled in the fermenter.

(2)

(c) Explain the purpose of the paddles in the fermenter.

(2)

(d) Other than temperature, name **one** condition that needs to be controlled in a fermenter and state why it needs to be controlled.

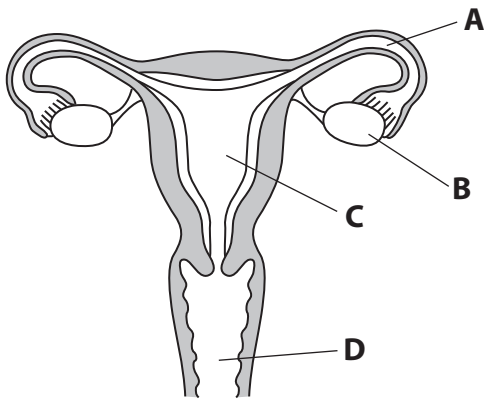
(2)

(e) Name a product that could be produced in this type of fermenter.

(1)

(Total for Question 3 = 9 marks)

4 The diagram shows the female reproductive system.



(a) Put a cross ☒ in the correct box to show

(i) where the egg is released

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) where the egg is fertilised

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(iii) where the embryo becomes surrounded by amniotic fluid

(1)

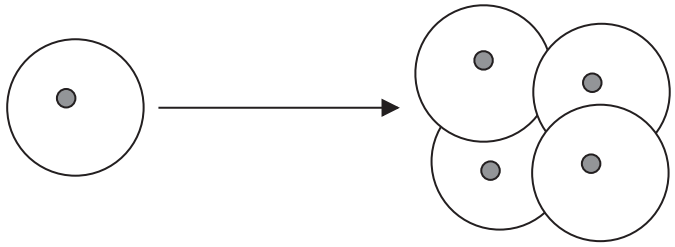
☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) The diagram shows a fertilised egg dividing into an embryo.



(i) What is another name used to describe a fertilised egg?

(1)

.....

(ii) Name the type of cell division used to produce the embryo.

(1)

.....

(iii) Complete the table by ticking the box that shows the correct description of each cell in the embryo.

(1)

Description	Tick
haploid with 23 chromosomes	
haploid with 46 chromosomes	
diploid with 23 chromosomes	
diploid with 46 chromosomes	

(c) Describe how the developing embryo is supplied with nutrients.

(3)

.....

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.....

(Total for Question 4 = 9 marks)

5 (a) The diagram shows the cell wall of a bacterium.

Complete the diagram by drawing and labelling the parts found inside the cell wall.

(3)

(b) Decomposition by bacteria helps to release mineral ions, such as nitrates, into the soil.

(i) Explain why the rate of decomposition is affected by the pH of the soil.

(2)

(ii) Explain how nitrate ions help plants to grow.

(2)

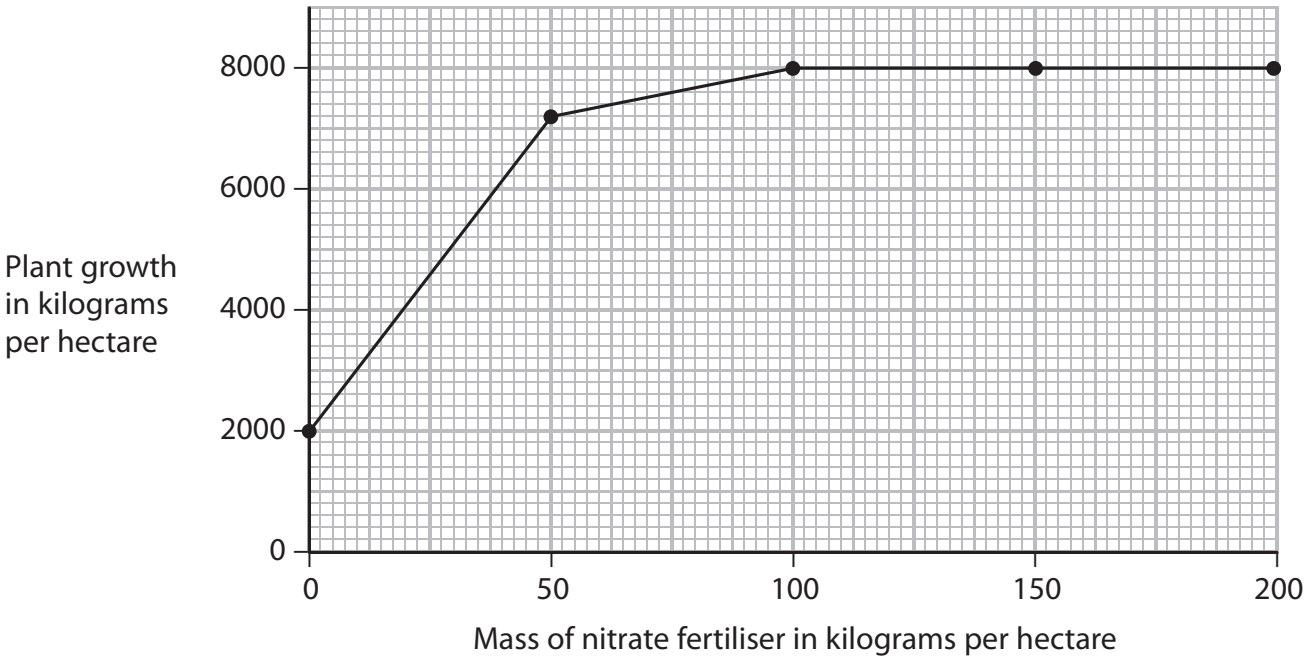
(iii) Explain how nitrate ions get into the root cells of plants.

(3)

(c) The graph shows the change in plant growth when different masses of nitrate fertiliser are added to fields.

(i) On the graph, mark with a cross (X) the point at which the concentration of nitrate ions ceases to be a limiting factor in the growth of the plant.

(1)



(ii) Calculate the percentage increase in plant growth when the mass of nitrate fertiliser is increased from 50 to 100 kilograms per hectare.

(2)

.....%

(iii) Suggest why crops still grow when no nitrate fertiliser is added.

(1)

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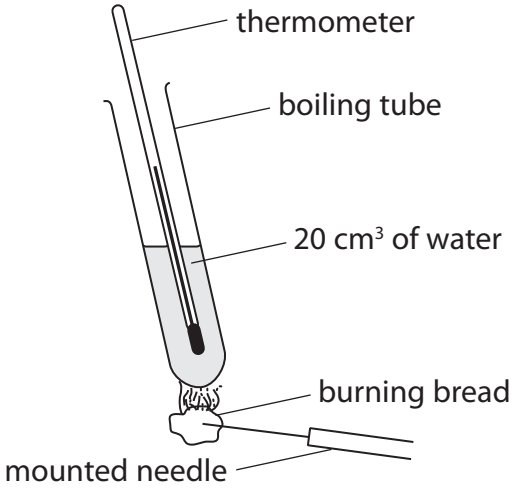
(Total for Question 5 = 14 marks)

6 This apparatus can be used to determine the energy value of food such as dried bread.



(a) John suggested that a more accurate value could be obtained if a larger volume of water was used.

Explain why John's suggestion might be correct.

(2)

(b) Suggest **one** other modification and explain how it would improve the accuracy of the result.

(2)

(Total for Question 6 = 4 marks)

TOTAL FOR PAPER = 60 MARKS

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