Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Biology

Unit B3: Using Biology

Higher Tier

Monday 20 May 2013 – Afternoon
Time: 1 hour

Paper Reference
5BI3H/01

You must have:
Calculator, ruler

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.*

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.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 1 9 3 5 A 0 1 1 6

PEARSON

Answer ALL questions

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Survival

1 Elk, *Alces alces,* are members of the deer family.

Elk mate in the autumn and their calves are born in the spring.

(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

During the mating season males make sounds to attract females.

This type of behaviour is part of

(1)

- ☒ **A** conditioning
- ☒ **B** courtship
- ☒ **C** habituation
- ☒ **D** imprinting

(ii) Females are also attracted to males by the size of their antlers.

Suggest why a male elk may move away if challenged by another male with larger antlers.

(1)

.....

.....

(b) A pregnant elk will search for a group of thick bushes in which to give birth.

Explain an advantage of this behaviour.

(2)

(c) (i) Some plants produce tannins.

Tannins are toxic. The tannins stop some herbivores from eating these plants.

Elk produce proteins in their saliva which bind to the tannins and make them inactive.

This inter-relationship is a product of co-evolution.

Describe the advantages to the elk of producing tannin-binding proteins in their saliva.

(2)

(ii) The development of flower structure and insect behaviour is another example of co-evolution.

Describe how this relationship benefits the plant.

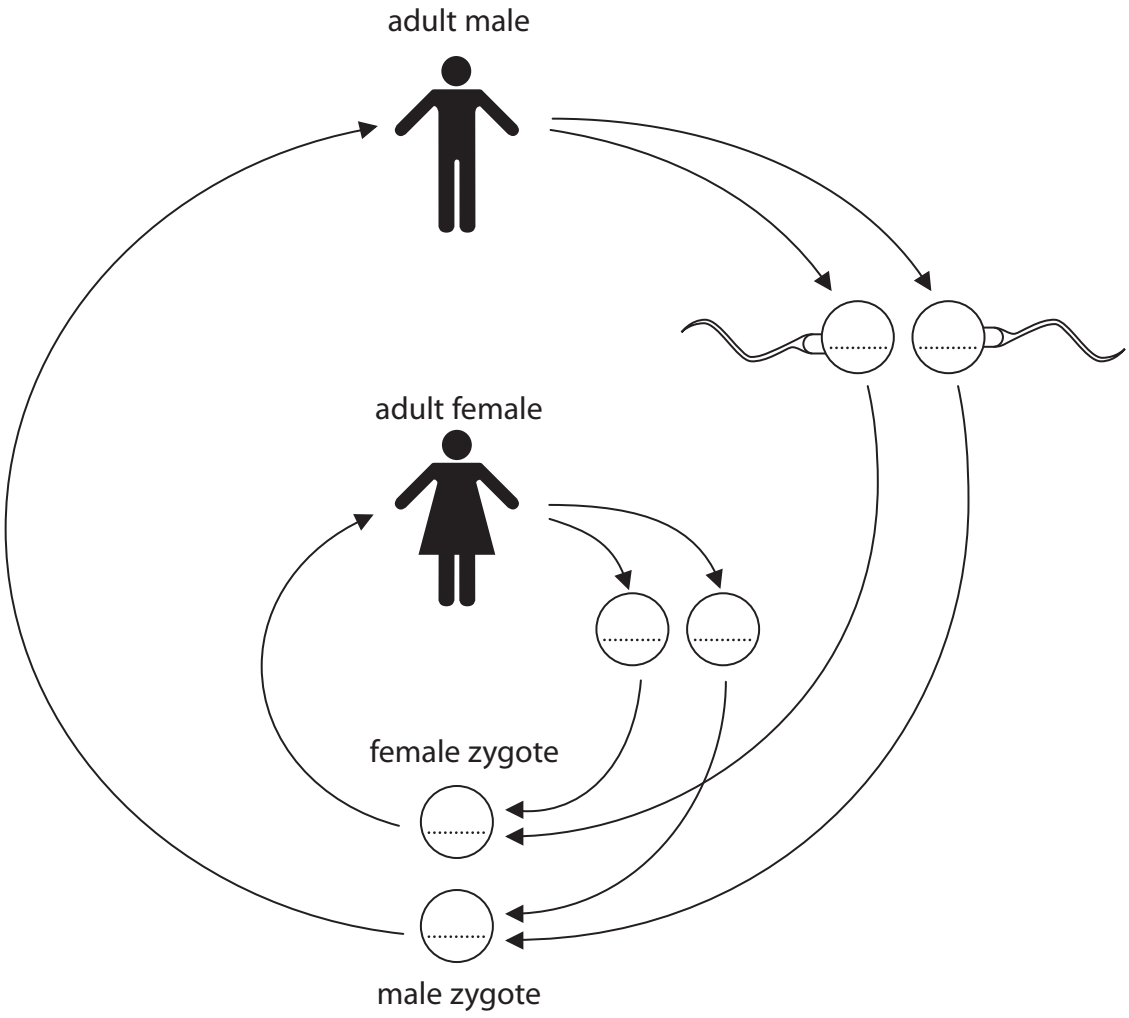
(2)

(Total for Question 1 = 8 marks)

Human reproduction

2 The diagram shows the human life cycle.

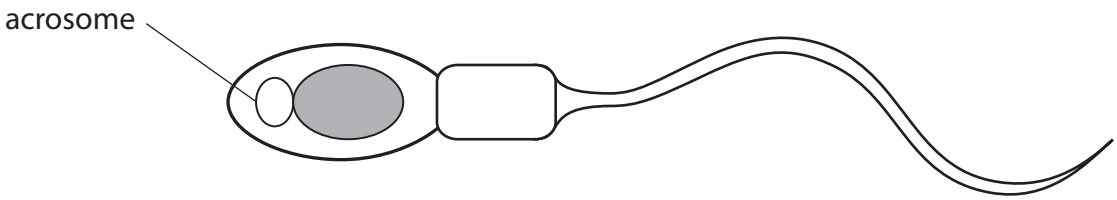
When a sperm cell fertilises an egg cell, a zygote is formed.



(a) Complete the diagram by writing the sex chromosomes in the egg cells, sperm cells, male zygote and female zygote.

(2)

(b) The diagram shows a sperm cell.



Complete the sentence by putting a cross (☒) in the box next to your answer.

The acrosome contains

(1)

☒ **A** enzymes to help get through the membrane of the egg cell

☒ **B** mitochondria to supply energy to swim

☒ **C** muscle fibres to swim

☒ **D** 23 chromosomes

(c) State why egg cells have a large amount of cytoplasm.

(1)

.....

.....

(d) During ovulation an egg cell is released from the ovary.

Explain how changes in the levels of hormones result in ovulation.

(2)

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.....

.....

.....

(e) Explain what happens to the uterus lining if the egg cell is fertilised.

(2)

.....

.....

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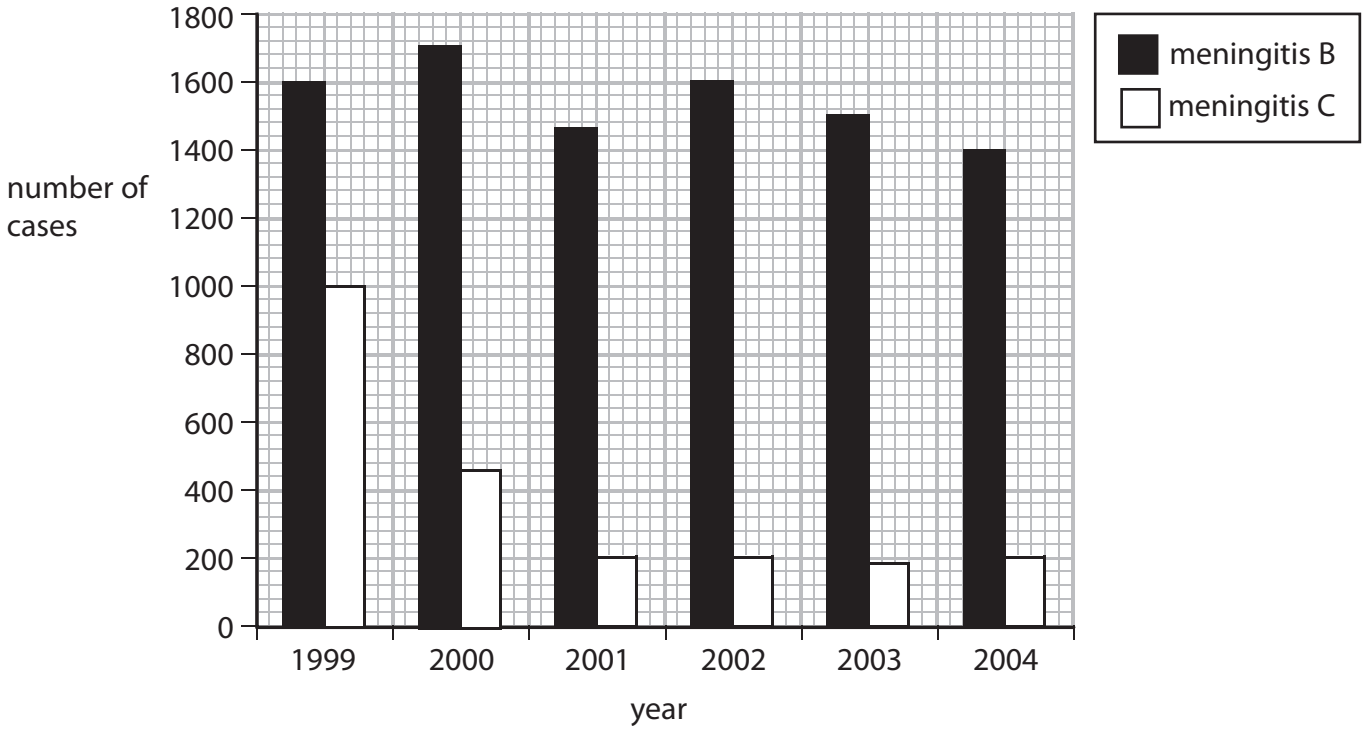
(Total for Question 2 = 8 marks)

Immunisation

3 Meningitis B and meningitis C are caused by bacteria.

The graph shows the number of cases of meningitis B and meningitis C in England, from 1999 to 2004.



(a) (i) Use the graph to calculate the change in the total number of cases of meningitis in 1999 compared with 2004.

(2)

answer = ...

(ii) Immunisation against meningitis C was introduced in 1999.

Describe the effects the immunisation had on the number of cases of both types of meningitis.

(2)

.....

.....

.....

.....

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

The molecules on pathogens which cause an immune response are called

(1)

☒ **A** antigens

☒ **B** bacteria

☒ **C** hybridomas

☒ **D** lymphocytes

(c) (i) Monoclonal antibodies can be produced in large quantities.

Describe the steps in producing monoclonal antibodies.

(3)

(ii) Explain the advantage of using monoclonal antibodies to treat cancer.

(2)

(Total for Question 3 = 10 marks)

Animal behaviour

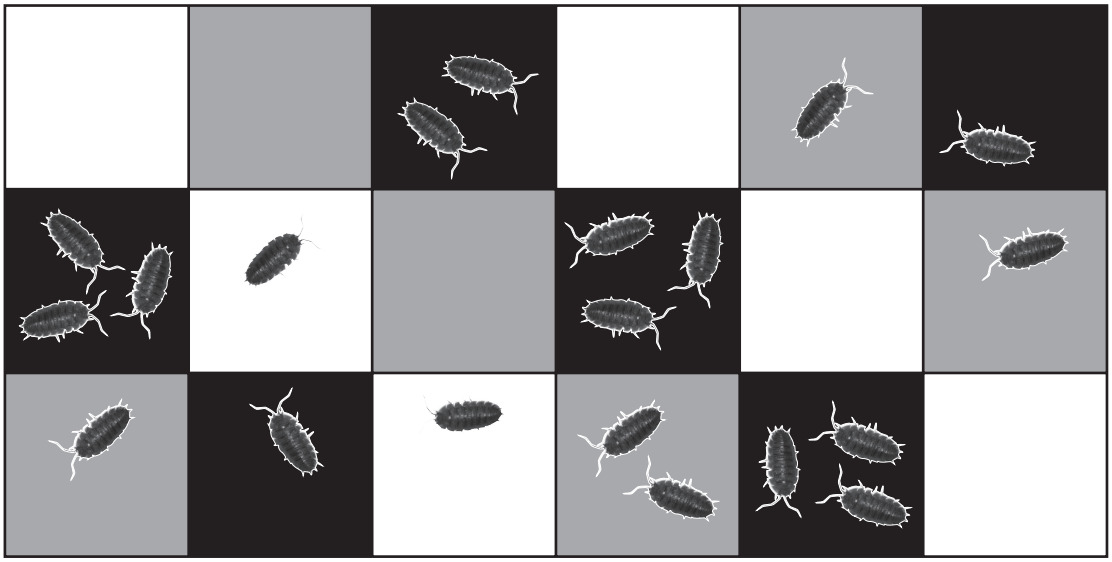
4 Woodlice are small animals that live in and under rotting wood.

20 woodlice were taken from a pile of logs in a forest and placed in the centre of a tray.

The tray had black, dark grey and white squares painted on the bottom.

The diagram shows where the woodlice were 30 minutes later.

Key:  = woodlice



(a) Calculate the percentage of woodlice found on the black squares.

(2)

answer = ...%

(b) The woodlice move quickly on the light squares and slow down on the dark squares.

All woodlice show this behaviour.

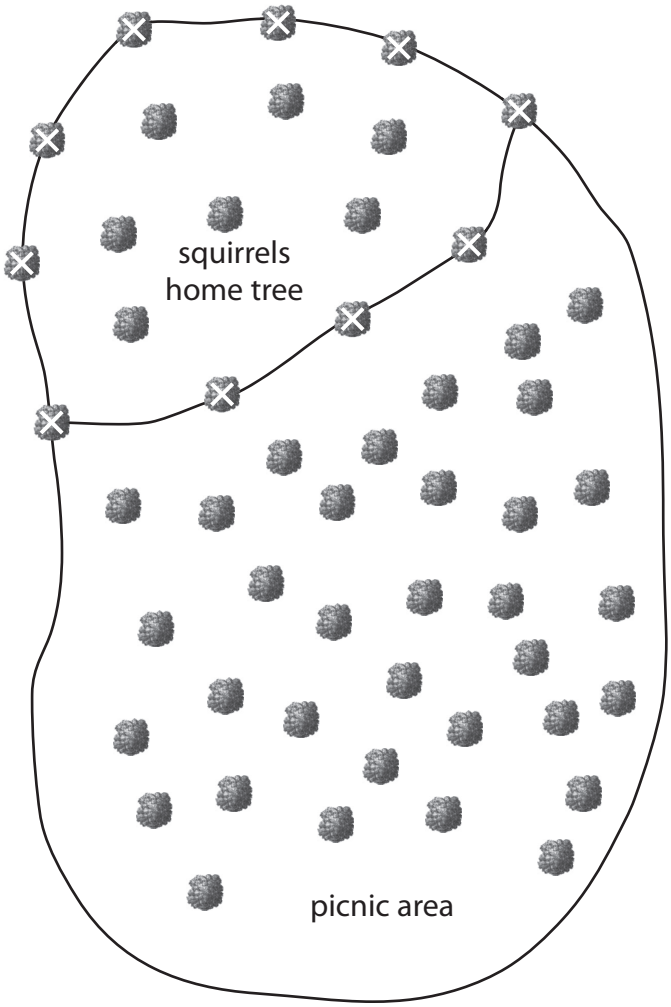
State the term used to describe this type of behaviour.

(1)

.....

(c) A pair of squirrels in a forest were studied for four months.

The map shows part of the forest including the area where the squirrels lived.



(i) The squirrels were observed to urinate regularly on particular trees.

The trees on which they urinated are marked on the map with an X.

Explain how this behaviour benefits the squirrels.

(3)

(ii) The squirrels being studied ran away from people. Other squirrels that lived by the picnic area did not run away.

A scientist suggested that the squirrels near the picnic area had become used to people because the people did not harm them.

Complete the sentence by putting a cross (☒) in the box next to your answer.

This type of behaviour is called

(1)

☒ **A** classical conditioning

☒ **B** habituation

☒ **C** imprinting

☒ **D** courtship

(iii) Another scientist suggested that the squirrels that lived near the picnic area were showing operant conditioning.

Describe what is meant by the term operant conditioning.

(3)

.....

.....

.....

.....

.....

.....

(Total for Question 4 = 10 marks)

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Question 5 is on the next page

Healthy foods

5 (a) Mycoprotein is one type of food produced using biotechnology.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The microorganism used in the production of mycoprotein is

(1)

☒ **A** *Agrobacterium*

☒ **B** *Bacillus*

☒ **C** *Fusarium*

☒ **D** *Saccharomyces*

(ii) The table shows the mass of different nutrients in 100 g of mycoprotein mince and 100 g of minced beef.

nutrient	mass of nutrient in 100 g of mycoprotein mince / g	mass of nutrient in 100 g of minced beef / g
protein	13.5	20.0
carbohydrates	12.0	1.0
fat	7.0	16.0
fibre	3.5	0.0
salt	1.0	0.7

Calculate the difference in the mass of protein contained in 200 g of minced beef compared with 200 g of mycoprotein mince.

(2)

answer = ... g

(iii) Mycoprotein mince has nutritional advantages compared with minced beef.

State **one** nutritional advantage of mycoprotein.

(1)

(b) Explain **one** advantage, other than a nutritional benefit, of using microorganisms to produce food.

(2)

*(c) Fermenters are used to grow microorganisms.

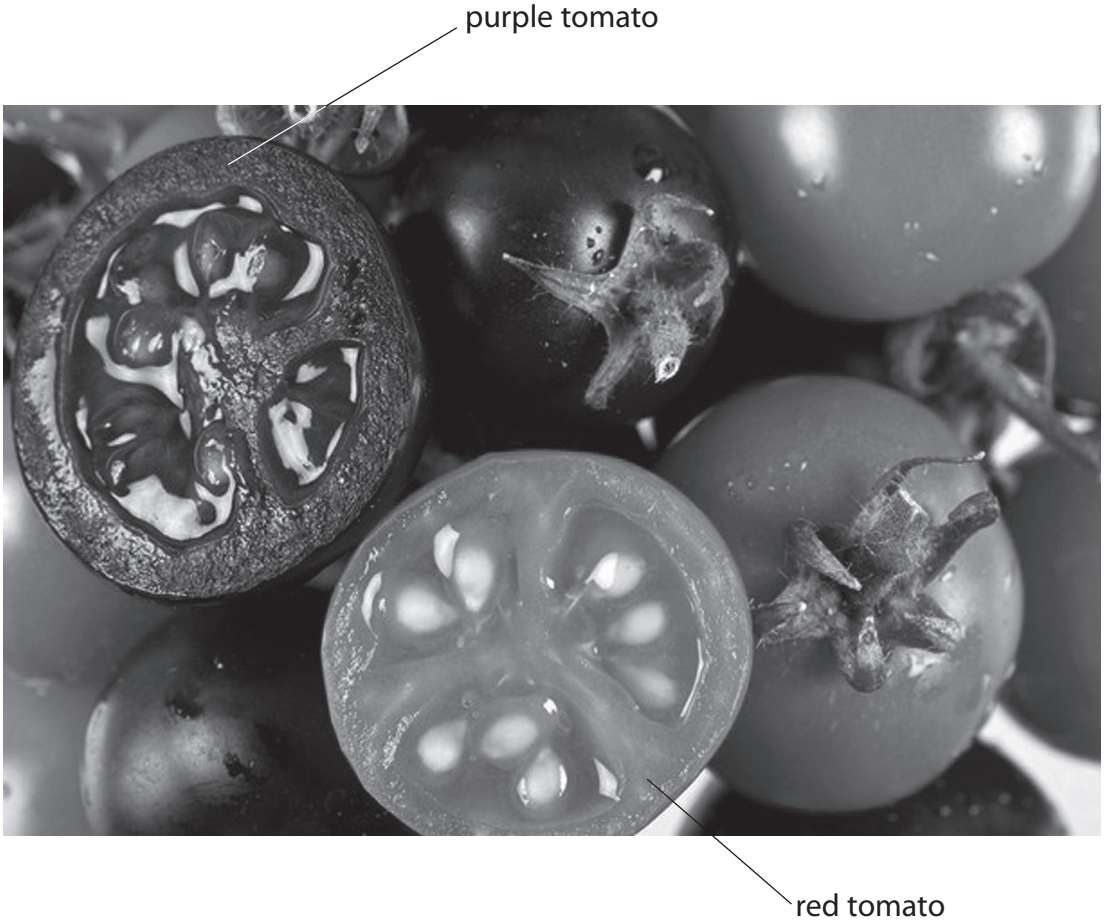
Explain how optimum conditions for the growth of microorganisms are controlled in a fermenter.

(6)

(Total for Question 5 = 12 marks)

Genetic modification of crops

6 (a) Purple tomatoes are transgenic plants that have been produced by genetic engineering.



(i) As a result of genetic modification, these tomatoes produce a new substance which has health benefits and turns the tomatoes purple.

Name this substance.

(1)

.....

(ii) What is inserted into the DNA of another plant to make it transgenic?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** a gene from another species

☒ **B** a gene from the same species

☒ **C** chromosomes from the same species

☒ **D** proteins from another species

*(b) Describe how *Agrobacterium tumefaciens* can be used to create transgenic plants.

(6)

(c) *Bacillus thuringiensis* contains a gene that codes for a toxin.

Explain **one** advantage and **one** disadvantage of introducing this gene into crop plants.

(4)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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