

Paper Reference(s) 5BI3H/01

Edexcel GCSE

Biology

Unit: B3: Using Biology

Higher Tier

Monday 20 May 2013 – Afternoon

Time: 1 hour plus your additional time allowance

INSTRUCTIONS TO CANDIDATES

Write your centre number, candidate number, surname, initials and your signature in the boxes below. Check that you have the correct question paper.

Centre No.					
Candidate No.					
Surname					
Initial(s)					
Signature					
Paper Reference	5	B	I	3	H / 0 1

Q41935A

PEARSON

- Use **BLACK** ink or ball-point pen.
- Answer **ALL** questions.
- Answer the questions in the spaces provided
– there may be more space than you need.

MATERIALS REQUIRED FOR EXAMINATION

Calculator, ruler

ITEMS INCLUDED WITH QUESTION PAPERS

Nil

INFORMATION FOR CANDIDATES

- 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 TO CANDIDATES

- 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)

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.



(Question continues on next page)

(Turn over)

- (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 mark)

- ☐ 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 mark)

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

Explain an advantage of this behaviour. (2 marks)

(Question continues on next page)

(Turn over)

(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 marks)

(Question continues on next page)

(Turn over)

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

Describe how this relationship benefits the plant. (2 marks)

(TOTAL FOR QUESTION 1 = 8 MARKS)

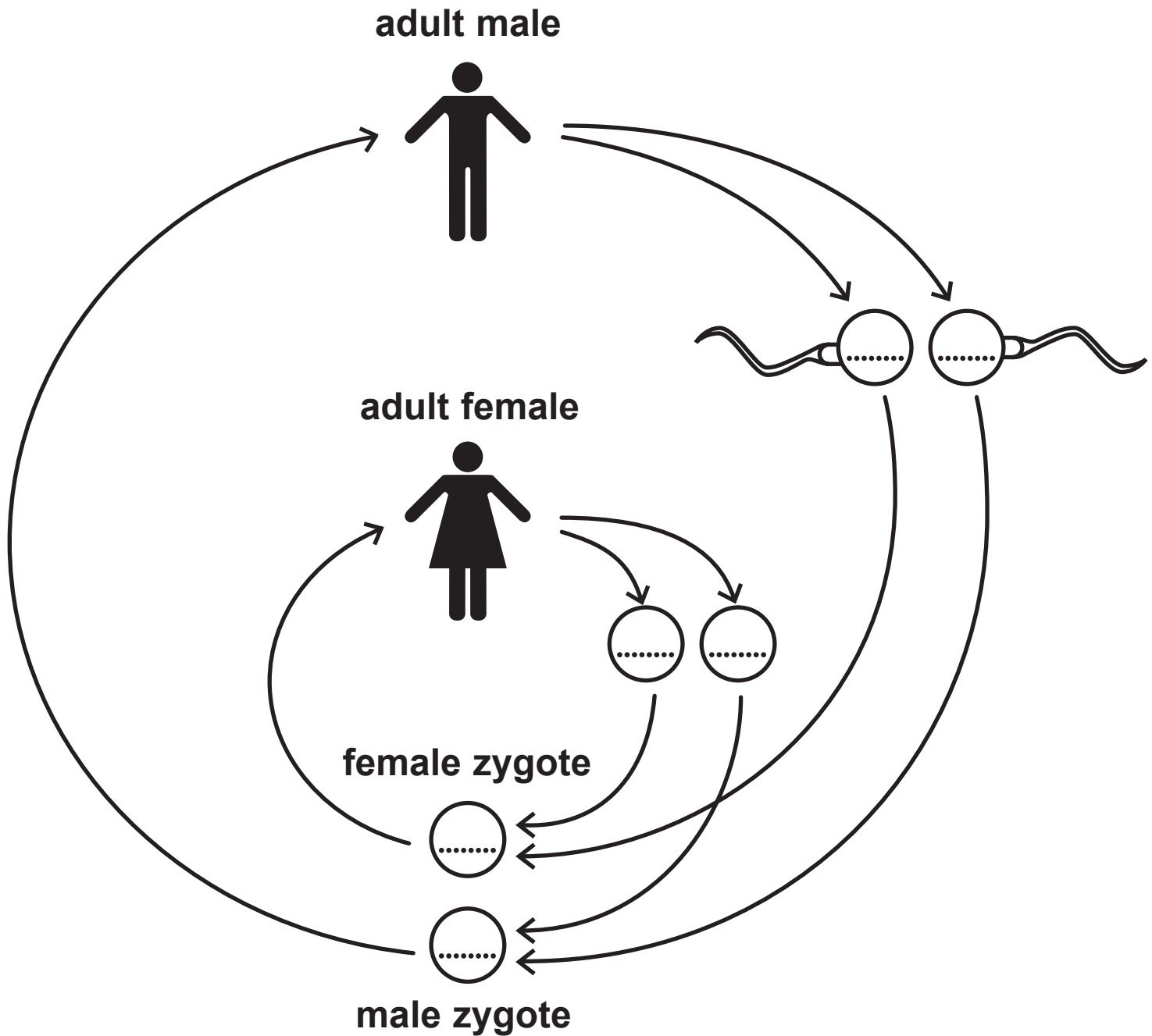
(Questions continue on next page)

(Turn over)

HUMAN REPRODUCTION

2 The diagram shows the human life cycle.

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



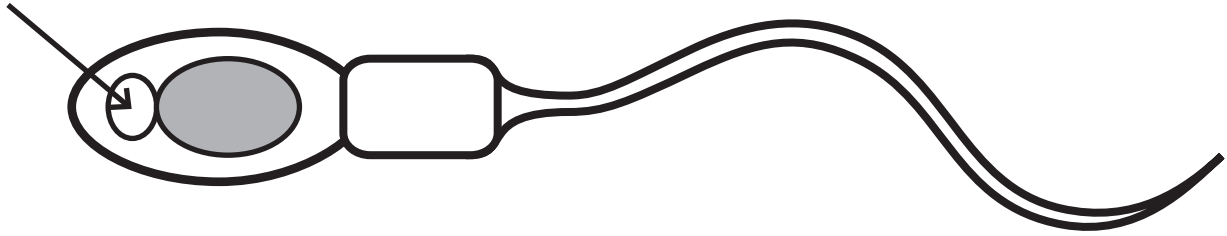
(a) Complete the diagram by writing the sex chromosomes in the egg cells, sperm cells, male zygote and female zygote. (2 marks)

(Question continues on next page)

(Turn over)

(b) The diagram shows a sperm cell.

acrosome



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

The acrosome contains

(1 mark)

- ☐ 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

(Question continues on next page)

(Turn over)

(c) State why egg cells have a large amount of cytoplasm. (1 mark)

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

Explain how changes in the levels of hormones result in ovulation. (2 marks)

(Question continues on next page)

(Turn over)

- (e) Explain what happens to the uterus lining if the egg cell is fertilised. (2 marks)

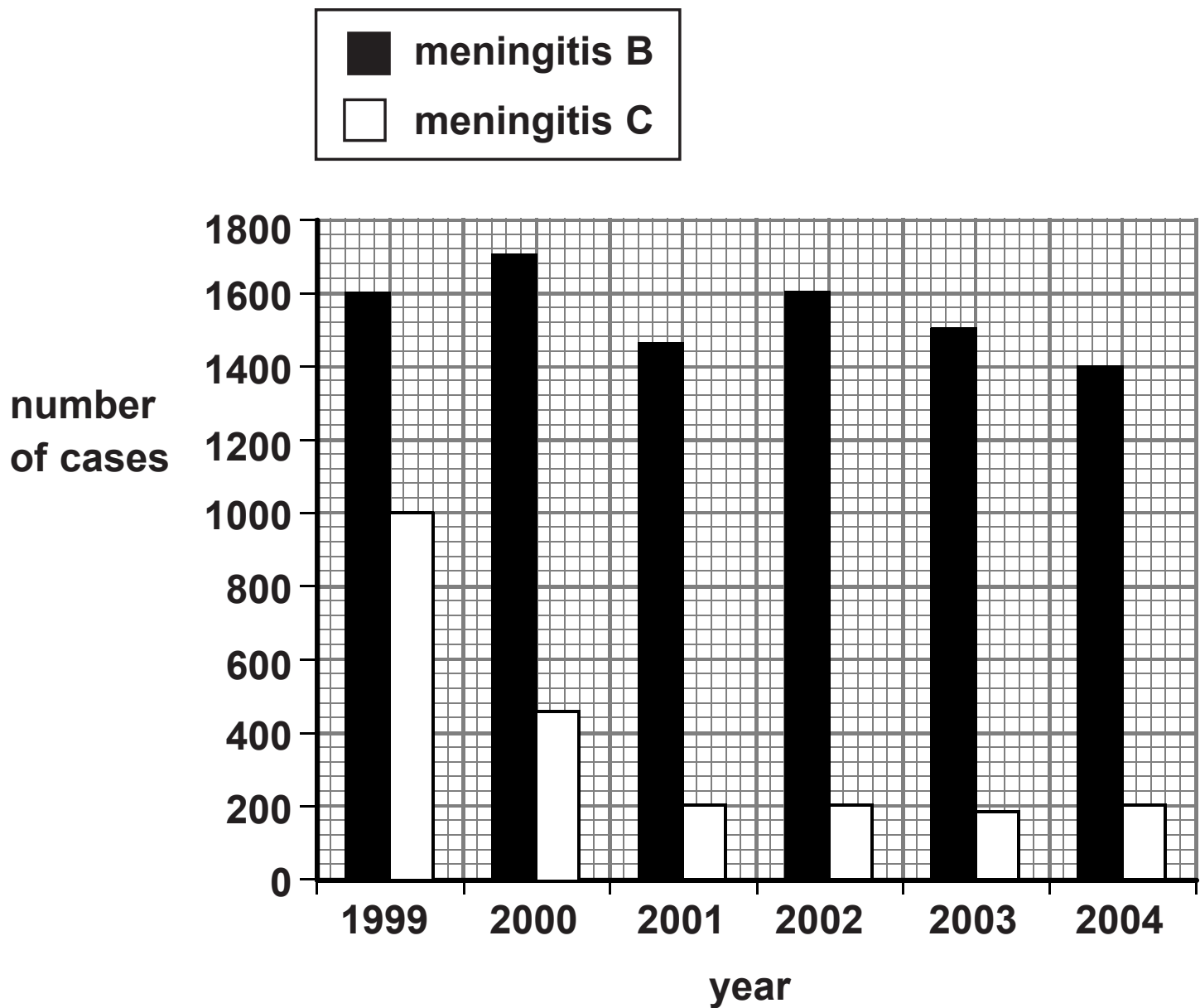
(TOTAL FOR QUESTION 2 = 8 MARKS)

(Questions continue on next page)

(Turn over)

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.



(Question continues on next page)

(Turn over)

- (a) (i) Use the graph to calculate the change in the total number of cases of meningitis in 1999 compared with 2004. (2 marks)

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 marks)

(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 mark)

- ☐ A antigens
- ☐ B bacteria
- ☐ C hybridomas
- ☐ D lymphocytes

(Question continues on next page)

(Turn over)

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

Describe the steps in producing monoclonal antibodies. (3 marks)

(Question continues on next page)

(Turn over)

- (ii) Explain the advantage of using monoclonal antibodies to treat cancer. (2 marks)

(TOTAL FOR QUESTION 3 = 10 MARKS)

(Questions continue on next page)

(Turn over)

ANIMAL BEHAVIOUR

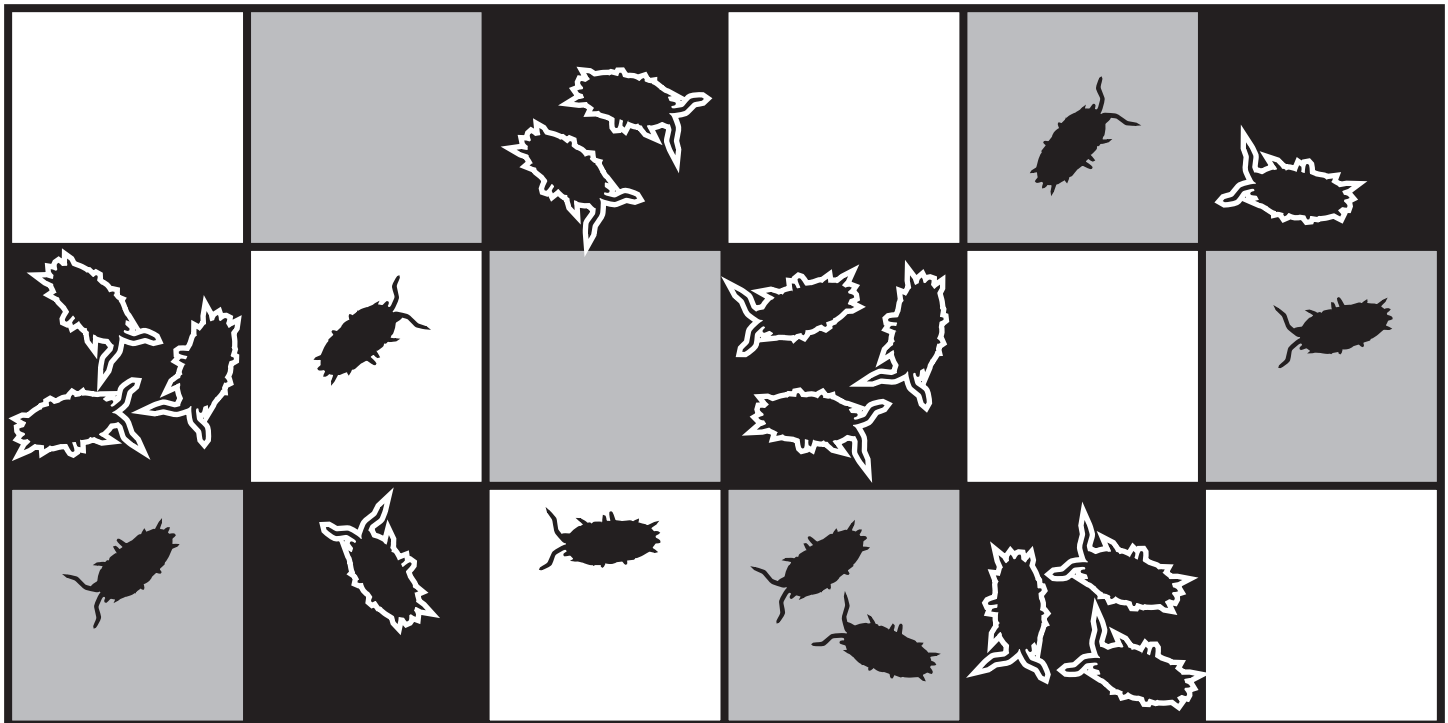
- 4 Woodlice are small animals that live in and under rotting wood.

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



(Question continues on next page)

(Turn over)

- (a) Calculate the percentage of woodlice found on the black squares. (2 marks)

answer = _____ %

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

All woodlice show this behaviour.

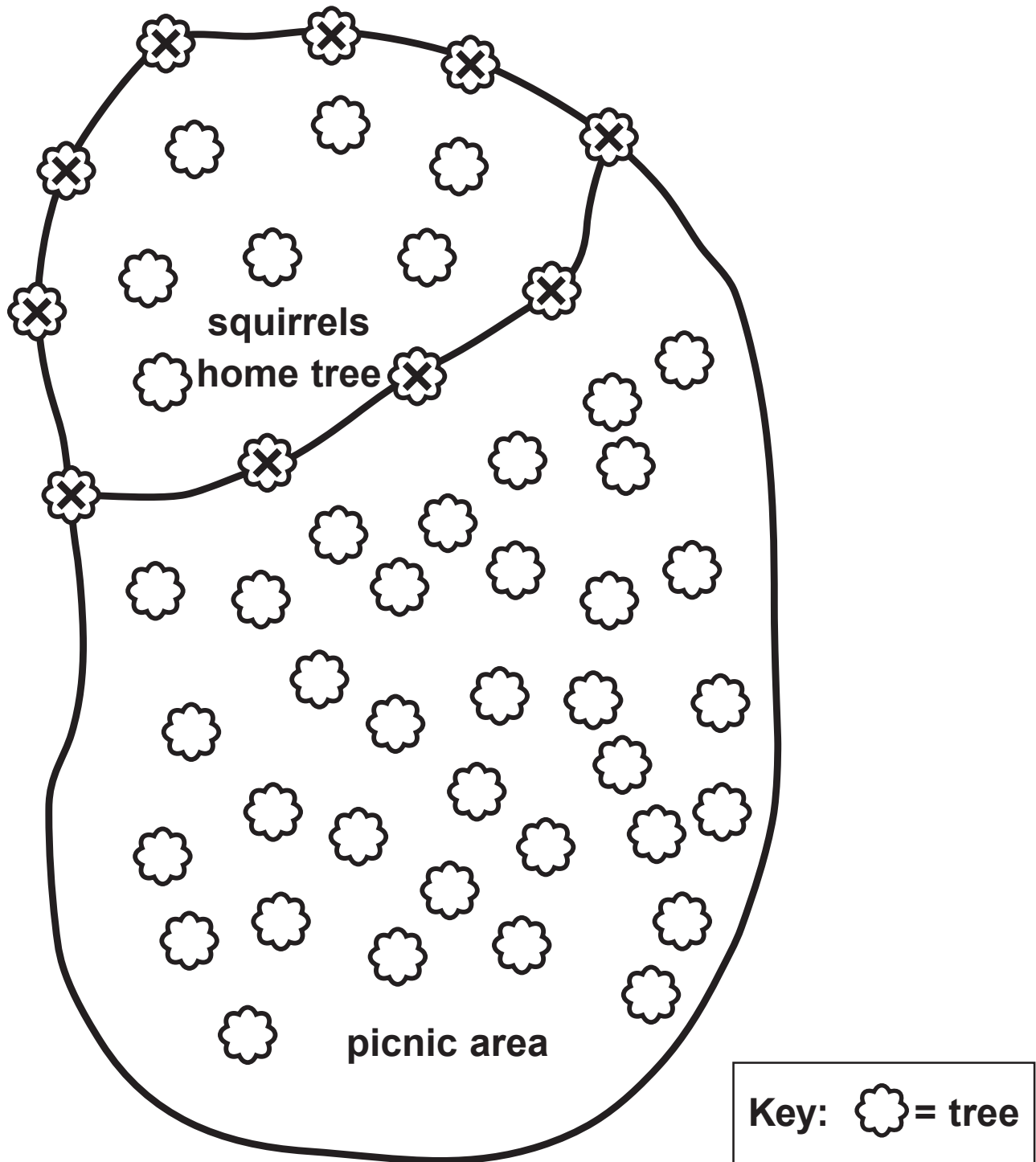
State the term used to describe this type of behaviour. (1 mark)

(Question continues on next page)

(Turn over)

- (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.



(Question continues on next page)

(Turn over)

- (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 marks)

(Question continues on next page)

(Turn over)

- (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 mark)

- ☐ A classical conditioning
- ☐ B habituation
- ☐ C imprinting
- ☐ D courtship

(Question continues on next page)

(Turn over)

- (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 marks)

(TOTAL FOR QUESTION 4 = 10 MARKS)

(Questions continue on next page)

(Turn over)

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 mark)

- ☐ **A Agrobacterium**
- ☐ **B Bacillus**
- ☐ **C Fusarium**
- ☐ **D Saccharomyces**

(Question continues on next page)

(Turn over)

- (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 marks)

answer = _____ g

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

State ONE nutritional advantage of mycoprotein. (1 mark)

- (b) Explain ONE advantage, other than a nutritional benefit, of using microorganisms to produce food. (2 marks)

(Question continues on next page)

(Turn over)

***(c) Fermenters are used to grow microorganisms.**

**Explain how optimum conditions for the growth of microorganisms are controlled in a fermenter.
(6 marks)**

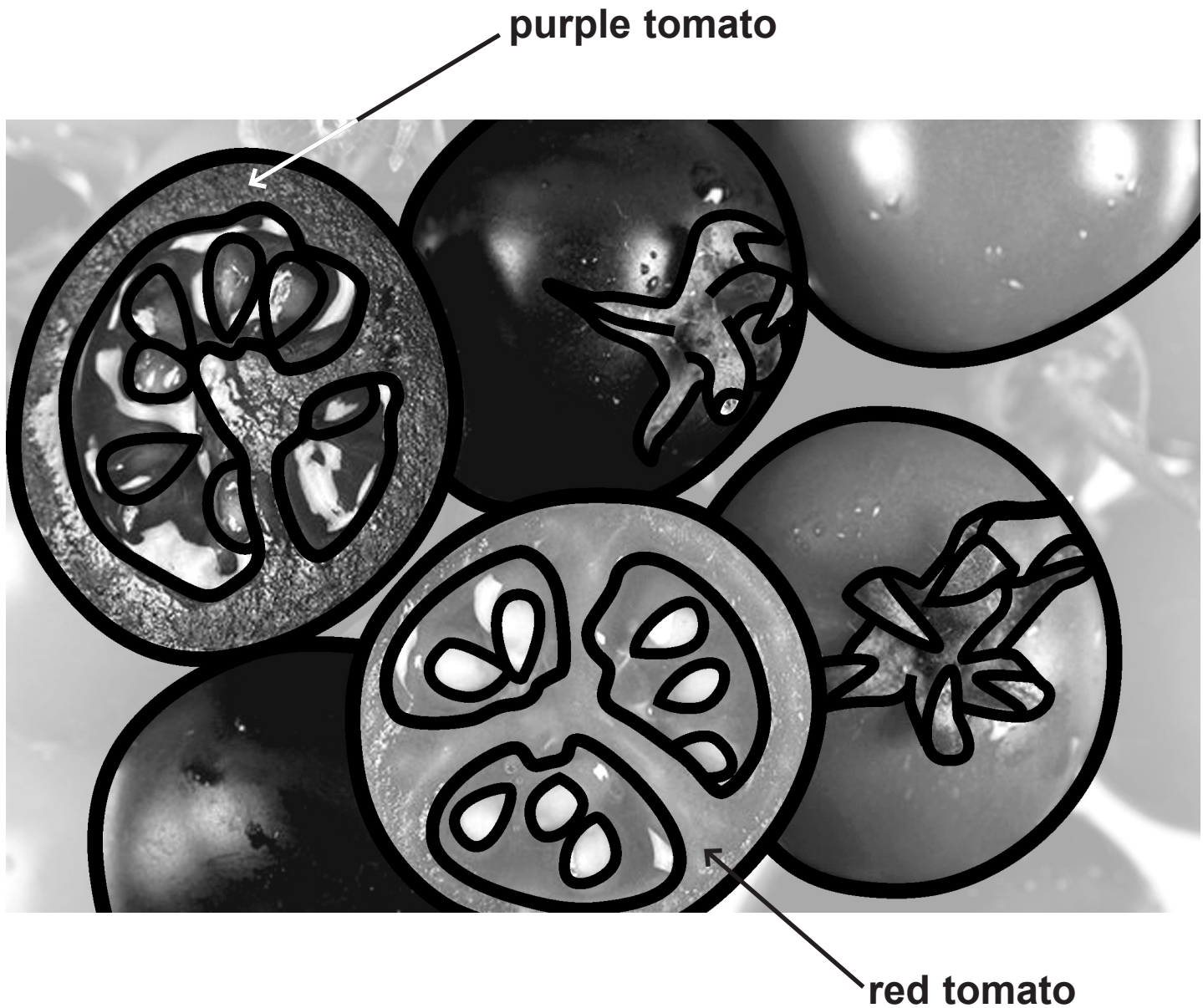
(TOTAL FOR QUESTION 5 = 12 MARKS)

(Questions continue on next page)

(Turn over)

GENETIC MODIFICATION OF CROPS

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



(Question continues on next page)

(Turn over)

- (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 mark)

- (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 mark)

- ☐ A a gene from another species
- ☐ B a gene from the same species
- ☐ C chromosomes from the same species
- ☐ D proteins from another species

(Question continues on next page)

(Turn over)

This image shows a single page of white paper with horizontal black lines spaced evenly apart, resembling notebook paper or primary-ruled paper. The lines are parallel and extend across the width of the page. There are no margins, text, or other markings present.

(Turn over)

(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 marks)

32

(TOTAL FOR QUESTION 6 = 12 MARKS)

TOTAL FOR PAPER = 60 MARKS

END