Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Biology

Unit B3: Using Biology

Higher Tier

Sample Assessment Material
Time: 1 hour

Paper Reference
5BI3H/01

You do not need any other materials.

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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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 ☒.

Animal behaviour

1 Meerkat pups spend their first few weeks underground suckling milk from their mother.

When the pups emerge above ground, they follow their parents.

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

(i) What type of behaviour is shown by the pups suckling milk?

(1)

☒ **A** operant conditioning

☒ **B** classical conditioning

☒ **C** habituation

☒ **D** innate

(ii) What type of behaviour is shown by the pups following their parents?

(1)

☒ **A** habituation

☒ **B** imprinting

☒ **C** operant conditioning

☒ **D** innate

(b) Adult meerkats teach their pups to catch prey.
By the time they are three months old, the pups can find their own food.

Explain how this benefits the adult meerkats.

(2)

.....

.....

.....

(c) Meerkat pups produce a high-pitched call to beg for food.
This is a form of verbal communication.

State **two** ways in which animals such as meerkats can communicate **non-verbally**.

(2)

1 .....

.....

2 .....

.....

(d) In captivity, meerkats learn not to be afraid of humans.

Explain how this type of behaviour is of benefit to the meerkat.

(2)

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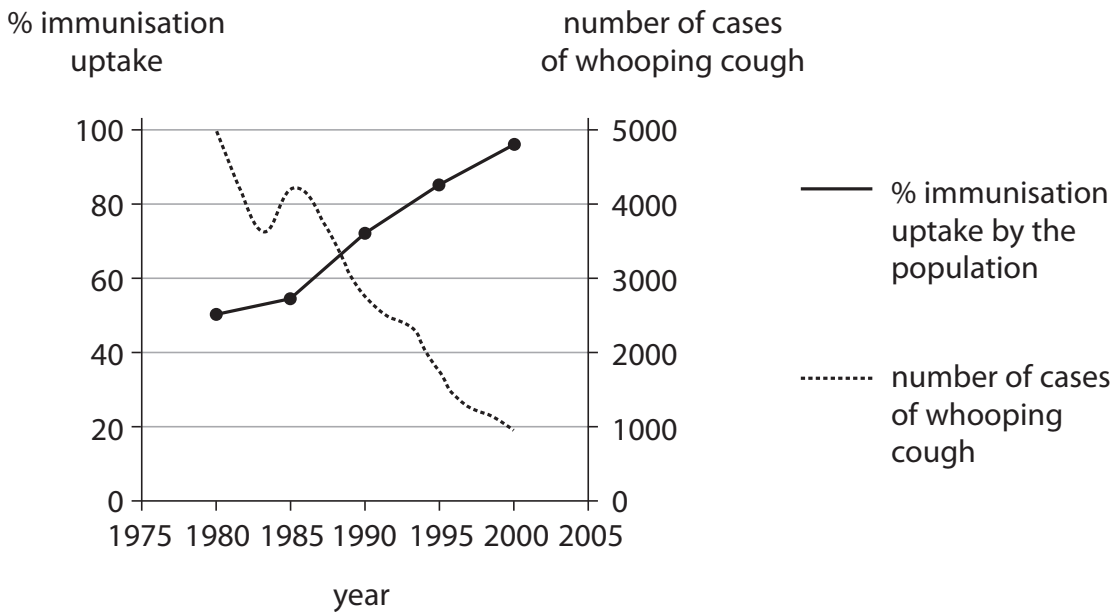
(Total for Question 1 = 8 marks)

Medical microbiology

2 (a) The National Health Service in Scotland carried out research to compare how the number of cases of the disease, whooping cough, varied with the percentage uptake of immunisation over a period of 20 years.

The graph shows the data that was collected.



Data: Crown copyright, licence C2009000819

(i) Describe the relationship between the percentage immunisation uptake by the population and the number of cases of whooping cough shown in the graph.

(2)

.....

.....

.....

.....

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

Immunisations stimulate our immune system because they contain

(1)

☒ **A** new antibodies

☒ **B** weak antigens

☒ **C** weak antiseptics

☒ **D** resistant antibiotics

(iii) Following immunisation, the immune system produces more of a specific type of lymphocyte.

What type of lymphocyte is produced?

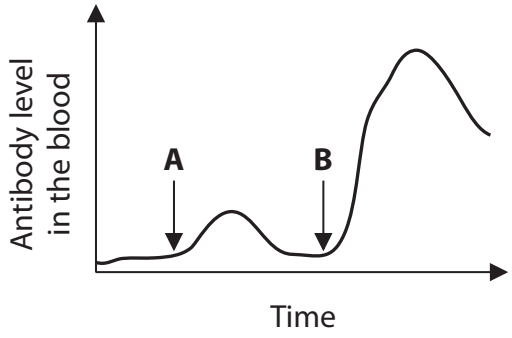
(1)

(b) Edward Jenner developed the first vaccine.

Suggest why his research methods would not be considered ethical today.

(1)

(c) The graph shows the antibody level in the blood after an immunisation (A) and a second exposure to the same pathogen (B).



Explain why the increase in antibody level after vaccination, at **A**, is different from the increase in antibody level after the second exposure to the same pathogen, at **B**.

(3)

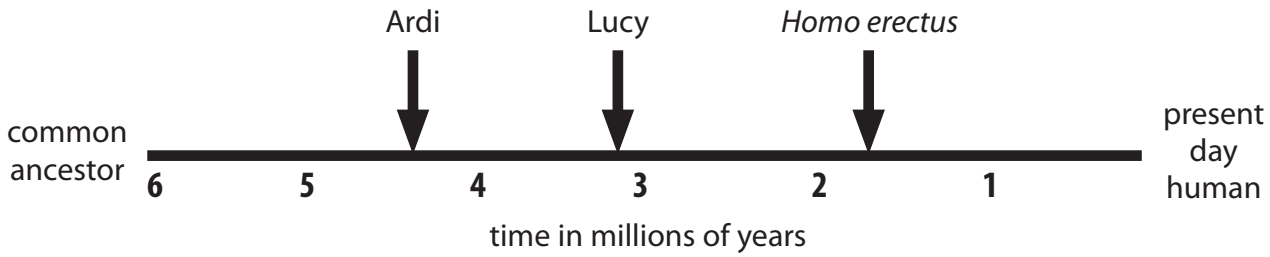
(Total for Question 2 = 8 marks)

The history of humans

3 Fossil evidence suggests that humans and apes both evolved from a common ancestor.

The diagram below shows a timeline for some important fossil discoveries.
These discoveries have contributed to our understanding of human evolution.

important fossil discoveries



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

(i) The time difference between the existence of Ardi and Lucy is

(1)

☒ **A** 4.4 million years

☒ **B** 3.2 million years

☒ **C** 1.8 million years

☒ **D** 1.2 million years

(ii) A stone tool, similar to the one below, was found with *Homo erectus*.

Explain why this helped scientists to date *Homo erectus*.

(2)

(b) (i) This is an image of the skeleton of an early human.

Explain one of the benefits of bipedalism (walking on two legs) to the early humans.

(2)

.....

.....

.....

.....

(ii) Early humans had very large hands and feet.

Suggest an evolutionary advantage of these features.

(1)

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.....

(c) DNA technology, such as the study of mitochondrial DNA, has improved our understanding of human evolution.

Describe the features of mitochondrial DNA that make it a helpful source of evidence for human migration and evolution.

(3)

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(Total for Question 3 = 9 marks)

Biotechnology at work

4 Poppy decided to investigate yogurt production. She used a recipe downloaded from the internet.

- Boil 500 ml of milk for 30 seconds
- Cool and add 2 teaspoons of live yogurt
- Stir and put into sterilised pots
- Incubate for 12 hours

(a) Yogurt is produced by fermentation using bacteria.

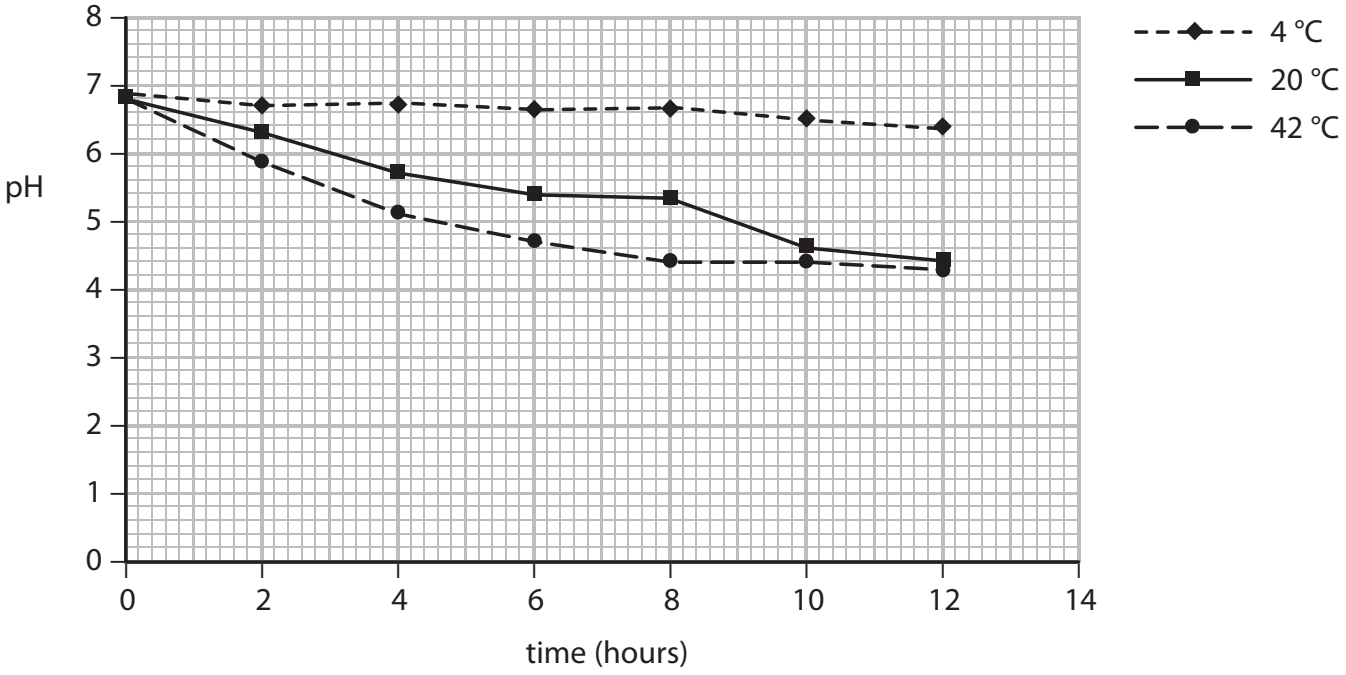
Complete the word equation for the fermentation stage in the production of yogurt.

(2)

..... → .....

(b) Poppy incubated the yogurt at three different temperatures.

She measured the pH of the yogurt over a 12-hour period and drew a graph of her results.



(i) Calculate the drop in pH during the first 8 hours for the yogurt incubated at 42 °C. Show your working.

(1)

answer .....

(ii) State why there is a greater drop in pH at 42 °C than at 4 °C.

(1)

(c) Live yogurt should be stored at 4 °C to help keep it fresh.

Use the graph to explain why this is recommended.

(3)

(d) Yogurt can be commercially produced in fermenters.

Explain how a fermenter maintains the conditions necessary for yogurt production.

(4)

(Total for Question 4 = 11 marks)

5 An internet news channel wrote about the fungi *Fusarium*.
It is used to make a protein-rich food source.

FERMENTERS TO SOLVE WORLD FOOD SHORTAGES

(a) (i) Name a protein-rich food source made by the fungi *Fusarium*.

(1)

.....

.....

(ii) Give an advantage, other than increased production, of using microorganisms for food production in fermenters.

(1)

.....

.....

(b) Chymosin is an enzyme that can be manufactured using genetically modified (GM) bacteria, and is used in the production of vegetarian cheese.
Chymosin is naturally found in animal rennet.

Suggest the function of animal rennet in cheese making.

(1)

.....

.....

*(c) Plants can be genetically modified to be resistant to herbicides.

Describe how plants are genetically modified. You may use a diagram to help with your answer.

(6)

(d) The growth of crops genetically modified to be herbicide resistant can increase yield.

Describe another approach scientists have taken to increase crop yields.

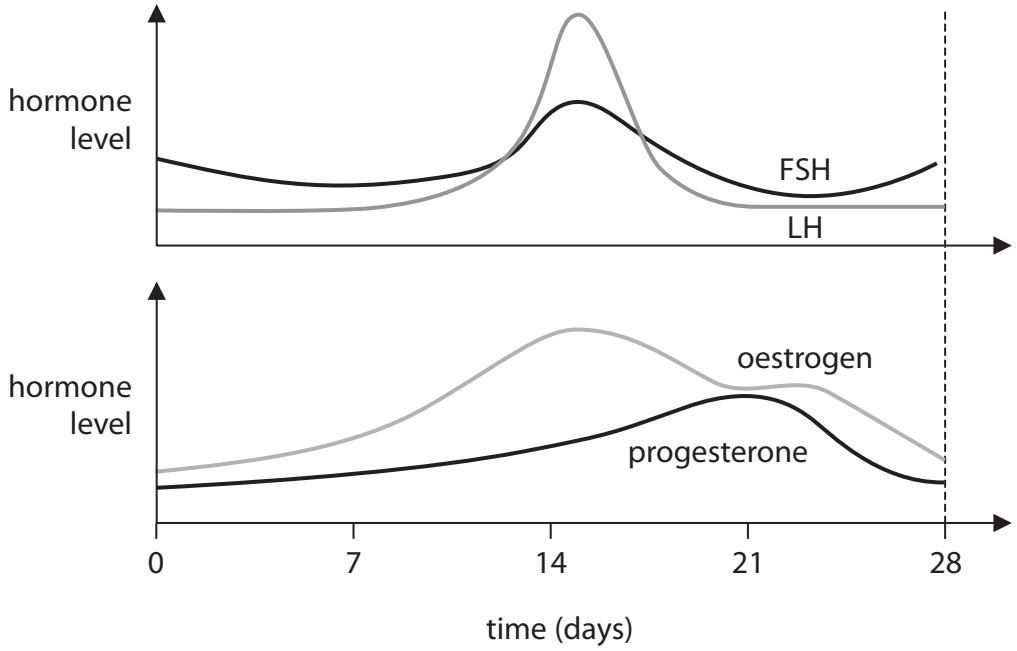
(3)

(Total for Question 5 = 12 marks)

Fertility in humans

6 In humans, fertilisation can only occur within a few days of a woman ovulating.

The graphs below show hormone levels during the menstrual cycle.



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

(i) Which hormone stimulates ovulation?

(1)

☒ **A** oestrogen

☒ **B** progesterone

☒ **C** FSH

☒ **D** LH

(ii) Which of the following is caused by high levels of oestrogen?

(1)

☒ **A** FSH production is stimulated

☒ **B** menstruation occurs

☒ **C** progesterone production is inhibited

☒ **D** LH production is stimulated

(b) Explain the reasons why the uterus lining is maintained if fertilisation occurs.

(2)

(c) Describe how the sex of the baby is determined at fertilisation.

(2)

In 1980, 1 in 52 children born in the UK was a twin or a triplet.
By 2004, this had increased to 1 in 34.
One reason for this increase is fertility treatment.

*(d) Discuss the benefits and drawbacks of using follicle stimulating hormone (FSH) as a fertility treatment.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

Sample Mark Scheme

Unit B3: Using Biology (Higher Tier)

Question number	Answer	Mark
1(a)(i)	**D**	**(1)**

Question number	Answer	Mark
1(a)(ii)	**B**	**(1)**

Question number	Answer	Mark
1(b)	an explanation linking a pair of the following: young are independent from an earlier age (1) (so) adults free to breed again/parents can concentrate on own food supply or safety pups stop feeding from the mother at early age (1) (so) energy no longer used for lactation (1)	**(2)**

Question number	Answer	Mark
1(c)	Any **two** from: • chemical signals/pheromones • visual signals (body language/gestures/facial expression)	**(2)**

Question number	Answer	Acceptable answers	Mark
1(d)	an explanation linking the following: stops responding to a neutral (repeated) stimulus (habituation) (so) reduces energy wastage/allows humans to approach (feed/treat) animals (1)	do not accept meerkats not afraid of humans	**(2)**

TOTAL: 8 MARKS

Question number	Answer	Acceptable answers	Mark
2(a)(i)	a description including the following: between 1980 and 2000 rate of uptake for the vaccination increased (1) corresponding decrease in occurrence of the disease (1)		**(2)**

Question number	Answer	Mark
2(a)(ii)	**B**	**(1)**

Question number	Answer	Mark
2(a)(iii)	memory	**(1)**

Question number	Answer	Mark
2(b)	it is not ethical to deliberately infect someone with a life-threatening disease (1) OR today regulated clinical trials, which do not put people in danger, must take place (1)	**(1)**

Question number	Answer	Mark
2(c)	a linked, sequential explanation including **three** of the following: after A, there are no memory lymphocytes so antibody production is slower and fewer antibodies are produced (1) at B, memory lymphocytes are already present so antibody production is immediate (1) at A, a low level of antibodies produced/time delay to trigger immune response (1) at B, memory lymphocytes triggered (1) so at B, higher level of antibody production/antibodies produced more quickly (1)	**(3)**

TOTAL: 8 MARKS

Question number	Answer	Mark
3(a)(i)	**D**	**(1)**

Question number	Answer	Mark
3(a)(ii)	an explanation linking the following: stone tools have developed over time/become more sophisticated (1) (so) presence of specific type (shape) of tool can indicate time period/tools of this shape have been found with fossils of a similar age (1)	**(2)**

Question number	Answer	Acceptable answers	Mark
3(b)(i)	an explanation linking a pair of the following: taller (eye line higher) (1) (so can) spot prey/predators/food/water source (over grass) (1) free hands (1) (so can) hunt/gather/care for young/use tools keep their head above water (1) (so can) cross water/carry young across water (1) less surface area exposed to sunlight (so) keep cool (1)	accept references to humans becoming hunter-gatherers	**(2)**

Question number	Answer	Mark
3(b)(ii)	better balance/better grip on branches/easier to (climb trees/harvest food)	**(1)**

Question number	Answer	Acceptable answers	Mark
3(c)	a description including the following: high mutation rate (1) maternally inherited (1) no recombination (1)		**(3)**

TOTAL: 9 MARKS

Question number	Answer	Acceptable answers	Mark
4(a)	lactose lactic acid	answers must be in the correct order	**(2)**

Question number	Answer	Acceptable answers	Mark
4(b)(i)	6.8 – 4.4 = 2.4	Accept range 4.2 to 4.4 for reading off graph	**(1)**

Question number	Answer	Mark
4(b)(ii)	fermentation happens faster at a higher temperature so more lactic acid is produced	**(1)**

Question number	Answer	Acceptable answers	Mark
4(c)	an explanation linking the following: only a small decrease in pH at 4°C (1) suggests fermentation occurs very slowly at 4°C (1) storage at 4°C prevents further fermentation affecting flavour (1)	 prevents the growth of other unwanted microbes	**(3)**

Question number	Answer		Mark
4(d)	an explanation including **two** pairs of the following: water jacket (1) (to) maintain (optimum) temperature for enzymes (1) stirrers (1) (to) circulate air/nutrients to stop dead pockets/ensure all bacteria have access to oxygen and nutrients (1) aseptic/sterile air inflow (1) (prevents) contamination by unwanted microorganisms (1) pH sensor (1) (to) detect end-point of fermentation (1)		**(4)**

TOTAL: 11 MARKS

Question number	Answer	Acceptable answers	Mark
5(a)(i)	mycoprotein/Quorn/soy bean products/yeast extract products, e.g. Marmite	accept cheeses that use fungi in the manufacturing process	**(1)**

Question number	Answer	Mark
5(a)(ii)	easy to manipulate conditions/independent of environment/use of waste products	**(1)**

Question number	Answer	Acceptable answers	Mark
5(b)	coagulation/clotting	thickening of milk	**(1)**

Question number		**Indicative content**	**Mark**
***5(c) QWC**		a description to include some of the following: • identification of relevant gene • isolation of a herbicide-resistant gene • use of (restriction) enzymes • sticky ends • gene inserted into plasmid/circular DNA • use of ligase • plasmid inserted into bacteria • *Agrobacterium tumefaciens* • bacteria infect/co-cultured with plant cells • cells from crown gall cultured • plant cells cultured on medium containing herbicide to select resistant plants	**(6)**
Level	**0**	No rewardable material	
1	**1-2**	• a limited understanding of the process of gene transfer to plants • use of everyday language and the response lacks clarity and organisation • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• a good understanding of the process of gene transfer to plants • use of some technical terms and the response is clear with some organisation • spelling, punctuation and grammar are used with some accuracy	
3	**5-6**	• a clear and accurate understanding of the process of gene transfer to plants • good and accurate use of scientific terms and the response is organised and shows clarity • spelling, punctuation and grammar are used with good accuracy	

Question umber	Answer	Acceptable answers	Mark
5(d)	a description including **three** of the following: selective breeding programmes (1) choosing parent plants with the most successful characteristics (1) breeding them together (1) choosing offspring with desired characteristics (1)	do not accept increase crop yields do not accept herbicide resistance	**(3)**

TOTAL: 12 MARKS

Question number	Answer	Mark
6(a)(i)	**D**	**(1)**

Question number	Answer	Mark
6(a)(ii)	**D**	**(1)**

Question number	Answer	Mark
6(b)	an explanation linking **two** of the following: placenta development (1) (to) maintain blood supply/supply nutrient(s)/remove waste product(s) (1)	**(2)**

Question number	Answer	Mark
6(c)	a description including the following: sperm contain either X or Y chromosome while egg contains X chromosome (1) XY combination gives male offspring and XX combination gives female offspring (1)	**(2)**

Question number		Indicative content	Mark
*6(d) QWC		a discussion, including at least one benefit and one drawback, to include some of the following: • FSH stimulates the maturation of follicles • increases the chance of ovulation • increases the chance of fertilisation • allows multiple eggs to be extracted (for IVF) • provides infertile couples with the chance to conceive • increases the chances of multiple births • multiple births more likely to lead to complications • (IVF) can allow older parents the chance to have children • consideration of ethical issues	(6)
Level	**0**	No rewardable material	
1	**1-2**	• a limited understanding of the role of FSH in fertility treatment and only describes a benefit or drawback of the use of FSH • use of everyday language and the response lacks clarity and organisation • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• a good understanding of the role of FSH in fertility treatment and describes a benefit and drawback of the use of FSH • use of some technical terms and the response is clear with some organisation • spelling, punctuation and grammar are used with some accuracy	
3	**5-6**	• a clear and accurate understanding of the role of FSH in fertility treatment and clearly explains the benefits and drawbacks of using FSH • good and accurate use of scientific terms and the response is organised and shows clarity • spelling, punctuation and grammar are used with good accuracy	

TOTAL: 12 MARKS

