

Write your name here

Surname					Other names									
Pearson					Centre Number					Candidate Number				
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Biology														
Unit B3: Using Biology														
Higher Tier														
Monday 16 June 2014 – Morning										Paper Reference				
Time: 1 hour										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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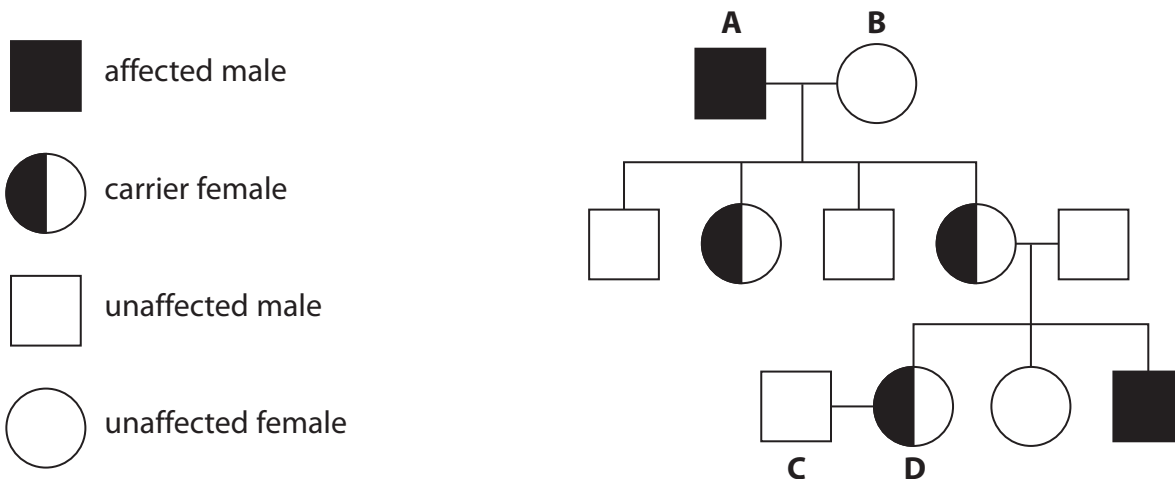
Answer ALL questions





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 ☒.

Sex-linked genetic disorders

1 Haemophilia is a recessive sex-linked disorder.

This family pedigree shows the inheritance of haemophilia.



-  affected male
-  carrier female
-  unaffected male
-  unaffected female

(a) (i) State the sex chromosomes of person **B**. (1)

(ii) Explain why the male offspring from **A** and **B** do not have haemophilia. (2)

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(iii) Using the Punnett square, calculate the probability that individuals **C** and **D** could have a child with haemophilia.

(3)

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(b) Haemophilia can be treated using a blood clotting factor produced in a fermenter.

The conditions inside a fermenter have to be carefully controlled.

Explain why **one** named condition must be controlled in a fermenter.

(2)

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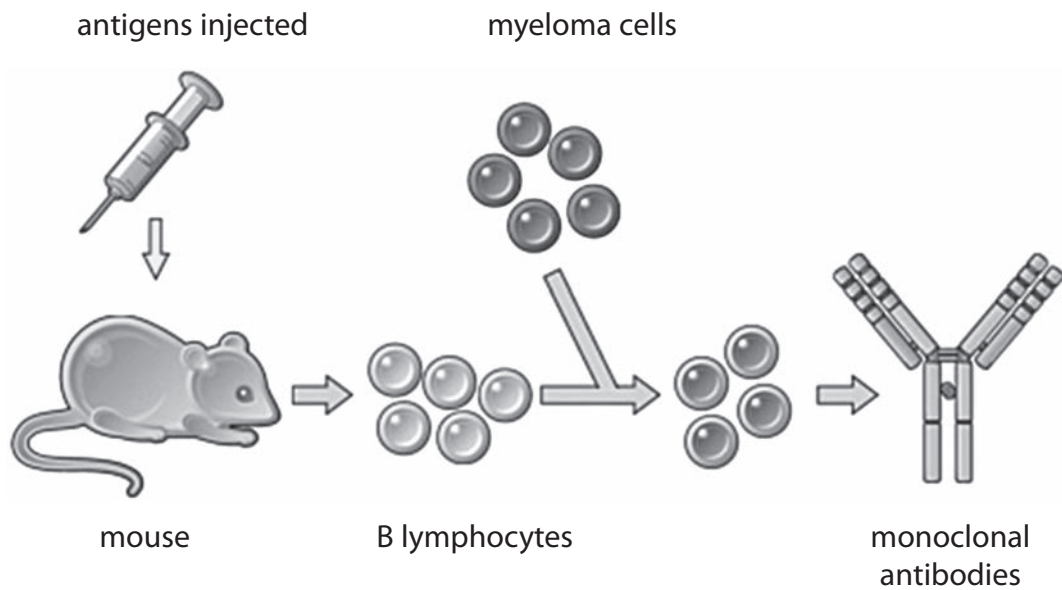
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(Total for Question 1 = 8 marks)



Monoclonal antibodies and the immune response

2 The diagram shows some stages in the production of monoclonal antibodies.



(a) (i) Complete the sentence using words from the box.

(2)

memory lymphocytes	exponential	hybridomas
immune	aseptic	myeloma cells

Injecting antigens into the mouse produces an
 response resulting in the production of antibodies and

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

The cells produced when B lymphocytes and myeloma cells combine are

(1)

- A antibodies
- B hybridomas
- C memory lymphocytes
- D platelets



(iii) Describe **two** ways in which monoclonal antibodies are used in medical diagnosis. (2)

1

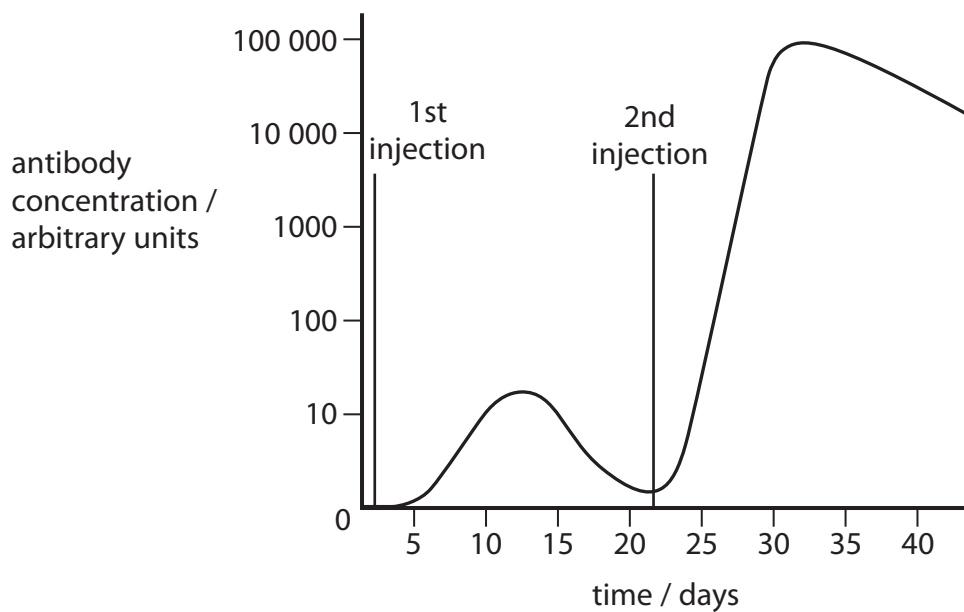
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(b) The graph shows the antibody concentration in a mouse after the first and second injection of the same antigens.



(i) Compare the antibody response after the first injection with the antibody response after the second injection.

(2)

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(ii) Suggest how this secondary response to antigens benefits the mouse.

(1)

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

Injecting patients with antigens forms the basis of vaccination.

This was first developed by

(1)

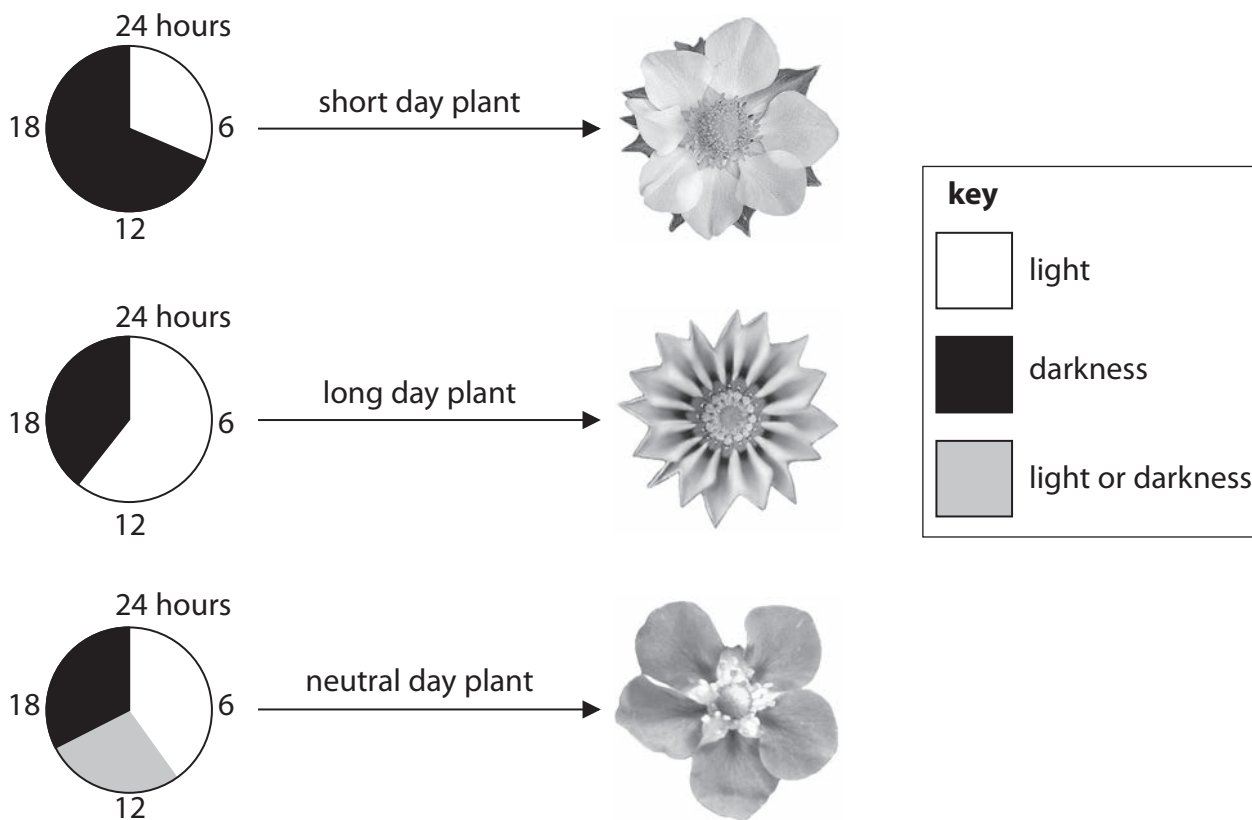
- A Diane Fossey
- B Edward Jenner
- C Louis Pasteur
- D Mary Leakey

(Total for Question 2 = 9 marks)



Plants and animals

3 The diagram shows the number of hours of darkness and light needed for flowering in three different plant groups.



(a) (i) State the number of hours of darkness needed for a long day plant to flower.

(1)

..... hours

(ii) A gardener has 500 short day plants.

85% of these plants flowered in March.

Calculate the number of plants flowering in March.

(2)

..... plants



(iii) Suggest a benefit to a plant of being day neutral.

(1)

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

Plants flowering in response to the number of hours of darkness and light is an example of

(1)

- A** circadian rhythms
- B** germination
- C** photoperiodism
- D** phototropism



- (b) (i) The leaves of some species of bamboo plants contain the poison cyanide.
Suggest how these bamboo plants benefit from having poisonous leaves.

(1)

- (ii) The photograph shows a greater bamboo lemur.



The greater bamboo lemur is adapted to tolerate cyanide.

This means that it can eat bamboo leaves containing cyanide.

Explain how the co-evolution of bamboo plants and the greater bamboo lemur could have occurred.

(2)



- (c) Two ethologists, Bergey and Patel, studied the call types used in communication between greater bamboo lemurs.

The table is a summary of their findings.

call types	behaviour
agitated calls	aggression
bahh calls	submission
breath out calls	aggression
contact calls	submission and aggression
purr calls	friendship and resting
squeal calls	submission
woof calls	aggression

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

The behaviour associated with most call types is

(1)

- A** aggression
- B** friendship
- C** resting
- D** submission

- (ii) Explain the benefit of communicating using sound rather than facial expressions.

(2)

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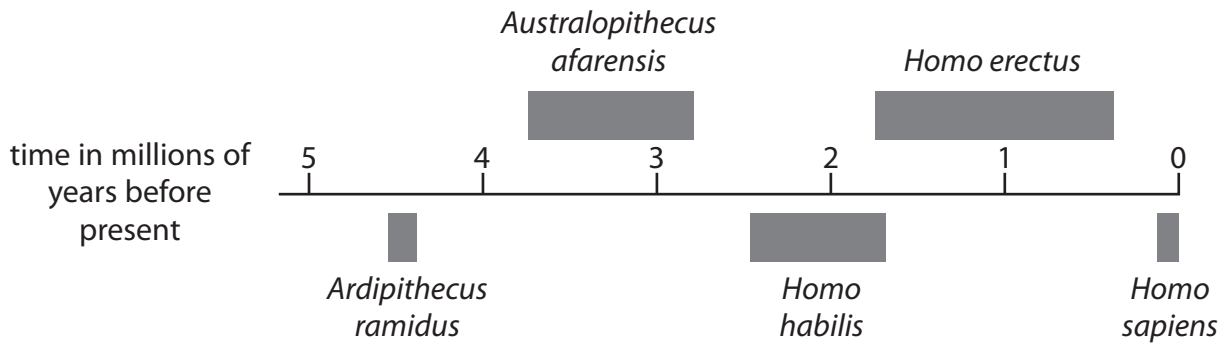
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(Total for Question 3 = 11 marks)



Human evolution and behaviour

4 The timeline shows when *Homo sapiens* and some of their ancestors are thought to have inhabited the Earth.



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

The species which is thought to have inhabited the Earth for the longest period of time is

(1)

- A *Australopithecus afarensis*
- B *Homo erectus*
- C *Homo habilis*
- D *Homo sapiens*

(ii) Estimate the number of years that *Homo habilis* inhabited the Earth.

(1)

(b) Scientists in Africa discovered part of a fossilised skull.

The skull was identified as belonging to the species *Homo erectus*.

Describe the methods scientists may have used to identify the skull as belonging to the species *Homo erectus*.

(2)

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(c) *Homo sapiens* evolved in Africa and then migrated to other areas of the world.

Mitochondrial DNA analysis can be used to map human migration.

Compare the benefits of using mitochondrial DNA rather than nuclear DNA to map human migration.

(3)

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(d) One group of *Homo sapiens* migrated to an environment where there was a large waterfall.

At first, the noise of the waterfall kept them awake at night but they got used to the noise over time.

Explain this behavioural response.

(2)

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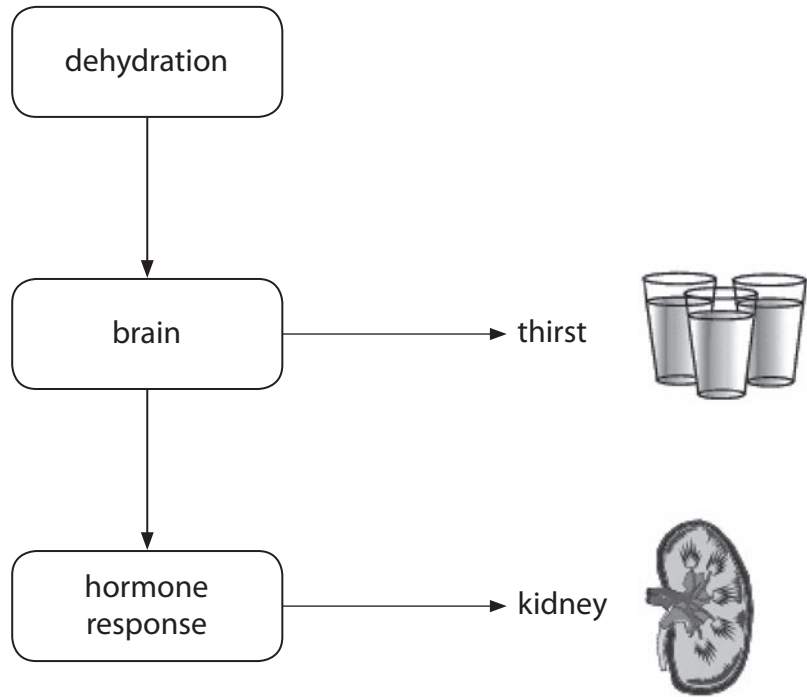
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(Total for Question 4 = 9 marks)



Hormonal control

5 The diagram shows the body's response to dehydration.



(a) Use the diagram to help explain the body's hormonal response to dehydration.

(4)

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(b) The menstrual cycle is also controlled by hormones including progesterone.

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

Progesterone is produced by the

(1)

- A** corpus luteum
- B** glomerulus
- C** hypothalamus
- D** pituitary gland

(ii) Describe the effect of high levels of progesterone on the uterus lining during pregnancy.

(1)

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*(b) (iii) Explain how the menstrual cycle is controlled by hormones and negative feedback.

(6)

A series of horizontal dotted lines for writing the answer.

(Total for Question 5 = 12 marks)



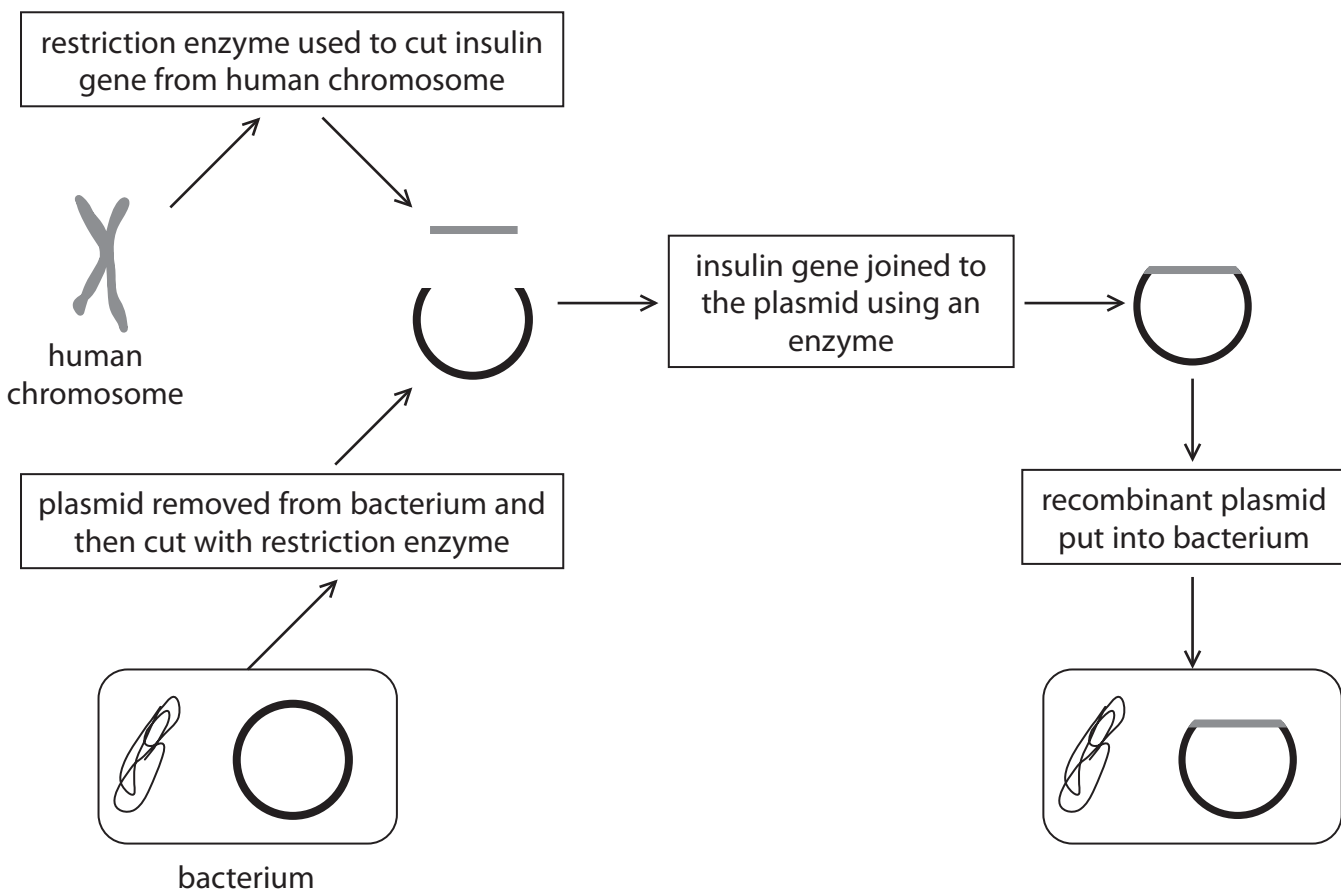
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Question 6 is on the next page



Enzyme technology

6 The diagram shows how the human insulin gene can be used to genetically modify bacteria.



(a) (i) Name the enzyme used to join the insulin gene to the plasmid.

(1)

(ii) Suggest why the same restriction enzyme was used to cut the human chromosome and the plasmid.

(2)

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*(b) Enzyme technology can be used in the production of foods including sweets, vegetarian cheese and lactose-free milk.

Describe how enzyme technology can be used to produce these food products.

(6)

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Question 6 continues on the next page



(c) Washing powders can be biological or non-biological.

Describe how biological washing powders can make clothes cleaner than non-biological washing powders.

(2)

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(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS

