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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number	Candidate Number

Time 1 hour 45 minutes

Paper reference **4HB1/02**

Human Biology

UNIT: 4HB1
PAPER: 02

You must have:
Ruler
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.
- 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 ☒.

Information

- The total mark for this paper is 90.
- 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.
- Try to answer every question.
- Check your answers if you have time at the end.
- Good luck with your examination.

Turn over ▶

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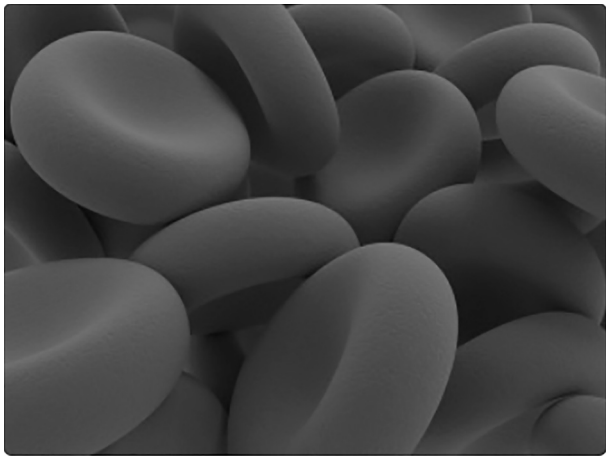
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Answer ALL questions.

1 (a) The photograph shows a group of red blood cells.



(Source: RomanenkoAlexey/Shutterstock)

(i) Describe the function of red blood cells.

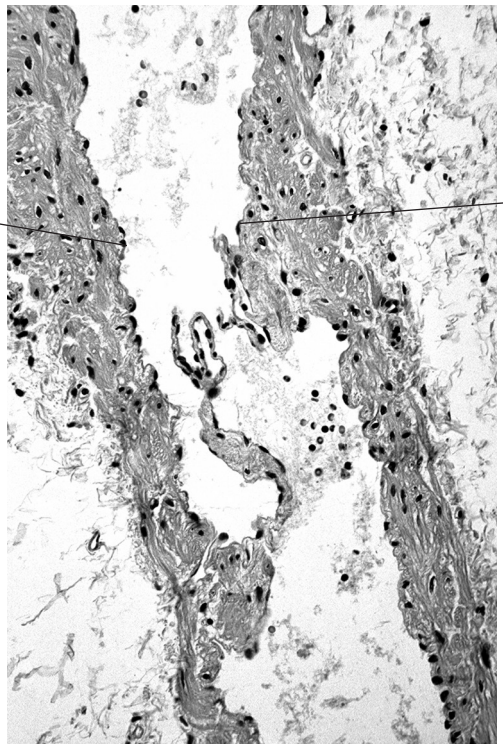
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(ii) Explain how the structure of the red blood cell is adapted to its function.

(4)

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(b) The photograph shows a section through a blood vessel in a leg.



magnification ×10

(Source: © DR. GLADDEN WILLIS, VISUALS UNLIMITED/SCIENCE PHOTO LIBRARY)

(i) State the type of blood vessel shown in the photograph.

(1)

.....

(ii) Explain your choice of blood vessel.

(2)

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(iii) Calculate the actual distance between points A and B.

2)

distance = ... mm

(Total for Question 1 = 12 marks)

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2 A student uses these three tests to identify the contents of four powders, W, X, Y a .

- iodine test
- Benedict's test
- biuret test

The table shows the student's results.

	Colour observed after testing			
Test	**Powder W**	**Powder X**	**Powder Y**	**Powder Z**
iodine	yellow / brown	black	black	yellow / brown
Benedict's	blue	brick red	blue	brick red
biuret	purple	blue	blue	purple

(a) Describe how the student should safely carry out the Benedict's test on the powders.

(4)

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(b) (i) Identify which powder gives a positive result for starch but a negative resu for the two other tests.

.....

(ii) Identify which powders contain protein but no starch.

(2)

.....

.....

(iii) Identify which powder contains reducing sugar but no protein.

(1)

.....

(iv) Give the contents of powder W.

(1)

.....

(Total for Question 2 = 9 marks)

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

Sweating is normal when we are hot. It is part of our natural cooling mechanism. If you sweat visibly when you do not need to cool down, it can be a problem.

The sweating process is controlled by the brain, which sends signals down the nerves to the sweat glands.

Sweating is crucial to survival. We sweat to control body temperature and the sweat glands in our armpits can produce several litres of sweat in 24 hours. How much we sweat varies hugely from individual to individual and even from day to day.

Hyperhidrosis occurs when some areas of the body start sweating excessively. This affects about 1% of the population. There are two main types. The most common type is primary focal hyperhidrosis, which affects many parts of the body. There is no known cause, but it usually begins in childhood and often runs in families. Another type is secondary hyperhidrosis, which often doesn't begin until after the teenage years, and usually has an underlying medical cause. These causes can include diabetes, menopause or chronic infection. It can also be a result of eating certain foods. Stress can play a major role too.

(a) Which part of the brain controls sweating (line 4)?

(1)

- ☒ **A** cerebellum
- ☒ **B** cerebral hemispheres
- ☒ **C** hypothalamus
- ☒ **D** pituitary gland

(b) Which type of nerve sends signals to the sweat glands (lines 4 and 5)?

(1)

- ☒ **A** connector
- ☒ **B** motor
- ☒ **C** relay
- ☒ **D** sensory

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(c) Describe how sweating controls body temperature (lines 6 and 7).

3)

(d) Explain the evidence in the passage that indicates primary focal hyperhidrosis is a genetic condition.

(3)

(e) Secondary hyperhidrosis can be caused by diabetes.

Give one risk factor for diabetes (line 16).

(1)

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(f) The passage states that how much we sweat varies from individual to individ and from day to day.

Explain why this is the case in people without hyperhidrosis (lines 8 and 9).

(5)

(Total for Question 3 = 14 marks)

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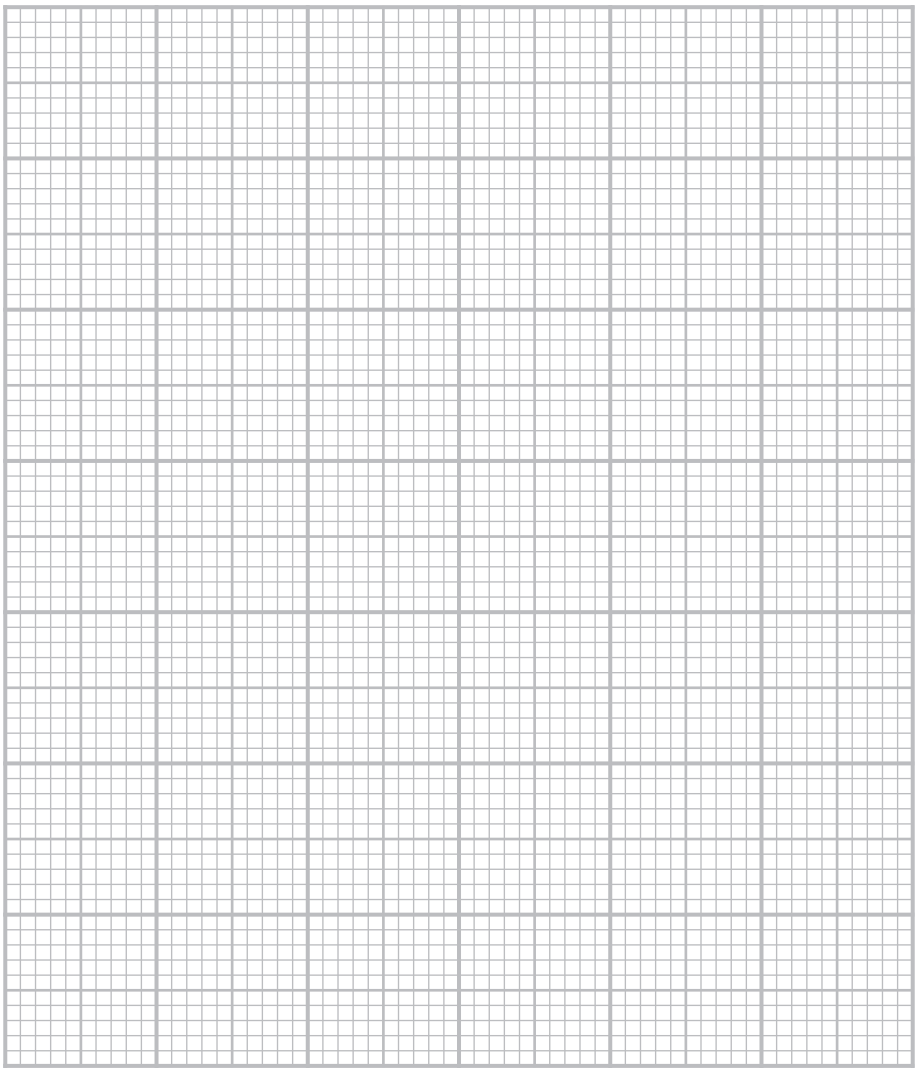
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4 The table shows the results of a survey about the number of teeth per student in class of young students.

Number of teeth	Number of students
23	1
24	2
25	3
26	4
27	7
28	13

(a) (i) Draw a bar chart to show the results of the survey.

(4)



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(ii) A full set of teeth for the students is 28

Calculate the percentage of the students in the class who have a full set of teet

(3

percentage = ... %

(b) A full set of teeth for an adult is 32

Suggest why the full set of teeth for these students is only 28

(2)

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(c) (i) Explain how reducing the amount of sugar in foods helps prevent tooth d .

4)

(ii) State two other methods that could reduce tooth decay.

(2)

1

2

(Total for Question 4 = 15 marks)

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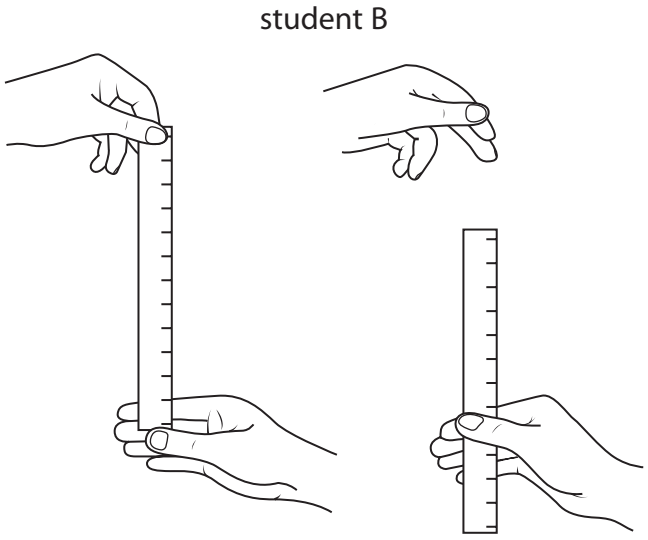
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5 Two students use this method to investigate if caffeine affects the speed of a refle tion.

- student A sits in a chair holding out a hand with their thumb and forefinger open
- student B holds a metre rule with the 0 mm mark just above the open thumb and forefinger of student A
- student B releases the ruler
- student A catches the ruler as quickly as possible by closing their thumb and forefinger



The method is repeated 10 times.

The student catching the ruler now drinks a cup of coffee and waits for 30 minutes.

The investigation is then repeated.

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The table shows the student's results.

Conditions \ Trial	Distance travelled by ruler in mm										
	1	2	3	4	5	6	7	8	9	10	mean
without coffee	210	190	200	205	207	195	198	195	199	201	200
with coffee	165	160	163	167	165	170	175	170	180	175	

(a) Complete the table by calculating the missing mean value.

(2)

(b) Coffee contains caffeine.

State the effect of caffeine on the reflex action.

(1)

(c) Explain why the student waited 30 minutes after drinking the coffee before continuing with the investigation.

(3)

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(d) The student who catches the ruler does not eat or drink anything for several hours before the investigation.

Suggest why this improves the validity of the investigation.

(2)

.....

.....

.....

.....

(e) A cup of coffee contains 100 mg of caffeine. A can of cola contains 50 mg of caffeine.

If the student catching the ruler had drunk a can of cola instead of coffee, estimate the mean distance travelled by the ruler.

(1)

mean distance = ... mm

(Total for Question 5 = 9 marks)

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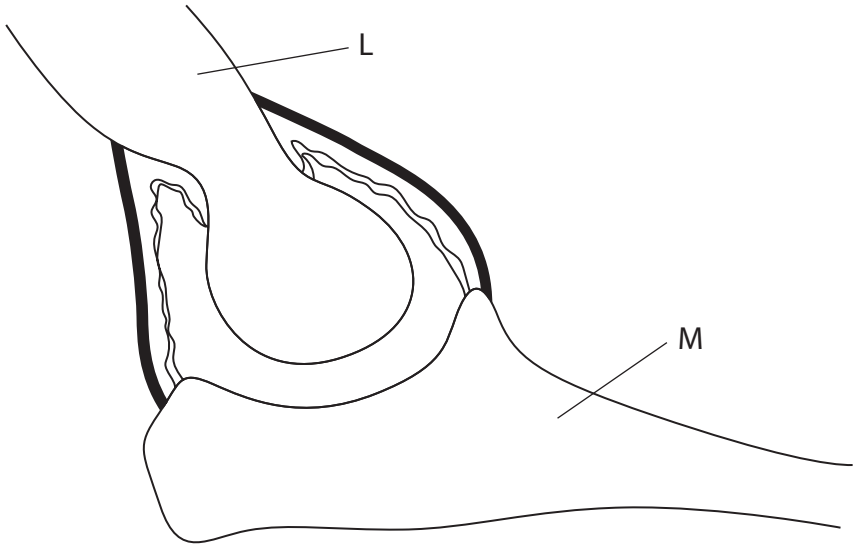
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6 The diagram shows some of the structures of the elbow joint.



(a) State what is meant by the term **joint**.

(2)

.....

.....

.....

.....

(b) (i) Give the name of bone L and the name of bone M.

(2)

L .....

M .....

(ii) Cartilage has not been shown on the diagram.

Draw the missing cartilage on the diagram.

(2)

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(c) Explain the effects on a person if the cartilage in this joint is missing or damag

2)

(d) Tendons are important in the functioning of a joint.

Explain the importance of tendons in the movement of bone M.

(4)

(Total for Question 6 = 12 marks)

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7 Various diseases are caused by microorganisms. Some diseases can be treated by using antibiotics.

(a) (i) Which of these is the name given to any microorganisms that cause disease?

(1)

- ☒ **A** bacteria
- ☒ **B** fungi
- ☒ **C** pathogens
- ☒ **D** protozoa

(ii) Explain why it is not possible to treat Ebola using antibiotics.

(2)

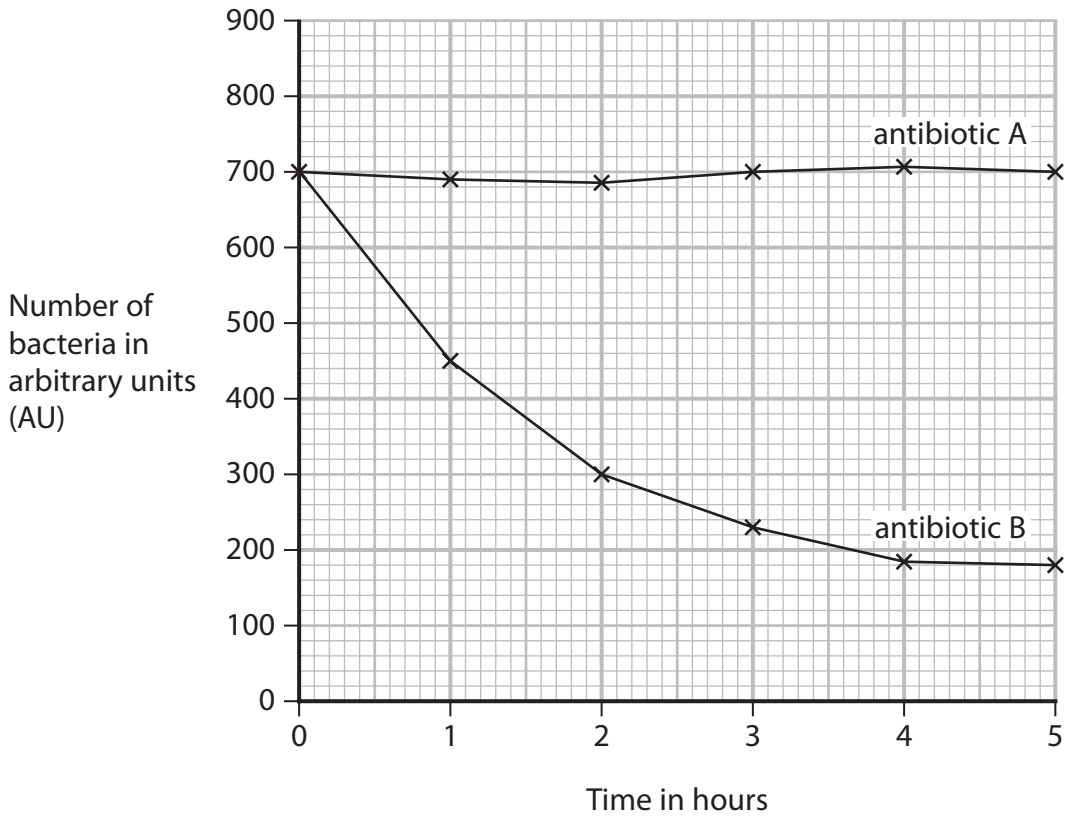
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(b) The graph shows the effect of two different antibiotics on the growth of a population of bacteria.



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(i) Calculate the mean rate of change of the bacterial population for antibioti during the five hours.

Give your answer to 2 significant figures.

(3)

mean rate of change = ... AU per hour

(ii) A bactericidal antibiotic kills bacteria.

A bacteriostatic antibiotic prevents bacteria from reproducing.

Explain which antibiotic is bactericidal.

Use data from the graph to help your answer.

(2)

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(iii) Discuss which antibiotic would be better to use to treat any disease cause the bacteria.

(Total for Question 7 = 11 marks)

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8 (a) Genetic conditions are often caused by recessive alleles.

(i) Which of these describes an allele?

(1)

☒ **A** a chromosome that controls a characteristic

☒ **B** an alternative form of a gene

☒ **C** a pair of chromosomes that are the same size

☒ **D** one of a pair of chromosomes

(ii) State what is meant by the term **recessive**.

(1)

.....

.....

(b) A student investigates a genetic condition found in his family.

The student made these observations.

- he is male and has the condition
- his mother does not have the condition
- his father and his father's brother have the condition
- his father's sister does not have the condition
- his father's mother (grandmother) does not have the condition but his father's father (grandfather) does have the condition

(i) Construct a family pedigree showing which members of the family have the condition and which do not.

(3)

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(ii) Discuss the conclusions the student can make about the inheritance of the condition.

(Total for Question 8 = 8 marks)

TOTAL FOR PAPER = 90 MARKS

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