Paper Reference(s) 4HB1/01
Pearson Edexcel International GCSE (9–1)

Total Marks

Human Biology
UNIT: 4HB1
PAPER: 01

Time: 1 hour 45 minutes

In the boxes below, write your name, centre number and candidate number.

Surname					
Other names					
Centre Number					
Candidate Number					

Y70973A

Pearson

YOU MUST HAVE

Calculator, ruler

YOU WILL BE GIVEN

Diagram Booklet

INSTRUCTIONS

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.

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.

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 ☒.

1 (a) Look at the diagram for Question 1(a) in the Diagram Booklet. It shows part of a molecule of DNA.

(i) Structure X is the backbone of the DNA molecule.

Which of these form part of the backbone of DNA?
(1 mark)

☐ A amino acids

☐ B bases

☐ C proteins

☐ D sugars

(continued on the next page)

1 continued.

(ii) What name is given to the structures labelled Y?
(1 mark)

☐ A amino acids

☐ B bases

☐ C proteins

☐ D sugars

(continued on the next page)

1 continued.

(iii) Describe how the two backbones of the DNA molecule are joined together.
(2 marks)

(continued on the next page)

1 continued.

(iv) State the name of the part of the cell where most of the DNA is found.
(1 mark)

(continued on the next page)

1 continued.

(b) DNA is a nucleic acid.

RNA is another type of nucleic acid.

(i) Give two differences between the structures of DNA and RNA.
(2 marks)

1 _____

_____

_____

2 _____

_____

_____

(continued on the next page)

1 continued.

(ii) There are different types of RNA.

Which of these are two types of RNA?
(1 mark)

☐ A mRNA and pRNA

☐ B dRNA and tRNA

☐ C dRNA and pRNA

☐ D mRNA and tRNA

(continued on the next page)

1 continued.

(c) DNA is formed from molecules called nucleotides.

Look at the diagram for Question 1(c) in the Diagram Booklet. It shows a single nucleotide.

Name the parts of the nucleotide labelled R, S and T.
(3 marks)

R _____

_____

S _____

_____

T _____

_____

(Total for Question 1 = 11 marks)

2 (a) Look at the graph for Question 2(a) in the Diagram Booklet. It shows how a person's heart rate changes with exercise.

(i) Determine the difference between the maximum heart rate and the resting heart rate.
(2 marks)

difference =

_____ beats per minute

(continued on the next page)

2 continued.

(ii) Which of these is the time taken for this person to recover from the exercise?
(1 mark)

☐ A 4 minutes

☐ B 6 minutes

☐ C 9 minutes

☐ D 15 minutes

(continued on the next page)

2 continued.

(iii) Complete the passage about what happens in the body during exercise using the correct words. (4 marks)

During exercise _____

gas moves from the lungs into the blood by

a process called _____.

This gas is needed by cells for

_____ respiration

which releases energy. Also during

exercise, the amount of urine produced

_____ as water is lost

in sweat.

(continued on the next page)

2 continued.

(b) (i) During exercise, body cells get damaged.

Body cells are replaced by a process called mitosis.

Look at the diagram for Question 2(b)(i) in the Diagram Booklet. The diagram represents one body cell but shows only 6 of the 46 chromosomes.

Complete the diagram to show the new body cells produced from this cell by mitosis.
(2 marks)

(continued on the next page)

2 continued.

(ii) Mitosis takes place in four stages.

Which of these gives the stage of mitosis where chromosomes align at the equator of the cell? (1 mark)

☐ A anaphase

☐ B metaphase

☐ C prophase

☐ D telophase

(Total for Question 2 = 10 marks)

3 (a) Look at the diagram for Question 3(a) in the Diagram Booklet. It shows some equipment that can be used to investigate the energy content of different foods.

(i) Describe how the equipment can be used to investigate the energy content of different foods.
(5 marks)

(continued on the next page)

3 continued.

(continued on the next page)

3 continued.

(continued on the next page)

3 continued.

(ii) Name two variables that need to be controlled in the investigation. (2 marks)

1 _____

_____

_____

2 _____

_____

_____

(continued on the next page)

3 continued.

(iii) Give two safety precautions needed for this investigation. (2 marks)

1 _____

_____

_____

2 _____

_____

_____

(continued on the next page)

3 continued.

(b) Different people have different energy requirements.

Look at the table for Question 3(b) in the Diagram Booklet. It shows the daily energy requirements in kilocalories (kcal) of males and females of different ages.

(continued on the next page)

3 continued.

(i) Describe the patterns in the energy requirements for males and for females.
(2 marks)

(continued on the next page)

3 continued.

(ii) Which of these gives a reason for the difference between the energy required by 25-year-old males and the energy required by 25-year-old females?
(1 mark)

☐ A females use more muscle mass than males

☐ B females eat less than males

☐ C males eat less than females

☐ D males use more muscle mass than females

(continued on the next page)

3 continued.

(iii) Calculate the percentage difference in the energy requirement of males compared with females in the age range of 35–44 years.
(3 marks)

percentage difference =

_____ %

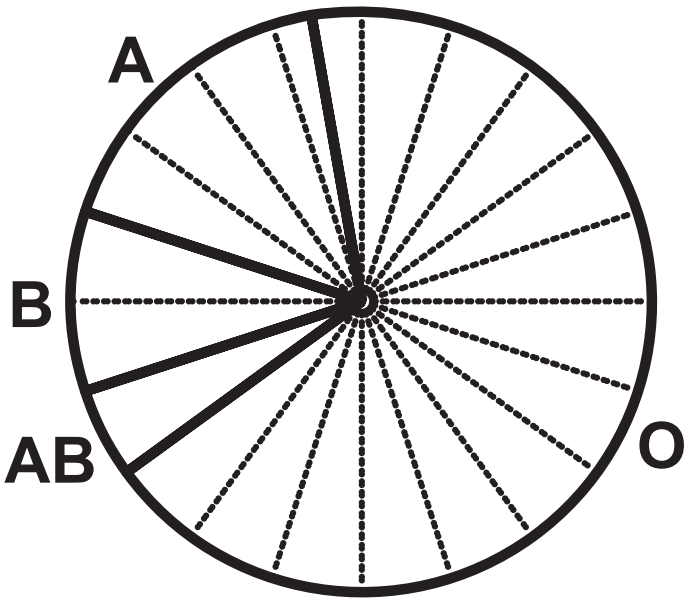
(Total for Question 3 = 15 marks)

4 (a) Humans belong to one of four blood groups.

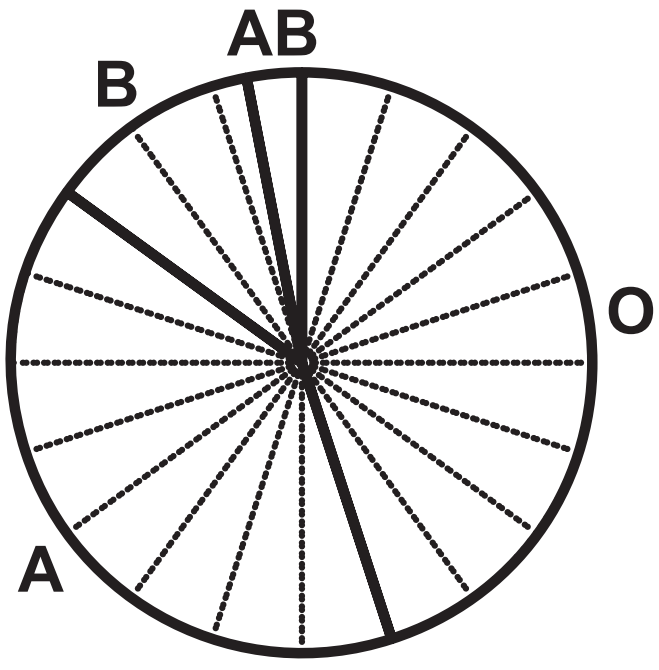
These blood groups are A, B, AB and O.

The pie charts show estimates of the percentages of people from Africa and the percentages of people from Europe in each blood group.

Africa



Europe



(continued on the next page)

4 continued.

(i) Look at the tables for Question 4(a)(i) in the Diagram Booklet. Complete the four missing values in the tables to give the percentage of each blood group.

Some information has been given.
(2 marks)

(continued on the next page)

4 continued.

(ii) Some people need a blood transfusion.

Explain why people with blood group A cannot receive a blood transfusion from people with blood group B.
(3 marks)

(continued on the next page)

4 continued.

(iii) A male with the genotype I^AI^O and a female with the genotype I^BI^O have a child with the genotype I^OI^O.

Draw a genetic diagram to show how the child inherits the genotype I^OI^O.
(3 marks)

(continued on the next page)

4 continued.

(iv) Determine the probability that a child from these parents will inherit the blood group AB. (1 mark)

probability = _____

(continued on the next page)

4 continued.

(b) The heart pumps the blood around the body.

Look at the diagram for Question 4(b) in the Diagram Booklet. It shows a human heart.

This heart has a hole in the septum.

This means that blood from the left side of the heart mixes with blood from the right side.

Explain why a person with a hole in their heart breathes at a greater rate than a person with a healthy heart. (4 marks)

(continued on the next page)

4 continued.

(Total for Question 4 = 13 marks)

5 (a) There is a difference in the volume of urine produced on a hot day and the volume of urine produced on a cold day.

Design an investigation to determine the difference in the volume of urine produced on a hot day and the volume of urine produced on a cold day.

Include experimental details in your answer and write in full sentences. (4 marks)

(continued on the next page)

5 continued.

(continued on the next page)

5 continued.

(b) Look at the diagram for Question 5(b) in the Diagram Booklet. It shows a cross-section of a blood vessel in the skin on a cold day.

Explain the changes in this blood vessel on a hot day.
(3 marks)

(continued on the next page)

5 continued.

(c) Describe how ADH regulates the volume of water in the body on a hot day.
(4 marks)

(continued on the next page)

5 continued.

(Total for Question 5 = 11 marks)

6 Describe how bacteria can be genetically modified to produce human insulin.
(6 marks)

(continued on the next page)

6 continued.

(continued on the next page)

6 continued.

(continued on the next page)

6 continued.

(Total for Question 6 = 6 marks)

7 (a) Industrial processes can use immobilised enzymes.

(i) Give one reason why using immobilised enzymes can cost less money than using enzymes that are not immobilised.
(1 mark)

(continued on the next page)

7 continued.

(ii) Look at the diagram for Question 7(a)(ii) in the Diagram Booklet. It shows the apparatus used to produce glucose and fructose using immobilised enzymes attached to alginate beads.

Name substance X.
(1 mark)

(continued on the next page)

7 continued.

(iii) Describe how to prepare alginate beads.
(3 marks)

(continued on the next page)

7 continued.

(b) Which process is involved in the conversion of glucose into glycogen in the human body?
(1 mark)

☐ A glucagon is released from the pancreas and travels to the liver

☐ B insulin is released from the pancreas and travels to the liver

☐ C glucagon is released from the liver and travels to the pancreas

☐ D insulin is released from the liver and travels to the pancreas

(continued on the next page)

7 continued.

(c) (i) The total population of the United Kingdom is 66·65 million.

Diabetes affects 6·0% of this population.

Calculate the number of people with diabetes in the United Kingdom.
(2 marks)

number of people =

_____ million

(continued on the next page)

7 continued.

(ii) Surveys were carried out in different areas of the United Kingdom.

These surveys collected data on the number of people in each area with diabetes.

The information collected is shown below.

38 62 51 96 49 78 82 91 65

Determine the median number of people with diabetes.
(2 marks)

median = _____

(Total for Question 7 = 10 marks)

8 Discuss the advantages and disadvantages of the use of embryonic and adult stem cells in medical research.
(6 marks)

embryonic stem cells

(continued on the next page)

8 continued.

(continued on the next page)

8 continued.

adult stem cells

(continued on the next page)

8 continued.

(Total for Question 8 = 6 marks)

9 In England, 31% of men and 26% of women have high blood pressure.

(a) Explain how medication can be used to treat people with high blood pressure.
(4 marks)

(continued on the next page)

9 continued.

(continued on the next page)

9 continued.

(b) (i) Describe what is meant by systolic blood pressure. (2 marks)

(continued on the next page)

9 continued.

(ii) Describe what is meant by diastolic blood pressure. (2 marks)

(Total for Question 9 = 8 marks)

TOTAL FOR PAPER = 90 MARKS
END OF PAPER