

Human Biology
UNIT: 4HB1
PAPER: 02

Total Marks

Time: 1 hour 45 minutes

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

Surname					
Other names					
Centre Number					
Candidate Number					

YOU MUST HAVE

Calculator, ruler

YOU WILL BE GIVEN

Diagram Booklet, Text Booklet

INSTRUCTIONS

Answer ALL questions.

Answer the questions in the spaces provided in this Question Paper or in the separate Diagram Booklet – 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.

There may be spare copies of some diagrams.

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 Look at the diagram for Question 1(a) in the Diagram Booklet. It shows a simple version of the human circulatory system.**

**(a) Name blood vessel X.
(1 mark)**

(continued on the next page)

1 continued.

(b) The list below gives words about the circulatory system.

body

oxygenated

lungs

ventricle

deoxygenated

atrium

(continued on the next page)

1 continued.

Complete the sentences using words from the list.

(5 marks)

Blood vessel Y transports

_____ **blood from the**

_____ **to the left**

_____ **of the heart.**

Blood vessel Z transports blood from the left

_____ **of the heart**

to the _____

(continued on the next page)

Turn over

1 continued.

(c) Look at the diagram for Question 1(c) in the Diagram Booklet. It shows the structure of blood vessel X and blood vessel Y.

**Compare the structure of blood vessel X with the structure of blood vessel Y.
(3 marks)**

(continued on the next page)

Turn over

1 continued.

(Total for Question 1 = 9 marks)

2 Look at the graph for Question 2(a) in the Diagram Booklet. It shows the number of working-age people at risk of developing a mental illness.

**(a) (i) Determine the year when the greatest number of women were at risk of developing a mental illness.
(1 mark)**

**(ii) Determine the year when there was the greatest difference between the number of males and the number of females at risk of developing a mental illness.
(1 mark)**

(continued on the next page)

Turn over

2 continued.

(iii) Determine the ratio of females at risk of developing a mental illness in 1999 compared with 2008.

**Give your answer in the form n : 1
(2 marks)**

ratio = _____

(continued on the next page)

Turn over

2 continued.

- (iv) Suggest one possible reason why the number of females at risk of developing a mental illness increased from 2007 to 2008.
(1 mark)**
-
-
-

- (b) Look at the boxes for Question 2(b) in the Diagram Booklet. They list two mental illnesses and some symptoms.**

Draw one straight line from each mental illness to a symptom of the illness.

(2 marks)

(continued on the next page)

Turn over

2 continued.

**(c) Which combination of drugs is most likely to affect mental health?
(1 mark)**

- ☐ **A alcohol and heroin**
- ☐ **B antibiotics and alcohol**
- ☐ **C cannabis and paracetamol**
- ☐ **D paracetamol and antibiotics**

(continued on the next page)

2 continued.

(d) People who use the drug cocaine often have a raised body temperature.

**Name two body structures that help to control body temperature.
(2 marks)**

1 _____

2 _____

(Total for Question 2 = 10 marks)

- 3 (a) The nervous system is adapted to transfer information rapidly from one part of the body to another.**

**Complete the passage about the nervous system by giving the correct words.
(4 marks)**

A change in the external environment is detected by

**_____ in sense organs.
These structures convert stimuli into electrical impulses which then travel along**

_____ neurones to the central nervous system.

(continued on the next page)

3 continued.

**The central nervous system
coordinates the incoming
information using**

**_____ neurones. These
neurones then transfer the electrical
impulses to**

_____ neurones.

**(b) Look at the diagram for Question 3(b)
in the Diagram Booklet. It shows the
junction between two neurones.**

**(i) State the name of the junction
between two neurones.
(1 mark)**

(continued on the next page)

Turn over

3 continued.

- (ii) Describe how an impulse reaching the end of one neurone produces an impulse in the next neurone.
(2 marks)**

(continued on the next page)

Turn over

3 continued.

(c) A nerve impulse travels at a speed of 120 metres per second.

**Calculate the distance that this nerve impulse will travel in 5·0 minutes.
(2 marks)**

distance = _____ m

(Total for Question 3 = 9 marks)

Turn over

- 4 A student tests foods W, X and Y for the presence of different nutrients.**

The student tests each of the foods using three different solutions, A, B and C.

Look at the table for Question 4 in the Diagram Booklet. It shows the student's results.

- (a) Name solution C.
(1 mark)**

- (b) Name the nutrient present in food X.
(1 mark)**

(continued on the next page)

4 continued.

**(c) Describe a safe method the student could use to test a food using solution B.
(4 marks)**

(continued on the next page)

Turn over

4 continued.

(Total for Question 4 = 6 marks)

5 Look at the diagram for Question 5(a) in the Diagram Booklet. It shows a section through the human ear.

**(a) (i) Name parts A and B.
(2 marks)**

A _____

B _____

**(ii) Describe the function of
the pinna.
(2 marks)**

(continued on the next page)

Turn over

5 continued.

(b) The range of frequencies audible to the human ear can vary with age.

Look at the table for Question 5(b) in the Diagram Booklet. It shows the maximum frequency detected by people of different ages.

**(i) Look at the grid for Question 5(b)(i) in the Diagram Booklet. Draw a bar chart to show how the maximum frequency detected varies with age.
(4 marks)**

(continued on the next page)

5 continued.

- (ii) Calculate the percentage change in the maximum frequency detected by people aged 20 and people aged 50.
(3 marks)**

percentage change =

_____ %

(continued on the next page)

Turn over

5 continued.

(c) A student suggests this method that could be used to produce the data shown in the table.

- select a person of each age to be tested**
- use a signal generator to produce sounds at different frequencies**
- record the maximum frequency detected by each person**

(i) Give two reasons why this is unlikely to produce valid results. (2 marks)

1 _____

(continued on the next page)

5 continued.

2 _____

**(ii) Describe how the reliability of the results could be improved.
(2 marks)**

(Total for Question 5 = 15 marks)

6 A student uses this method to investigate the effect of different antibacterial cleaners on the growth of bacteria.

- **add bacterial culture to sterile agar in a Petri dish using an inoculating loop**
- **using a pipette, place two drops of an antibacterial cleaner onto a filter paper disc**
- **repeat using two other filter paper discs, each one soaked with a different antibacterial cleaner**
- **soak one filter paper disc in distilled water**
- **place the four filter paper discs onto the sterile agar**
- **place a lid on the Petri dish**
- **place the dish into an incubator at 25°C for 5 days**

(continued on the next page)

Turn over

6 continued.

**(a) State the independent variable in this investigation.
(1 mark)**

**(b) Give two improvements to this method that will reduce the risk of introducing unwanted microorganisms into the Petri dish.
(2 marks)**

1

(continued on the next page)

Turn over

6 continued.

2 _____

(c) Explain why it is important that the Petri dish is incubated at a temperature no higher than 25°C. (2 marks)

(continued on the next page)

Turn over

6 continued.

**(d) Give a reason why the filter paper disc soaked in distilled water is included in the investigation.
(1 mark)**

(Total for Question 6 = 6 marks)

Turn over

7 Look at the text for Question 7 in the Text Booklet.

Read the passage.

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

(a) (i) Free radicals can damage genetic material in cells.

Describe one effect that this could have on body cells.

(lines 2 to 7)

(2 marks)

(continued on the next page)

Turn over

7 continued.

- (ii) Suggest how antioxidants, such as vitamin C, allow cells to function normally. (lines 10 to 12 and lines 17 to 21)
(2 marks)**
-
-
-
-
-
-
-

(continued on the next page)

Turn over

7 continued.

- (iii) Calculate the mass, in grams, of boiled broccoli that should be eaten to provide the recommended daily intake of vitamin C. (lines 24 to 28)
(3 marks)**

mass = _____ g

(continued on the next page)

Turn over

7 continued.

(b) DCPIP is a chemical used to determine the amount of vitamin C in food.

**Describe a method, using DCPIP, to compare the amount of vitamin C in fresh orange juice with that in boiled orange juice.
(5 marks)**

(continued on the next page)

Turn over

7 continued.

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Turn over

7 continued.

(Total for Question 7 = 12 marks)

- 8 (a) Duchenne muscular dystrophy (DMD) is a sex-linked genetic disorder caused by a gene mutation.**

The symptoms of DMD are caused by the absence of a protein called dystrophin.

**Explain how a gene mutation can result in the absence of dystrophin.
(4 marks)**

(continued on the next page)

Turn over

8 continued.

(b) Look at the diagram for Question 8(b) in the Diagram Booklet. It shows the inheritance of Duchenne muscular dystrophy in one family.

**(i) Explain what is meant by a carrier of DMD.
(2 marks)**

(continued on the next page)

Turn over

8 continued.

- (ii) Explain how the diagram shows that DMD is caused by a recessive allele.
(3 marks)**

(continued on the next page)

Turn over

8 continued.

(iii) Turn to page 16 for Question 8(b)(iii) in the Diagram Booklet. Draw a genetic diagram to show the inheritance of DMD from the parents to generation 1.

**Use X^D for the dominant allele and X^d for the recessive allele.
(2 marks)**

(Total for Question 8 = 11 marks)

9 (a) Hepatitis is a disease of the liver.

This disease can be caused by drinking too much alcohol.

**Explain the damaging effects of alcohol on the liver.
(3 marks)**

(continued on the next page)

Turn over

9 continued.

(continued on the next page)

9 continued.

(b) Hepatitis B is one type of virus that can cause hepatitis.

**Describe the reproduction of a hepatitis B virus.
(6 marks)**

(continued on the next page)

Turn over

9 continued.

(continued on the next page)

Turn over

9 continued.

(c) Vaccinations can be used to prevent the spread of hepatitis.

**Explain how vaccines can help people become immune to hepatitis.
(3 marks)**

(continued on the next page)

Turn over

9 continued.

(Total for Question 9 = 12 marks)

TOTAL FOR PAPER = 90 MARKS
END OF PAPER