

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education
Advanced Subsidiary Examination
June 2012

Human Biology

HBIO1

Unit 1 The body and its diseases

Monday 14 May 2012 9.00 am to 10.30 am

For this paper you must have:

- a ruler with millimetre measurements
- a calculator.

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- You may ask for extra paper. Extra paper must be secured to this booklet.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You are expected to use a calculator where appropriate.
- You will be marked on your ability to:
 - use good English
 - organise information clearly
 - use scientific terminology accurately.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	



J U N 1 2 H B I O 1 0 1

Answer **all** questions in the spaces provided.

- 1 (a)** Bacteria have prokaryotic cells. The table shows functions of parts of a prokaryotic cell.
Complete the table by naming the part of the cell that carries out each function.

Part of cell	Function
	Synthesises proteins
	Carries genes such as those for antibiotic resistance that are not in the main loop of DNA
	Protects the cell against drying out and against phagocytosis
	Helps the cell to move around

(4 marks)

- 1 (b)** Antibiotics can be used to treat disease caused by bacteria. Give **two** reasons why antibiotics **cannot** be used to treat disease caused by viruses.

1

.....

.....

2

.....

.....

(2 marks)



2 Influenza is caused by a virus. People can be protected against influenza with a vaccine. Each year a different influenza vaccine is made using antigens from the strain of virus most common at the time.

2 (a) When a person is given the influenza vaccine, it does **not** make them ill. Explain why.

.....

.....

.....

.....

.....

(2 marks)

2 (b) Doctors recommend that some people have an influenza vaccination each year. Explain why they recommend a vaccination each year.

.....

.....

.....

.....

.....

(2 marks)

4

Turn over for the next question

Turn over ►



- 3 (a)** A healthy diet should be high in fibre.
Give **two** reasons why.

1

.....

2

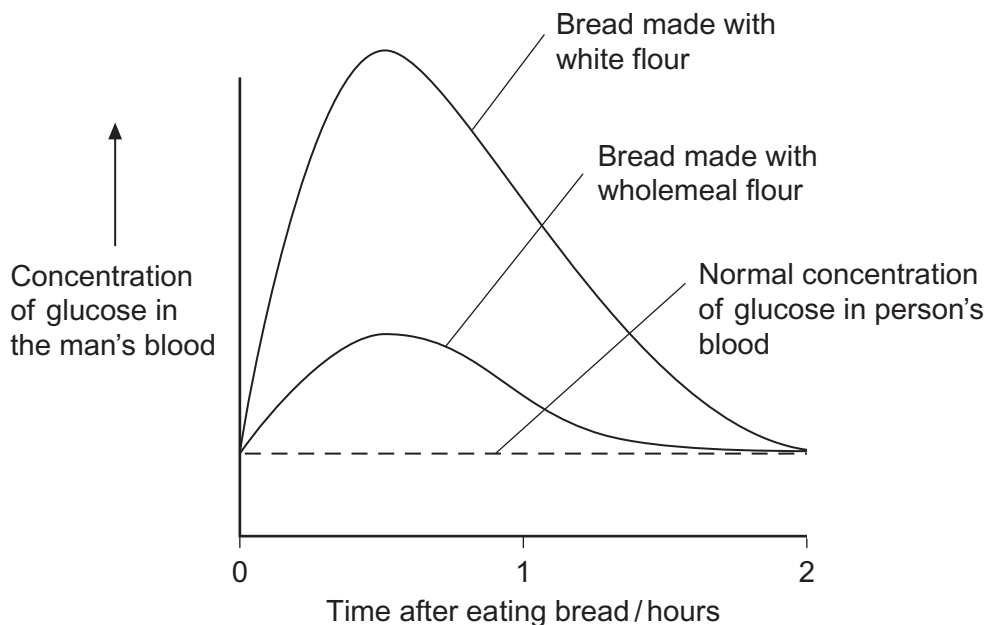
.....

(2 marks)

- 3 (b)** A scientist investigated the effect of eating the same amount of two different types of bread on the concentration of glucose in a man's blood.

- The man ate a piece of bread made with white flour. The scientist then measured the concentration of glucose in his blood over the next 2 hours.
- When the concentration of glucose in the blood had returned to its normal level, the man ate a piece of bread made with wholemeal flour. The scientist again measured the concentration of glucose in his blood over the next 2 hours.

The results are shown in the graph below.



Suggest **two** explanations for the different effects of these two types of bread on the concentration of glucose in the man's blood.

1

.....

.....

.....

2

.....

.....

.....

(4 marks)

6

Turn over for the next question

Turn over ►



4 (a) What is an antibody?

.....

.....

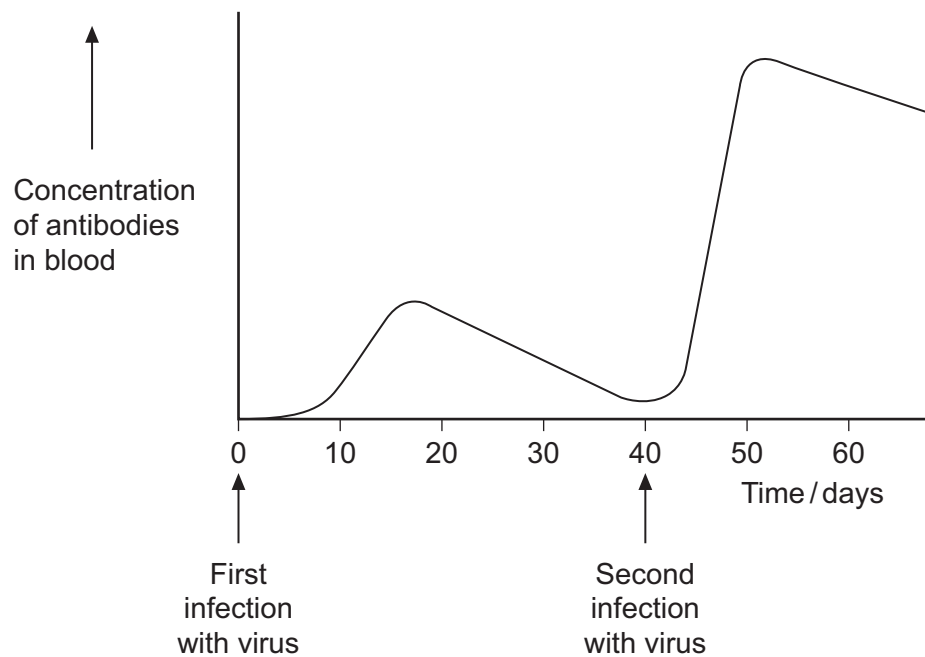
.....

.....

.....

(2 marks)

4 (b) A child was infected with the chicken pox virus. She developed chicken pox and then recovered. 40 days after the first infection, the child became infected again with the same virus. The graph shows the concentration of antibodies against the chicken pox virus in her blood.



- 4 (b) (i)** After the first infection, there was a delay before the steep rise in concentration of antibodies in the child's blood.
Explain this delay.

.....

.....

.....

.....

.....

.....

(3 marks)

(Extra space)

.....

.....

- 4 (b) (ii)** The second time the child was infected with the chicken pox virus she did **not** develop symptoms of the disease.
Use the graph to explain why.

.....

.....

.....

.....

.....

(2 marks)

7

Turn over ►



- 5** When blood is collected from a donor, technicians sometimes separate the red blood cells from the plasma and other blood cells. They store these red blood cells at 4 °C. They mix the red blood cells with an isotonic solution before giving them to a patient.

- 5 (a)** Suggest **one** reason why red blood cells are stored at 4 °C.

.....

.....

.....

.....

.....

(2 marks)

- 5 (b)** The red blood cells are mixed with an **isotonic** solution before they are used. Explain why it is important that this solution is isotonic with the red blood cells.

.....

.....

.....

.....

.....

(2 marks)



5 (c)

A large volume of isotonic solution containing red blood cells is often given to injured people who have lost a lot of blood. Suggest how this treatment might help to save their lives.

.....

.....

.....

.....

.....

(2 marks)

6

Turn over for the next question

Turn over ►



- 6 (a)** Many people with cystic fibrosis take capsules containing pancreatic digestive enzymes before a meal.
Explain why they need these digestive enzymes.

.....

.....

.....

.....

.....

(2 marks)

Scientists investigated the effect of a drug called cimetidine on digestion in people with cystic fibrosis. These people were taking capsules containing pancreatic digestive enzymes. The scientists asked volunteers with cystic fibrosis to take cimetidine and these capsules for 6 weeks. For each volunteer they recorded:

- body mass at the start of the investigation and after 6 weeks
- change in the percentage of fat in the faeces.

The table shows some of their results.

Volunteer number	Body mass at start of investigation / kg	Body mass after 6 weeks / kg	Change in percentage of fat in faeces
1	38.3	40.4	–9
2	53.6	54.4	–17
3	27.7	28.0	–9
4	37.0	38.3	–3
5	33.7	34.5	–3
6	19.3	20.0	–2
7	27.5	28.5	–7
8	59.0	61.5	–11



- 6 (b)** Calculate the percentage change in body mass of volunteer number **1** after 6 weeks.
Show your working.

Answer%
(2 marks)

- 6 (c)** Suggest and explain **two** reasons why the data in the table show that cimetidine improved digestion.

1

.....

.....

.....

2

.....

.....

.....

(4 marks)

8

Turn over for the next question

Turn over ►



7 (a) (i) Name the bacterium that causes tuberculosis (TB).

.....
(1 mark)

7 (a) (ii) Infection with this bacterium leads to a reduction in the surface area of the lungs. Describe how.

.....
.....
.....
.....
.....
(2 marks)

7 (b) Doctors investigated the most effective antibiotic to treat TB. They divided patients with TB into four groups at random.

- They treated each group with a different antibiotic.
- They calculated the mean time taken for the number of living TB bacteria in samples of saliva to decrease by 50%.

Their results are shown in the table.

Antibiotic used	Mean time taken for number of living TB bacteria in saliva to decrease by 50% / days
Moxifloxacin	0.88
Isoniazid	0.46
Rifampicin	0.71
Pyrazinamide	0.59

7 (b) (i) An investigation such as this would usually include a control group. Suggest why there was no control group in this investigation.

.....
.....
.....
.....
.....
(2 marks)



- 7 (b) (ii)** Which of these antibiotics would you expect to be the most effective in treating TB?
Explain your answer.

.....

.....

.....

.....

.....

(2 marks)

7

Turn over for the next question

Turn over ►



8 People who are obese have a high risk of developing coronary heart disease (CHD). Doctors recruited a large number of volunteers who were obese. None of the volunteers smoked or had been diagnosed with CHD. The doctors put the volunteers on a diet to lose body mass and gave them a drug called orlistat every day. Orlistat inhibits the digestion of fat in the gut.

Every 4 weeks the doctors recorded each volunteer's:

- body mass
- blood pressure.

Figures 1 and 2 show their results.

Figure 1

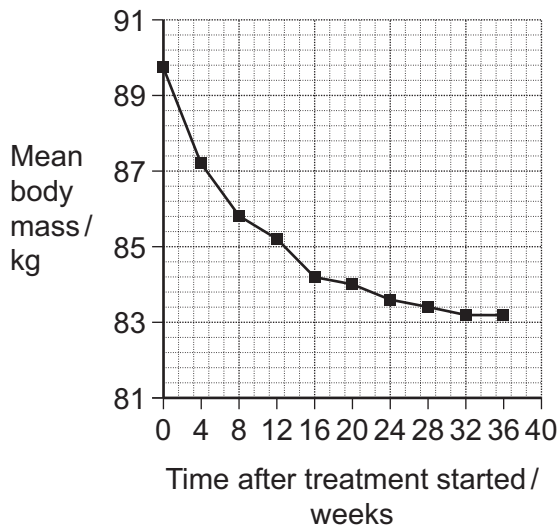
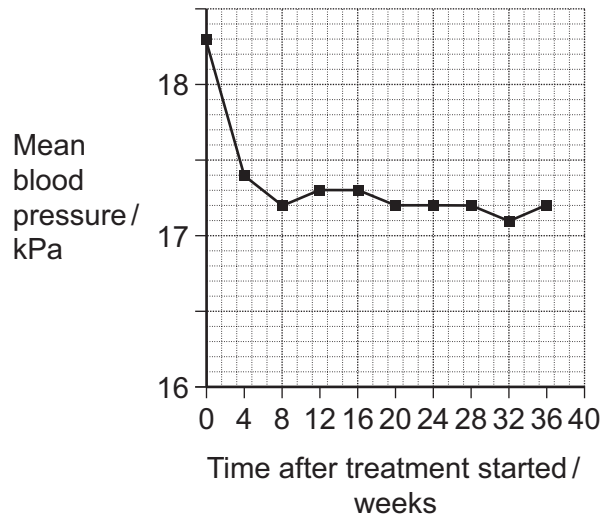


Figure 2



8 (a) Describe the results shown for the mean blood pressure in Figure 2.

.....

.....

.....

.....

.....

(2 marks)



- 8 (b)** It was important that none of the volunteers in this study smoked, or had CHD.
Explain why.

.....

.....

.....

.....

.....

(2 marks)

- 8 (c)** Use the information to explain how dieting and the use of orlistat may have reduced the volunteers' risk of developing CHD.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

(Extra space)

.....

.....

.....

8

Turn over ►



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



- 9 (a)** The heart is described as myogenic. What does myogenic mean?

.....

.....

.....

.....

.....

(2 marks)

- 9 (b)** The statements in **Figure 3** describe the events during one cardiac cycle. They are **not** in the correct order.

Figure 3

A	Atria contract
B	Blood passes through the semi-lunar valves into the aorta and into the pulmonary artery
C	Blood passes through the atrioventricular valves into the ventricles
D	Ventricles relax
E	Ventricles contract

Put one of the letters, **B** to **E**, into each box to give the events in the correct order. The first one has been done for you.

A				
---	--	--	--	--

(1 mark)

Question 9 continues on the next page

Turn over ►



Before every baby is born, it obtains oxygen from its mother via the placenta. Blood carrying oxygen from the placenta enters the right atrium of an unborn baby's heart. The heart of each unborn baby has a hole allowing blood to flow from its right atrium into its left atrium. This hole normally closes when each baby is born and starts to obtain oxygen using its lungs.

- 9 (c)** Suggest and explain **one** advantage to an unborn baby of having a hole allowing blood to flow from the right atrium into the left atrium of its heart.

.....

.....

.....

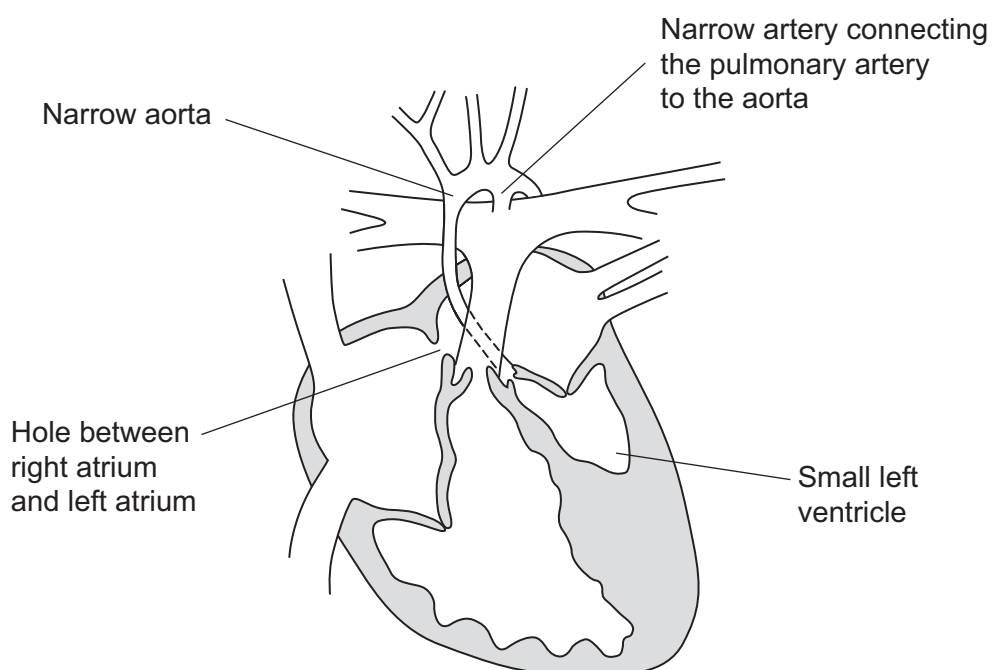
.....

.....

(2 marks)

- 9 (d)** Some babies are born with hypoplastic left heart syndrome. **Figure 4** shows the heart of a baby with this condition.

Figure 4



To improve the baby's condition, an operation is carried out to:

- increase the size of the hole between the right atrium and the left atrium
- widen the artery connecting the pulmonary artery to the aorta

Suggest how this operation improves the baby's condition.

.....

.....

.....

.....

.....

.....

(Extra space) (3 marks)

.....

.....

8

Turn over for the next question

Turn over ►



10 We all have bacteria in our guts. Many of these bacteria are beneficial to us.

Researchers have suggested that chocolate lovers who feel the need to eat chocolate every day may do so because of the bacteria in their guts. The researchers compared 11 men who were chocolate lovers with 11 men who did not eat chocolate. The men were all healthy and not obese. The investigation lasted 5 days. Other than chocolate, they were all eating the same diet during the investigation.

5

The researchers showed that chocolate lovers have different species and numbers of bacteria in their guts compared with people who did not eat chocolate. The researchers also found that chocolate lovers have lower concentrations of cholesterol and higher concentrations of protein in their blood. High concentrations of cholesterol increase the risk of developing coronary heart disease. High concentrations of protein in the blood reduce the risk of oedema.

10

15

A journalist wrote about this research. He concluded that some gut bacteria cause people to feel the need to eat chocolate. He also concluded that eating chocolate is good for a person's health.

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

10 (a) Give **one** way in which gut bacteria may be beneficial to us (lines 1 to 2).

.....

.....

.....

(1 mark)



This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and run across the entire width of the page. There are no margins, text, or other markings present.

[illegible]

Turn over ►



- 10 (c)** A high concentration of protein in the blood reduces the risk of developing oedema (lines 14 to 15). Explain how.

.....

.....

.....

.....

.....

.....

(3 marks)

(Extra space)

.....

.....

- 10 (d)** It was important that the men in the study had the same diet during the investigation, except for the chocolate (lines 7 to 8). Explain why.

.....

.....

.....

.....

.....

(2 marks)



- 10 (e)** A journalist concluded that some gut bacteria can cause people to feel the need to eat chocolate (lines 16 to 17). Suggest an alternative explanation for the different groups of men having different gut bacteria.

.....

.....

.....

.....

.....

(2 marks)

Question 10 continues on the next page

Turn over ►



[illegible]

(6 marks)

.....

.....

.....

.....

.....

END OF QUESTIONS