Centre Number						Candidate Number				
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For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
June 2014

Biology BIOL1

Unit 1 Biology and disease

Wednesday 21 May 2014 9.00 am to 10.15 am

For this paper you must have:
- a ruler with millimetre measurements
- a calculator.

Time allowed
- 1 hour 15 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 in margins 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 maximum mark for this paper is 60.
- The marks for questions are shown in brackets.
- You are expected to use a calculator, where appropriate.
- Quality of Written Communication will be assessed in all answers.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use scientific vocabulary accurately.

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

1 (a) Describe how phospholipids are arranged in a plasma membrane.

[2 marks]

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1 (b) Cells that secrete enzymes contain a lot of rough endoplasmic reticulum (RER) and a large Golgi apparatus.

1 (b) (i) Describe how the RER is involved in the production of enzymes.

[2 marks]

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1 (b) (ii) Describe how the Golgi apparatus is involved in the secretion of enzymes.

[1 mark]

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2 (a) Give **two** risk factors associated with coronary heart disease.

[2 marks]

1 .....

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2 .....

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2 (b) During a myocardial infarction, areas of heart muscle begin to die.
Explain why.

[3 marks]

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[Extra space] .....

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Turn over for the next question

Do not write outside the box

3 (a) Describe how bacteria are destroyed by phagocytes.

[3 marks]

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[Extra space] .....

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3 (b) Give **two** structures a bacterial cell may have that a white blood cell does not have.

[2 marks]

1 .....

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2 .....

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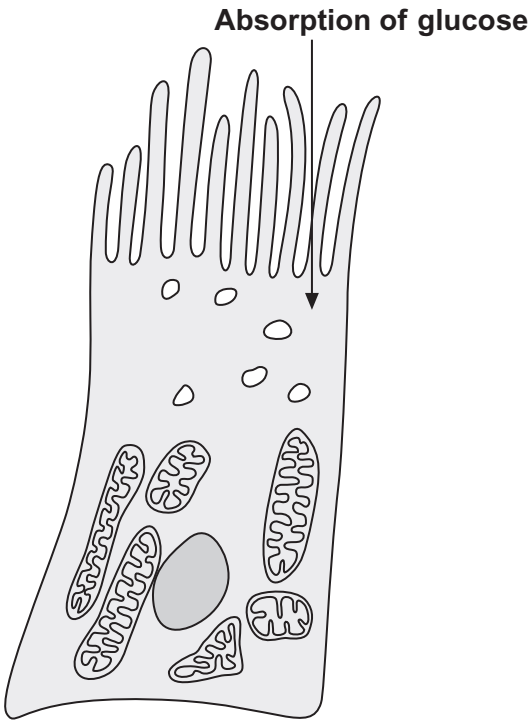
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ANSWER IN THE SPACES PROVIDED

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4 **Figure 1** shows a cell from the kidney. This cell rapidly absorbs glucose.

Figure 1



4 (a) (i) Give **two** structures shown in **Figure 1** that are adaptations of this cell that make possible the rapid absorption of glucose.

[1 mark]

Structure 1 .....

Structure 2 .....

4 (a) (ii) For each structure you identified in part **4(a)(i)**, explain how it is an adaptation to make possible the rapid absorption of glucose.

[2 marks]

Structure 1 .....

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Structure 2 .....

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4 (b) The absorption of glucose into the cell leads to the movement of water into the cell.

Explain how.

[2 marks]

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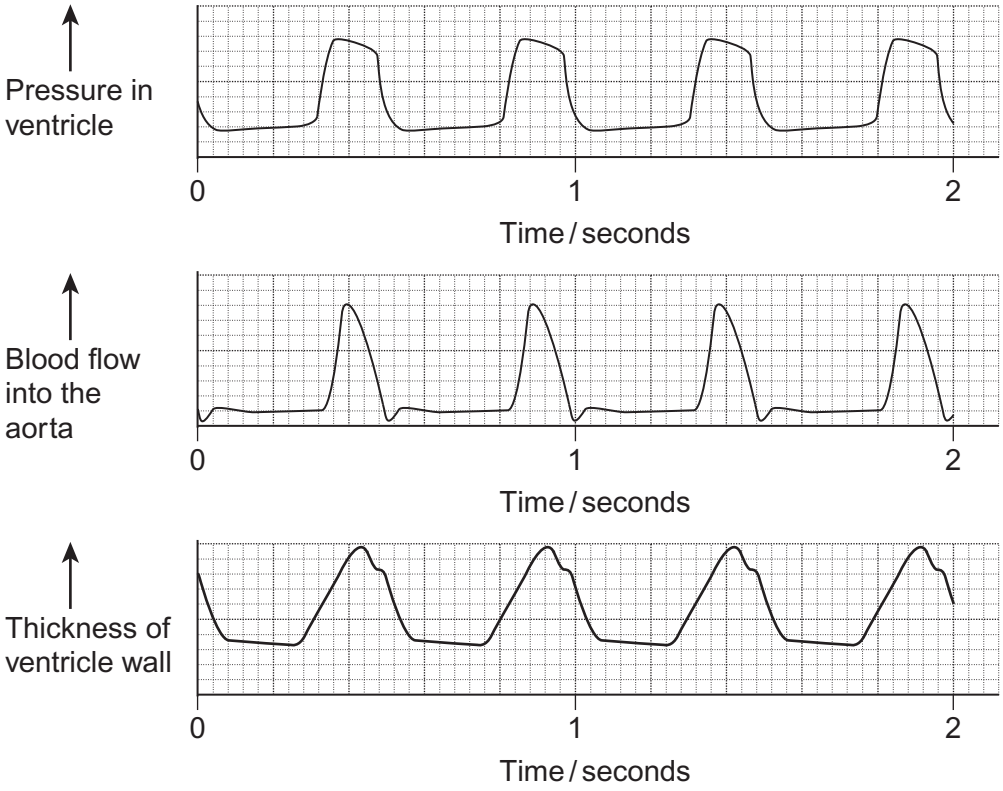
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5 **Figure 2** shows recordings made from the heart of a dog.

Figure 2



5 (a) Use information from **Figure 2** to explain how the pressure in the dog's ventricle is related to blood flow into the aorta.

[2 marks]

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[Extra space] .....

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5 (b) Use information from **Figure 2** to explain how the pressure in the dog's ventricle is related to the thickness of the ventricle wall.

[2 marks]

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[Extra space] .....

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5 (c) Use **Figure 2** to calculate the heart rate of the dog in beats per minute.
Show your working.

[2 marks]

Heart rate ..... beats per minute

6

Turn over for the next question

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6 Some mice have diabetes. The diabetes causes the blood glucose concentration to become very high after a meal. Scientists investigated the use of an inhibitor of amylase to treat diabetes.

The scientists took 30 mice with diabetes and divided them into two groups, **A** and **B**.

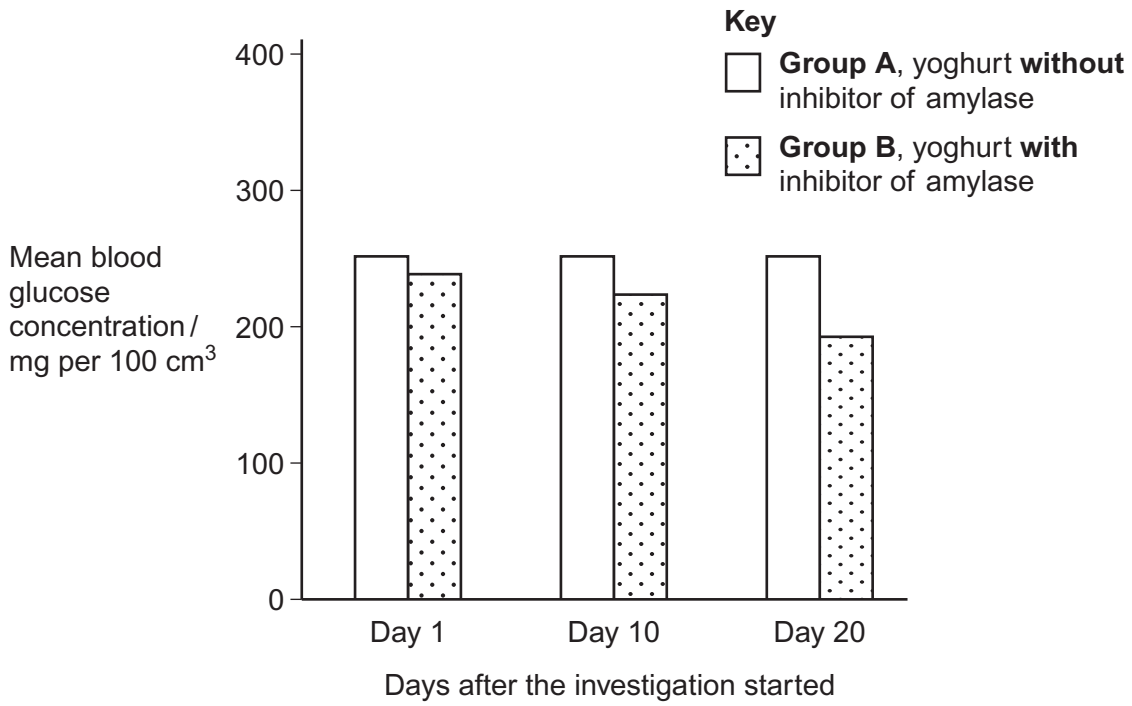
- **Group A** was given yoghurt **without** the inhibitor of amylase each day.
- **Group B** was given yoghurt **with** the inhibitor of amylase each day.

Apart from the yoghurt, all of the mice were given the same food each day.

The scientists measured the blood glucose concentration of each mouse, 1 hour after it had eaten. This was done on days 1, 10 and 20 after the investigation started.

Figure 3 shows the scientists' results.

Figure 3



6 (a) **Group A** acted as a control in this investigation.

Explain the purpose of this group.

[2 marks]

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6 (b) Apart from the yoghurt, it was important that all of the mice were given the same food each day.

Give **two** reasons why it was important that all of the mice were given the same food each day.

[2 marks]

1 .....

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2 .....

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6 (c) The scientists' hypothesis was that adding the inhibitor of amylase to the food would lead to a lower blood glucose concentration.

Use your knowledge of digestion to suggest how the addition of the inhibitor could lead to a lower blood glucose concentration.

[2 marks]

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6 (d) Give **one** reason why these results may **not** support the use of the inhibitor of amylase to treat diabetes in mice.

[2 marks]

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7 Scientists investigated the effect of tuberculosis (TB) on breathing. They obtained data from African miners aged 20 to 65 years.

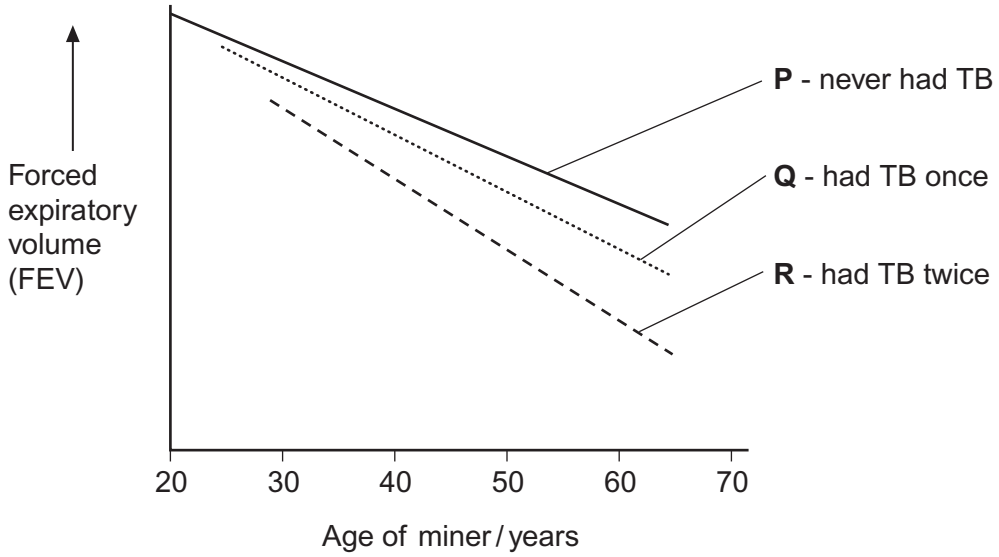
They divided the miners into groups based on how many times they had had TB.

- **Group P**, never had TB
- **Group Q**, had TB once
- **Group R**, had TB twice

The data were for forced expiratory volume (FEV). FEV is the maximum volume a person can breathe out in 1 second.

Their results are shown in **Figure 4**.

Figure 4



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7 (a) Describe the results.

[3 marks]

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[Extra space] .....

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7 (b) Tuberculosis leads to permanent changes in the gas exchange system.
These changes include fibrosis.

Explain how fibrosis caused by tuberculosis could have produced the changes in FEV of the miners.

[3 marks]

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[Extra space] .....

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8 Read the following passage.

Whooping cough is caused by the bacterium *Bordetella pertussis*. The first vaccines for whooping cough contained whole bacterial cells that had been heated for several minutes. Today, most vaccines only contain between one and three parts of the bacterial cells. People given whole-cell vaccines were more likely to develop harmful side effects than the people given the vaccines containing parts of the bacterial cells. Those given whole-cell vaccines produced a greater range of antibodies against the bacterium.

There have been suggestions that whooping cough vaccines may not work very well. These suggestions are due to recent reports of large rises in the number of cases of whooping cough. Doctors who examined a group of patients with coughs diagnosed about 17% of them as having whooping cough. Scientists tested the blood of the same group of patients for antibody against a toxin produced by *Bordetella pertussis*. They concluded that 4% of this group actually had whooping cough.

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

8 (a) (i) People given whole-cell vaccines were more likely to develop harmful side effects than the people given the vaccines containing parts of the bacterial cells (lines 4–6).

Suggest reasons why.

[3 marks]

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8 (a) (ii) People given whole-cell vaccines produced a greater range of antibodies against the bacterium than the people given the vaccines containing parts of the bacterial cells (lines 7–8).

Explain why.

[2 marks]

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8 (b) The scientists concluded from their test that 4% of patients with long-term coughs actually had whooping cough (line 15).

Explain how they used the results of their test to reach this conclusion.

[3 marks]

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Question 8 continues on the next page

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8 (c) What does the scientists' work suggest about reports of large rises in the number of cases of whooping cough (lines 10–11)?

Explain your answer.

[2 marks]

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9 (a) In humans, the enzyme maltase breaks down maltose to glucose.
This takes place at normal body temperature.

Explain why maltase:
- only breaks down maltose
- allows this reaction to take place at normal body temperature.

[5 marks]

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Question 9 continues on the next page

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9 (b) Scientists have investigated the effects of competitive and non-competitive inhibitors of the enzyme maltase.

Describe competitive and non-competitive inhibition of an enzyme.

[5 marks]

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END OF QUESTIONS

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