Please write clearly in block capitals.

Centre number ___________ Candidate number ___________

Surname ____________________________
Forename(s) __________________________
Candidate signature ___________________

GCSE Biology
Foundation Tier  Unit Biology B3

Friday 10 June 2016  Morning  Time allowed: 1 hour

Materials
For this paper you must have:
• a ruler.
You may use a calculator.

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.
• 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 60.
• You are expected to use a calculator where appropriate.
• You are reminded of the need for good English and clear presentation in your answers.
• Question 9 should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
• In all calculations, show clearly how you work out your answer.
Answer all questions in the spaces provided.

1 (a) Figure 1 shows the breathing system in humans.

![Figure 1](image)

Use the correct answer from the box to complete the sentence.

[1 mark]

<table>
<thead>
<tr>
<th>abdomen</th>
<th>air passages</th>
<th>thorax</th>
</tr>
</thead>
</table>

The lungs and ribs are found in the ____________________________.

1 (b) (i) What happens to the ribs when we breathe in?

Tick (✓) one box.

- The ribs move down and in. 
- The ribs move up and in. 
- The ribs move up and out.

1 (b) (ii) Describe what happens to the muscles between the ribs when we breathe in.

[1 mark]

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1 (c) **Figure 2** shows an alveolus from a healthy lung and an alveolus from a damaged lung.

![Figure 2](image)

1 (c) (i) Which **one** of the following is a difference between the alveolus from the damaged lung and the alveolus from the healthy lung?  

[1 mark]

Tick (✓) one box.

- The damaged alveolus has a smaller surface area.  
- The damaged alveolus has a shorter diffusion pathway.  
- The damaged alveolus has a better blood supply.

1 (c) (ii) A person with damaged alveoli finds exercising difficult.  

Which **one** of the following is the reason why the damaged alveoli will make exercising difficult?  

[1 mark]

Tick (✓) one box.

- Less carbon dioxide is taken in.  
- Less energy is needed for exercise.  
- Less oxygen is taken in.
A scientist measured the volume of sweat lost between 9.00 am and 2.59 pm in one day by one person. Figure 3 shows the results.

Figure 3

<table>
<thead>
<tr>
<th>Time of day</th>
<th>Volume of sweat lost in cm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00–9.59 am</td>
<td>0</td>
</tr>
<tr>
<td>10.00–10.59 am</td>
<td>100</td>
</tr>
<tr>
<td>11.00–11.59 am</td>
<td>600</td>
</tr>
<tr>
<td>12.00–12.59 pm</td>
<td>900</td>
</tr>
<tr>
<td>1.00–1.59 pm</td>
<td>800</td>
</tr>
<tr>
<td>2.00–2.59 pm</td>
<td>400</td>
</tr>
</tbody>
</table>

2 (a) (i) Suggest what happened at 11.00 am. [1 mark]

Tick (✓) one box.

- The person moved into a cold room.
- The person removed their coat.
- The person started running a race.

2 (a) (ii) Calculate the total volume of sweat lost between 11.00 am and 1.59 pm. [1 mark]

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Total volume of sweat lost = _________________ cm³
2 (a) (iii) Suggest one way the person could replace the water that was lost as sweat. [1 mark]

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2 (b) (i) Sweating helps keep our internal body temperature within a narrow range.

Which organ monitors body temperature? [1 mark]

Tick (✓) one box.

- brain
- kidney
- pancreas

2 (b) (ii) The organ that monitors internal body temperature receives information about temperature from the skin.

Which structures in the skin send impulses with this information? [1 mark]

Tick (✓) one box.

- capillaries
- glands
- receptors

2 (c) How does sweating help to control body temperature? [1 mark]

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Turn over
The heart is part of the circulatory system.

3 (a) (i) Name one substance transported by the blood in the circulatory system. [1 mark]

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3 (a) (ii) What is the main type of tissue in the heart wall? [1 mark]

_____________________________________________________________________________________

3 (b) Figure 4 shows the human heart.

Figure 4 shows the human heart.

3 (b) (i) Which blood vessel, A, B or C, takes blood to the lungs? [1 mark]

3 (b) (ii) Name parts D and E shown in Figure 4. [2 marks]

D ________________________________

E ________________________________
3 (c) **Figure 5** shows three types of blood vessel, F, G and H.

![Figure 5](image)

3 (c) (i) What type of blood vessel is **F**?

Tick (✓) one box.

- an artery
- a capillary
- a vein

3 (c) (ii) A man needs to have a stent fitted to prevent a heart attack.

In which type of blood vessel would the stent be placed?

Tick (✓) one box.

- an artery
- a capillary
- a vein

3 (c) (iii) Explain how a stent helps to prevent a heart attack.

[2 marks]

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Turn over ➔
Some people with diabetes do not produce enough insulin to keep their blood glucose at the correct levels.

**4 (a) (i)** Which organ monitors blood glucose levels? [1 mark]

Tick (✓) one box.

- liver  
- pancreas  
- skin

**4 (a) (ii)** What effect does insulin have on glucose in the blood? [1 mark]

Tick (✓) one box.

- Insulin causes glucose to move into the cells.  
- Insulin increases the amount of glucose in the blood.  
- Insulin converts glucose to starch.
4 (b) Some people with diabetes inject insulin several times a day. There are different types of insulin. **Figure 6** shows some information about three different types of insulin, A, B and C.

![Figure 6](image)

4 (b) (i) Which type of insulin, A, B or C, should a person with diabetes inject just before eating a meal high in carbohydrates? [2 marks]

________________

Give a reason for your answer.

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Question 4 continues on the next page
4 (b) (ii) A woman with diabetes has a blood glucose level of 12 mmol per dm$^3$ of blood.

The woman’s normal blood glucose level is 6 mmol per dm$^3$.

The woman will need to inject insulin to lower her blood glucose level.

For each unit of insulin injected the blood glucose level will fall by 3 mmol per dm$^3$.

How many units of insulin does the woman need to inject to bring her blood glucose level down to the normal level?

[1 mark]

_____________________________________________________________________________________

Number of units = ________________

4 (c) Some people have pancreas transplants to treat diabetes.

Give one possible disadvantage of a pancreas transplant.

[1 mark]

Tick (✓) one box.

The pancreas could be rejected. ☐

The patient will need to inject insulin every day. ☐

The patient’s blood glucose levels may rise and fall too much. ☐
It is important to conserve fish stocks.

**Figure 7** shows a new type of fishing net and a traditional fishing net.

![New type of fishing net](image1)

![Traditional fishing net](image2)

Holes surrounded by rigid plastic lights

5 (a) (i) Describe how the new type of fishing net helps to conserve fish stocks.  

[3 marks]

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5 (a) (ii) Give one way, other than controlling nets, to reduce overfishing.  

[1 mark]

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Another way to make sure there is food for an increasing human population is to make food production more efficient.

**Figure 8** shows how some cows are farmed.

**Figure 8**

5 (b) (i) Use information from **Figure 8** to suggest **two** ways in which this type of farming reduces energy loss from the cows.

[2 marks]

1 ___________________________________________________________________________________

_____________________________________________________________________________________

2 ___________________________________________________________________________________

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5 (b) (ii) Give **two** reasons why some people disagree with farming cows in this way.

[2 marks]

1 ___________________________________________________________________________________

_____________________________________________________________________________________

2 ___________________________________________________________________________________

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6 Human activity affects ecosystems.

6 (a) Draw one line from each human activity to the effect on ecosystems. [2 marks]

<table>
<thead>
<tr>
<th>Human activity</th>
<th>Effect on ecosystems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in rice fields</td>
<td>Increases the amount of methane in the atmosphere</td>
</tr>
<tr>
<td>Destruction of peat bogs</td>
<td>Increases the amount of carbon dioxide that is released into the atmosphere</td>
</tr>
<tr>
<td></td>
<td>Reduces the rate at which carbon dioxide is locked up as wood</td>
</tr>
</tbody>
</table>

6 (b) (i) Deforestation also affects the atmosphere.

Give two reasons why deforestation takes place. [2 marks]

1 ______________________________________________________________________________________
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2 ______________________________________________________________________________________
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6 (b) (ii) Changes in the gases in our atmosphere can cause global warming.

Give two possible effects of a rise in the Earth’s temperature. [2 marks]

1 ______________________________________________________________________________________
_____________________________________________________________________________________

2 ______________________________________________________________________________________
_____________________________________________________________________________________
Cells, tissues and organs are adapted to take in different substances and get rid of different substances.

Table 1 shows the concentration of four ions outside cells and inside cells.

<table>
<thead>
<tr>
<th>Ion</th>
<th>Concentration outside cells in mmol per dm³</th>
<th>Concentration inside cells in mmol per dm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>140</td>
<td>9</td>
</tr>
<tr>
<td>Potassium</td>
<td>7</td>
<td>138</td>
</tr>
<tr>
<td>Calcium</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>Chloride</td>
<td>118</td>
<td>3</td>
</tr>
</tbody>
</table>

7 (a) Use information from Table 1 to complete the following sentences. [2 marks]

Sodium ions will move into cells by the process of ________________________________.

Potassium ions will move into cells by the process of ________________________________.

7 (b) Some students investigated the effect of the different concentrations of sugar in four drinks, A, B, C and D, on the movement of water across a partially permeable membrane.

The students:
- made four bags from artificial partially permeable membrane
- put equal volumes of 5% sugar solution in each bag
- weighed each bag containing the sugar solution
- placed one bag in each of the drinks, A, B, C and D
- after 20 minutes removed the bags containing the sugar solution and weighed them again.
Figure 9 shows how they set up the investigation.

**Figure 9**

- Boiling tube
- Artificial partially permeable membrane bag, tied at both ends
- 5% sugar solution

A: 0.1% sugar solution  
B: 4.2% sugar solution  
C: 6.9% sugar solution  
D: 10.6% sugar solution

7 (b) (i) The bag in drink A got heavier after 20 minutes. Explain why.

[3 marks]

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7 (b) (ii) In which drink, A, B, C or D, would you expect the bag to show the smallest change in mass? Tick (✓) one box.

[1 mark]

A  [ ]  B  [ ]  C  [ ]  D  [ ]

7 (b) (iii) Explain why you think the bag you chose in part (b)(ii) would show the smallest change.

[2 marks]

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Turn over ▶
8 (a) Carbon dioxide enters a plant through stomata on the leaves.

Name the cells that control the size of the stomata.

[1 mark]

8 (b) Scientists grew tomato plants in air containing different concentrations of carbon dioxide.

The scientists recorded the number of stomata found on the lower surface of the leaves of plants grown at each carbon dioxide concentration.

Figure 10 shows the results.

Figure 10

[Graph showing the relationship between concentration of carbon dioxide and mean number of stomata on the lower surface of leaves per mm²]
8 (b) (i) Describe the relationship between the mean number of stomata per mm$^2$ and carbon dioxide concentration. [2 marks]

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8 (b) (ii) Suggest a reason for the relationship you described in part (b)(i). [1 mark]

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8 (c) (i) Suggest one disadvantage to a plant of having a large number of stomata per mm$^2$ on each leaf. [1 mark]

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8 (c) (ii) Suggest one environmental condition where a large number of stomata per mm$^2$ on each leaf would be a disadvantage. [1 mark]

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Turn over for the next question
In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Plants transport many substances between their leaves and roots.

**Figure 11** shows the direction of movement of substances through a plant.
Describe how ions, water and sugar are obtained and transported through plants.

In your answer you should refer to materials moving upwards in a plant and to materials moving downwards in a plant.

[6 marks]

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END OF QUESTIONS
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