AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

AS BIOLOGY

Unit 1 Biology and disease

Thursday 26 May 2016 Afternoon Time allowed: 1 hour 15 minutes

Materials

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

Do not write outside the box

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

1 (a) **Table 1** shows some parts of cells and two different types of cell.
Complete **Table 1** by putting a tick in a box if the structure is present in the type of cell.

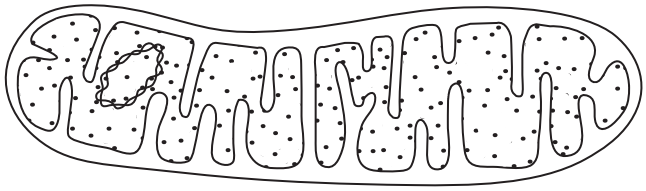
[2 marks]

Table 1

	Cell wall	Cell-surface membrane	Nucleus
White blood cell			
Bacterial cell			

1 (b) **Figure 1** is a diagram of a mitochondrion at a magnification of × 30 000.

Figure 1



Calculate the actual length of this mitochondrion in micrometres (µm). Show your working.

[2 marks]

Answer = _____ µm

Do not write outside the box

1 (c) Some scientists support the theory that mitochondria are organelles that evolved from prokaryotic cells.

1 (c) (i) Give **one** piece of evidence that supports the theory that mitochondria evolved from prokaryotic cells.

[1 mark]

1 (c) (ii) What is the advantage to cells of having mitochondria?

[2 marks]

7

Turn over for the next question

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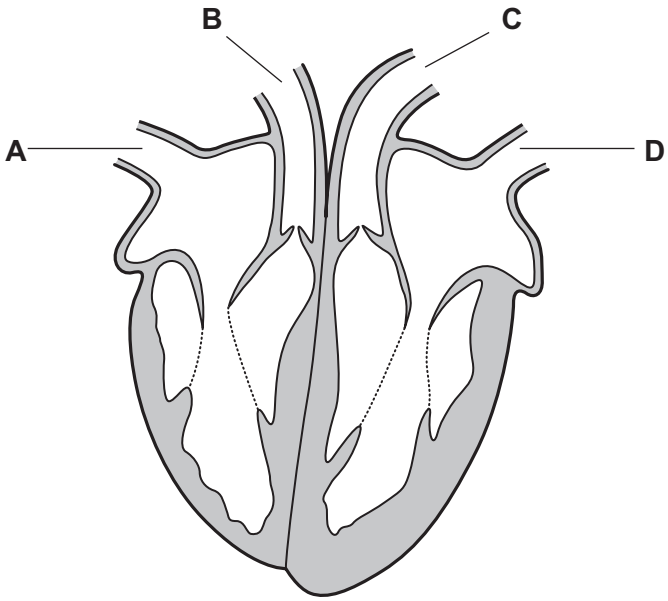
2 **Figure 2** shows a section through the heart. The main blood vessels are labelled **A**, **B**, **C** and **D**.

Figure 2



2 (a) In parts **(a) (i)** and **(a) (ii)**, write a letter, **A**, **B**, **C** or **D**, in the box to represent the correct blood vessel.

2 (a) (i) Which blood vessel carries oxygenated blood away from the heart?

[1 mark]

2 (a) (ii) Which blood vessel carries deoxygenated blood to the heart?

[1 mark]

Do not write outside the box

2 (b) Explain how the highest blood pressure is produced in the left ventricle.

[1 mark]

2 (c) Some babies are born with a hole between the right and the left ventricles.

These babies are unable to get enough oxygen to their tissues.
Suggest why.

[2 marks]

5

Turn over for the next question

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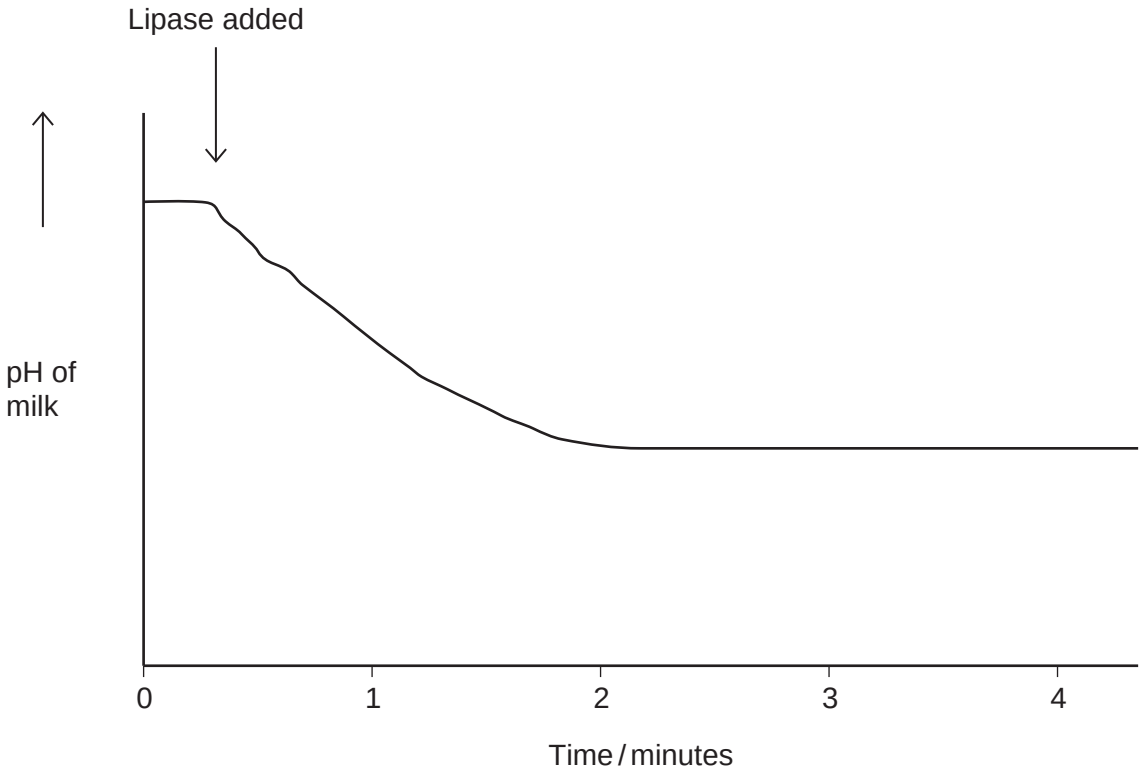
3 Lipase is an enzyme that hydrolyses triglycerides.

A student investigated the hydrolysis of triglycerides in milk by human lipase at 20 ºC.

He recorded the pH of a sample of milk before and after adding lipase. He used a pH meter to record pH.

Figure 3 shows a graph of his results.

Figure 3



3 (a) Suggest **one** advantage of using a pH meter rather than a pH indicator in this experiment.

[1 mark]

Do not write outside the box

3 (b) Explain why the pH decreases when the lipase is added to the milk.

[1 mark]

3 (c) Suggest why the pH remained constant after 2 minutes.

[2 marks]

3 (d) The student carried out his experiment at 20 ºC. He then repeated the experiment at 15 ºC.
Draw a line on the graph in **Figure 3** to show the results you would expect at 15 ºC.

[2 marks]

6

Turn over for the next question

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4 Trypsin is a protease. It is produced in an inactive form inside some of the cells of the pancreas.

4 (a) Name the part of a pancreatic cell that produces the inactive form of trypsin.

[1 mark]

_____

4 (b) Suggest the advantage of producing trypsin in an inactive form inside cells in the pancreas.

[2 marks]

_____

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_____

4 (c) After the inactive form of trypsin enters the small intestine, another enzyme removes a short chain of amino acids from the end of the inactive trypsin molecules. This leads to the formation of the active form of trypsin.

4 (c) (i) Name the type of bond hydrolysed when the short chain of amino acids is removed.

[1 mark]

_____

Do not write outside the box

4 (c) (ii) Sometimes trypsin can become activated inside a pancreatic cell. A competitive inhibitor in the cell then binds to the trypsin and stops it working.
Explain how the competitive inhibitor stops trypsin working.

[3 marks]

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Turn over for the next question

Do not write outside the box

5 (a) Explain the role of the diaphragm in breathing out.

[3 marks]

Scientists investigated the effect of stopping smoking on the forced expiratory volume of people. The forced expiratory volume (FEV_1) is the greatest volume of air that a person can breathe out in 1 second.

The scientists recruited a large number of people who smoked. Some of these smokers stopped smoking at the start of the investigation whilst others continued to smoke.

The scientists:

- measured the FEV_1 of each person and calculated the mean FEV_1
- re-measured the FEV_1 of each person after one year and calculated the mean FEV_1 of the smokers and the mean FEV_1 of the people who had stopped smoking
- repeated this at the end of five years.

Figure 4 shows the scientists' results.

Figure 4

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5 (b) Use the data shown in **Figure 4** to compare the change in FEV_1 of people who continued to smoke with those who stopped smoking.

[2 marks]

5 (c) Smoking causes changes in the lungs and airways of smokers.
Suggest **two** changes in the lungs of people who continue to smoke that could explain the change in their FEV_1.

[2 marks]

1

2

7

Turn over for the next question

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6 Scientists investigated whether people who are lactose intolerant can drink small volumes of milk without developing symptoms.

The scientists recruited a large number of volunteers who were lactose intolerant. They asked each person to drink 240 cm^3 milk every morning and to record their symptoms each day. The scientists told them to record their symptoms using a scale from 0 to 5.

The scientists split the volunteers into two groups, **A** and **B**.
For the first week, they gave:

- untreated milk containing lactose to group **A**
- lactose-free milk to group **B**.

After 1 week, the scientists changed the type of milk given to the volunteers.

Table 2 summarises the treatment.

Table 2

Group	Week 1	Week 2
A	Untreated milk	Lactose-free milk
B	Lactose-free milk	Untreated milk

6 (a) Suggest how the scientists may have treated the milk to remove lactose.

[1 mark]

6 (b) The scientists told the volunteers to drink the milk first thing in the morning rather than at bedtime.

Suggest why.

[1 mark]

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6 (c) Suggest **one** instruction that the scientists would have given the volunteers about what they should **not** eat or drink each day, during this investigation.

[1 mark]

_____

_____

_____

6 (d) Suggest why the scientists changed the type of milk they gave each group after one week.

[1 mark]

_____

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_____

Question 6 continues on the next page

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6 (e) The volunteers were asked to record three symptoms. They used a scoring scale from 0 to 5, where 0 indicates no symptoms and 5 indicates severe symptoms.

Table 3 shows the scientists' results.

Table 3

	Mean symptom score	
Symptom	**Drinking untreated milk**	**Drinking lactose-free milk**
Bloating	1.6	0.5
Stomach pain	0.4	0.3
Diarrhoea	0.1	0.3

6 (e) (i) What can you conclude from the scientists' results in **Table 3**?

[3 marks]

6 (e) (ii) Suggest why the scientists' results might be unreliable.

[1 mark]

8

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7 Ebola is a disease caused by a virus. The Ebola virus has a glycoprotein on its surface which binds to a specific receptor protein in the cell-surface membranes of human cells. When it binds to this receptor protein, the virus can enter the cell. Some people do not produce this receptor protein. These people may become infected with the Ebola virus but do not develop the disease.

A blood test can be used to determine whether a person has Ebola. People with Ebola have large numbers of specific plasma cells and a specific antibody in their blood. Some scientists have suggested treating people suffering from Ebola by using transfusions of blood plasma from people who have recently recovered from the disease.

The Ebola virus has a high mutation rate. This makes it difficult to develop a vaccine.

7 (a) People who do not have the specific receptor protein in their cell-surface membranes may be infected with the Ebola virus but do not develop the disease (lines 1–5).

Explain why they do **not** develop the disease.

[2 marks]

7 (b) Explain the increase in specific plasma cells and antibody in people infected with the Ebola virus.

[2 marks]

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7 (c) Explain how a blood transfusion from a patient recently recovered from Ebola may be an effective treatment (lines 8–10).

[3 marks]

7 (d) A high mutation rate makes it difficult to develop a vaccine (line 11).
Explain why.

[3 marks]

Turn over for the next question

10

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8 (a) Glucose is absorbed from the lumen of the small intestine into epithelial cells.
Explain how the transport of sodium ions is involved in the absorption of glucose by epithelial cells.

[5 marks]

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8 (b) Oxygen and chloride ions can diffuse across cell-surface membranes. The diffusion of chloride ions involves a membrane protein. The diffusion of oxygen does not involve a membrane protein.

Explain why the diffusion of chloride ions involves a membrane protein and the diffusion of oxygen does not.

[5 marks]

10

END OF QUESTIONS

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