Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Education
Advanced Subsidiary Examination
January 2012

Biology BIOL1

Unit 1 Biology and disease

Wednesday 11 January 2012 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 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 60.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use scientific terminology accurately.

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

1 (a) Some seeds contain lipids. Describe how you could use the emulsion test to show that a seed contains lipids.

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(3 marks)

(Extra space) .....

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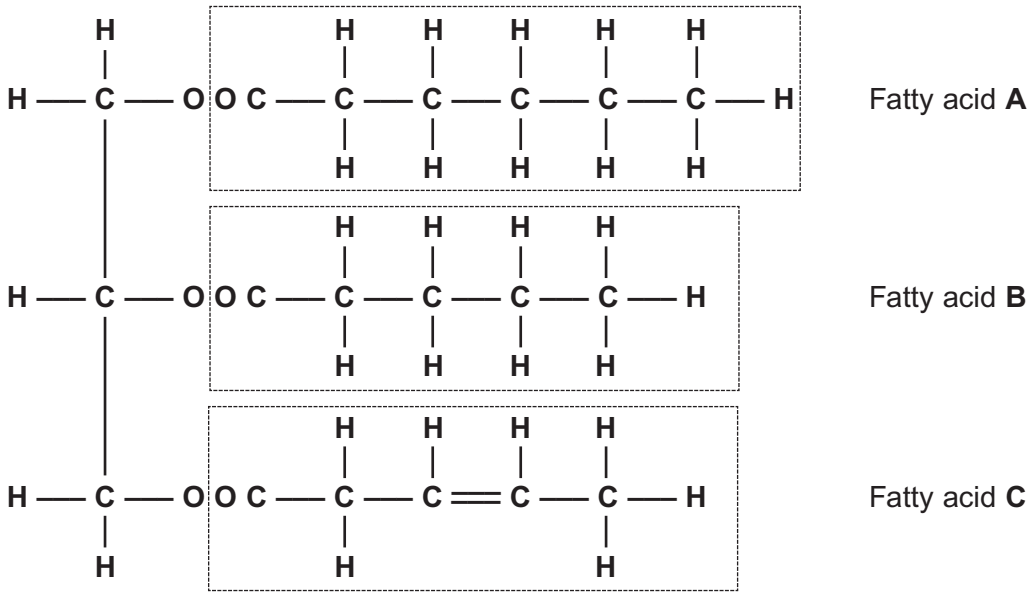
1 (b) A triglyceride is one type of lipid. The diagram shows the structure of a triglyceride molecule.



1 (b) (i) A triglyceride molecule is formed by condensation. From how many molecules is this triglyceride formed?

(1 mark)

1 (b) (ii) The structure of a phospholipid molecule is different from that of a triglyceride. Describe how a phospholipid is different.

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(2 marks)

1 (b) (iii) Use the diagram to explain what is meant by an unsaturated fatty acid.

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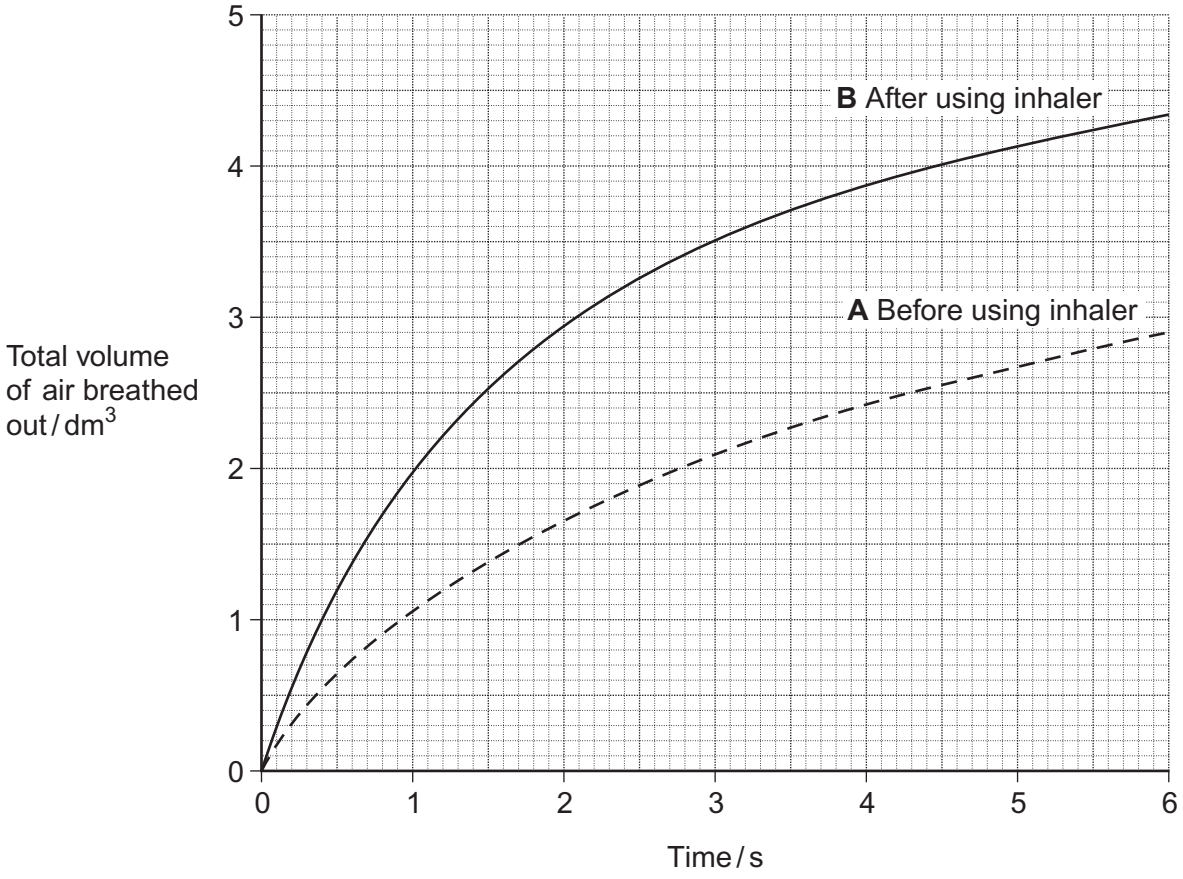
(2 marks)

8

Turn over for the next question

2 A person with asthma breathed out as hard as he could. The graph shows the volume of air he breathed out in the first 6 seconds of a breath. Curve **A** shows the volume before he used an inhaler. Curve **B** shows the volume after he used an inhaler.



2 (a) The diaphragm helps to bring about the changes shown by the curve **A**. Explain how.

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(3 marks)

(Extra space) .....

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2 (b) You could use curve **A** to find the total volume of air that this person could breathe out in one complete breath. Describe how.

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(2 marks)

2 (c) The inhaler which the person used contained a substance that dilates bronchioles. Use this information to explain why curve **A** is different from curve **B**.

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(2 marks)

7

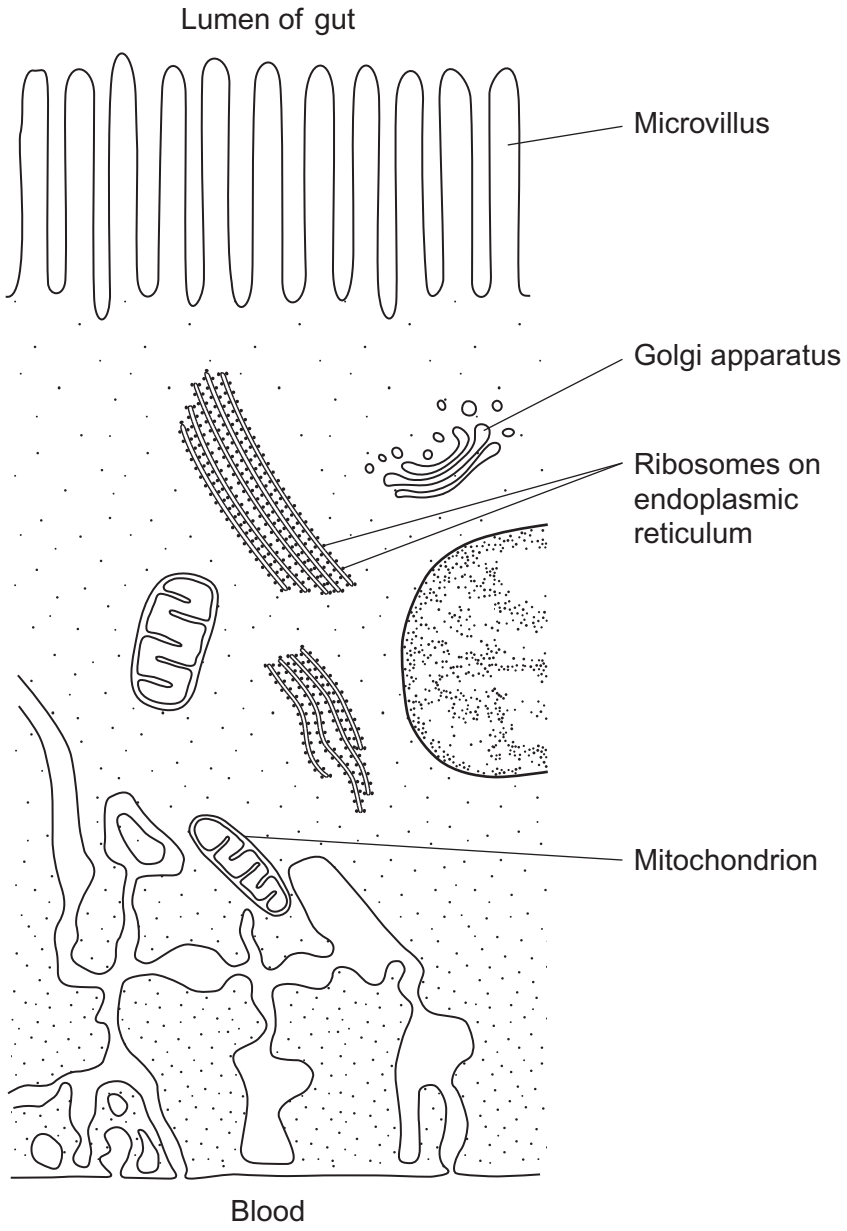
Turn over for the next question

3 (a) The table shows some features of cells. Complete the table by putting a tick in the box if the feature is present in the cell.

Feature	**Cell**		
	Cholera bacterium	Epithelial cell from intestine	Epithelial cell from alveolus of lung
Cell-surface membrane			
Flagellum			
Nucleus			

(3 marks)

3 (b) The diagram shows part of an epithelial cell from an insect's gut.



This cell is adapted for the three functions listed below. Use the diagram to explain how this cell is adapted for each of these functions.

Use a **different** feature in the diagram for each of your answers.

3 (b) (i) the active transport of substances from the cell into the blood

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(2 marks)

3 (b) (ii) the synthesis of enzymes

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(2 marks)

3 (b) (iii) rapid diffusion of substances from the lumen of the gut into the cytoplasm

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(1 mark)

8

4 (a) Scientists who investigate disease may look at risk factors. What is a risk factor?

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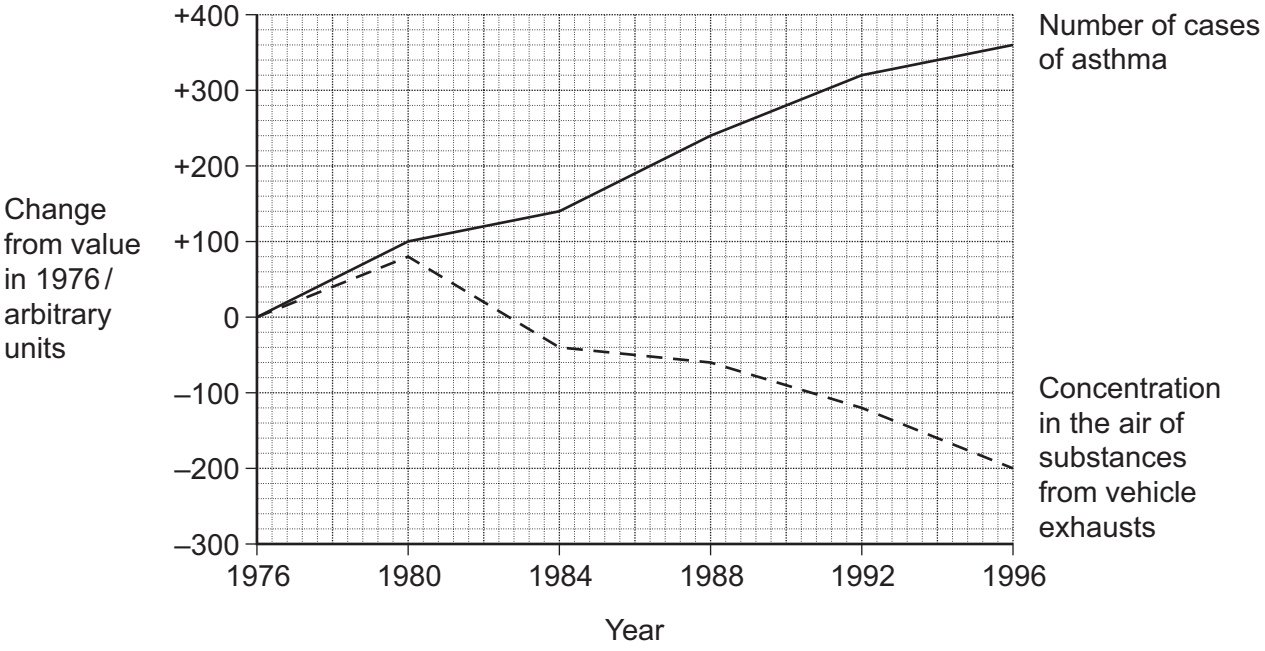
(1 mark)

Scientists investigated the link between pollution from vehicle exhausts and the number of cases of asthma. Between 1976 and 1996, the scientists recorded changes in the following

- the concentration in the air of substances from vehicle exhausts
- the number of cases of asthma.

The graph shows their results



4 (b) Between which years on the graph was there

4 (b) (i) a positive correlation between the number of cases of asthma and the concentration in the air of substances from vehicle exhausts

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(1 mark)

4 (b) (ii) a negative correlation between the number of cases of asthma and the concentration in the air of substances from vehicle exhausts?

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(1 mark)

4 (c) The scientists concluded that substances in the air from vehicle exhausts did **not** cause the increase in asthma between 1976 and 1980. Explain why.

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(3 marks)

(Extra space) .....

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6

5 (a) (i) The human heart has four chambers.
In which **one** of the four chambers of the human heart does pressure reach the highest value?

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(1 mark)

5 (a) (ii) Explain how the structure of this chamber causes this high pressure.

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(1 mark)

Figure 1 shows the volume of blood in a man's right ventricle at different times during one cardiac cycle.

Figure 1

Time / s	Volume of blood / cm^3
0.0	125
0.1	148
0.2	103
0.3	70
0.4	56
0.5	55
0.6	98
0.7	125

5 (b) (i) Use the data in the **Figure 1** to calculate the man's heart rate.

Heart rate = ... beats per minute

5 (b) (ii) Use the data in **Figure 1** and your answer to part **5 (b) (i)** to calculate the man's cardiac output. Show your working.

Cardiac output = ... cm^3 per minute
(3 marks)

5 (c) Use information from **Figure 1** to complete the table below to show whether the valves are **open** or **closed** at each of the times shown. Write open or closed in the appropriate boxes.

Time / s	Valve between right atrium and right ventricle	Valve between right ventricle and pulmonary artery
0.2		
0.6		

(2 marks)

7

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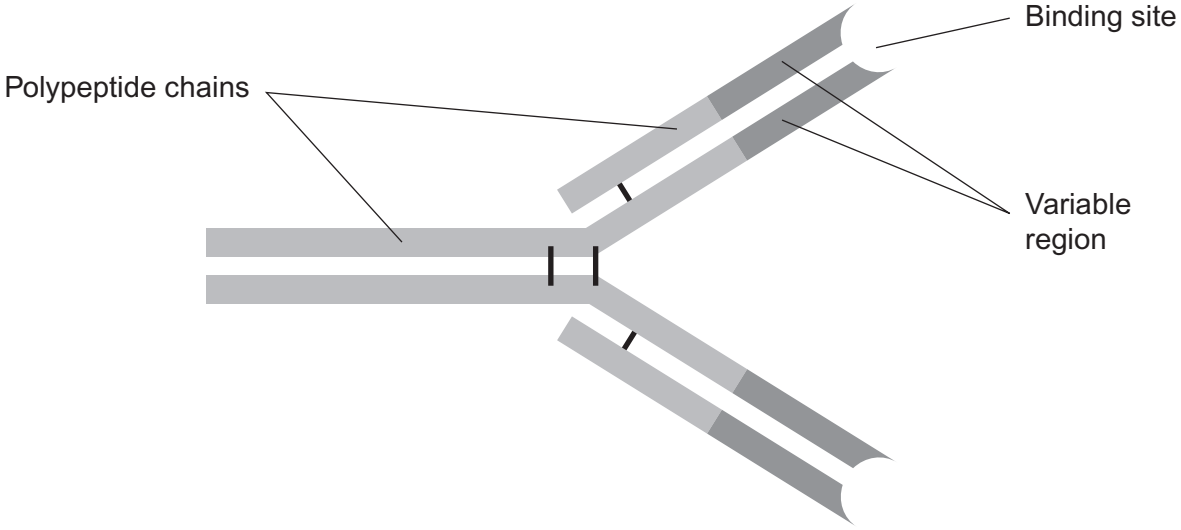
6 The diagram shows an antibody molecule.



6 (a) What is the evidence from the diagram that this antibody has a quaternary structure?

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(1 mark)

6 (b) Scientists use this antibody to detect an antigen on the bacterium that causes stomach ulcers. Explain why the antibody will only detect this antigen.

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(3 marks)

(Extra space) .....

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4

7 Read the following passage.

Aspirin is a very useful drug. One of its uses is to reduce fever and inflammation. Aspirin does this by preventing cells from producing substances called prostaglandins. Prostaglandins are produced by an enzyme-controlled pathway. Aspirin works by inhibiting one of the enzymes in this pathway. Aspirin attaches permanently to a chemical group on one of the monomers that make up the active site of this enzyme.

The enzyme that is involved in the pathway leading to the production of prostaglandins is also involved in the pathway leading to the production of thromboxane. This is a substance that promotes blood clotting. A small daily dose of aspirin may reduce the risk of myocardial infarction (heart attack).

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

7 (a) Name the monomers that make up the active site of the enzyme (lines 6 – 7).

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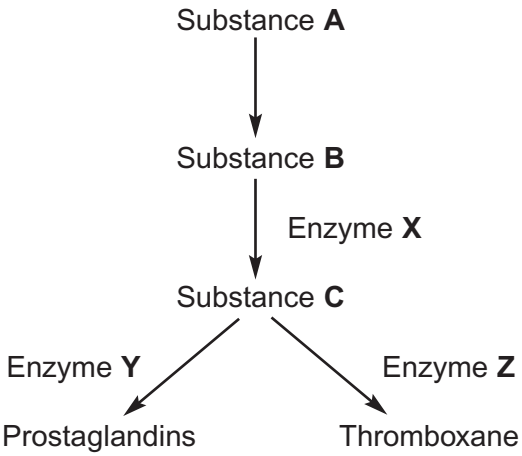
(1 mark)

7 (b) The diagram shows the pathways by which prostaglandins and thromboxane are formed.



7 (b) (i) Aspirin only affects one of the enzymes in this pathway. Use information in lines 5 – 7 to explain why aspirin does **not** affect the other enzymes.

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(2 marks)

7 (b) (ii) Which enzyme, **X**, **Y** or **Z**, is inhibited by aspirin? Explain the evidence from the passage that supports your answer.

Enzyme .....

Explanation .....

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(2 marks)

7 (c) Aspirin is an enzyme inhibitor. Explain how aspirin prevents substrate molecules being converted to product molecules.

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(2 marks)

7 (d) Aspirin may reduce the risk of myocardial infarction (lines 8 – 12). Explain how.

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(3 marks)

(Extra space) .....

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10

8 (a) Vaccines protect people against disease. Explain how.

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(5 marks)

(Extra space) .....

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8 (b) Oral rehydration solutions (ORS) are used to treat diarrhoeal disease. What does an ORS consist of and how does it work?

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(5 marks)

(Extra space) .....

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10

END OF QUESTIONS

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