

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	
9	
10	
TOTAL	



General Certificate of Education
Advanced Subsidiary Examination
June 2009

Human Biology

HBIO1

Unit 1 The body and its diseases

Monday 1 June 2009 1.30 pm to 3.00 pm

For this paper you must have:

- a ruler with millimetre measurements.
You may use 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. **Answers written in margins or on blank pages will not be marked.**
- 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

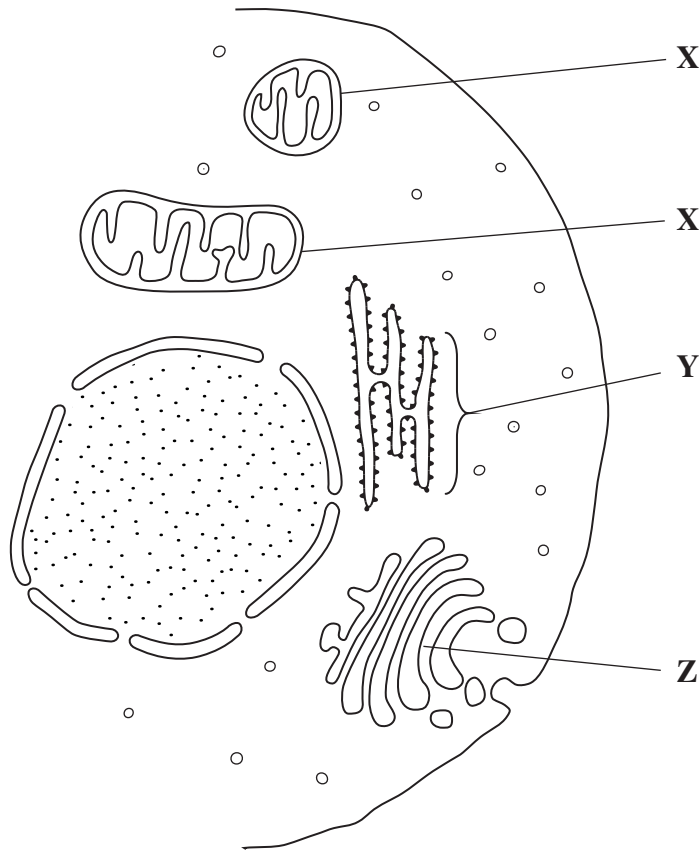
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in all answers.



J U N 0 9 H B I O 1 0 1

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

1 The drawing shows part of a human cell.



1 (a) Name organelles

X

Y

(2 marks)

1 (b) (i) The organelles labelled **X** all have very similar shapes in this cell. Explain why they appear to have different shapes in this drawing.

.....

(1 mark)

(Extra space)

.....



1 (b) (ii) Large numbers of organelles **X** and **Z** are found in mucus-secreting cells.
Explain why.

.....

.....

.....

.....

(2 marks)

(Extra space)

.....

5

Turn over for the next question

Turn over ►



2 (a) What is an antigen?

.....
.....
.....
.....

(2 marks)

2 (b) A zookeeper was bitten by a snake. The bite contained venom which is a poison. He was given an injection of antivenom. This antivenom contained antibodies against this snake venom.

The antivenom did not give the zookeeper lasting protection against this snake venom. Explain why.

.....
.....
.....
.....

(2 marks)

(Extra space)
.....

4



3 Scientists have developed a new technique that can identify whether people smoke tobacco. Tobacco contains nicotine, which is broken down to cotinine. Cotinine is found in fingerprints. The new technique uses antibodies against cotinine.

3 (a) These scientists injected laboratory mice with cotinine. Describe how this injection stimulates mice to produce antibodies against cotinine.

.....
.....
.....
.....
.....
.....
.....
.....
.....

(4 marks)

(Extra space)
.....
.....
.....

3 (b) The antibodies bind only to cotinine, and not to any other substance in the fingerprint. Explain why.

.....
.....
.....
.....

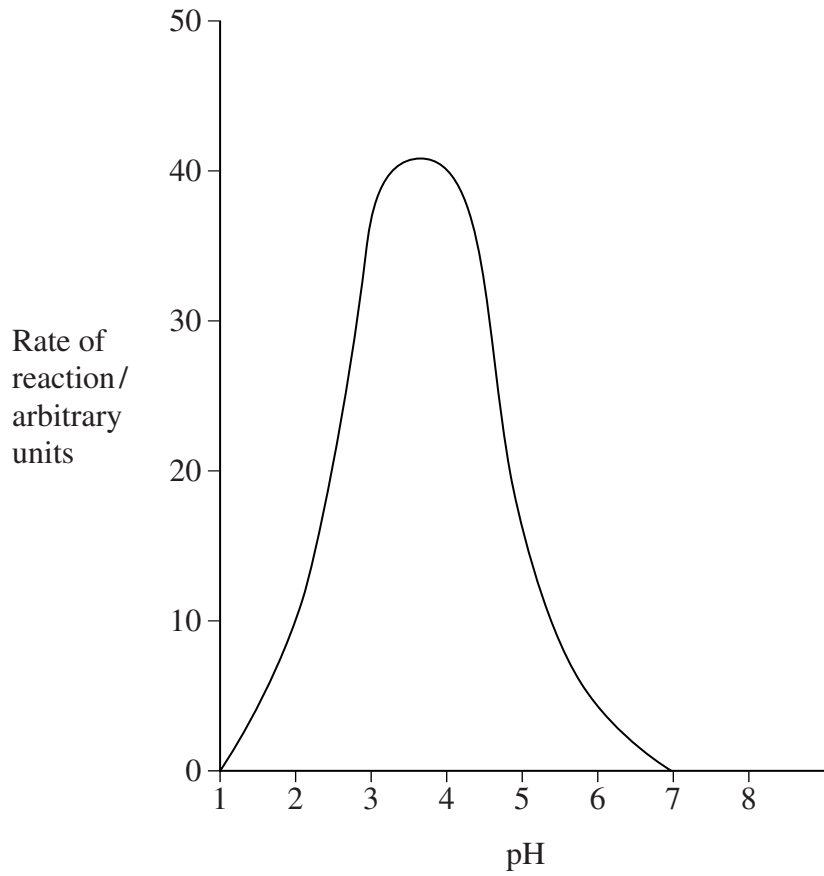
(2 marks)

6

Turn over ►



4 The graph shows the rate of a reaction catalysed by the enzyme lysozyme at different pH values.



4 (a) Explain the shape of the curve between pH4 and pH7.

.....

.....

.....

.....

.....

.....

(3 marks)

(Extra space)

.....

.....



4 (b) Name **two** other factors that affect enzyme activity.

1

2

(2 marks)

4 (c) Lysozyme is an enzyme found in tears. It breaks down cell walls of bacteria. This results in death of the bacterial cells. Suggest how the loss of the cell walls results in death of bacterial cells.

.....
.....
.....
.....
.....
.....

(3 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**



5 (a) Deep vein thrombosis (DVT) is the formation of a blood clot. This commonly occurs in a leg vein. DVT may occur as a result of inactivity during a long-haul flight. Describe how.

.....
.....
.....
.....

(2 marks)

(Extra space)
.....

5 (b) Pieces may break off a clot formed in a leg vein and travel in the circulatory system. These pieces may block capillaries in the lungs but they very rarely cause a myocardial infarction. Use your knowledge of the circulatory system to explain why.

.....
.....
.....
.....
.....
.....

(3 marks)

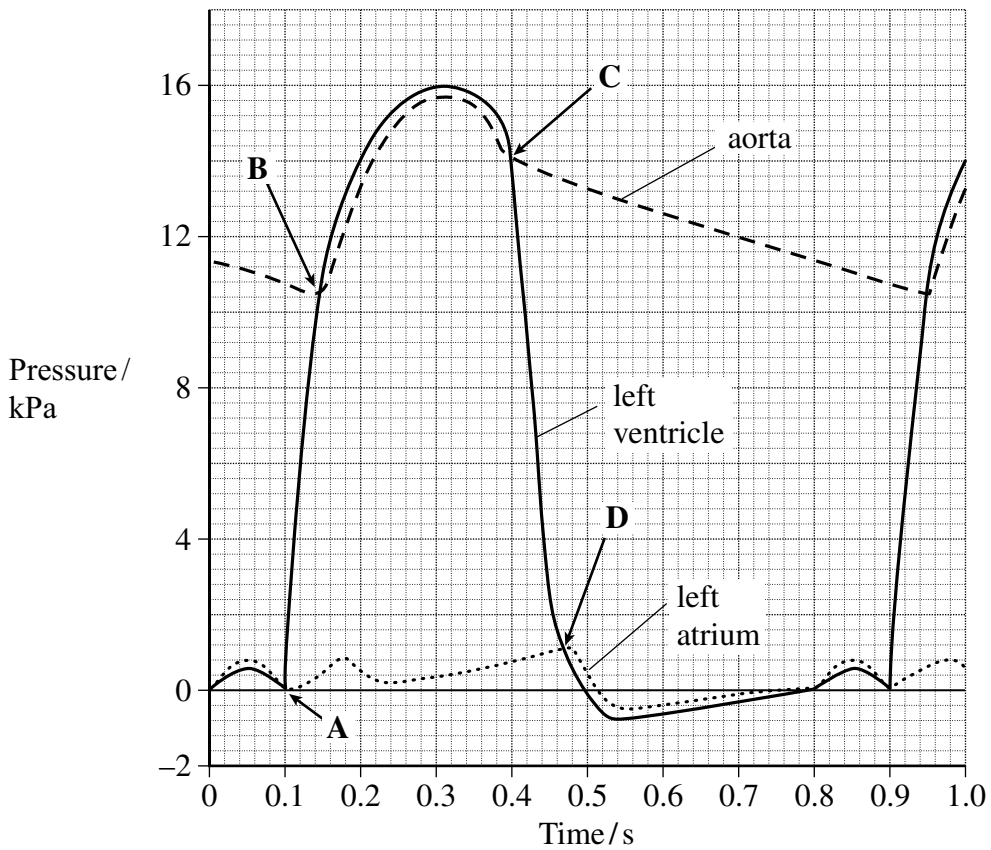
(Extra space)
.....
.....

5

Turn over ►



6 The graph shows pressure changes in the left atrium, left ventricle and aorta over a period of time.



6 (a) (i) Complete the table with the letters **A**, **B**, **C** or **D** to indicate when the following events occur.

Atrioventricular valve opens	
Atrioventricular valve closes	
Semilunar valves open	
Semilunar valves close	

(2 marks)

6 (a) (ii) Calculate this person's heart rate. Show your working.

Answer beats per minute (2 marks)



6 (a) (iii) Draw a curve on the graph to show the pressure changes in the right ventricle. (2 marks)

6 (b) When a person has a heart transplant, the nerves going to the sinoatrial node (SAN) are cut. These nerves cannot be connected to the transplanted heart. Despite this, the transplanted heart has a regular heart beat. Explain why.

.....

.....

.....

.....

(2 marks)

8

Turn over for the next question

Turn over ►



7 Antimicrobial proteins (AMPs), found in the skin of the African clawed frog, can kill bacteria. When AMPs are injected into humans, they are broken down by protease enzymes. Scientists have produced a number of AMPs that are not broken down by proteases. They did this by making these AMPs from man-made amino acids containing fluorine. The AMPs containing fluorine were found to be more effective in killing bacteria than AMPs without fluorine.

7 (a) Name the type of reaction involved when a protease enzyme breaks down an AMP.

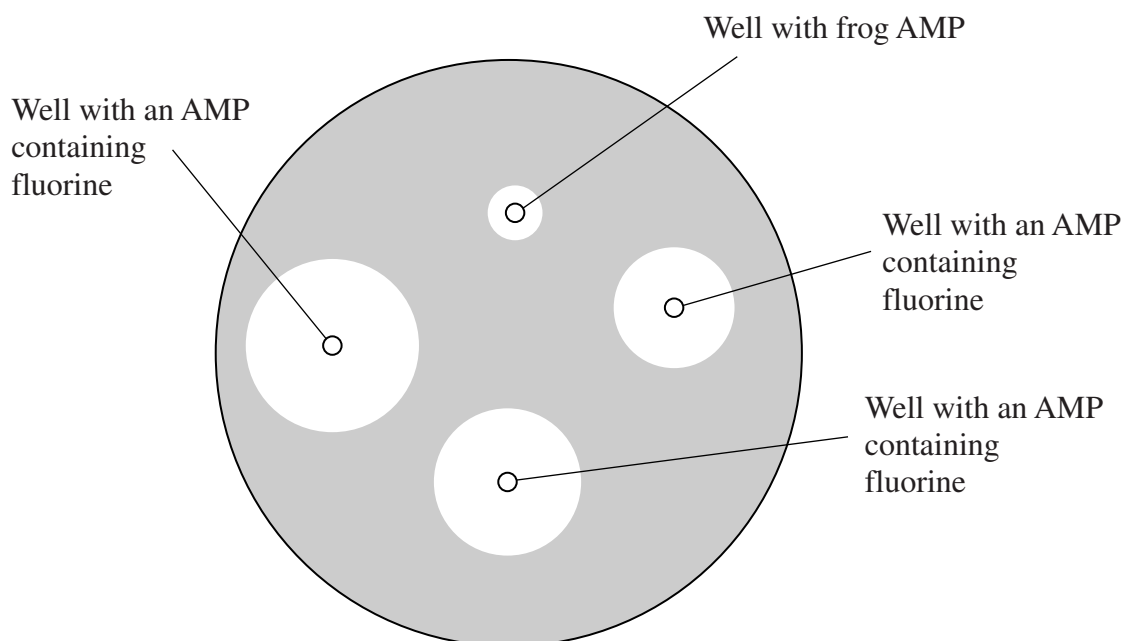
.....
(1 mark)

7 (b) Suggest why protease enzymes cannot break down AMPs made from amino acids containing fluorine.

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

7 (c) Scientists carried out an investigation to compare the effectiveness of AMPs containing fluorine and a frog AMP. They inoculated an agar plate with a culture of one species of bacterium. They cut four wells in the agar. They placed a frog AMP in one well. They put three different man-made AMPs containing fluorine in the other three wells. They incubated the plate for 48 hours. After incubation, there were clear areas around each well where the bacteria had not grown.

The appearance of the plate after incubation is shown below.



7 (c) (i) Give **one** example of aseptic technique that the scientists would have used during this investigation.

.....
.....

(1 mark)

7 (c) (ii) What conclusions could the scientists draw from these results?

.....
.....
.....
.....
.....
.....
.....

(3 marks)

(Extra space)

.....
.....

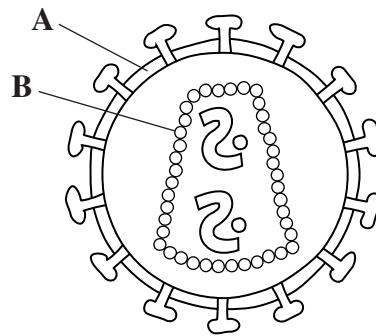
7

Turn over for the next question

Turn over ►



8 The diagram shows the human immunodeficiency virus (HIV).



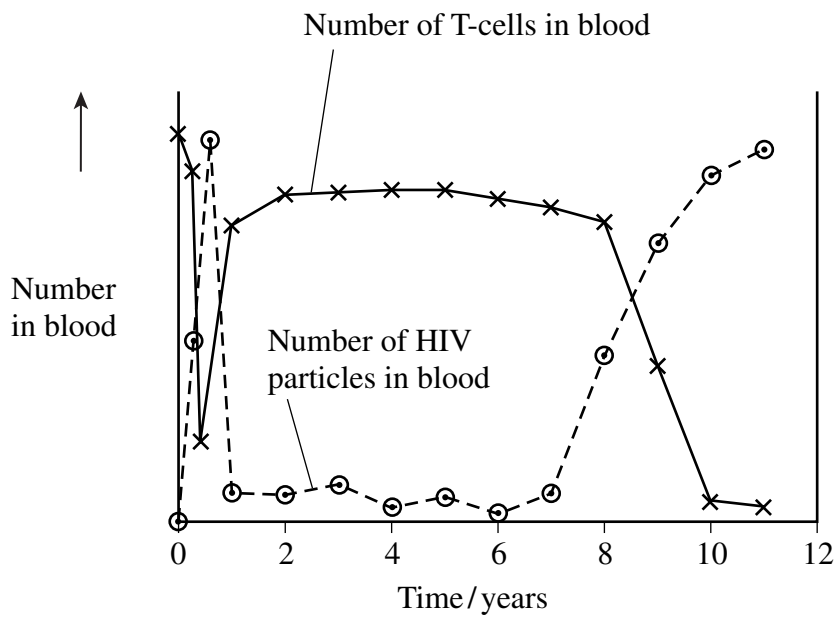
8 (a) Name

A

B

(2 marks)

The graph shows changes in the number of T-cells and HIV particles in the blood of a person following infection.



8 (b) Explain why the number of HIV particles in the blood

8 (b) (i) rises during the first few months after infection

.....
.....
.....
.....

(2 marks)

8 (b) (ii) remains low between 1 and 7 years after infection.

.....
.....

(1 mark)

8 (c) This person developed a large number of infections about 9 years after he first became infected with HIV. Using information from the graph, explain why.

.....
.....
.....
.....
.....
.....
.....
.....
.....

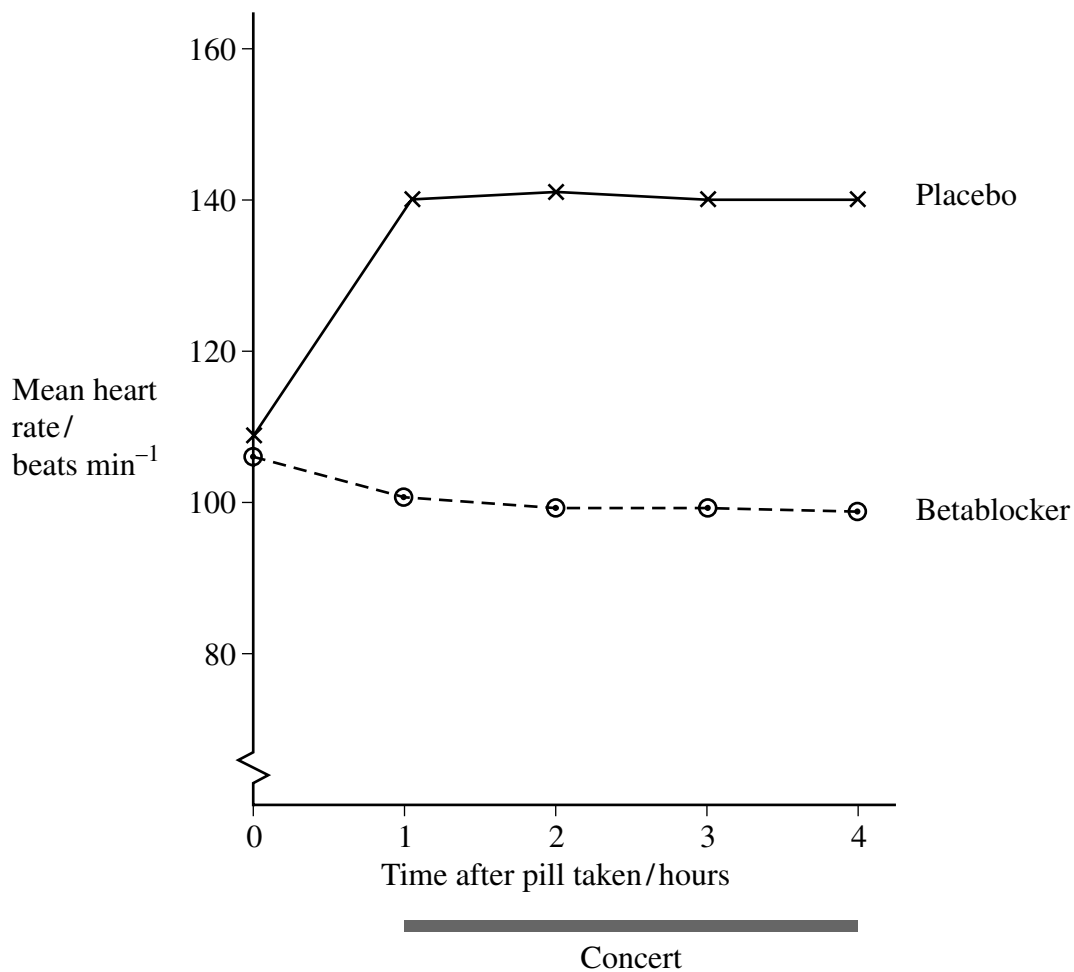
(4 marks)

(Extra space)
.....
.....
.....



- 9 Some musicians find concerts stressful. Doctors investigated the effect of a betablocker on the heart rate of these musicians during a concert. The musicians ranged in age from 20 to 54 years. There were 9 female and 13 male musicians and all played the same type of instrument. None of them suffered from coronary heart disease. They were told not to take any other medicines on the day of the concert.

The musicians were divided randomly into two groups. Members of one group were each given a pill containing the betablocker. Members of the other group were each given a placebo. A placebo is a 'dummy' pill that does not contain the betablocker. The heart rates of the musicians were recorded one hour before and during a concert. The graph shows the results.



- 9 (a) Explain why it was important that

- 9 (a) (i) none of the musicians suffered from coronary heart disease

.....

(1 mark)



9 (a) (ii) the musicians did not take any other medicines on the day of the concert.

.....
.....
.....
.....

(2 marks)

9 (b) Use the graph to describe the effect of taking a betablocker on the heart rate of the musicians.

.....
.....
.....
.....

(2 marks)

9 (c) Some doctors have commented that the results of this investigation are not reliable. Suggest reasons why.

.....
.....
.....
.....
.....
.....
.....

(3 marks)

(Extra space)

.....
.....

8

Turn over ►



10 A fat substitute called Olestra was first used in the 1990s. It is made by attaching 6 to 8 fatty acid molecules to the disaccharide, sucrose. Olestra passes through the gut without being digested.

Some nutritionists believe that Olestra can be useful in preventing obesity. Olestra can be used to prepare foods such as chips, meat pies and biscuits. However, one study reported that people eating food containing Olestra suffer from abdominal pains and increased bowel movements. 5

An investigation was carried out to find the effect of Olestra in the diet. Seventy-six volunteers were used in a three-month study. They were divided into two groups, a control group and an experimental group. The volunteers in the experimental group ate food containing 40 grams of Olestra each day. Neither the volunteers nor the scientists analysing the results knew which volunteers were eating Olestra and which were not. 10

10 (a) (i) Give **one** similarity between the structure of the Olestra molecule and the type of fat usually found in food.

.....
.....
(1 mark)

10 (a) (ii) Use your knowledge of enzyme action to explain why Olestra passes straight through the gut without being digested (lines 2 and 3).

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
(4 marks)

(Extra space)

.....
.....
.....



10 (b) (i) It was important that neither the volunteers nor the scientists analysing the results knew which volunteers were eating Olestra and which were not (lines 12 and 13). Explain why.

.....
.....
(1 mark)

10 (b) (ii) Suggest how members of the control group were selected and treated (line 10).

.....
.....
.....
.....
.....
.....
.....
(3 marks)

(Extra space)

.....
.....

Question 10 continues on the next page

Turn over ►



10 (c) Is the use of Olestra in foods such as those mentioned in the passage (line 5) a suitable approach to the problem of obesity? Explain your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(5 marks)

(Extra space)

.....

.....

.....

.....



10 (d) Eating a diet high in fat can lead to a myocardial infarction. Describe how.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

(Extra space)

.....

.....

.....

.....

.....

.....

.....

.....

.....

20

END OF QUESTIONS



There are no questions printed on this page

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



There are no questions printed on this page

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



There are no questions printed on this page

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

Copyright © 2009 AQA and its licensors. All rights reserved.

