

Surname	Centre Number	Candidate Number
Other Names		2



GCE AS/A level

1072/02

HUMAN BIOLOGY – HB2

P.M. MONDAY, 21 May 2012

1½ hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	5	
2	10	
3	14	
4	9	
5	12	
6	10	
7	10	
Total	70	

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

1. Complete the following paragraph by inserting the correct terms in the spaces. [5]

Carbohydrates (polysaccharides) are broken down first of all in the mouth. The polysaccharide, starch is broken down by the enzyme into the disaccharide The disaccharide is further broken down by the enzyme into In both cases the type of reaction used for the breakdown is a reaction.

(Total 5 Marks)

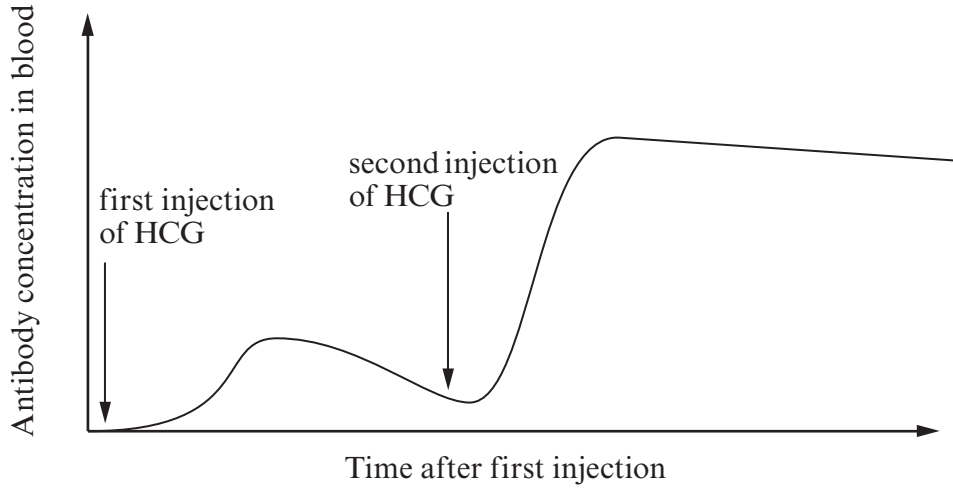
2. (a) A method has been developed for producing antibodies. These can be used in a variety of tests but, in particular, home pregnancy testing kits. A sample of urine is tested for the presence of a glycoprotein hormone known as HCG. HCG acts as an antigen. Explain what is meant by the term *antigen*. [2]

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(b) The production of antibodies against HCG involves injecting the hormone into an animal. Explain how the animal produces the antibodies when the hormone is injected. [4]

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- (c) The diagram shows the effect of injecting the HCG hormone into an animal during the process described in (b).



- (i) Use the information from the graph to describe **two** differences in the responses to the first and second injections of HCG. [2]

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- (ii) Explain why there is a difference in the response. [2]

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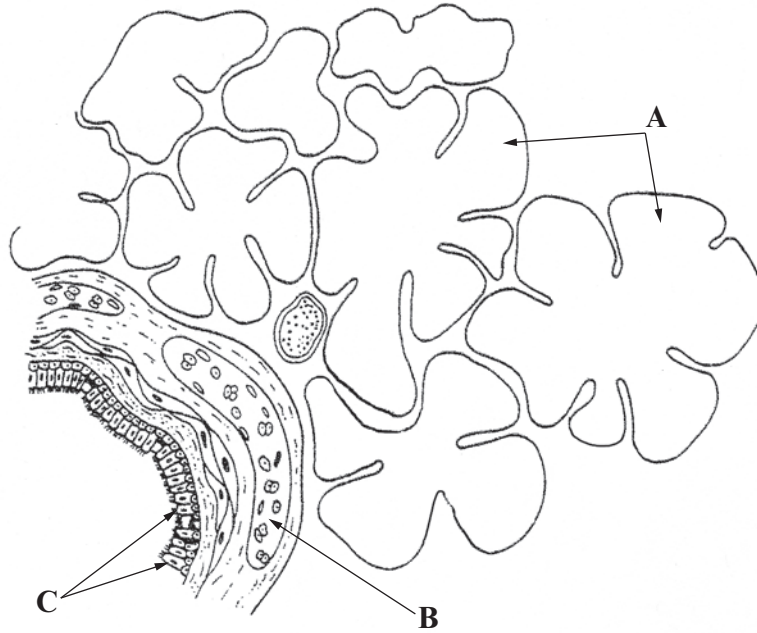
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(Total 10 marks)

3. (a) The diagram shows part of a human lung.



(i) Name the structures labelled **A** and **C**. [2]

A

C

(ii) Explain why thousands of structure **A** are found in a lung. [2]

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(iii) The structure labelled **B** is cartilage which is a firm but flexible tissue. Suggest the role of this cartilage during ventilation. [2]

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(b) Emphysema is a condition of the lungs that develops over a period of 20 years.

(i) Describe **two** symptoms of emphysema. [2]

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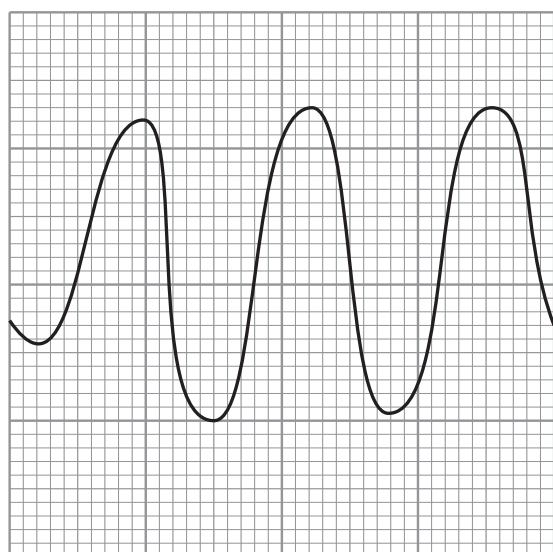
(ii) Explain how the appearance of the structures labelled A might appear in a person suffering from emphysema. [2]

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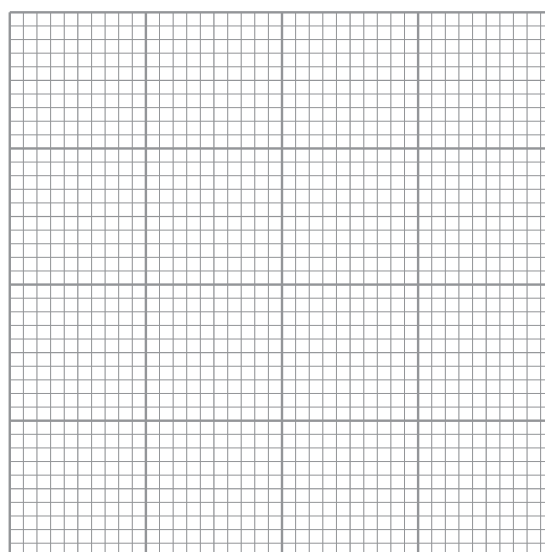
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(iii) A spirometer can be used to trace the movements of air during breathing. The diagram below shows the spirometer trace of a normal person at rest. In the empty box draw the spirometer trace obtained from a person with emphysema. [2]



Normal



Emphysema

(iv) State **two** variables associated with the two people that should be kept constant in producing the two traces. [2]

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(Total 14 marks)

4. (a) Describe and explain the effect of an increase in carbon dioxide concentration in the blood on the release of oxygen from haemoglobin. [4]

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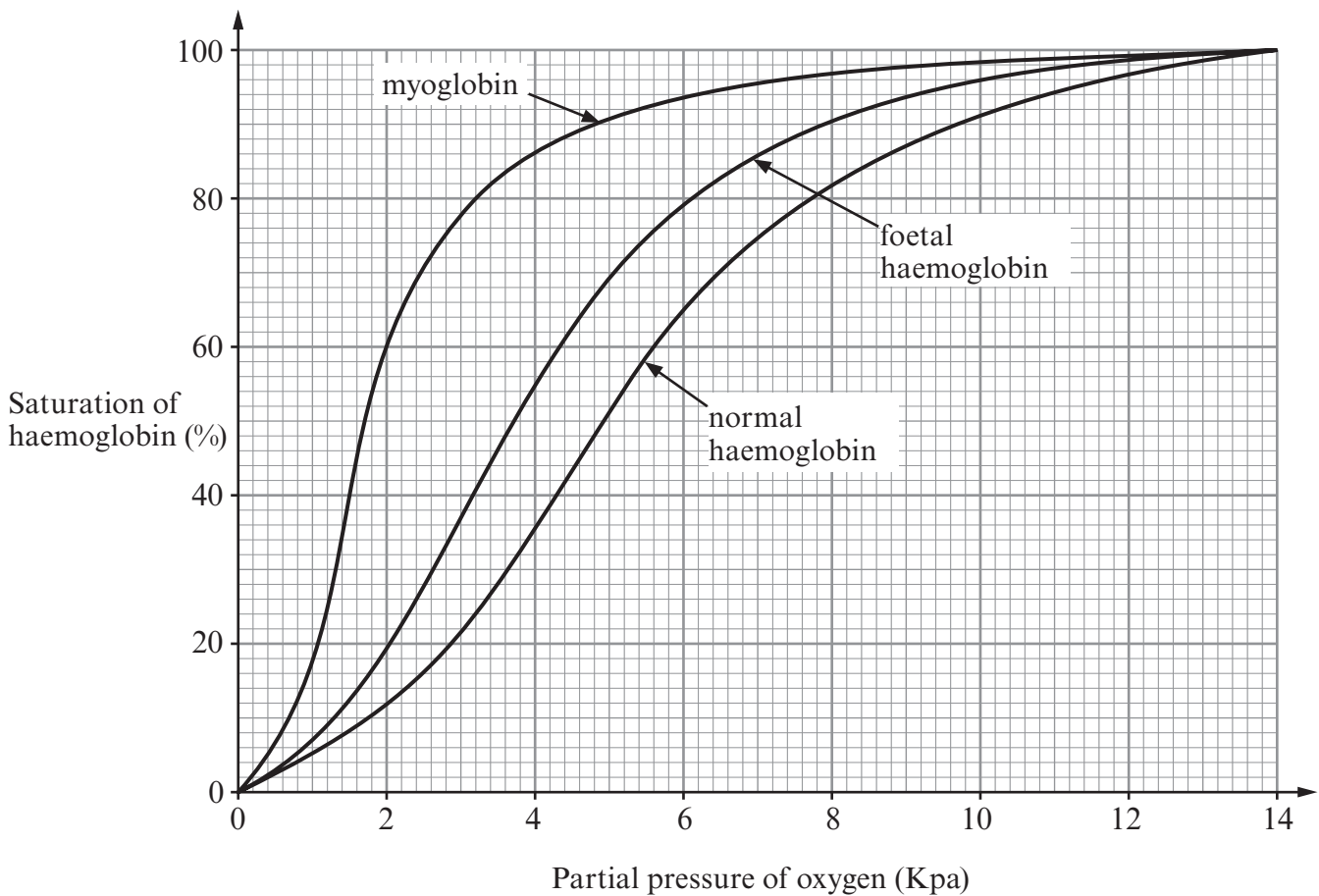
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- (b) The graph shows the oxygen dissociation curves for myoglobin (which is found in muscle), foetal haemoglobin and normal adult haemoglobin.



- (i) Give the percentage saturation with oxygen of foetal haemoglobin and normal haemoglobin at a partial pressure of oxygen of 4 kPa. [1]

foetal haemoglobin

normal haemoglobin

(ii) Use the graph and the results in (i) to explain how this difference in percentage saturation enables the foetal haemoglobin to carry out its function. [3]

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(iii) Use the graph to suggest a function for myoglobin. [1]

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(Total 9 marks)

5. Digested food is absorbed in the small intestine. Absorption occurs through the villi. Diagram 1 is of a villus and diagram 2 is an electron micrograph of a cell from the surface of a villus.

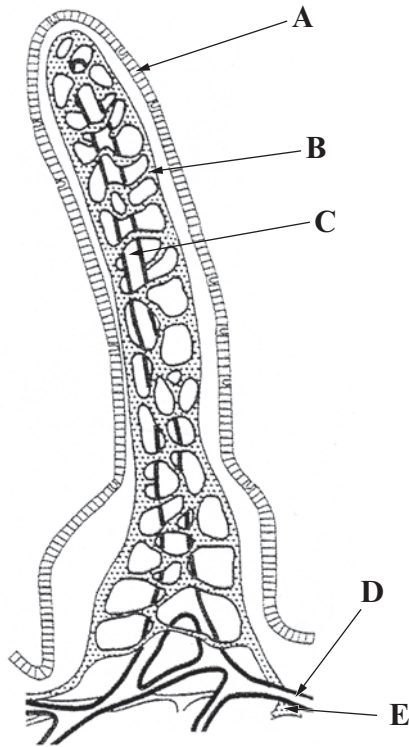


Diagram 1

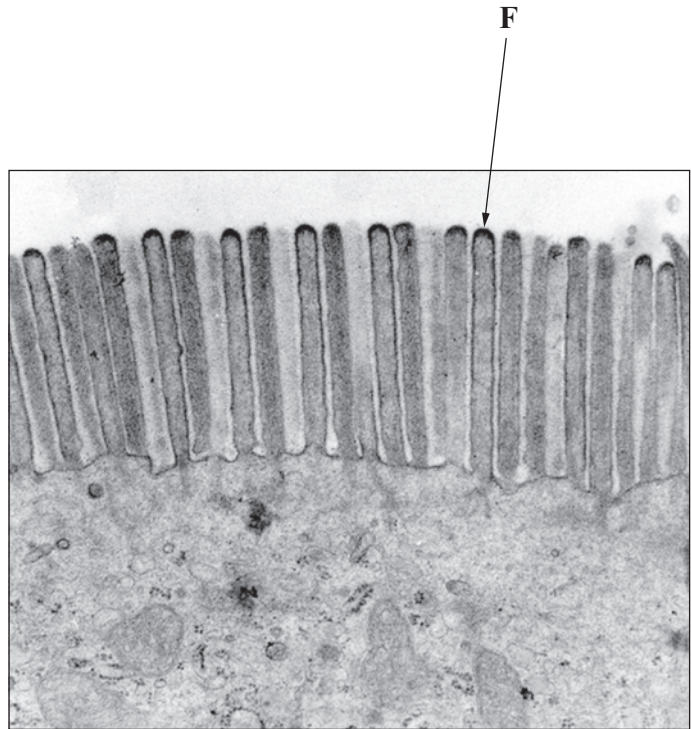


Diagram 2

- (a) Complete the table below by naming structures **B**, **C** and **F** and describing their function in absorbing digested food. [6]

	<i>Name of structure</i>	<i>Function in absorption</i>
B
C
F

(b) (i) Name the type of cell labelled **A**. [1]

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(ii) Other cells in the surface layer of a villus secrete mucus. State **two** functions of this mucus. [2]

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(c) (i) Name the system into which the contents of **D** are transferred. [1]

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(ii) Name the vessel into which the contents of **E** are transferred. [1]

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(d) Suggest **one** practical difficulty that could occur in testing a sample of blood for the presence of glucose, using the Benedict's test. [1]

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(Total 12 marks)

6. A mammalian heart will continue to beat after it is removed from the body. The sino-atrial node (SAN) acts as a pacemaker and sends a wave of excitation across both atria. The wave reaches a second node, the atrio-ventricular node (AVN), 0.045 seconds after leaving the SAN. A group of fibres, known as Purkinje fibres, arise from the AVN and are known as the Bundle of His. A time delay of 0.12 seconds occurs at the AVN before the wave passes to the Bundle of His. The wave passes to the bases of the two ventricles and then spreads up the side walls of the two ventricles. The wave reaches the base of the two ventricles 0.04 seconds after leaving the AVN and reaches the top of the ventricles 0.08 seconds after leaving the AVN.

- (a) Complete the table to show the timing of a wave of excitation as it passes through the heart. [2]

<i>Position</i>	<i>Time from start of wave / s</i>
SAN	0.000
AVN	0.045
Bundle of His	
base of ventricles	
top of ventricles	0.245

- (b) Which piece of evidence from the above paragraph suggests that the heart muscle is myogenic? [1]

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- (c) There is a delay of 0.12 seconds in transferring the wave from the AVN to the Bundle of His. Explain the advantage of this delay. [3]

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- (d) Explain the advantages, for efficient pumping of blood out of the heart, for the wave of excitation to pass from the base of the ventricles upwards. [2]

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- (e) An electrocardiogram (ECG) shows electrical activity that takes place in the heart muscle as the heart beats.
Complete the table to show the action of the heart and its associated ECG activity. [2]

<i>Cardiac control</i>	<i>Action of heart muscle</i>	<i>ECG activity</i>
SAN impulse		P wave
Purkinje tissue	ventricle contracts	

(Total 10 marks)

