

Candidate Name	Centre Number	Candidate Number
		2



**GCE AS/A level**

1072/02

**HUMAN BIOLOGY – HB2**

P.M. TUESDAY, 18 January 2011

1½ hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	9	
2	14	
3	13	
4	12	
5	12	
6	10	
<b>Total</b>	<b>70</b>	

**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. (a) In the table below give an example of a disease caused by an organism from each of the kingdoms shown. [3]

<i>Kingdom</i>	<i>Disease</i>
Prokaryotae	
Protoctista	
Fungi	

- (b) The percentage (%) difference in the DNA between different organisms is directly related to the time since the species diverged from their common ancestor.

- (i) There is 3.6% difference between the DNA of humans and orangutans, 2.3% difference between the DNA of humans and gorillas and a 1.6% difference between the DNA of humans and chimps. Arrange these organisms in terms of how closely they are related to humans. [1]

Humans

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- (ii) There is a 0.7% difference between the DNA of the common chimp and the pygmy chimp and they diverged 3 million years ago. Human DNA differs from the common chimp and the pygmy chimp by 1.6%. Calculate how long ago humans and chimps diverged from their common ancestor. Show your working. [2]

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- (iii) Apart from DNA, give an example of another molecule which can be used to assess how closely organisms are related. [1]

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(c) Fossil evidence suggests that there have been other species of humans, for example *Homo neanderthalensis* and *Homo habilis*. Suggest why these are considered to be members of different species. [2]

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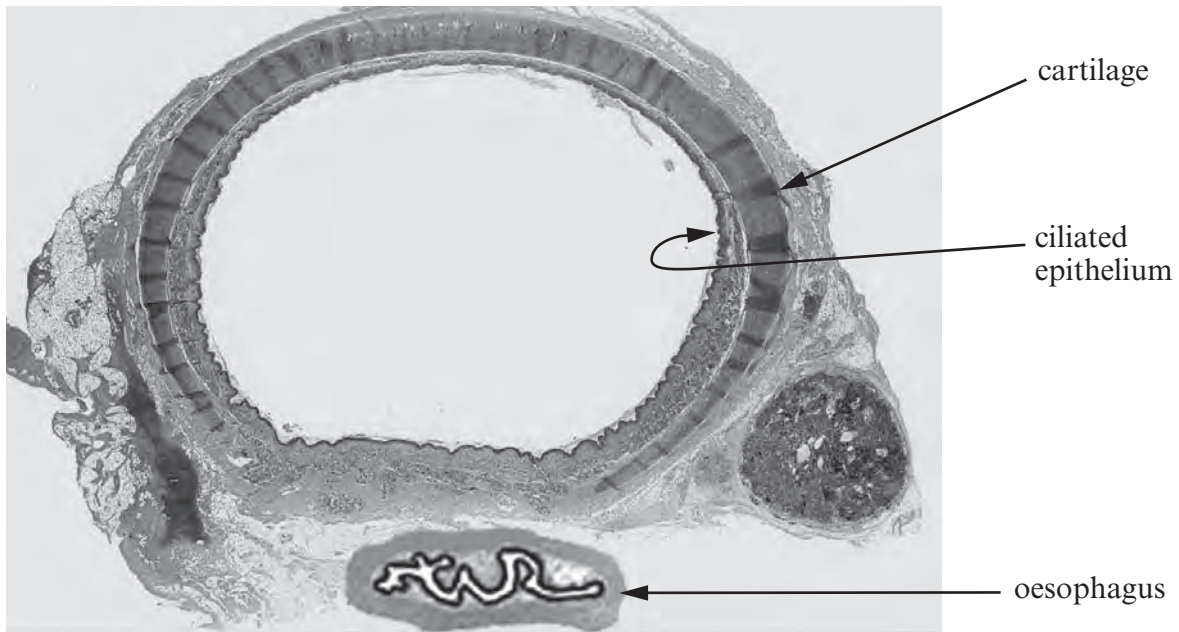
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**(Total 9 marks)**

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2. The micrograph shows a section of the trachea of a human.



- (a) What is the function of the ciliated epithelial layer? [2]

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- (b) (i) What is the function of the layer of cartilage? [2]

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- (ii) Suggest why the cartilage is not in the form of a complete ring. [1]

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(c) The spirometer can be used to measure the rate and depth of breathing in a human.

- (i) State why it is important that carbon dioxide is absorbed from the exhaled air before it is breathed in from the apparatus again. [2]

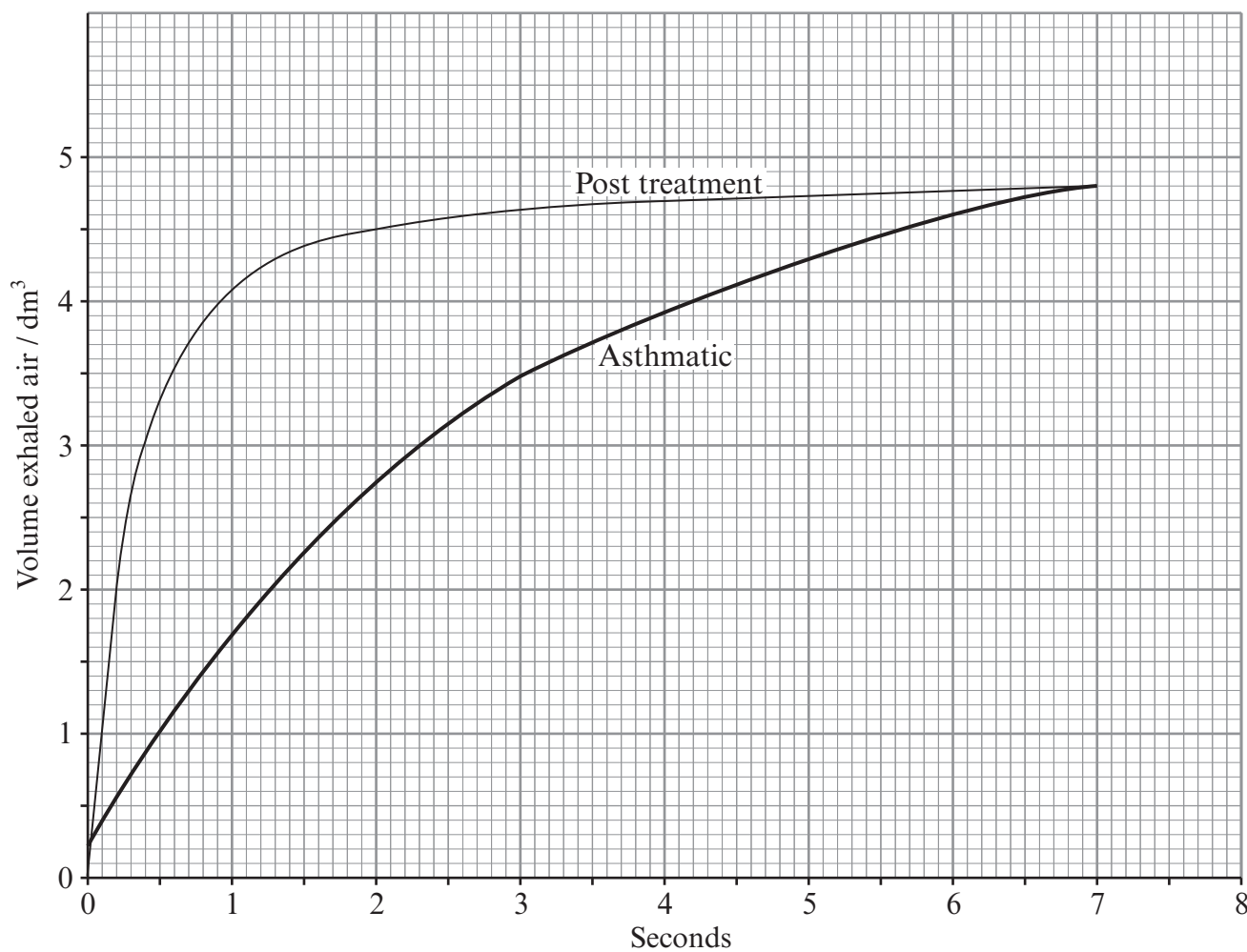
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One method used by doctors to assess lung function is to use a spirometer to record the flow volume rate during expiration. The graph shows such a recording from a patient suffering from asthma before and after treatment.



- (ii) Using data from the graph describe the effect the treatment has on the patient's breathing. [3]

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- (iii) State **two** common allergens which can cause asthma. [1]

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- (iv) State **two** ways the drugs used to treat asthma give relief from the symptoms. [2]

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- (v) Individuals suffering from asthma or emphysema share the common symptoms of breathlessness and shortage of oxygen. Suggest what effect treatment with asthma drugs would have on a patient with emphysema. [1]

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**(Total 14 marks)**

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3. There are four different blood groups in humans A, B, AB and O.  
 People with blood group A have antigen type A in the membrane of the red blood cells.  
 People with blood group B have antigen type B in the membrane.  
 People with blood group AB have both antigen A and B in the membrane.  
 People with blood group O have neither antigen A nor B.

- (a) Complete the following table to show the antibodies found in the blood of people with the indicated blood groups. Use the key to complete the table. [4]

Key: antibody a = a, antibody b = b, neither antibody a nor b = none.
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<i>Blood Group</i>	<i>A</i>	<i>B</i>	<i>AB</i>	<i>O</i>
Antibodies found in blood plasma				

- (b) (i) Complete the following table using a tick (✓) if blood could be successfully transfused and a cross (×) if the blood would be rejected. [4]

	<i>Blood group of donor</i>			
<i>Blood group of recipient</i>	<i>A</i>	<i>B</i>	<i>AB</i>	<i>O</i>
<i>A</i>				
<i>B</i>				
<i>AB</i>				
<i>O</i>				

- (ii) State the blood group of the universal donor and the universal recipient. [2]

Universal donor .....

Universal recipient .....



- (c) Another important blood group system is the rhesus system (RhD system). Some people have a protein called the D antigen on their red blood cells and are said to be rhesus positive (RhD positive). People without this antigen are rhesus negative (RhD negative). The table below shows the percentage (%) of the population with the different blood groups.

Blood group	% population with this group
O <sup>+</sup>	37
O <sup>-</sup>	7
A <sup>+</sup>	35
A <sup>-</sup>	7
B <sup>+</sup>	8
B <sup>-</sup>	2
AB <sup>+</sup>	3
AB <sup>-</sup>	1

- (i) Calculate the percentage of the population who could successfully donate blood to a person who is blood group AB negative. [1]

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- (ii) To what percentage of the population could a person who is blood group O positive successfully donate blood? [1]

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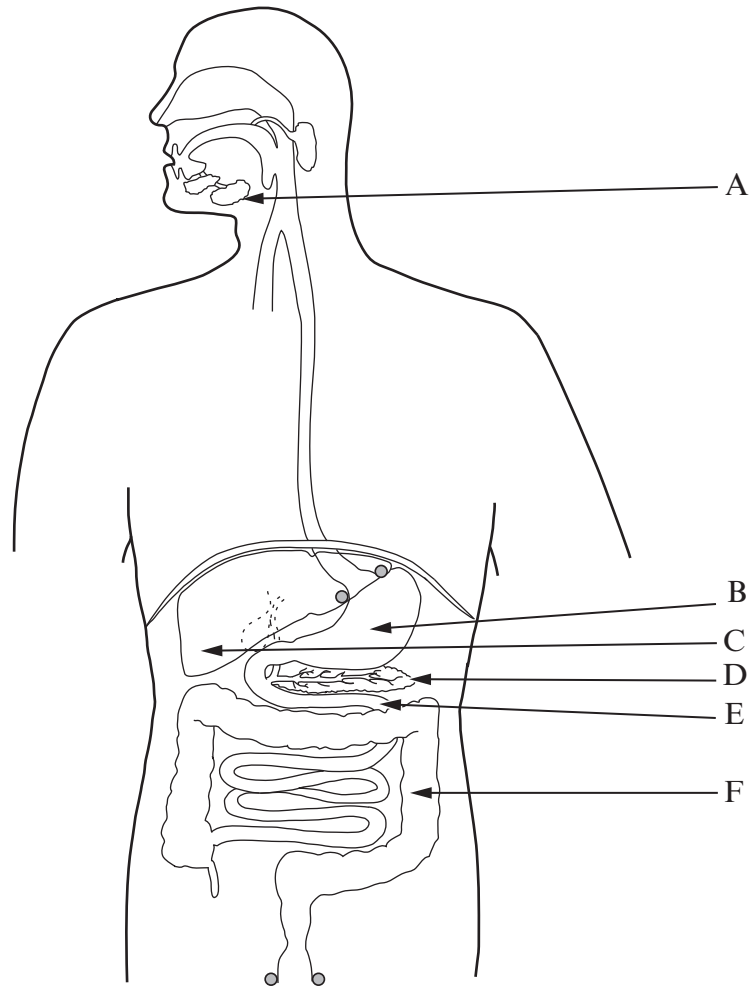
- (d) Before blood is transfused into some patients the white blood cells are removed. Suggest why this is not normally necessary. [1]

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**(Total 13 marks)**

4. The diagram represents the human digestive system.



(a) Using the appropriate letter(s), A-F shown on the diagram, complete the following statements. [4]

An acidic region

The region where the hydrolysis of protein begins

**Two** regions where the enzyme amylase is produced

The structure which produces chemicals which emulsify fats

(b) In the villi of the small intestine what is the function of:

(i) the lacteal, [1]

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(ii) the capillaries, [1]

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(iii) the smooth muscle cells? [1]

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(c) The symptoms of Coeliac disease include severe weight loss, deficiency diseases such as anaemia and a range of symptoms caused by increased bacterial activity in the large intestine. Suggest why the patient shows these symptoms. [4]

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(d) Patients with colon cancer may have their colon surgically removed (total colectomy). Explain why they are likely to suffer from symptoms of dehydration. [1]

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**(Total 12 marks)**

5. (a) The heart is a muscular pump and the blood is kept moving in the correct direction by a system of valves. Complete the table using a tick (✓) if the statement applies to atrial systole, atrial diastole, ventricular systole or ventricular diastole. [4]

	<i>Atrial systole</i>	<i>Atrial diastole</i>	<i>Ventricular systole</i>	<i>Ventricular diastole</i>
Bicuspid and tricuspid valves open				
Semi-lunar/aortic valves closed				
Initiated by sinoatrial node (SAN)				
Initiated by Purkyne fibres (Purkinje fibres)				

- (b) Explain why a contraction in the left atrium takes place a few milliseconds after that in the right atrium. [2]

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- (c) There is a layer of connective tissue between the atria and ventricles. What is the function of this tissue? [2]

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(d) Explain why, during periods of exercise, blood flow through the coronary arteries is increased. [4]

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**(Total 12 marks)**





