

Surname	Centre Number	Candidate Number
Other Names		2



GCE AS/A level

1072/02

HUMAN BIOLOGY – HB2

P.M. TUESDAY, 14 January 2014

1 hour 30 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	6	
3.	8	
4.	11	
5.	6	
6.	10	
7.	13	
8.	10	
Total	70	

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INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use pencil or gel pen. Do not use correction fluid. 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) Complete the table below to show the classification of modern humans.

[4]

Taxon	Name
KINGDOM	Animalia
PHYLUM	
CLASS	
	Primates
	Hominidae
GENUS	<i>Homo</i>
SPECIES	<i>sapiens</i>

- (b) The fossil record shows that a close relative of modern humans, the Neanderthals, once lived in Europe at the same time as modern humans.

Originally, based on the fossil record alone, Neanderthals were given a different species name to that of modern humans – *Homo neanderthalensis*.

More recent evidence suggests that they were the same species as modern humans and have since been given the species name *Homo sapiens neanderthalensis*.

- (i) Name one analytical technique that could provide evidence of a close genetic relationship between modern humans and Neanderthals. [1]

.....

- (ii) Suggest why the absence of fossils with characteristics of both modern humans and Neanderthals supported the original theory that Neanderthals should be classified as a different species to modern humans. [1]

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2. Immunity can be acquired **actively** or **passively** in response to foreign antigens. Specific immunity involves both **humoral** and **cell-mediated** responses.

Explain what is meant by the following terms:

(i) the **humoral** immune response; [1]

.....
.....

(ii) the **cell-mediated** immune response; [1]

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.....

(iii) **natural active** immunity; [2]

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(iv) **natural passive** immunity. [2]

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6

3. Read the information below about human blood groups and then answer the questions that follow.

1 Every person belongs to one of four blood groups, A, B, AB or O. These letters refer to the **antigens** found on the cell membrane of **erythrocytes**. People with blood group O have neither A nor B antigens on their erythrocytes while people who are of blood group AB have both antigens.

5 Blood group A people naturally produce **antibodies** against the B antigen and blood group B people produce antibodies against antigen A. People of blood group AB do not produce antibodies against either antigen A or B while people who are blood group O produce antibodies against both antigens A and B.

10 Erythrocytes can also carry the rhesus antigen (also called antigen D). People with this antigen are said to be rhesus positive (Rh +) and those without rhesus negative (Rh -). Antibodies against the rhesus antigen are only produced if a person is exposed to the rhesus antigen.

- (a) Explain what is meant by the following terms:

antigens (*line 2*);

[1]

.....

.....

antibodies (*line 5*).

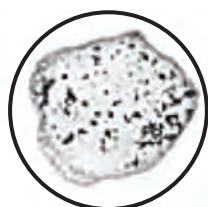
[1]

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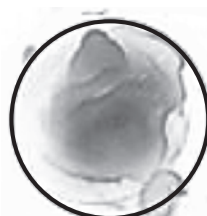
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- (b) The **Eldoncard** is one method of identifying your blood group. In this method, antibodies against antigens A, B and D (rhesus antigen) are absorbed into areas of the card. A drop of blood is then spread over each area.

A positive result is shown by haemagglutination as shown in the image below.
A negative result is shown for comparison.



Positive result



Negative result

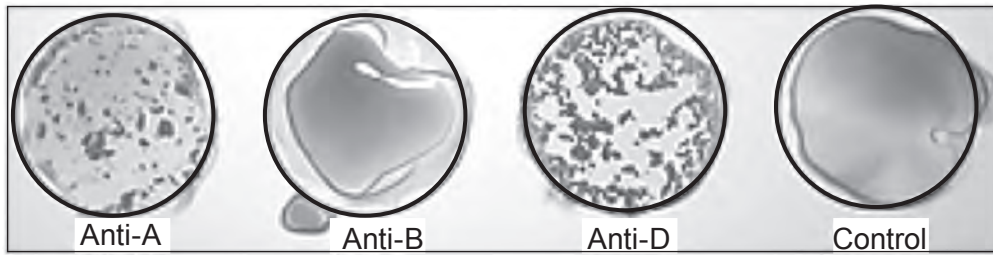
(b) (i) Identify the blood groups of the people shown below.

[2]



Person A:

Blood Group:



Person B:

Blood Group:

(ii) Explain your answers to question (b) (i).

[3]

Person A:

.....
.....

Person B:

.....
.....

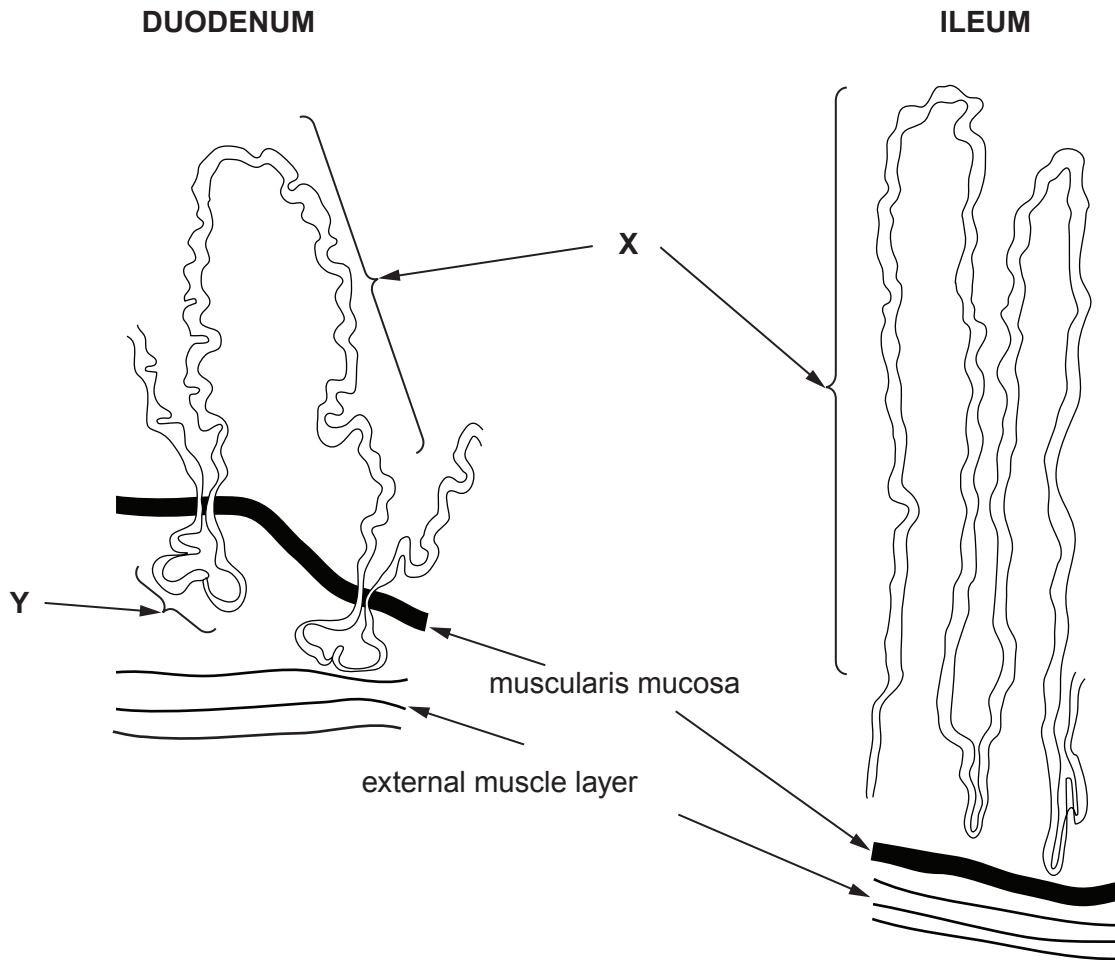
(iii) Suggest the purpose of the control in this test.

[1]

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4. The diagrams below show sections through the duodenum and ileum at the same magnification.



(a) Name the structure labelled **X** in each diagram.

[1]

.....

(b) What is the **main** function of the regions of the alimentary canal shown in these diagrams?

[2]

DUODENUM

ILEUM

The duodenum receives food mixed with hydrochloric acid from the stomach.

(c) (i) Suggest how secretions from structure **Y** affect the pH of the duodenum contents. [1]

(ii) What effect would this have on the activity of the enzymes that pass into the duodenum from the stomach? [1]

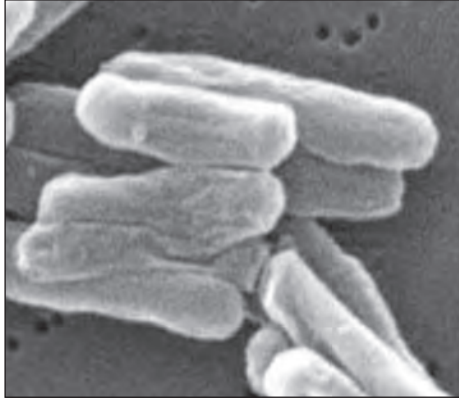
(d) (i) Suggest how the increased size of structure **X** in the ileum reflects its main function. [1]

(ii) Describe **two** other adaptations of the ileum, **not** shown in the diagram, that increase the efficiency of this function. [2]

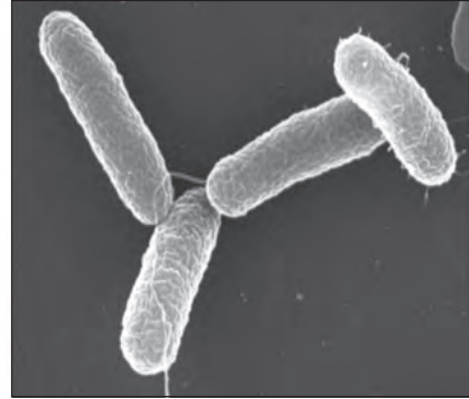
(e) Describe the appearance of structure **X** in a person suffering from coeliac disease and explain how this can lead to weight-loss and fatigue. [3]

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5. The electron micrographs below show images of the bacteria *Mycobacterium tuberculosis* and a species of *Salmonella*. Both types of bacteria are pathogenic and when stained with the Gram staining technique are stained red or pink.



Mycobacterium tuberculosis



Salmonella sp.

- (a) What is meant by the term **pathogenic**? [1]

.....

- (b) What name is given to bacteria of this shape? [1]

.....

- (c) Describe the structure of the cell wall of these bacteria. [2]

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- (d) Suggest why penicillin may **not** be effective against these bacteria. [2]

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6. (a) Small, unicellular organisms can obtain the oxygen needed for respiration through their cell membranes and do not require specialised gas exchange surfaces.

(i) A high ratio between two features of these cells makes it possible for them to rely on their cell membranes alone for gas exchange. Name this ratio. [1]

..... :

(ii) Explain why the maximum size of a unicellular organism is about 100µm. [3]

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(b) Large, multicellular organisms have evolved specialised gas exchange surfaces. Many aquatic organisms have external foldings of their body surface called gills to increase the ratio stated in (a)(i) while terrestrial mammals, such as humans, have internal foldings called lungs.

(i) Explain why humans have internal gas exchange systems. [1]

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(ii) Explain how **three** different structural features of the lungs increase the efficiency of gas exchange. [3]

I

.....

II

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III

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(c) Tuberculosis is a bacterial disease that in its most common form attacks the lungs and neck lymph nodes.

Describe how and under what conditions TB is transmitted.

[2]

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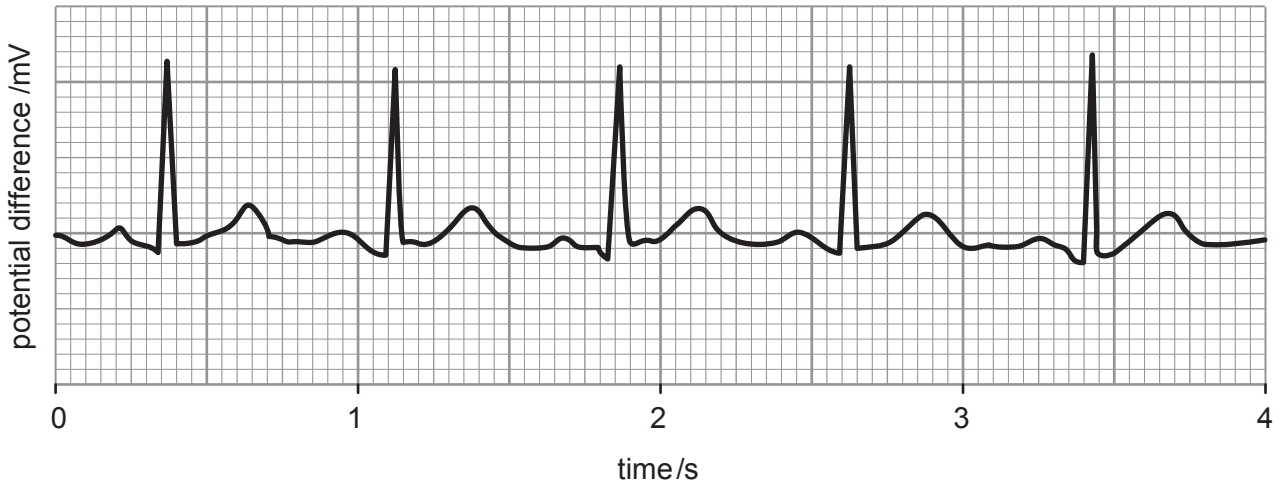
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7. The chart below shows an electrocardiograph (ECG) for a patient's heart beat at rest.



(a) (i) Calculate the average resting heart rate for this person in beats per minute. Show your workings. [2]

..... beats per minute

(ii) Describe how the ECG would change if the person was carrying out physical exercise. [1]

.....

(b) The trace of each heart beat shown on the electrocardiograph corresponds to three main waves of electrical activity in the heart – **P**, **QRS** and **T**.

(i) Label **one** heartbeat trace on the ECG with the letters **P**, **Q**, **R**, **S** and **T** to indicate these waves of electricity. [1]

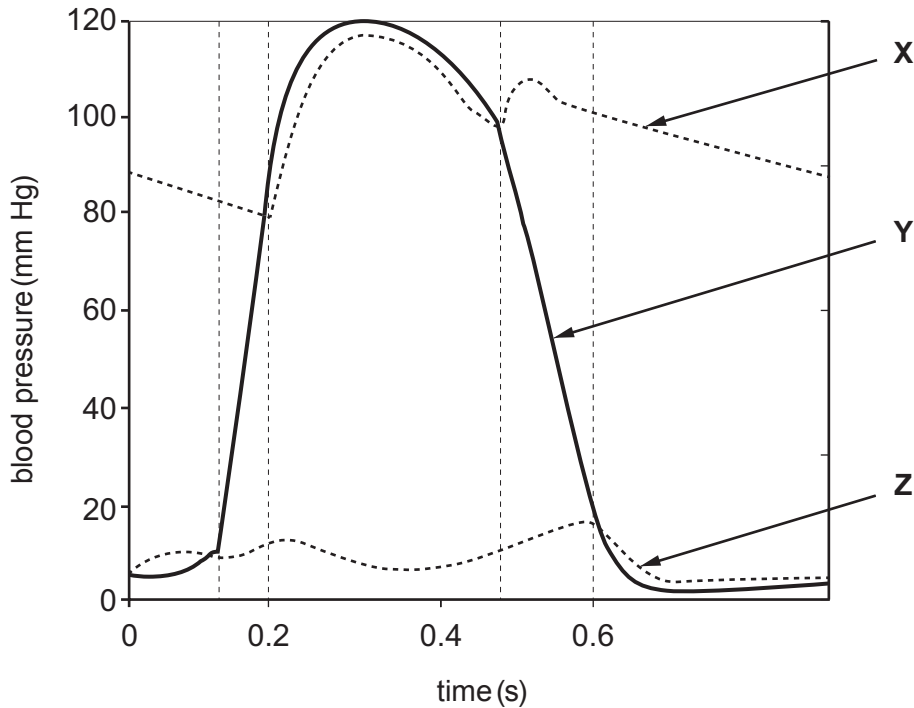
(ii) Describe what is happening in the heart during each of these waves of electrical activity. [3]

P

QRS

T

(c) The graph below shows the pressure changes in the left atrium and ventricle and the aorta during a single heartbeat.



(i) Which of the letters **X**, **Y** and **Z** from the diagram show the pressure changes in the: [2]

Left Atrium;

Left Ventricle.

(ii) Pressure changes during the cardiac cycle cause the heart valves to open and close.

At 0.2s state if the atrio-ventricular and aortic valves would be open or closed. [1]

ATRIO-VENTRICULAR VALVE

AORTIC VALVE

(iii) Explain how ventricular systole causes these valves to open or close at this point in the cardiac cycle. [3]

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