

Surname	Centre Number	Candidate Number
Other Names		2



GCE AS/A level

1072/02 – **LEGACY**



HUMAN BIOLOGY – HB2

P.M. TUESDAY, 7 June 2016

1 hour 30 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	10	
2.	14	
3.	7	
4.	8	
5.	13	
6.	8	
7.	10	
Total	70	

ADDITIONAL MATERIALS

In addition to this examination paper you will need a ruler and a calculator.

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.

Answer **all** questions.

1. Organisms can be placed into a hierarchical system of classification. Each of the five boxes below contains the names of some organisms found in the same taxonomic groups as humans.

<u>Group A</u>		
human	lemur	bear
gorilla	chimpanzee	

<u>Group B</u>		
human	snail	locust
lemur	bear	gorilla
goldfish	sparrow	chimpanzee

<u>Group C</u>	
human	lemur
gorilla	chimpanzee

<u>Group D</u>		
human	gorilla	chimpanzee

<u>Group E</u>		
human	lemur	bear
gorilla	goldfish	sparrow
chimpanzee		

- (a) Complete the table below to show part of the classification of modern humans. Each group should be used only once. One has been completed for you. [4]

Taxon	Group	Classification of modern humans
Kingdom	B	Animalia
Phylum		
Class		
Order		
Family		

(b) What is the binomial name of modern humans?

[1]

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(c) With reference to their cellular organisation, explain why the organisms in Group **B** are placed in the same taxon.

[2]

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(d) Plants, fungi and bacteria all have cell walls but are in different kingdoms. With reference to their cell wall composition, explain the reason for their classification.

[3]

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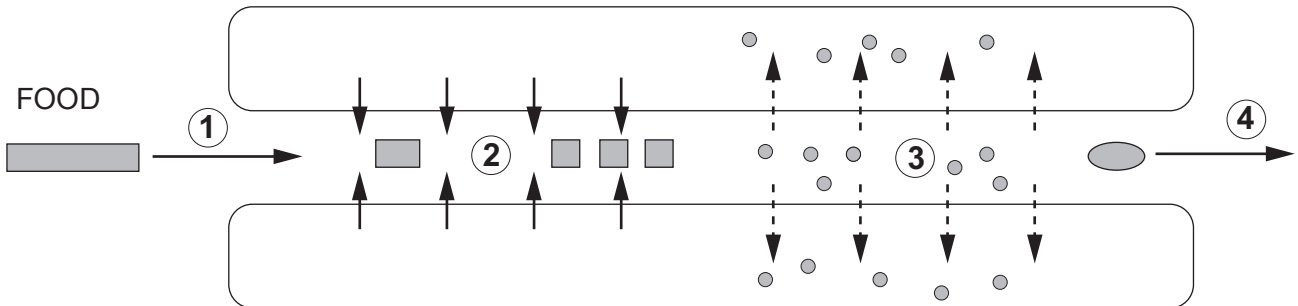
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2. (a) Many organisms have a simple tube gut as shown in the diagram below.



(i) Name the processes numbered 1 and 4 in the diagram. [1]

1.

4.

(ii) Explain why the human gut is divided into a number of different parts. [2]

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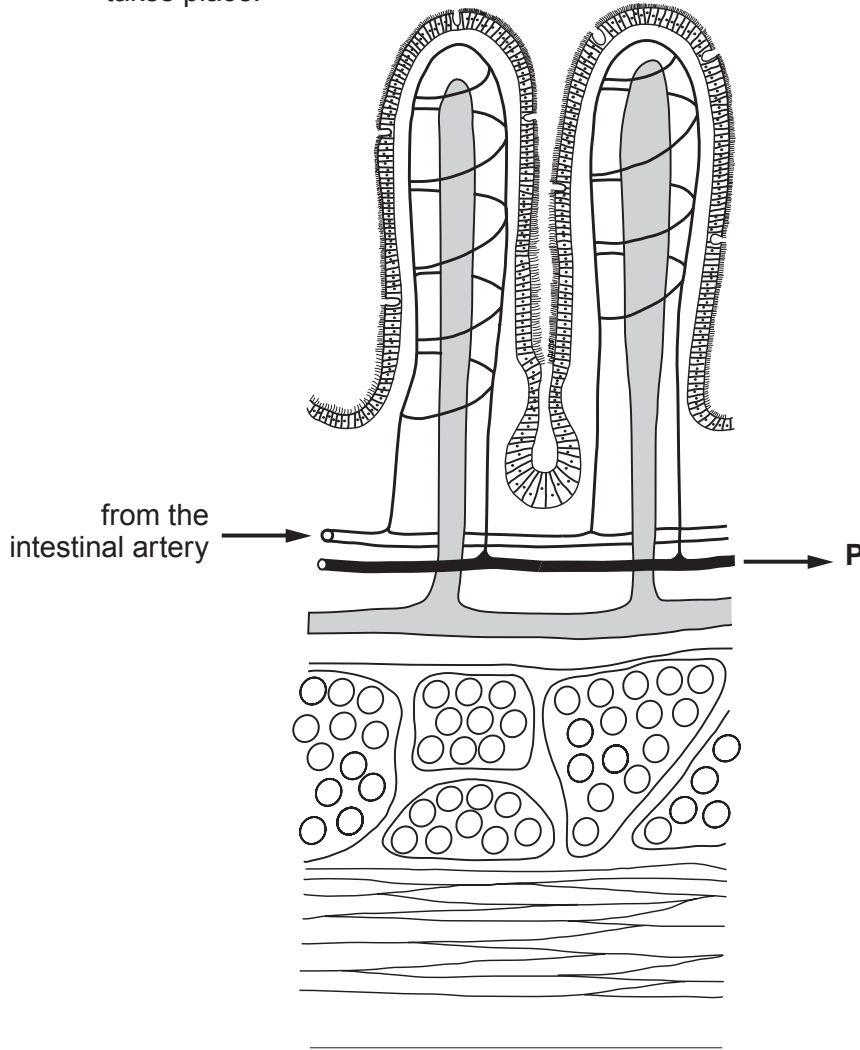
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(b) The diagram below shows a section through the part of the human gut where process 3 takes place. Examiner only



(i) Label the diagram with the appropriate letters to show the following. [2]

X Where the final stages of digestion of disaccharides take place.

Y The vessel that fatty acids and glycerol enter after absorption.

(ii) Following absorption glucose and amino acids are carried to the liver by blood vessel **P**.

Name blood vessel **P**. [1]

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(iii) Describe what happens to excess amino acids when they reach the liver. [2]

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(c) Cholera is caused by a Gram negative bacterium. It secretes toxins that can cause the gut lining to lose up to six litres of water a day. This loss of water results in the production of large volumes of diarrhoea and rapid dehydration and death if a person is not treated quickly.

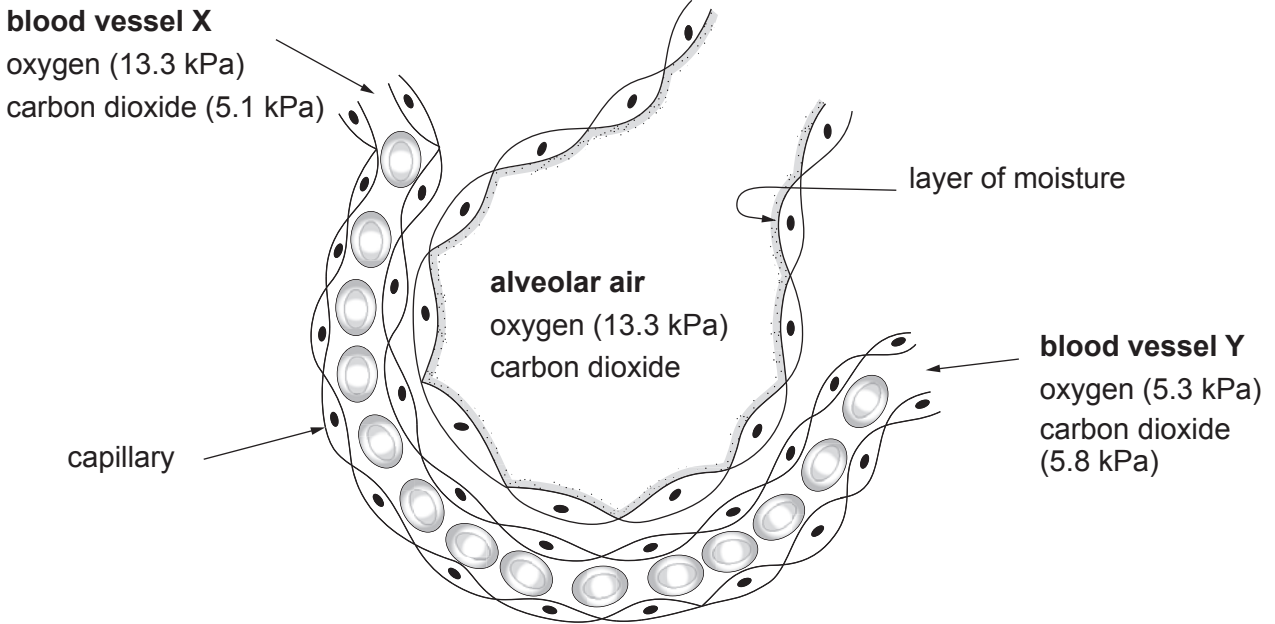
(i) Name the **two** regions of the human gut where most water is absorbed into the blood. [2]

(ii) Cholera can be successfully treated by giving the infected person a solution of salts and glucose in boiled water.

Suggest why the patient is given salts and glucose in addition to water. [2]

(iii) Suggest why treatment with antibiotics is not recommended in some geographical regions, even though this disease is endemic. [2]

3. The diagram below shows a section through an alveolus with its blood supply. The numbers show the relative concentrations of oxygen and carbon dioxide in the alveolus and at two points along the capillary.



- (a) (i) Which of blood vessels (**X** or **Y**) represents the venous end of the capillary? [1]

- (ii) Give a reason for your answer. [1]

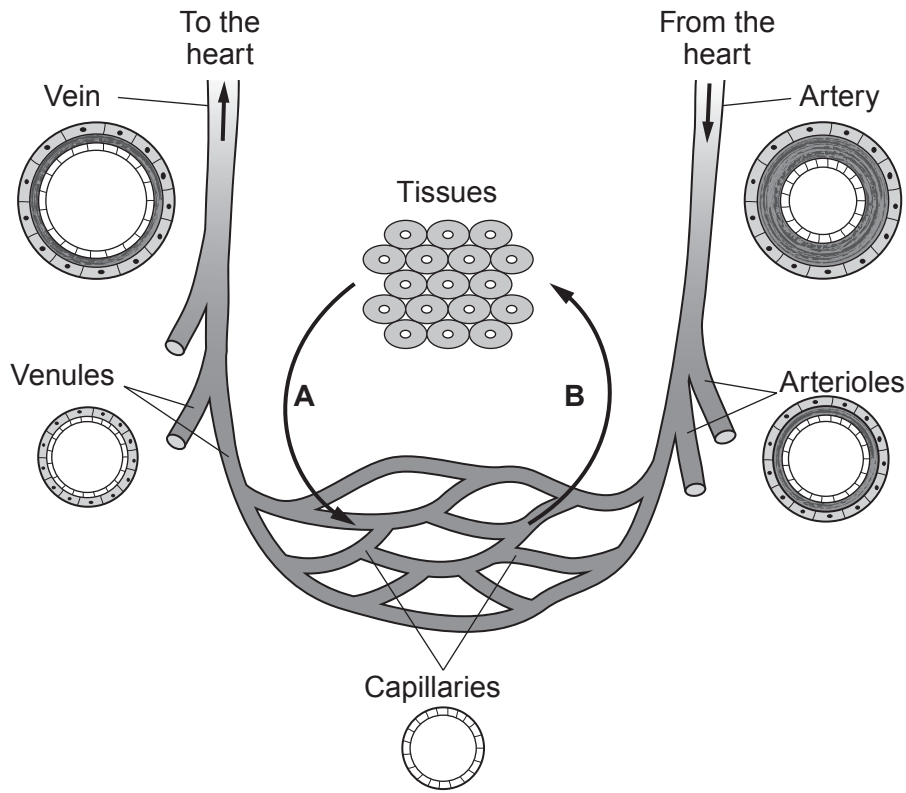
- (b) (i) Suggest a value for the carbon dioxide level in the **alveolar air**. [1]
 kPa
- (ii) Explain why you chose this value. [1]

- (c) Explain how the thin walls of the alveolus and the capillary increase the efficiency of gas exchange. [1]

- (d) The layer of moisture contains a substance called a surfactant. Suggest why an artificial surfactant might be used in lung transplants. [2]

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4. The diagram below shows how the structure of human blood vessels changes as blood is transported from the heart to the tissues and then returned to the heart.



- (a) The walls of arteries and veins have three main layers. Explain how each layer is adapted to its main function in an artery.

[3]

Outer Layer (tunica externa / tunica adventitia)

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Middle layer (tunica media)

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Inner layer (tunica intima)

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- (b) The capillary walls are only one cell thick and have a small diameter. Blood flows through them at a low pressure and at a low velocity.

- (i) Name **two** substances that would be exchanged between the blood and the tissue fluid at: [2]

I. **A** and

II. **B** and

(ii) Explain why the blood pressure and velocity decrease in the capillaries. [2]

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(iii) One type of malnutrition affects the function of the capillaries and can result in the condition called kwashiorkor where fluid is retained in the tissues.

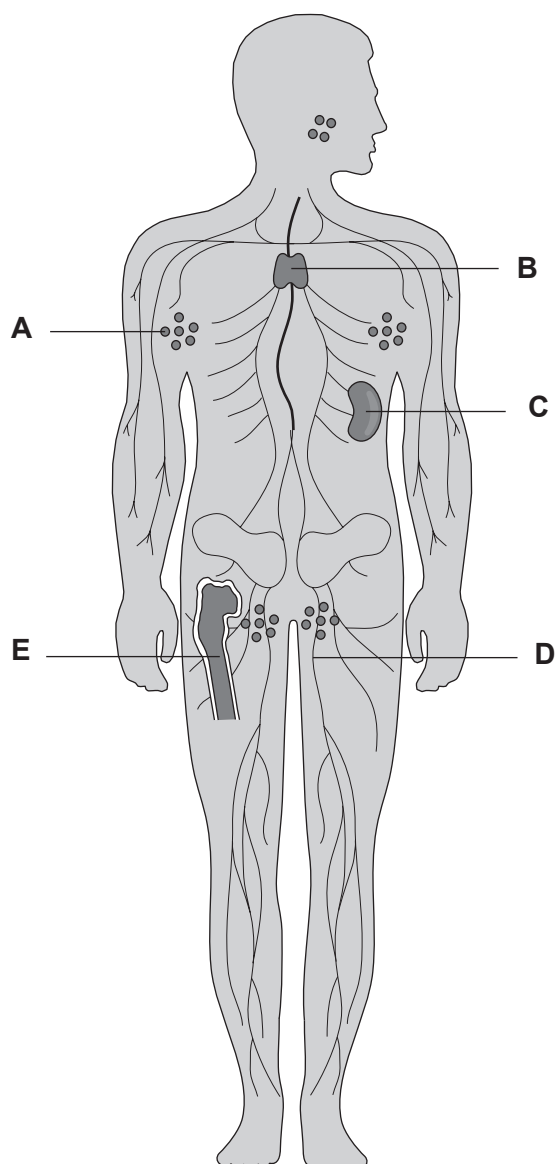
Name the food group that must be present in the diet to avoid developing kwashiorkor. [1]

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5. The diagram below shows the position of some of the main tissues and organs associated with the human immune system.



- (a) Use letters from the diagram to answer the questions that follow. The letters may be used once, more than once or not at all.

[5]

- (i) contains stem cells that differentiate to form lymphocytes

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- (ii) where T lymphocytes are activated

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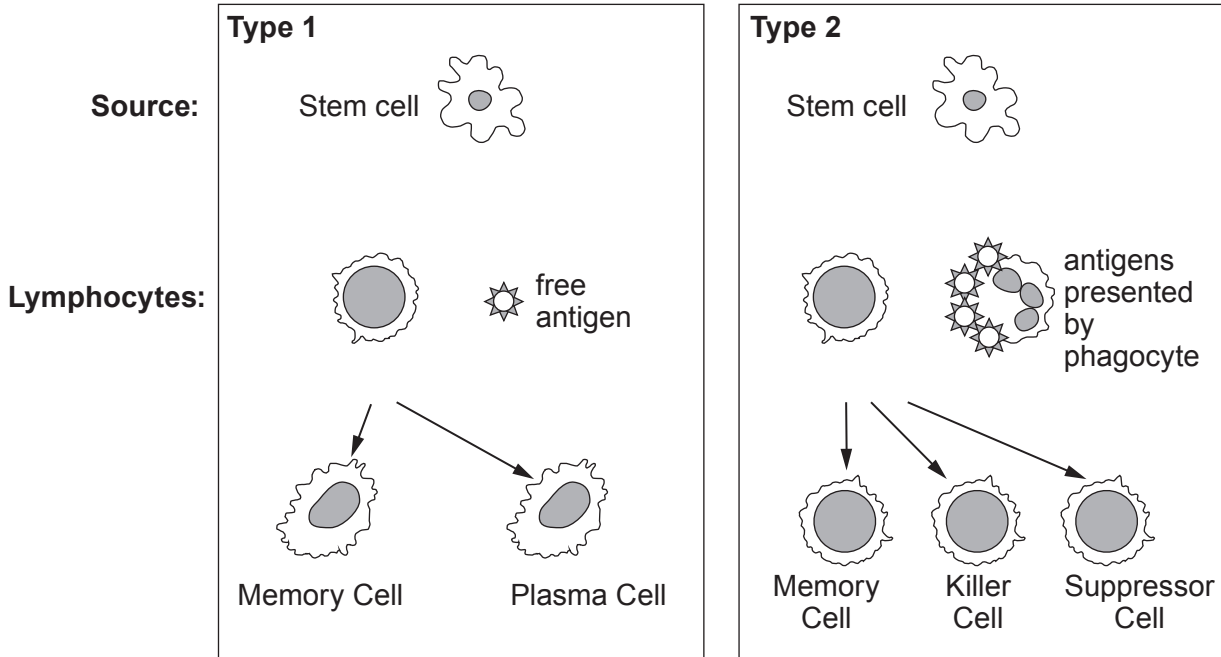
- (iii) transports excess tissue fluid from the tissues back to the blood

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- (iv) where B lymphocytes mature

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(b) T lymphocytes and B lymphocytes produce different types of immune response as shown in the diagrams below.



(i) Complete the table to give the name of responses shown in **Type 1** and **Type 2** above and the name of the lymphocytes responsible for each response. [4]

Type of Immune response	Name of response	Name of lymphocytes responsible
Type 1		
Type 2		

(ii) Following exposure to foreign antigens, the lymphocytes responsible for each type of immune response differentiate.

Describe the functions of the **memory cells** and **plasma cells** produced in immune response **Type 1**.

Memory cells

[2]

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Plasma cells

[2]

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6. The carbon dioxide concentration of a person's blood was monitored at rest and when exercising. The results are shown in the table below.

Form of carbon dioxide	concentration in blood plasma (mmol l^{-1})		
	arterial blood	venous blood at rest	venous blood during exercise
dissolved CO_2	0.68	0.78	1.32
hydrogen carbonate ions	13.52	14.51	14.66
CO_2 bound to plasma proteins	0.30	0.30	0.24

	arterial blood	venous blood at rest	venous blood during exercise
pH of plasma	7.40	7.37	7.14

- (a) Calculate the percentage increase in the concentration of hydrogen carbonate ions between arterial blood and venous blood at rest. Show your working. [2]

Percentage increase = %

- (b) The results also show that plasma pH decreases during exercise. Explain how this change in pH is an advantage to respiring tissues. [2]

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(c) With reference to the table, explain why the plasma concentration of chloride ions is lower in venous blood than in arterial blood. [4]

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