Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1072/02

S15-1072-02-R1

HUMAN BIOLOGY – HB2

P.M. MONDAY, 1 June 2015

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**9**	
3.	**6**	
4.	**12**	
5.	**12**	
6.	**7**	
7.	**9**	
8.	**10**	
Total	**70**	

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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.

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Answer **all** *questions.*

1. The first lines of defence against disease involve a number of natural barriers and localised defence mechanisms.

Complete the sentences below that describe some first lines of defence. [5]

One of the first lines of defence is the strong connective tissue found in the skin and lining of the buccal cavity. A deficiency in ..... can lead to weakened connective tissue and open wounds that can enable micro-organisms to gain entry to the body.

Bacteria naturally present on the skin are called the ..... and offer protection by competing with pathogenic micro-organisms.

If bacteria do enter the body through the skin, ... increases blood flow to the site of infection. White blood cells called ..... also help localise the infection by ingesting bacteria that enter the tissues.

..... epithelia in the trachea help to reduce the chance of lung infection by moving mucus, which traps bacteria, out of the respiratory system.

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Turn over.

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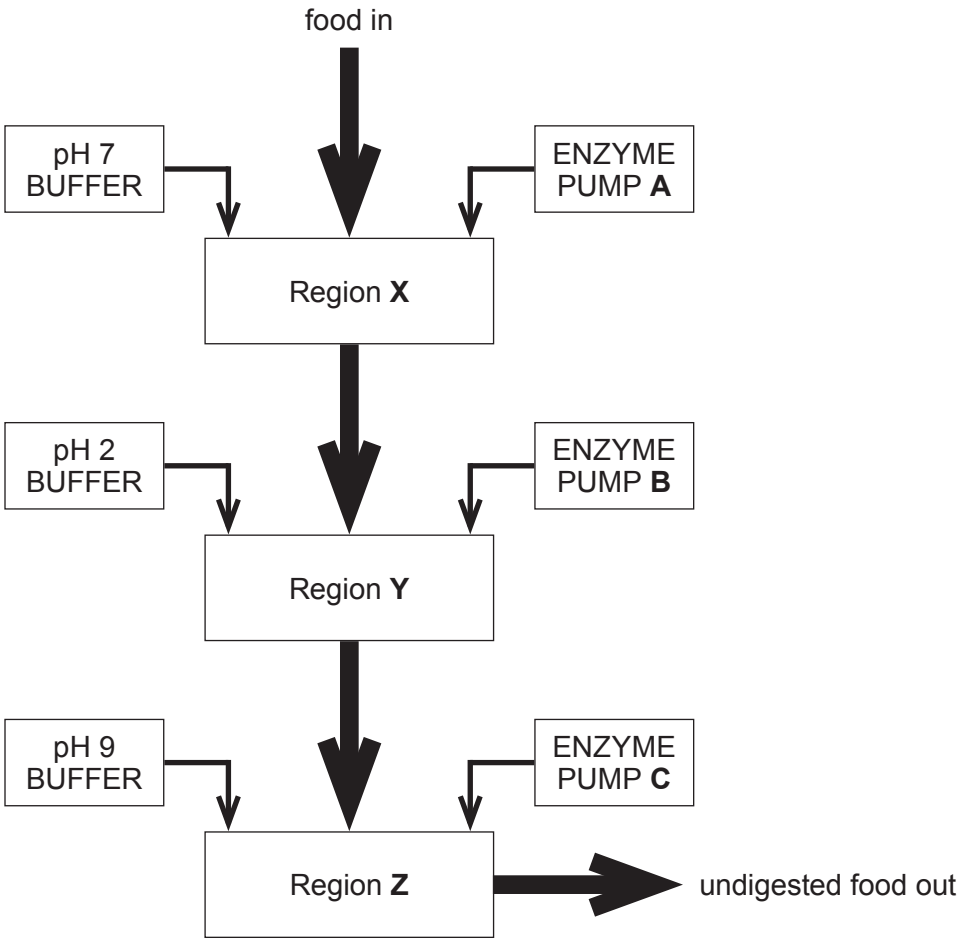
2. The diagram shows an artificial gut which contains the normal enzymes and micro-organisms found in the human gut. This model allows scientists to follow the digestion of food in detail.



(a) Name the regions of the human gut represented by **X**, **Y** and **Z** in the model gut. [1]

X .....

Y .....

Z .....

(b) Name a carbohydrase added by enzyme pumps **A and C**. [1]

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(c) Some protease enzymes added by enzyme pumps **B** and **C** are added in the form of inactive precursors.

Explain why these enzymes are not secreted in their active form. [1]

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(d) In the artificial gut, the pH of each region is controlled by a pH buffer.
Explain why the pH of each region needs to be kept at a certain pH. [1]

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(e) In the real human gut the pH of region **Z** is partly controlled by bile.
Describe the role of bile in digestion. [2]

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(f) *Salmonella* is a Gram-negative, rod-shaped bacterium that can cause food poisoning. Antibiotics can be given to control infection but are generally not used as they encourage the build-up of resistant strains.

(i) Describe how the structure of the cell wall of *Salmonella* reduces the effectiveness of some antibiotics on this species of bacterium. [2]

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(ii) The chance of passing a gene for antibiotic resistance from one bacterium to another in the gut is estimated at 1 in 10 billion. If the gut contains 10 000 billion bacteria, estimate how many might receive the gene for antibiotic resistance. [1]

Answer .....

Examiner only

3. *(a)* What term is used to describe the variation in number of species in different places? [1]

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(b) Identify **two** habitats where you would expect to find a high number of species. [2]

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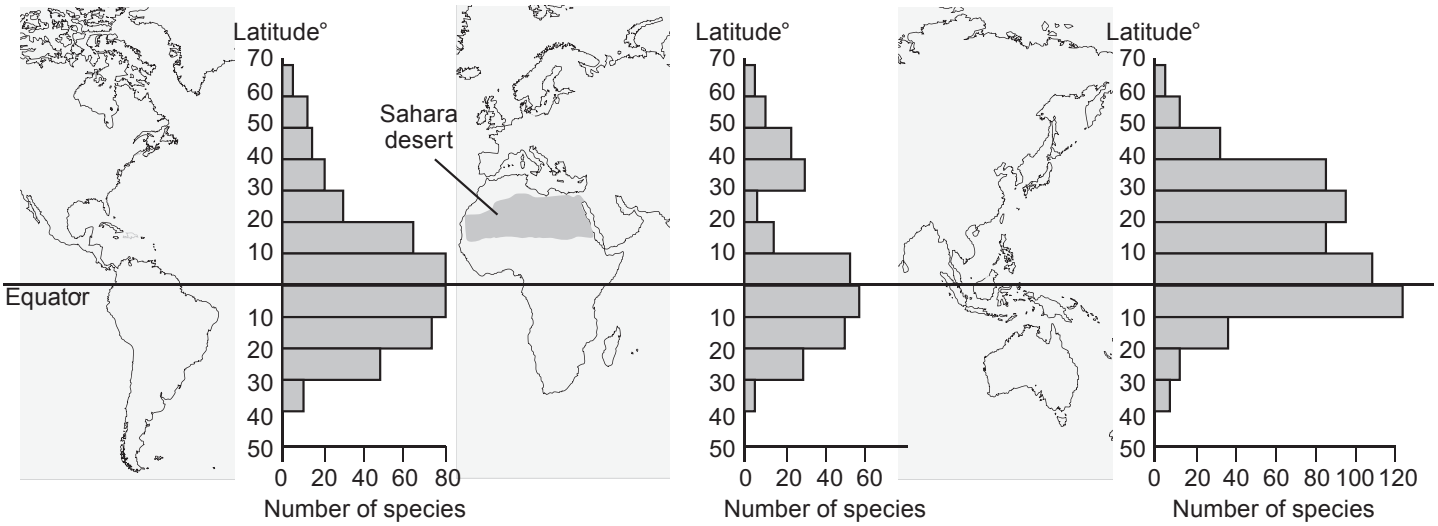
The diagram shows how the number of different species of a type of butterfly varies with latitude in different parts of the world.



(c) Describe the general relationship between latitude and number of species shown in the diagram. [1]

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(d) Suggest why there is a decrease in the number of species of this type of butterfly in the region covered by the Sahara desert. [2]

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4. The human heart is made of specialised tissue called cardiac muscle. The rate at which the heart contracts can be increased or slowed down in response to environmental stimuli.

(a) State the **two** mechanisms by which the body can regulate the heart rate. [2]

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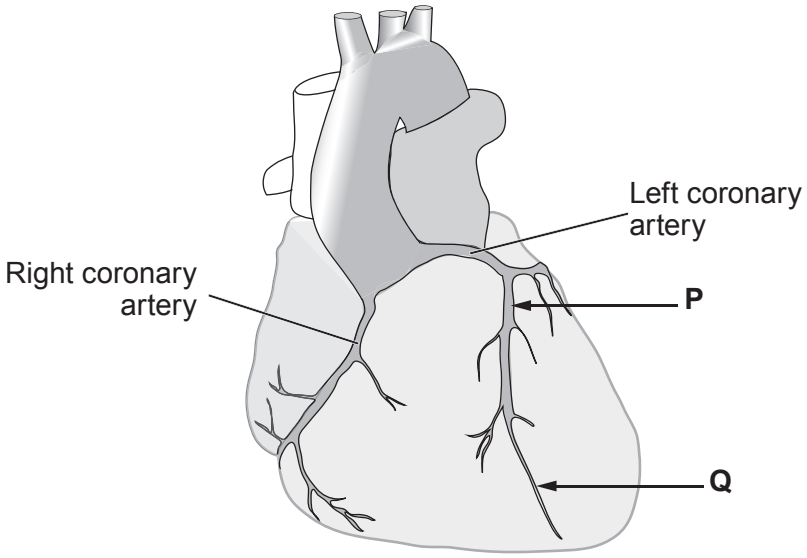
(b) The heart has its own blood supply via the coronary arteries. These are shown in the diagram below.



Ischaemic heart disease is caused by the occurrence of clots in a coronary artery.

(i) Describe the effect of a clot in the coronary artery. [2]

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(ii) Suggest why a clot at point **P** on the diagram would be more serious than a clot at point **Q**. [2]

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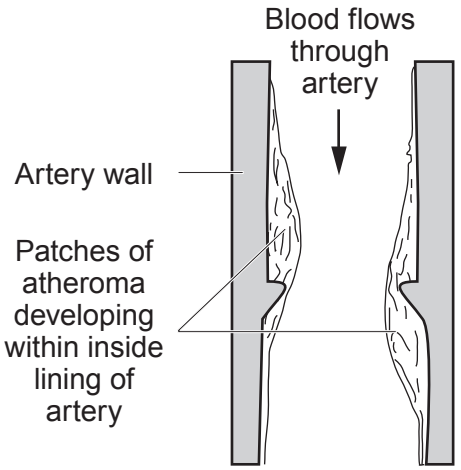
(c) Atherosclerosis is a condition that can cause hypertension and can lead to similar effects as a clot in the coronary arteries and also increases the risk of stroke.



Section of an artery

(i) Apart from a high cholesterol diet, name **two** *other* factors that could increase the risk of an atheroma forming. [2]

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(ii) Describe and explain how surgical procedures can be used to reduce the effects of an atheroma. [4]

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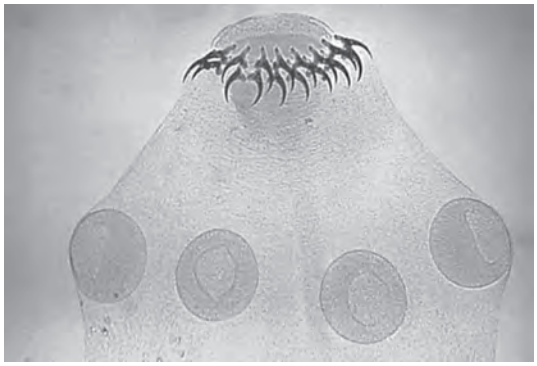
5. The images below show two parasites of humans. Both are specialised to survive in different environments. The head louse, *Pediculus humanus capitis*, is an **ectoparasite** while the tapeworm *Taenia solium* is an **endoparasite**.



(a) What is the difference between an **ectoparasite** and an **endoparasite**? [1]

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(b) Describe how these parasites are adapted to reduce the risk of being dislodged from their habitats. [2]

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(c) Head lice are usually transmitted by direct contact between affected people.

Describe how *Taenia solium* is transmitted. [2]

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(d) The advert below appeared in a magazine in the 1890s claiming that people could lose weight without dieting or exercising by infecting themselves with tapeworms with no ill effects.

Suggest why infecting yourself with tapeworms could lead to weight loss but also cause serious health problems. [2]

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Turn over.

Examiner only

(e) Malaria is an infection also caused by an endoparasite.

(i) Name the parasite that causes malaria. [1]

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(ii) Name the vector of this parasite. [1]

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(f) The table shows the average figures for rainfall and the number of new cases of malaria in a region of South Africa over a 10 year period.

Month	Rainfall (mm)	Number of new Malaria Cases
January	130	2000
February	180	1600
March	145	1000
April	75	700
May	40	400
June	10	280
July	5	100
August	4	95
September	12	130
October	65	350
November	80	550
December	105	1750

(i) Describe the general relationship between rainfall and the number of new cases of malaria. [1]

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Examiner only

(ii) Suggest an explanation for this relationship. [2]

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Turn over.

Examiner only

6. *(a)* Give **two** advantages of humans having internal gas exchange surfaces. [1]

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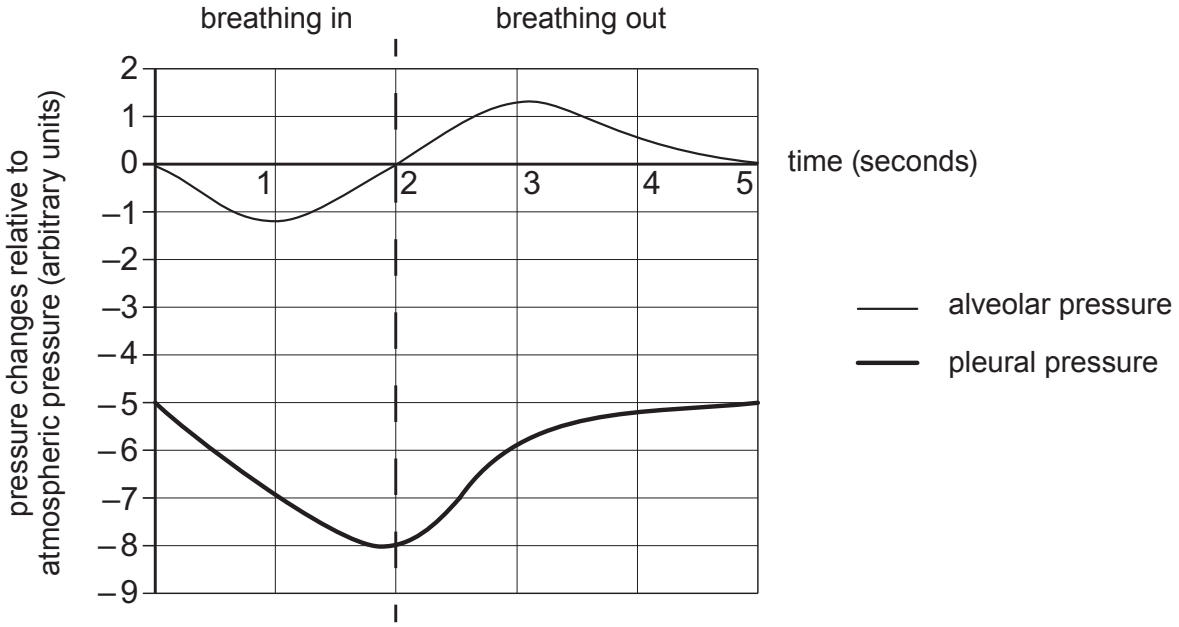
Lungs are enclosed inside the body and so humans have to breathe in actively to get oxygen to the gas exchange surface. Breathing out at rest relies mainly on elastic recoil.

The graph below shows how the pressures in the alveoli and the pleural cavity change during breathing in and out.



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(b) The outer pleural membrane is attached to the ribcage and the inner pleural membrane is attached to the outer surface of the lungs. Using your knowledge of ventilation, and with reference to the graph, explain how the outward movement of the ribcage causes the changes in the pleural and alveolar pressures during breathing in. [4]

(c) State **one** medical use of artificial surfactant and explain why it would be needed. [2]

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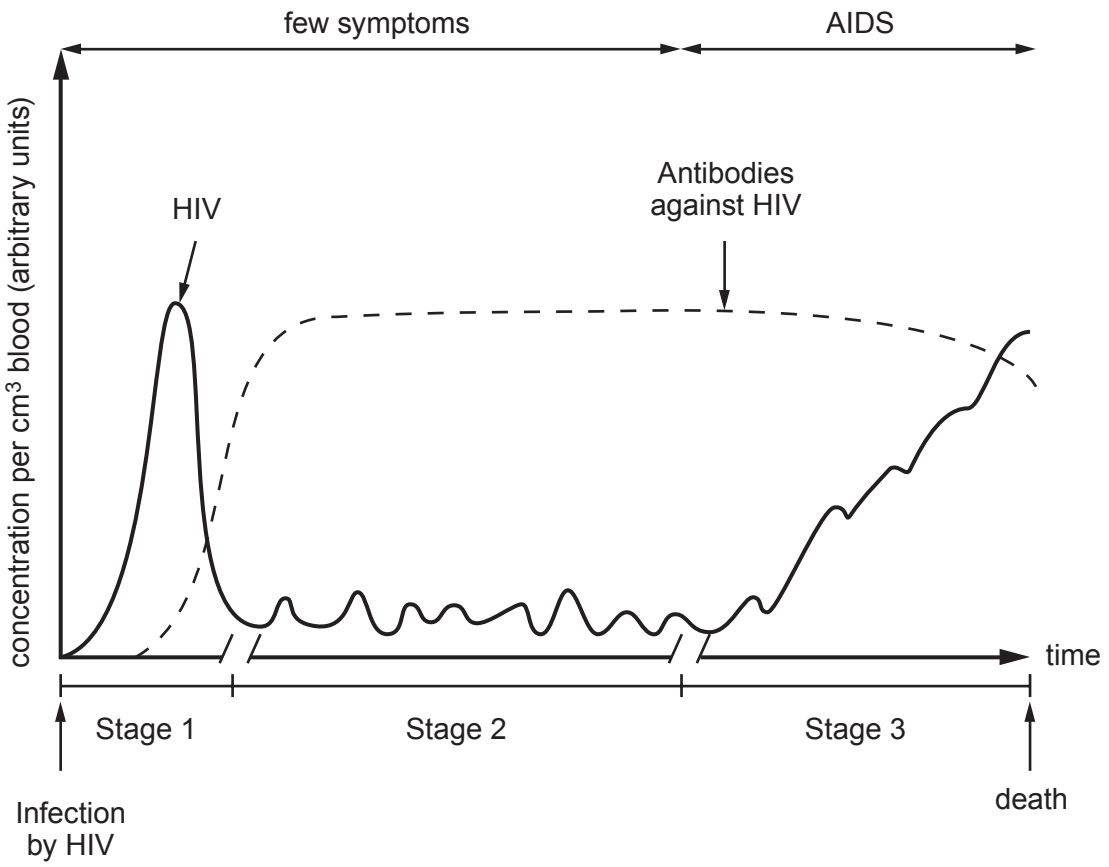
7. The diagram below shows how the concentration of HIV and antibodies against HIV change during the course of an infection with HIV.



(a) Describe how the concentration of HIV changes during the **first stage** of the infection. Explain why these changes occur. [3]

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(b) During the final stage of the infection the blood concentration of antibodies against HIV falls while the level of HIV in the blood increases. Over the same period patients begin to suffer from the symptoms of clinical AIDS and eventually die.

(i) Explain why the blood concentration of antibodies against HIV falls during the final stages of the infection. [2]

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(ii) Suggest why a patient suffering from AIDS might die from a usually non-fatal infection or cancer. [2]

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(c) Explain why it is difficult to develop an effective vaccine against HIV. [2]

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8. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* (i) Describe the functions of the different components of human blood. [5]

(ii) Explain what is meant by the ABO blood group system and its importance in blood transfusion. [5]

Or, *(b)* The sorting of living organisms, including humans, into groups of a manageable size is known as taxonomy or classification.

Describe and explain the principles underlying modern classification. [10]

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Turn over.

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END OF PAPER

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