

Candidate Name	Centre Number	Candidate Number
		2



GCE AS/A level

1072/02

HUMAN BIOLOGY – HB2

P.M. THURSDAY, 26 May 2011

1½ hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	8	
2	10	
3	11	
4	16	
5	6	
6	9	
7	10	
Total	70	

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0230001

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) Table 1 gives some features of three kingdoms of living organisms. Complete the table by stating the name of each kingdom.

[3]

Table 1

<i>Features</i>	<i>Kingdom</i>
Unicellular, no nuclear membrane, cell wall made of murein, not cellulose	
Thread-like hyphae forming a mycelium, cell wall made of chitin	
Multicellular, cells have cellulose cell wall	

- (b) Table 2 gives some details of human classification, in hierarchical order.

Table 2

<i>Taxon</i>	<i>Human</i>
Kingdom	Animalia
	Chordata
	Mammalia
	Primates
	Hominidae
	Homo
Species	sapiens

Name the class and the family to which the human belongs.

[2]

Class

Family

- (c) (i) Fossil evidence suggests that *Homo sapiens* and *Homo neanderthalensis* coexisted for at least 40 000 years. State why these two human forms might be classified as separate species despite having many common features.

[2]

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- (ii) Name a biological technique that can be used to confirm that *H. sapiens* and *H. neanderthalensis* are separate species.

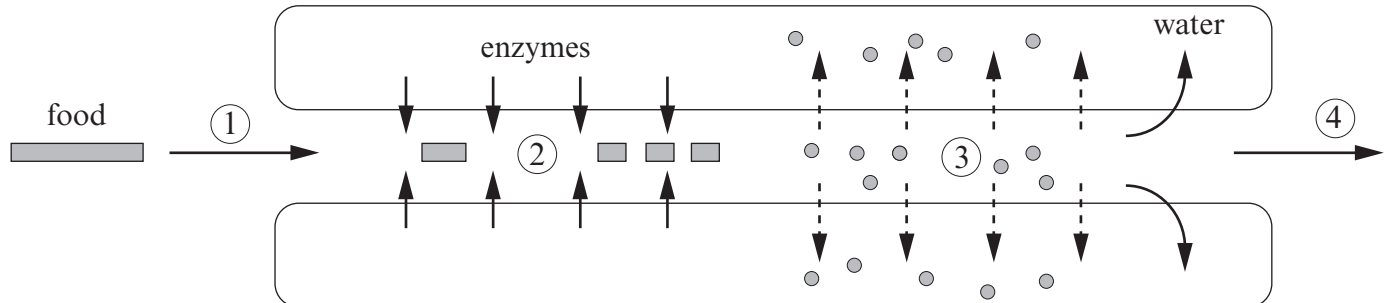
[1]

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(Total 8 marks)

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2. The diagram shows the processes that would take place in a simple tube gut.



(a) (i) Name the processes numbered 1-4.

[2]

1.

2.

3.

4.

(ii) Define the process numbered 3.

[1]

.....

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(b) (i) Explain why the digestion of proteins is more efficient if they are exposed to endopeptidases before being acted upon by exopeptidases.

[2]

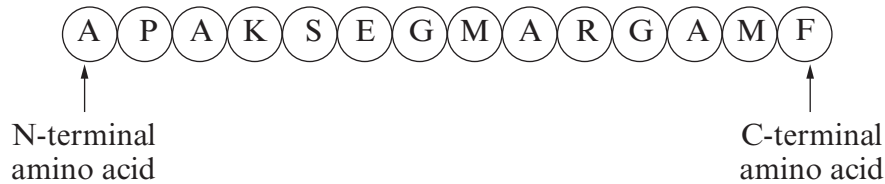
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- (ii) Figure 1 shows a peptide. Each circled letter represents a single amino acid.

Figure 1



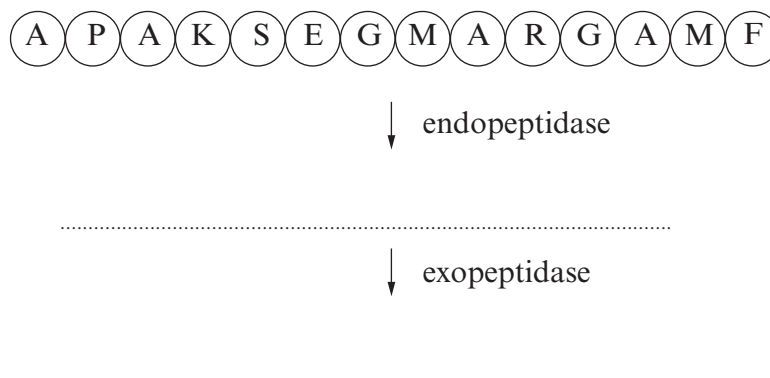
This peptide was digested first with endopeptidase and then with an exopeptidase.

Endopeptidase hydrolyses peptide bonds on the C-terminal side of either the amino acid R or the amino acid K.

Exopeptidase hydrolyses one amino acid at a time from the C-terminal end of a peptide, but will not hydrolyse a dipeptide.

Complete figure 2 to show digestion of this peptide as described above. [2]

Figure 2



- (c) Coeliac disease in humans is caused by a protein, gluten, found in wheat, barley and rye. It leads to a loss of villus height and a breakdown of microvilli.

- (i) Explain why people with coeliac disease sometimes suffer from deficiency diseases. [2]

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- (ii) Explain the reduced efficiency of digestive enzymes, such as those involved with the final breakdown of dipeptides, in people with coeliac disease. [1]

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(Total 10 marks)

Turn over.

3. A small tube called a catheter, with a pressure sensor at the tip, can be inserted through a vein and through the heart until its tip is in the pulmonary artery. It can then be used to measure pressure changes in the pulmonary artery. The diagram shows a section through the heart (diagram A) with the catheter in place. The graph (graph B) shows the pressure changes recorded in the pulmonary artery.

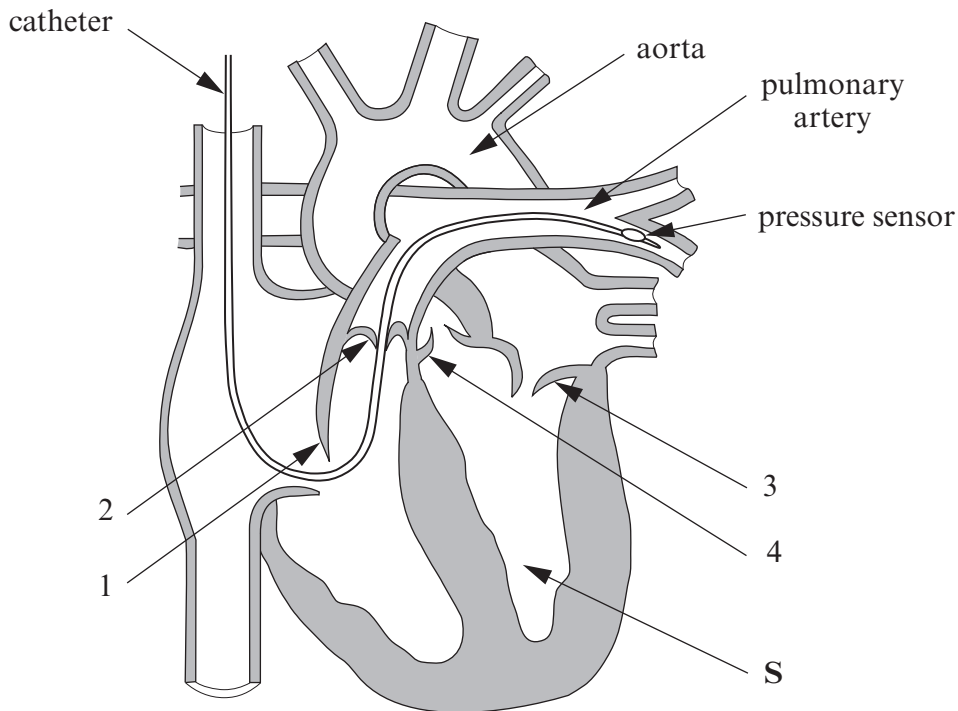
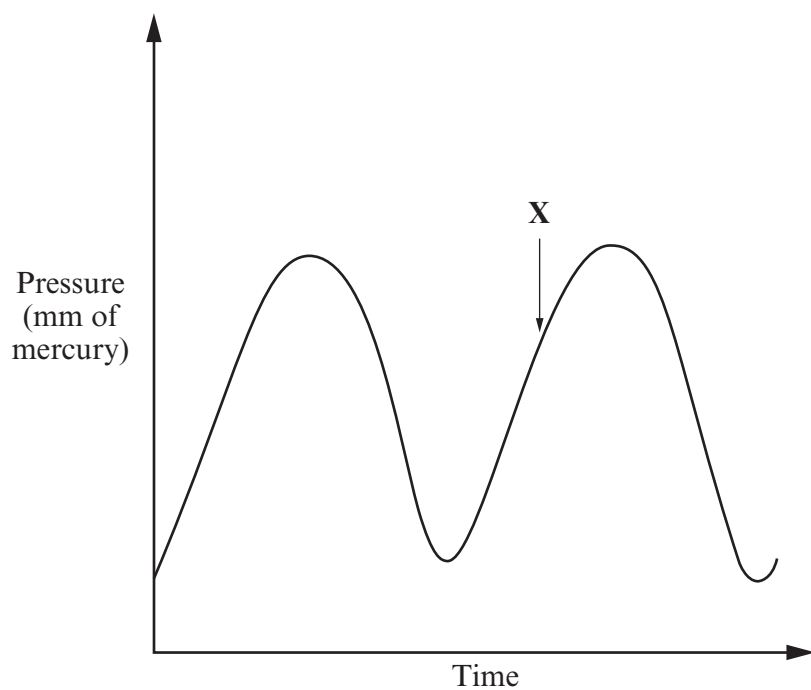


Diagram A



Graph B

- (a) (i) Name the chamber of the heart labelled S.

[1]

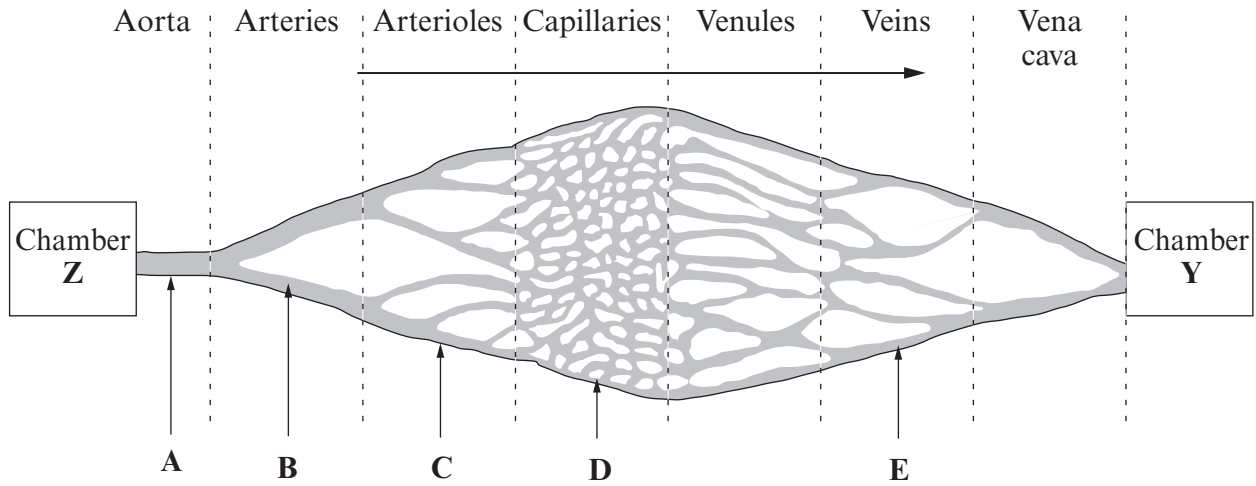
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- (ii) Complete the table by placing ticks in the appropriate boxes to show which of valves 1 to 4 will be open and which will be closed at time X on the graph. [2]

<i>Valve</i>	<i>Open</i>	<i>Closed</i>
1		
2		
3		
4		

- (iii) On graph B, sketch a line to show the pressure changes expected if the pressure in the aorta were measured at the same time. [2]

(b) The diagram shows part of the human circulatory system.



(i) At which points, A to E, would the blood pressure be lowest? [1]

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(ii) Which chamber of the heart is represented by Y? [1]

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(iii) The walls of the arterioles contain muscle. Explain how this muscle is important in controlling blood flow. [2]

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(iv) Explain why the blood pressure decreases rapidly in region C. [1]

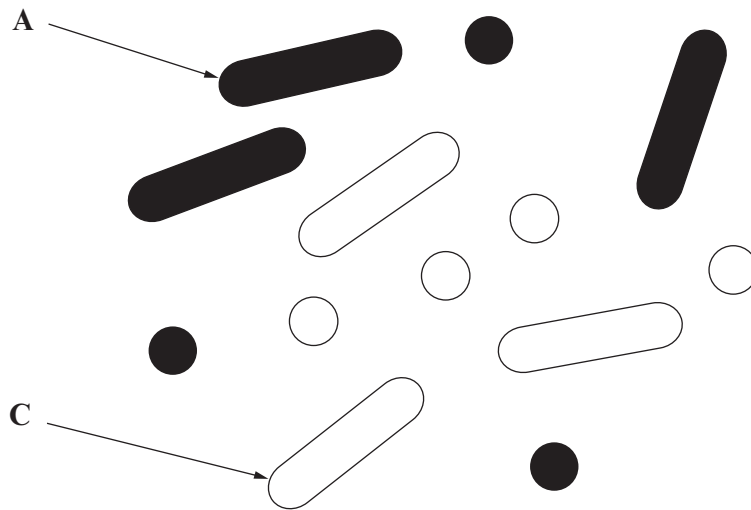
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(v) Why is it important that the pressure is low in region D? [1]

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(Total 11 marks)

4. Bacteria must be stained to be identified. A sample of bacteria was stained and the results shown below.



Key:



Purple stain



Red stain

- (a) Explain the reason for the difference in staining between the bacteria labelled **A** and **C**. [2]

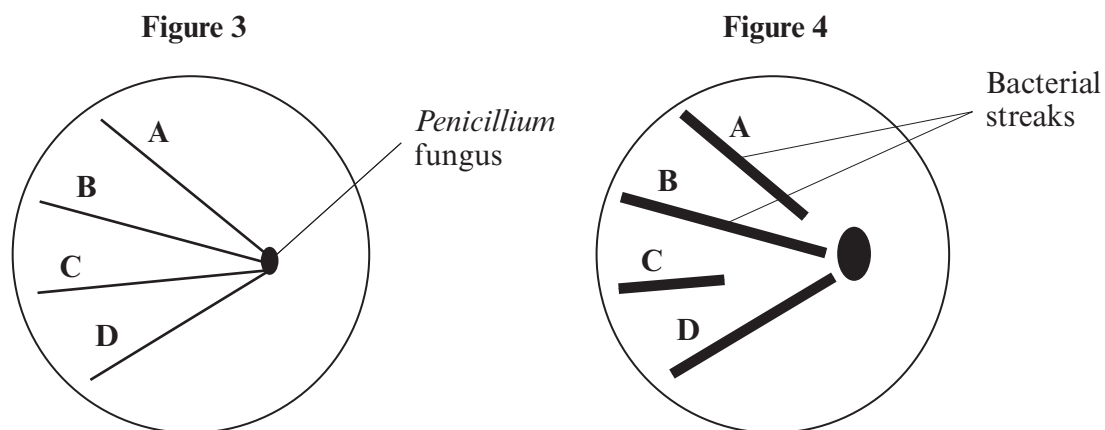
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- (b) A disc of growing *Penicillium* fungus was placed on an agar plate which was inoculated with four different types of bacteria, A, B, C and D, in streaks as shown in figure 3. Figure 4 shows the appearance of the agar plate after it had been incubated for two days.



Explain the appearance, after incubation, of

1. the *Penicillium* fungus;

[1]

.....

2. the bacterial streaks.

[3]

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- (c) Tetracycline is a bacteriostatic antibiotic. It is effective against many species of bacteria but it does not affect human cells.

When a person has a bacterial infection and is treated with tetracycline, the concentration of tetracycline in the person's cells is much lower than in the bacterial cells.

Once inside the bacterial cell, tetracycline prevents protein synthesis.

Scientists have recently discovered a worrying feature about tetracycline. It increases the transfer of antibiotic resistant genes from one species of bacterium to another.

Use information from the passage and your own knowledge to answer the questions.

- (i) Explain why tetracycline is described as *bacteriostatic*. [1]

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.....

- (ii) Explain why tetracycline is effective against many species of bacteria. [1]

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- (iii) Suggest why the concentration of tetracycline is much lower in a human's cells than in bacterial cells. [1]

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- (iv) Explain what is meant by an *antibiotic resistant gene*. [1]

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- (v) Explain why the discovery that tetracycline increases the transfer of antibiotic resistance causes concern to scientists. [2]

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- (d) Tetracycline belongs to a group of antibiotics called 'broad spectrum' antibiotics. Explain how *Penicillium*, a 'narrow spectrum' antibiotic, destroys bacteria. [4]

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(Total 16 marks)

5. (a) Define an *antigen*.

[2]

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(b) The table gives information about some components of red blood cells.

<i>Component</i>	Glycoprotein	Phospholipid	Haemoglobin
<i>Location in cell</i>	on outer surface of plasma membrane	within plasma membrane	in cytoplasm


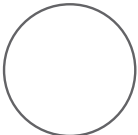
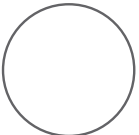
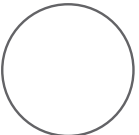
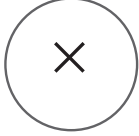
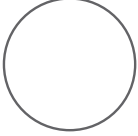
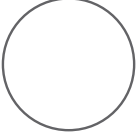
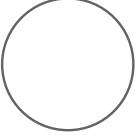
Suggest which component of an intact red blood cell is most likely to act as an antigen during a blood transfusion. Explain your answer. [2]

Component

Explanation

.....

(c) Samples of blood of each group A, B, AB and O were tested with anti-A and anti-B antibodies. In some of the samples this resulted in agglutination. The results of the tests with blood group A are shown in the table below. Agglutination is shown as a tick (✓) and no agglutination is shown as a cross (×).

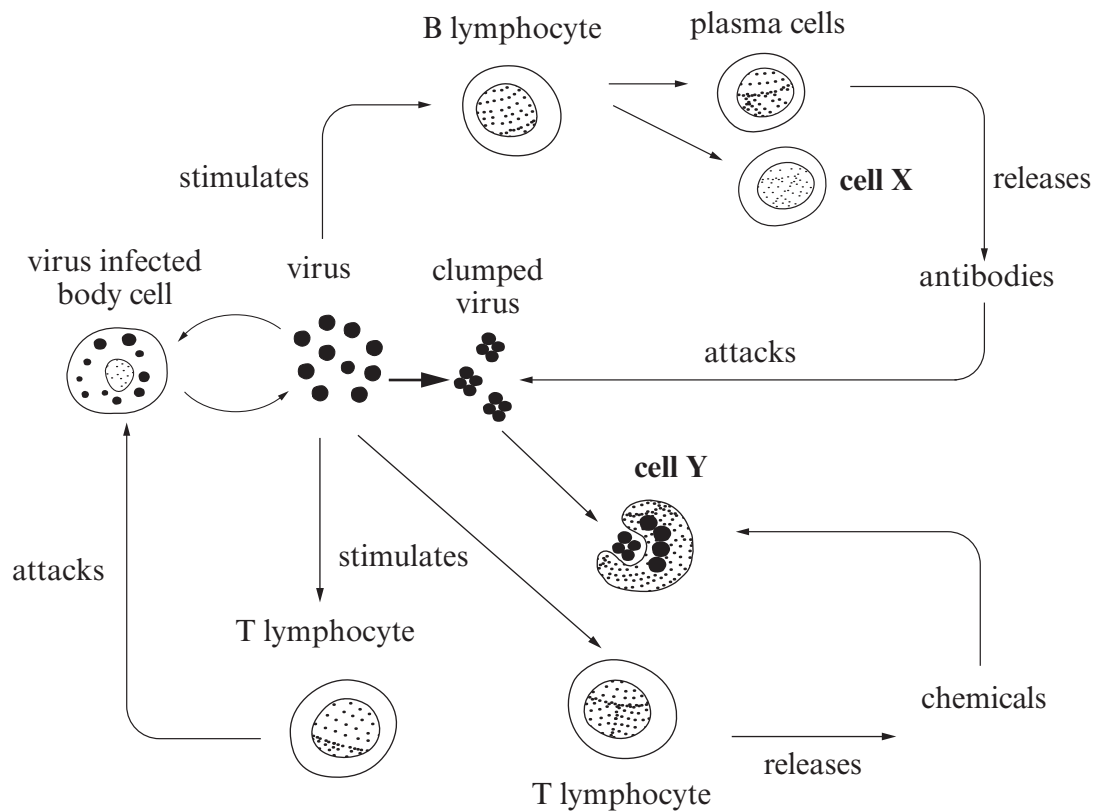
Blood group	A	B	AB	O
Appearance with anti-A antibodies				
Appearance with anti-B antibodies				

Complete the table with a tick or a cross to show the results you would expect for blood groups B, AB and O. [2]

(Total 6 marks)

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6. The diagram shows some of the events occurring during the process of immunity.



(a) Name **cell X** and describe its function. [2]

Name

Function

(b) (i) With reference to the diagram, suggest why some T lymphocytes are referred to as *killer cells*. [1]

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(ii) What is the function of **cell Y**? [1]

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(iii) How do T lymphocytes affect the activity of **cell Y**? [1]

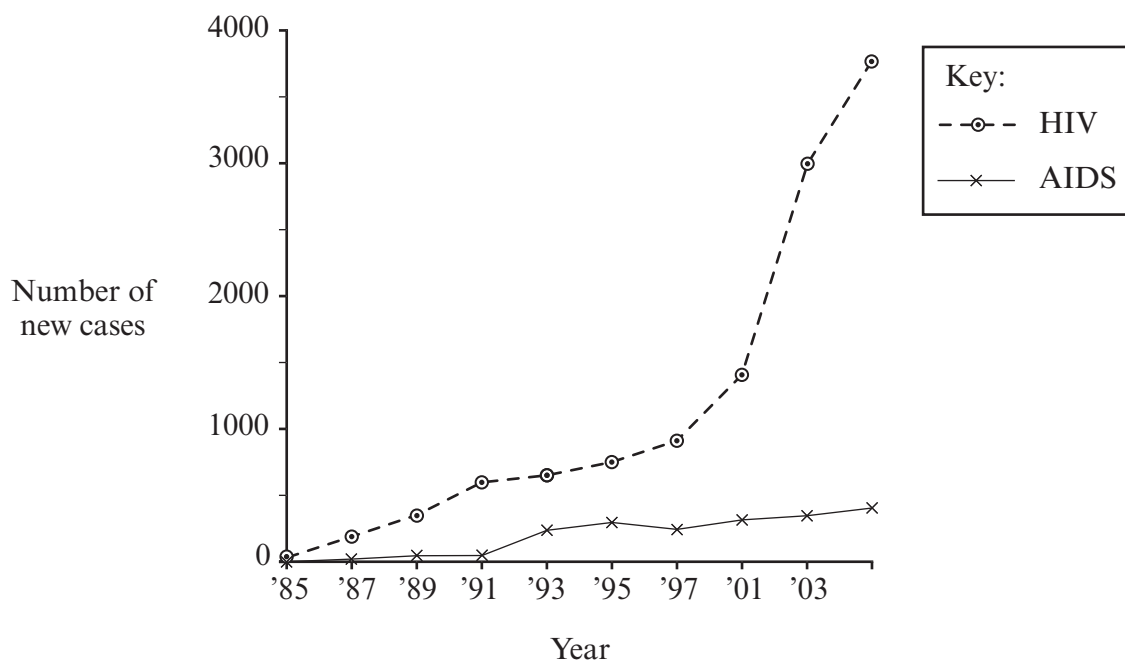
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(c) Describe how antibodies are specific to a virus. [1]

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- (d) Acquired immune deficiency syndrome (AIDS) can develop after infection by the human immunodeficiency virus (HIV). The graph shows the number of people newly infected with HIV and newly diagnosed with AIDS between 1985 and 2003.



- (i) Describe what the graph shows about the number of people newly infected with HIV. [1]

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- (ii) Explain why the curve for AIDS does not follow the same pattern as the curve for HIV. [2]

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(Total 9 marks)

Any diagrams included in your answer must be fully annotated.

- Or,** (b) Write an account to include the causative organism, symptoms, mode of transmission, treatment and prevention of the disease for

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This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting or typing. There are no margins, text, or other markings on the page.

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