



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
 General Certificate of Education  
 Advanced Subsidiary Level and Advanced Level

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**BIOLOGY**

**9700/21**

Paper 2 Structured Questions AS

**May/June 2013**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name in the spaces provided at the top of this page.

Write in dark blue or black ink.

You may use a soft pencil for any diagrams, graphs, or rough working.

Do not use red ink, staples, paper clips, highlighters, glue or correction fluid.

**DO NOT WRITE IN ANY BARCODES.**

Answer **all** questions.

Electronic calculators may be used.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **12** printed pages.

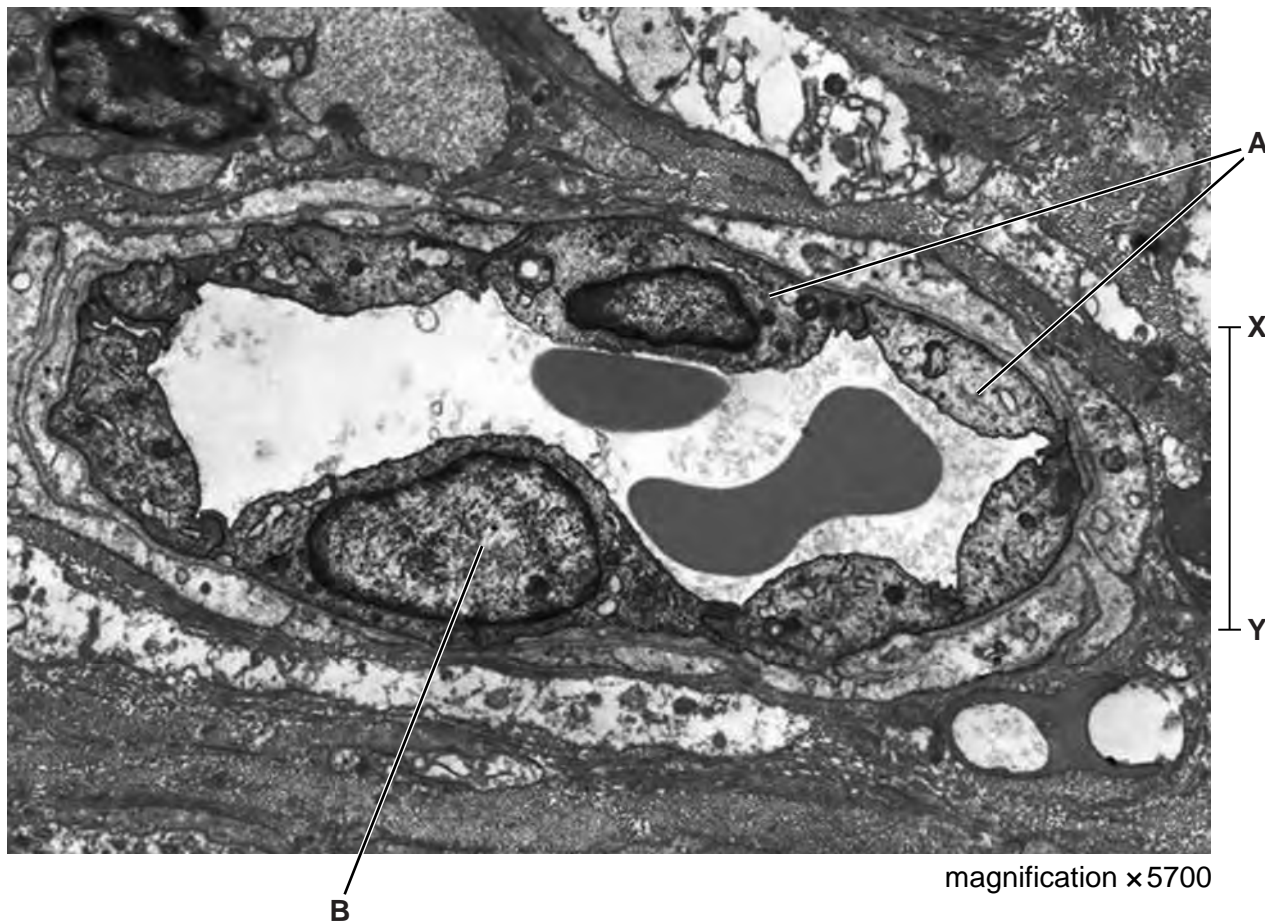


Answer **all** the questions.

For  
Examiner's  
Use

- 1 Capillaries are known as exchange vessels. Substances are exchanged between blood and tissue fluid as the blood flows through the capillaries.

Fig. 1.1 is an electron micrograph of a section through a capillary with two red blood cells.



**Fig. 1.1**

- (a) (i) Name the cells labelled **A** and the structure labelled **B**.

**A** .....

**B** ..... [2]

- (ii) Calculate the actual distance **X – Y** on Fig. 1.1.

Show your working and give your answer to the nearest micrometre ( $\mu\text{m}$ ).

answer .....  $\mu\text{m}$  [2]

3

(iii) Explain how capillaries are adapted for their function as exchange vessels.

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Use

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..... [2]

(b) Table 1.1 shows the composition of blood, tissue fluid and lymph.

Table 1.1

component	blood	tissue fluid	lymph
red blood cells /cells mm <sup>-3</sup> × 10 <sup>6</sup>	5.1	0.0	0.0
white blood cells /cells mm <sup>-3</sup>	9 000	75	1 000 000
glucose/g dm <sup>-3</sup>	800	800	775
protein/g dm <sup>-3</sup>	71	1	26

Explain the differences between the composition of blood, tissue fluid and lymph as shown in Table 1.1, for white blood cells, glucose and protein.

*white blood cells* .....

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*glucose* .....

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*protein* .....

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..... [5]

4

(c) Outline how **red blood cells** are involved in the transport of carbon dioxide.

*For  
Examiner's  
Use*

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[Total: 14]

2 (a) Explain how the virus that causes measles is transmitted.

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(b) Antibodies against measles are produced by plasma cells during an immune response.

Fig. 2.1 shows a diagram of an antibody molecule.

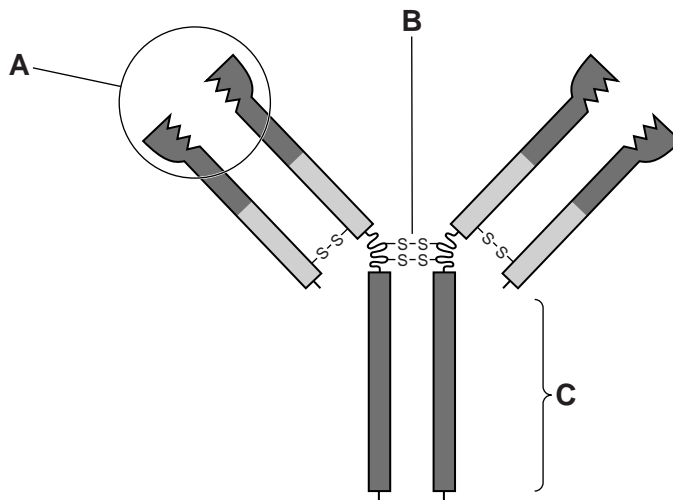


Fig. 2.1

Explain the functions of the parts labelled A, B and C.

(i) A .....

.....

.....

..... [2]

(ii) B .....

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..... [1]

(iii) C .....

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..... [1]

[Total: 6]

[Turn over





4 Fig. 4.1 shows the two base pairs in a DNA molecule.

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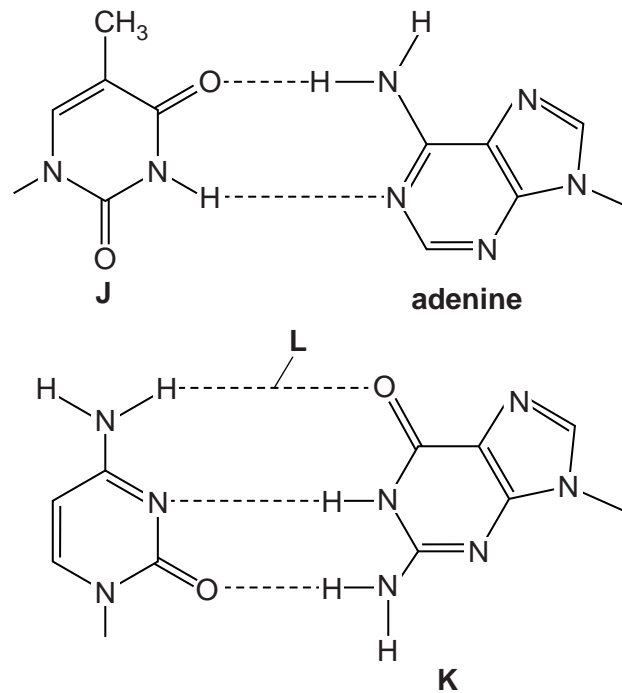


Fig. 4.1

(a) Name the bases labelled **J** and **K** and the bond labelled **L**.

**J** .....

**K** .....

**L** ..... [3]

HIV enters T-lymphocytes by a form of endocytosis. Two of the enzymes in HIV are:

- reverse transcriptase, which uses viral RNA as a template to make DNA to incorporate into the chromosomes of the host's cells
- protease, which is used to break a polypeptide into smaller molecules. These molecules are used to make the protein coat of new viral particles, which will infect other cells.

Various drugs have been developed to treat HIV infections. Table 4.1 gives information about some of these drugs.

Table 4.1

drug	enzyme inhibited	mode of action
zidovudine	reverse transcriptase	occupies active site
tenofovir	reverse transcriptase	occupies active site
efavirenz	reverse transcriptase	occupies sites other than the active site
atazanavir	protease	occupies active site



9

(b) Explain the difference between the mode of action of zidovudine and efavirenz.

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(c) People who receive drug treatment for HIV take a mixture of drugs that act in different ways.

Suggest the advantage of taking a mix of the drugs shown in Table 4.1.

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..... [2]

(d) Antibiotics are prescribed to people who have HIV/AIDS for the treatment of secondary infections, but not to treat the HIV infection.

Explain why this is so.

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..... [2]

[Total: 11]

5 Fig. 5.1 shows a section of a cell surface membrane.

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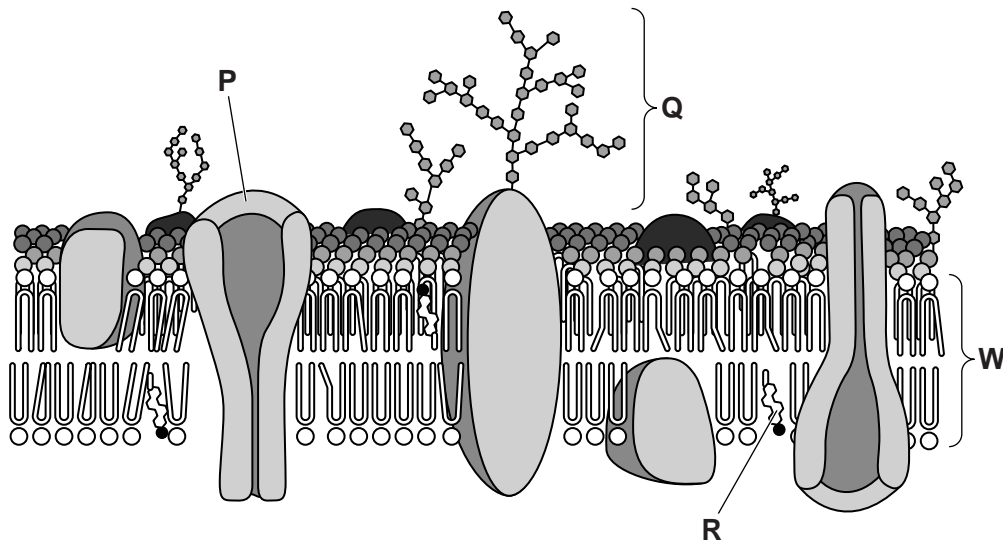


Fig. 5.1

(a) State the functions of structures P, Q and R.

P .....

.....

Q .....

.....

R .....

..... [3]

(b) Circle the width of the membrane shown as W in Fig. 5.1.

17.0 μm    1.7 μm    0.7 μm    70.0 nm    17.0 nm    7.0 nm    0.7 nm    [1]

(c) Membranes, such as the cell surface membrane, are described as having a fluid mosaic structure.

Explain what is meant by the term *fluid mosaic*.

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..... [2]



(c) Fig. 6.1 shows the changes in mortality rates for lung cancer in five countries between 1950 and 2006 for males.

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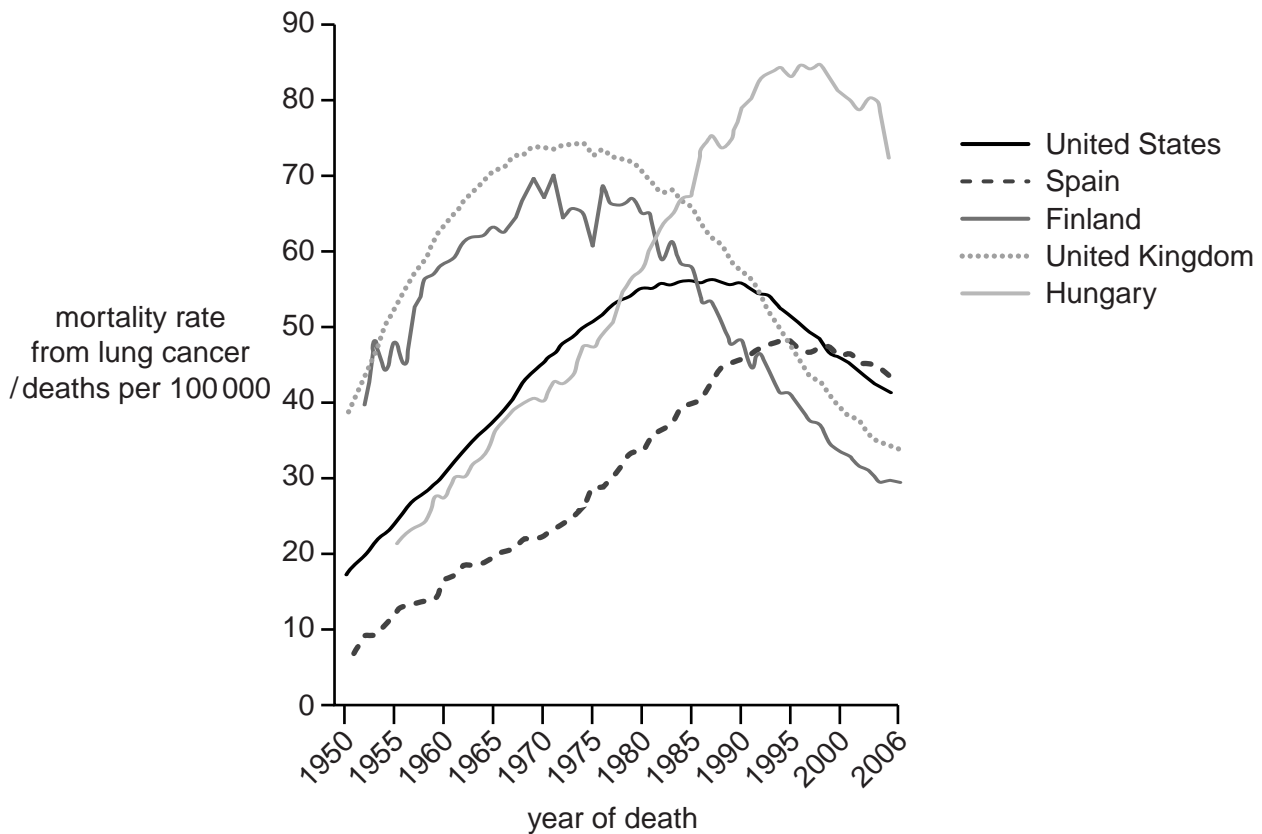


Fig. 6.1

With reference to Fig. 6.1, describe the similarities **and** differences in the trends in mortality rates in the countries shown.

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[3]

[Total: 9]

Copyright Acknowledgements:

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