

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**Advanced Subsidiary GCE**

**BIOLOGY**

**2802**

Human Health and Disease

Tuesday

**8 JUNE 2004**

Morning

1 hour

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Ruler (cm/mm)

Candidate Name

Centre Number

Candidate  
Number

	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; height: 20px;"></td> <td style="width: 10%; height: 20px;"></td> <td style="width: 10%; height: 20px;"></td> <td style="width: 10%; height: 20px;"></td> <td style="width: 10%; height: 20px;"></td> <td style="width: 10%; height: 20px;"></td> </tr> </table>							<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; height: 20px;"></td> <td style="width: 10%; height: 20px;"></td> <td style="width: 10%; height: 20px;"></td> <td style="width: 10%; height: 20px;"></td> <td style="width: 10%; height: 20px;"></td> </tr> </table>					

**TIME** 1 hour

**INSTRUCTIONS TO CANDIDATES**

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Read each question carefully before starting your answer.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

<b>FOR EXAMINER'S USE</b>		
<b>Qu.</b>	<b>Max.</b>	<b>Mark</b>
1	10	
2	11	
3	8	
4	13	
5	6	
6	12	
<b>TOTAL</b>	<b>60</b>	

**This question paper consists of 16 printed pages.**

Answer **all** the questions.

1 A balanced diet contains the following:

- sufficient energy to meet an individual's needs
- essential amino acids
- essential fatty acids
- vitamins
- minerals
- water
- fibre

(a) State **three** groups of nutrients that provide energy in the diet.

.....[1]

(b) The table below contains statements about four nutrients that are part of a balanced diet.

Complete the table to show which statements apply to the nutrients by putting a tick (✓) in the appropriate box.

Some of the statements apply to more than one nutrient.

	nutrient			
	vitamin A	vitamin D	essential amino acids	essential fatty acids
nutrient cannot be synthesised in the body				
nutrient is converted into a protein				
nutrient deficiency in adults causes osteomalacia				
nutrient is stored in fat tissue				
nutrient is converted to a light sensitive pigment in the eye				

[5]

(c) In the West African country of The Gambia, 28% of children under five years of age suffer from stunted growth as a result of severe malnutrition.

Outline the likely effects, **other than on growth**, of long-term severe malnutrition on the body of a young child.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 10]

- 2 The vital capacity and the forced expiratory volume of a person with asthma were measured over a period of 23 days. The forced expiratory volume is the volume of air that can be breathed out in one second. On day 4 of the investigation, the person breathed in an allergenic substance.

The results are shown in Fig. 2.1.

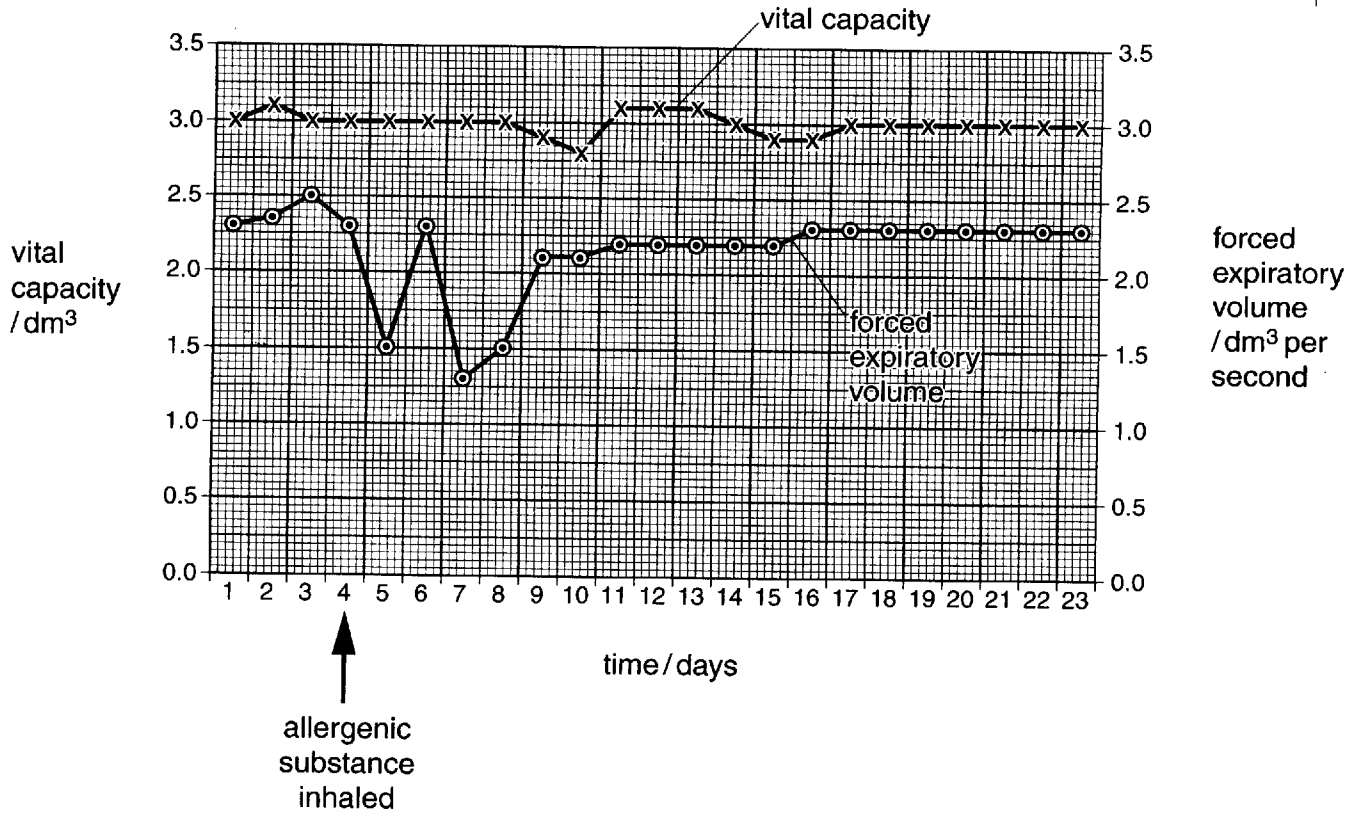


Fig. 2.1

- (a) (i) Calculate for day 1 the percentage of the vital capacity that was breathed out in one second.

Show your working and give your answer to the nearest whole number.

answer .....% [2]

(ii) Using the data in Fig. 2.1, describe the effect of the allergenic substance on the forced expiratory volume and the vital capacity.

forced expiratory volume .....

.....

.....

.....

vital capacity .....

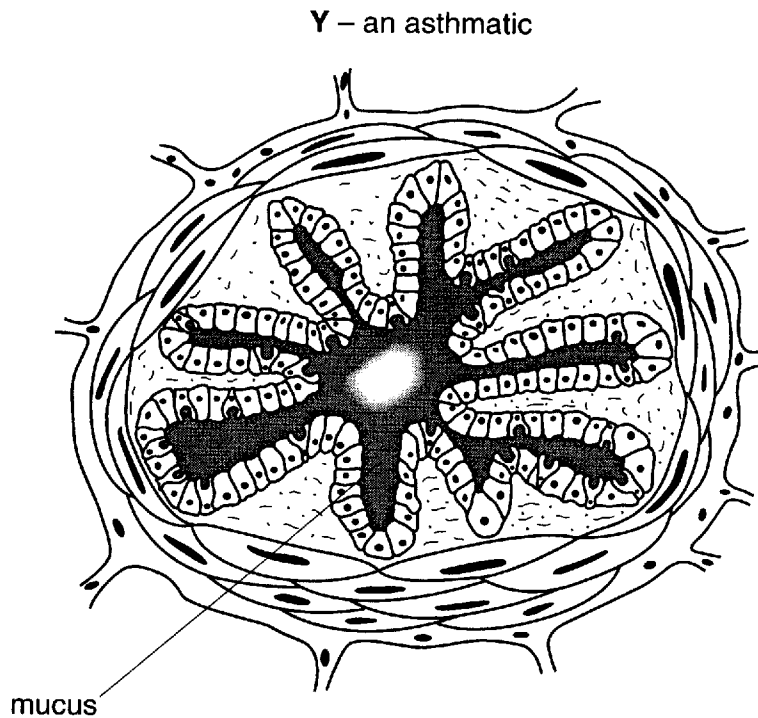
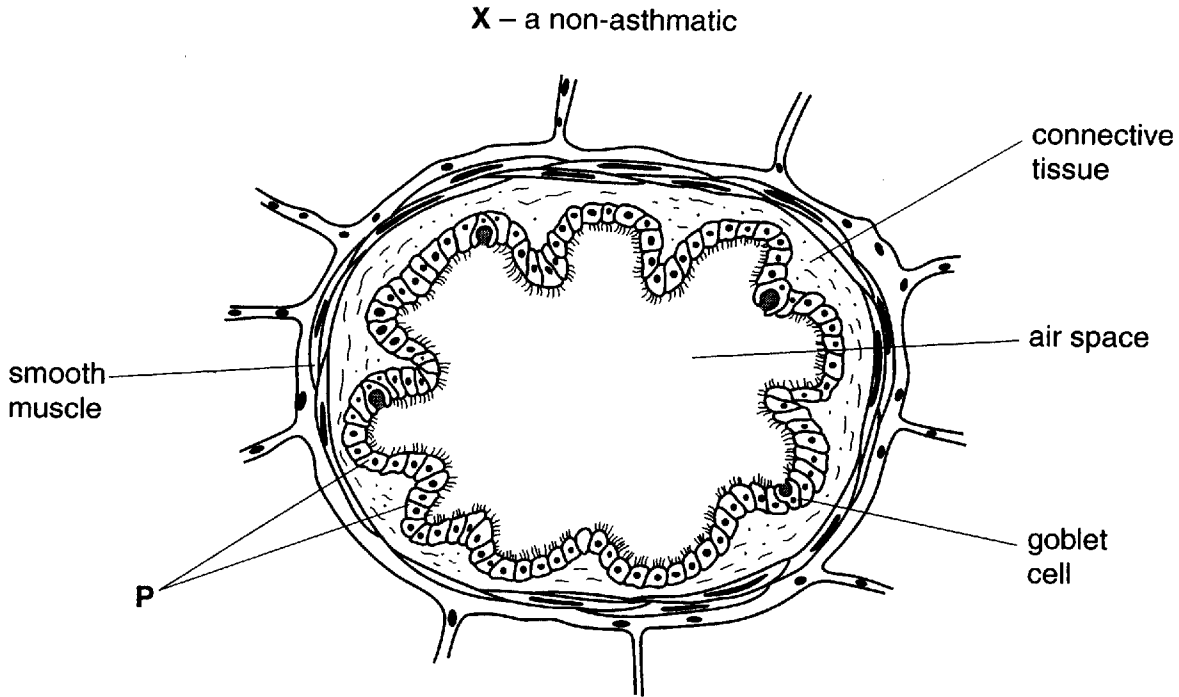
.....

.....

.....[3]

Fig. 2.2 shows drawings made from cross sections of the upper bronchioles of a non-asthmatic, X, and an asthmatic, Y. The sections were drawn from observations made with a light microscope.

Upper bronchioles normally have an epithelium with a few, scattered, goblet cells.



**Fig. 2.2**

**(b)** Describe the function of the cells labelled **P** on Fig. 2.2 in the gas exchange system.

.....  
.....  
.....  
.....  
.....[3]

**(c)** Use the information given in Fig. 2.2 to explain the following observations made on the bronchioles of an asthmatic during an attack of asthma.

**(i)** The bronchioles fill with mucus.

.....  
.....  
.....  
.....

**(ii)** The cross sectional area of the air spaces in the bronchioles decreases.

.....  
.....  
.....  
.....[3]

[Total: 11]

3 The following passage is taken from a medical encyclopaedia.

Smokers are at risk of developing two long-term conditions. In the first, there is breathlessness, wheezing and a cough, dry at first but later with increasing production of sputum. This condition is likely to become permanent with age and lead to progressive disability. It is commonly associated with a second condition in which the chest sometimes becomes barrel-shaped. In this condition, there is a deficient oxygen supply which leads to a reduction in the amount of exercise a person can do. There may be a blueness of the skin. The condition may become so severe that oxygen has to be supplied by mask.

(a) Name the **two** medical conditions described in the passage.

- 1 .....
- 2 .....[2]

(b) Fig. 3.1 shows a cross section of a coronary artery from a patient who had a heart attack.

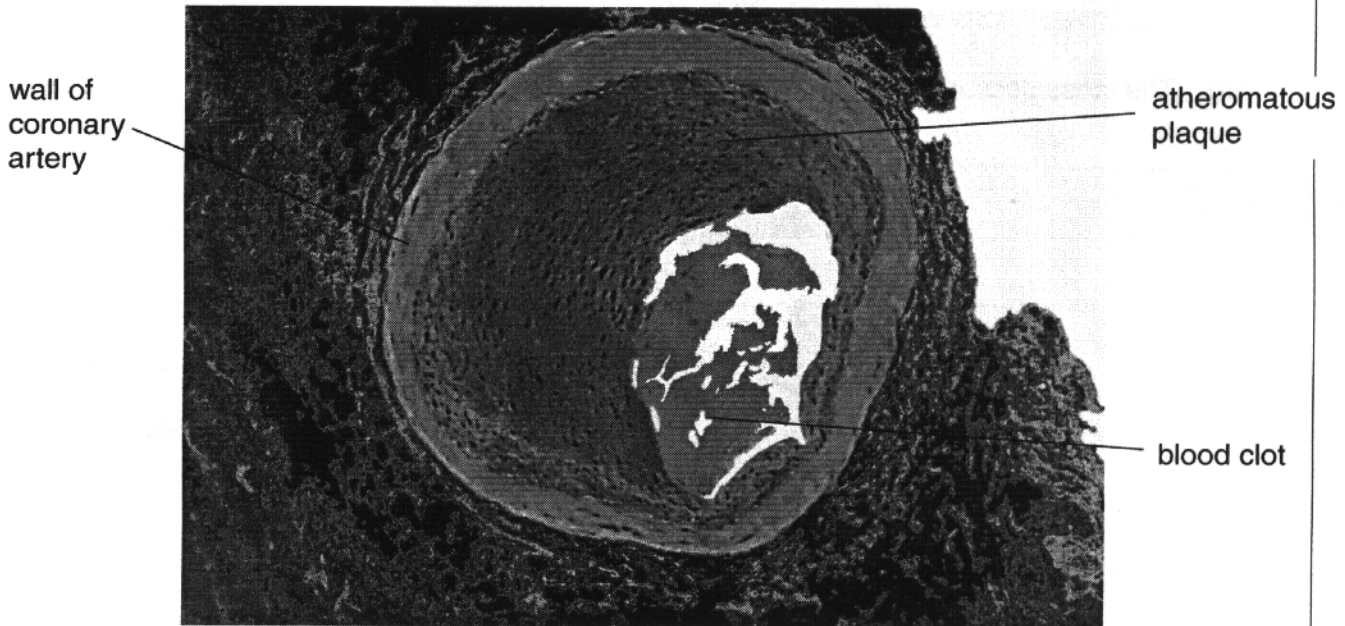


Fig. 3.1

Describe how **changes** in the walls of coronary arteries make it likely that a blood clot will develop.

- .....
- .....
- .....
- .....
- .....
- .....[3]



- (c) Outline how nicotine and carbon monoxide in cigarette smoke may increase the risks of atherosclerosis and blood clotting.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[3]

[Total: 8]

4 Fig. 4.1 is a diagram that shows the origin and maturation of lymphocytes.

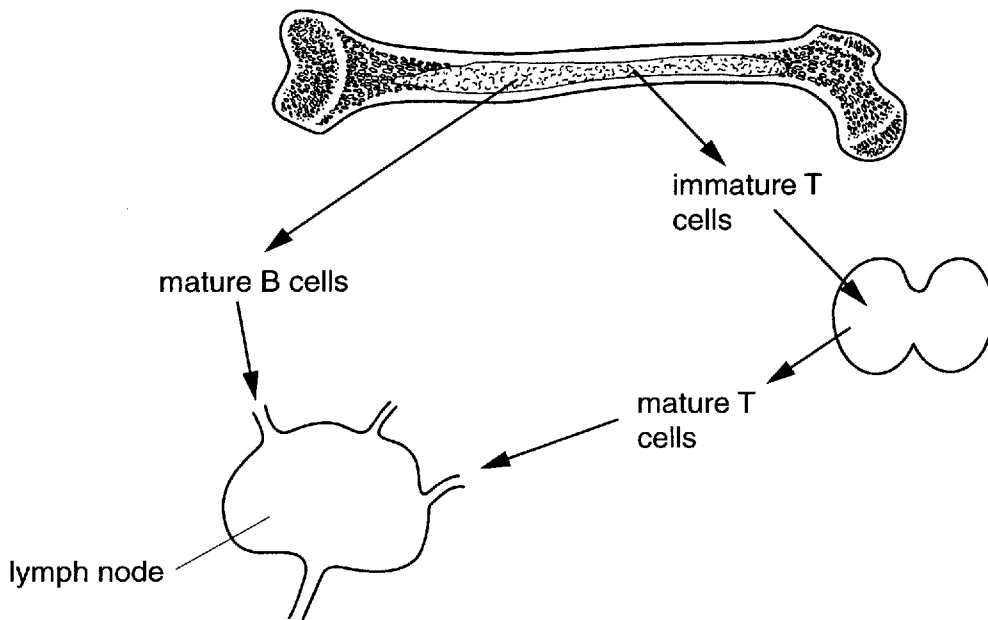


Fig. 4.1

Fig. 4.2 shows the changes that occur to B and T lymphocytes during an infection by a pathogen, such as a virus.

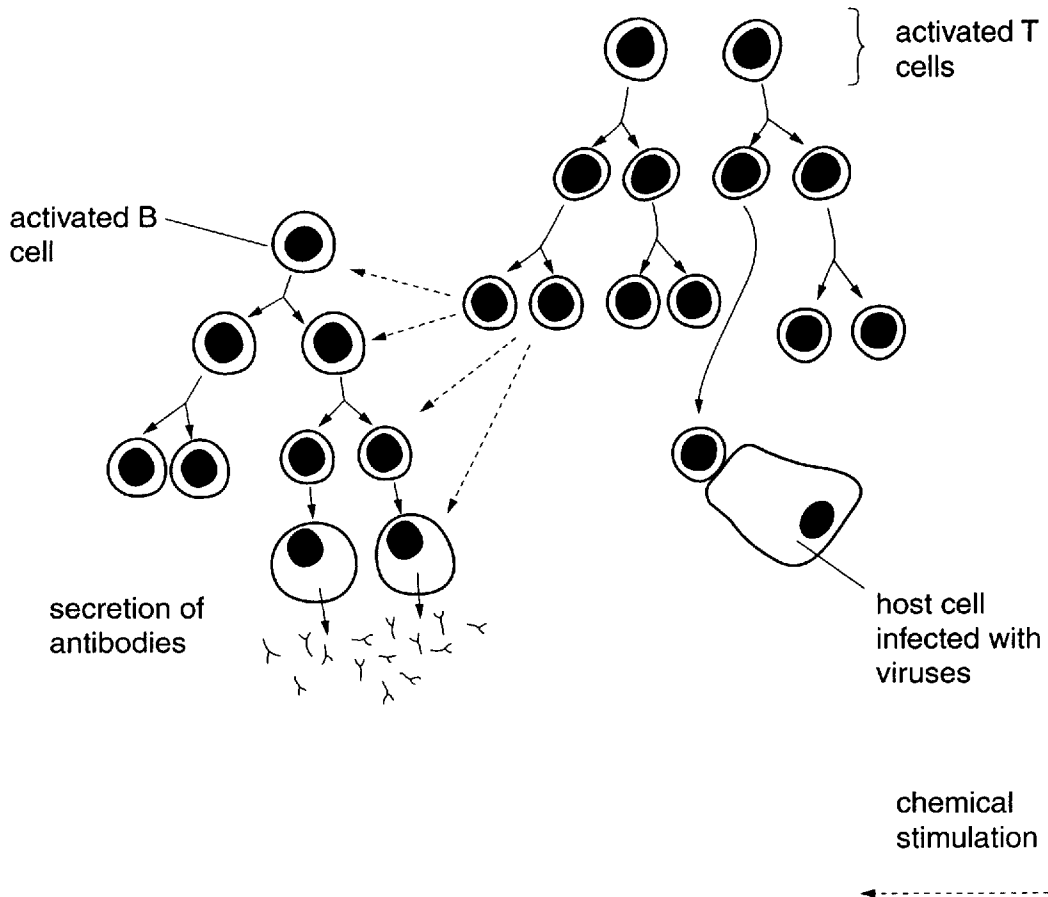


Fig. 4.2

(a) Complete the following passage using the most appropriate terms.

The cells of the immune system originate from .....  
where stem cells divide by mitosis to produce cells that differentiate into lymphocytes  
and .....

Immature T lymphocytes migrate to the ..... gland where they mature.  
Mature B lymphocytes and mature T lymphocytes circulate and enter lymph nodes.  
During an immune response some B lymphocytes differentiate into .....  
..... and secrete ..... [5]

(b) In this question, one mark is available for the quality of written communication.

Describe the changes that occur to **T lymphocytes** during an immune response.  
Explain the roles of **T lymphocytes** in fighting an infection by a pathogen, such as a  
virus.

You may use information from Fig. 4.2 in your answer.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

[7]

Quality of Written Communication [1]

[Total: 13]



6 HIV is transmitted in a variety of ways.

In the UK, most of the HIV infections reported to the Communicable Disease Surveillance Centre (CDSC) have occurred as a result of sex between men.

(a) Describe **three** ways in which HIV is transmitted, **other than during sexual activity**.

- 1 .....
- .....
- 2 .....
- .....
- 3 .....
- .....[3]

(b) The CDSC collects statistics on HIV/AIDS and estimates the total number of people who are infected with HIV. This increases in the UK each year and in 2002, the CDSC estimated the number to be about 33 500. It also estimated that 30% of these people were not diagnosed.

Fig. 6.1 shows the numbers of new HIV and AIDS diagnoses and deaths in those infected through sex between men in the UK between 1985 and 2001.

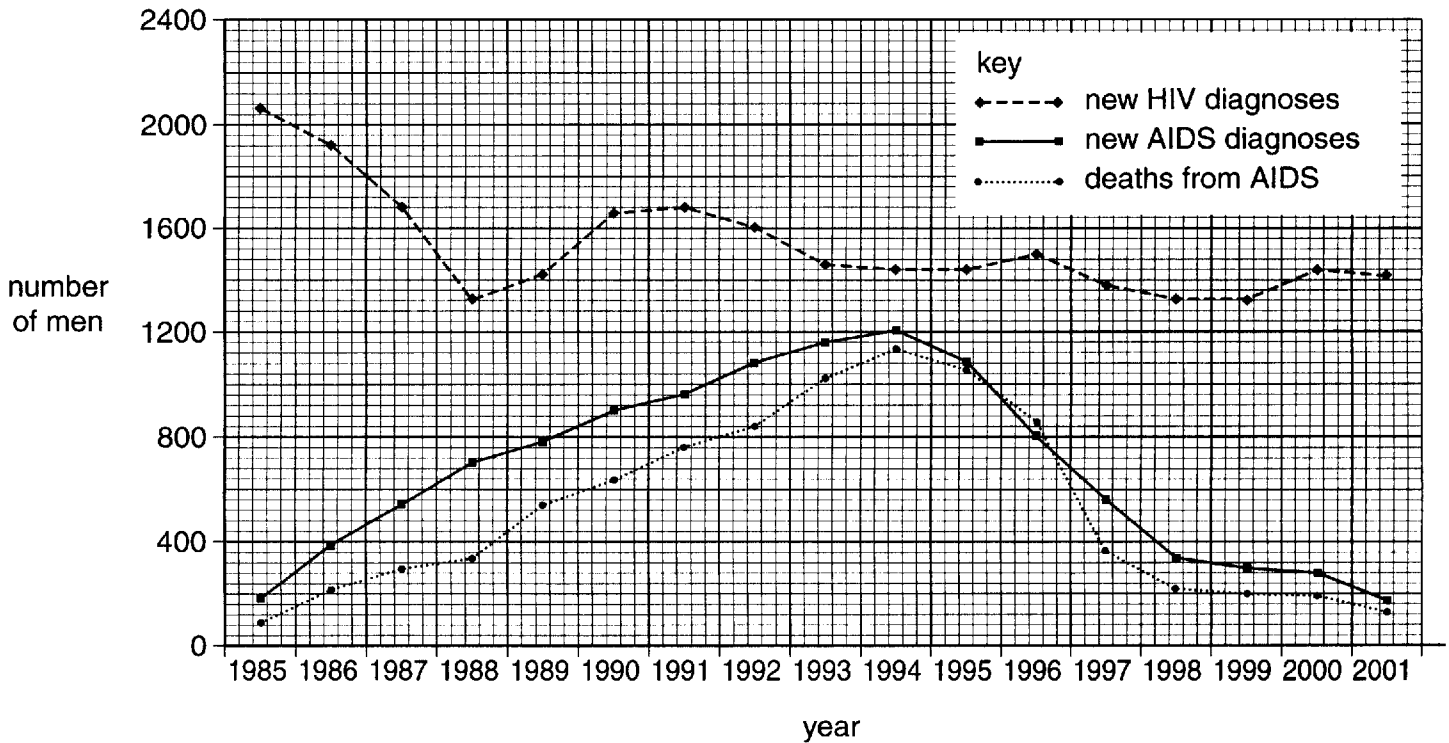


Fig. 6.1

- (i) Using the data in Fig. 6.1, describe the changes that have occurred in the numbers of men diagnosed with HIV between 1985 and 2001.

.....

.....

.....

.....

.....

- (ii) Explain the **decrease** in number of men who have been diagnosed with AIDS and who have died from HIV/AIDS since 1994.

.....

.....

.....

.....

.....

- (iii) Using the data in Fig. 6.1, explain why the number of people infected with HIV in the male homosexual population in the UK is increasing.

.....

.....

.....

.....

.....

[6]

- (c) Explain the importance to health authorities of statistics on infectious diseases, such as those shown in Fig. 6.1.

.....

.....

.....

.....

.....

.....

[3]

[Total: 12]

## END OF QUESTION PAPER

---

*Copyright acknowledgements:*

- Q.2 Fig. 2.1 Graph from *ABC of Allergies*, p28 top figure, edited by S. R. Durham. The British Medical Journal, 1998. (ISBN 0 7279 1236 4)
- Q.3 Passage adapted from *Royal Society of Medicine Health Encyclopaedia*, edited by Dr R. Youngson. Bloomsbury/Softback Preview
- Q.3 Fig. 3.1 © Science Photo Library
- Q.5 Table 5.1 Data from:
1. *World Health and Disease*, p24 Table 2.4, edited by A. Grey. Open University Press, 1995. (ISBN 0 335 19078 2) Data originally from *United Nations Demographic Yearbook, 1989*.
  2. *World Health Report (1999)*, World Health Organisation
- Q.6 Fig. 6.1 Graph from the Public Health Laboratory Service website:  
[http://www.phls.org.uk/topics\\_az/hiv\\_and\\_sti/hiv/epidemiology/epidemiology.htm](http://www.phls.org.uk/topics_az/hiv_and_sti/hiv/epidemiology/epidemiology.htm)