

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 |
|----------------|---------------|---------------------|
| | | |

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.

| FOR EXAMINER'S USE | | | |
|--------------------|------|------|--|
| Qu. | Max. | Mark | |
| 1 | 10 | | |
| 2 | 11 | | |
| 3 | 8 | | |
| 4 | 13 | | |
| 5 | 6 | | |
| 6 | 12 | | |
| TOTAL | 60 | | |
| | | | |

2

Answer all the questions.

For Examiner's Use

- 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 | | | | |

3

For Examiner's Use

| (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. |
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| | [4] |
| | [Total: 10] |

4

For Examiner's Use

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.

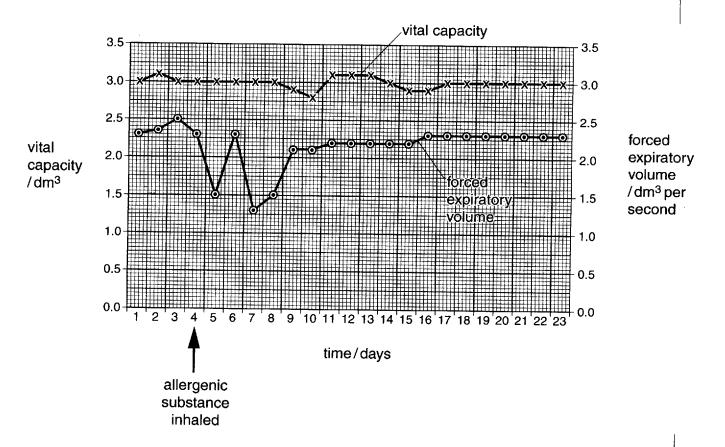


Fig. 2.1

(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.

5

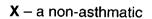
For Examiner's

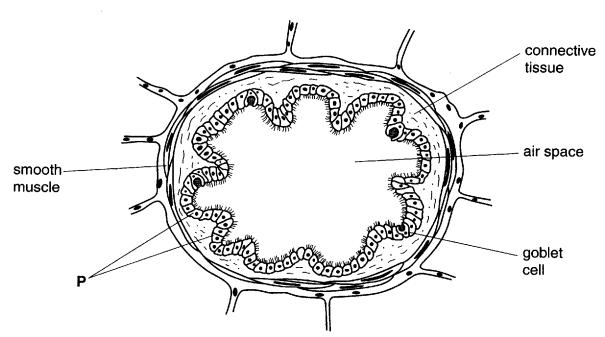
| ii) | Using the data in Fig. 2.1, describe the effect of the allergenic substance on the forced expiratory volume and the vital capacity. |
|-----|---|
| | forced expiratory volume |
| | |
| | |
| | vital capacity |
| | |
| | |
| | [3 |

For Examiner's Use

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

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





Y - an asthmatic

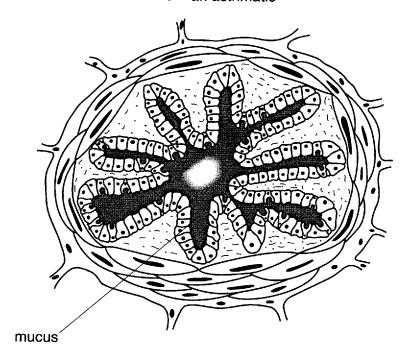


Fig. 2.2

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| (b) | Des | cribe the function of the cells labelled P on Fig. 2.2 in the gas exchange system. |
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| | | [3] |
| (c) | Use bror | the information given in Fig. 2.2 to explain the following observations made on the achieles 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. |
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| | | [3] |
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[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. | |
| wall of coronary artery | atheromator plaque blood clot | us |
| | Fig. 3.1 | |
| | Describe how changes in the walls of coronary arteries make it likely that a blood clot will develop. | |

| vill develop. | | | | | |
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| (c) | Outline how nicotine and carbon monoxide in cigarette smoke may increase the risks of atherosclerosis and blood clotting. | Exa |
|-----|---|-----|
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| | ······································ | |
| | | |
| | [3] | |
| | ITotal: 81 | |

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

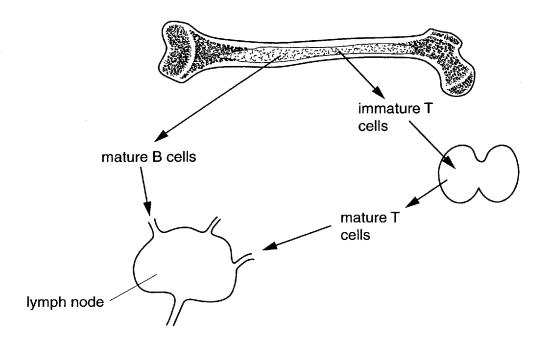
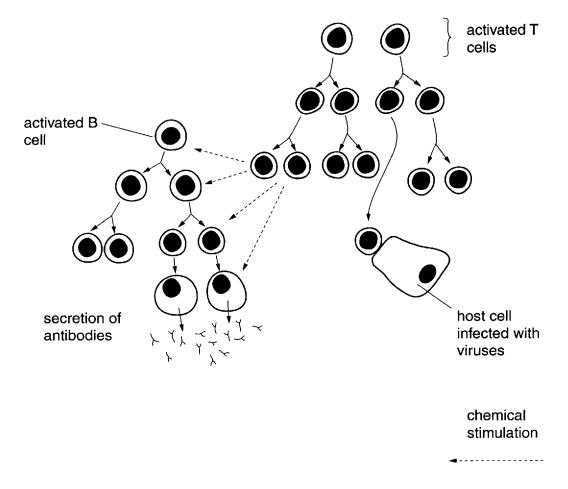


Fig. 4.1

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



11

For Examiner's Use

| (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. |
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| [7] |
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| Quality of Written Communication [1] |

[Total: 13]

For Examiner's

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For Examiner's Use

5 The World Health Organisation monitors standards of health worldwide by collecting information such as the infant mortality rate (IMR) from different countries. The IMR is the number of children per 1 000 live births who die during their first year.

Table 5.1 shows changes in infant mortality rates in the United Kingdom (a developed country) and in Zimbabwe (a developing country) in the second half of the twentieth century.

Table 5.1

| | IN | 1R (deaths of | infants per 1 | 000 live birth | ıs) | |
|-------------------|---------|---------------|---------------|----------------|---------|-----------|
| country | 1950-54 | 1965-69 | 1975-79 | 1985-89 | 1990-94 | 1995-1999 |
| United Kingdom | 24 | 19 | 14 | 9 | 7 | 6 |
| Zimbabwe | 120 | 101 | 86 | 72 | 70 | 66 |

| (a) | Explain why the infant mortality rate has decreased in both developed and developing countries since 1950. |
|-----|---|
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| | [3] |
| (b) | The chance of an infant dying in Zimbabwe was five times greater than in the UK in 1950-54, but in 1995-99 it was eleven times greater. |
| | Suggest why there was a large difference in the IMR between Zimbabwe and the UK in 1995-99. |
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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.

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- (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 between1985 and 2001.

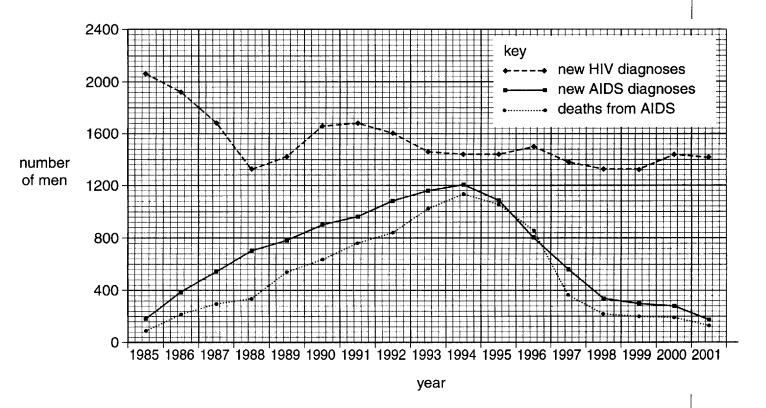


Fig. 6.1

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| (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. |
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| (ii) | Explain the decrease in number of men who have been diagnosed with AIDS and who have died from HIV/AIDS since 1994. |
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| /:::\ | Uning the data in Fig. C.1. availain why the number of people infected with UNA in |
| (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. |
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| | [6] |
| | lain the importance to health authorities of statistics on infectious diseases, such as se shown in Fig. 6.1. |
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| ••••• | [3] |

(c)

[Total: 12]

16

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:
 - 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

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