



**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**Advanced Subsidiary GCE**

**BIOLOGY**

**2802**

Human Health and Disease

Friday

**15 JUNE 2001**

Morning

1 hour 30 minutes

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number											
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**TIME** 1 hour 30 minutes

**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 on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 90.
- You will be awarded marks for the quality of written communication where an answer requires a piece of extended writing.
- You may use an electronic calculator.
- You are advised to show all the steps in calculations.

<b>FOR EXAMINER'S USE</b>		
Qu.	Max.	Mark
1	15	
2	14	
3	16	
4	15	
5	13	
6	9	
7	8	
<b>TOTAL</b>	<b>90</b>	

**This question paper consists of 15 printed pages and 1 blank page.**

Answer **all** questions

1 Fig. 1.1 shows a transverse section of a bronchus from the lung of a mammal.

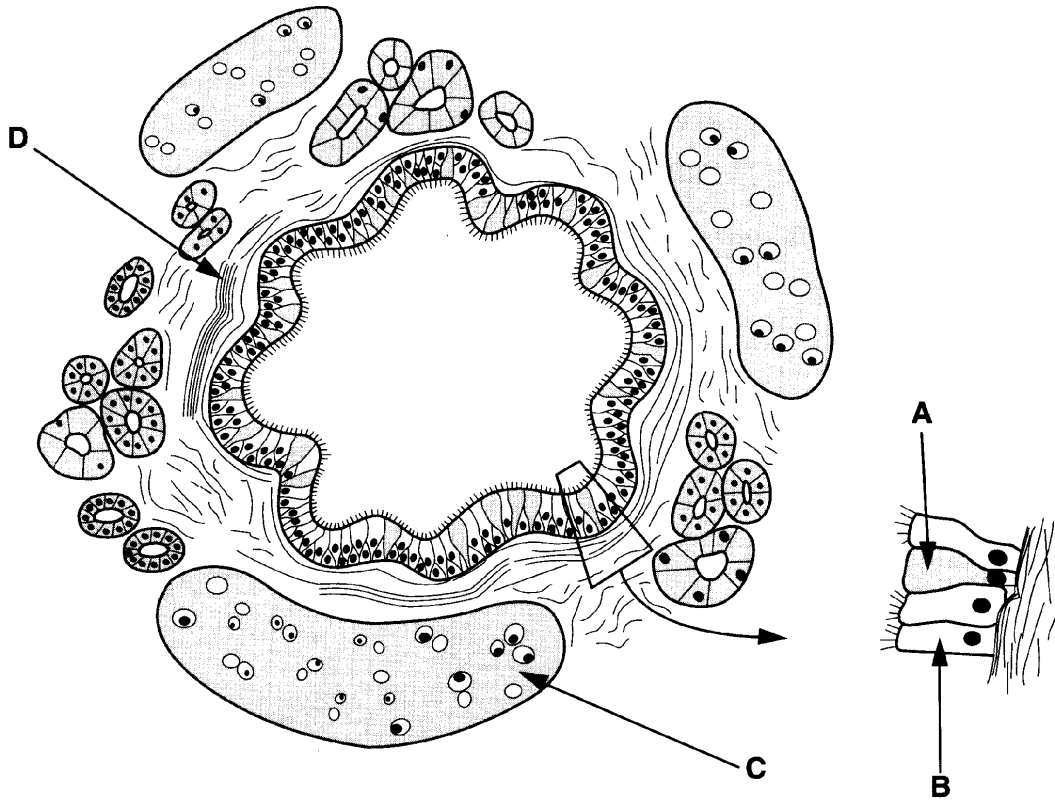


Fig. 1.1

(a) Name A to D.

A .....

B .....

C .....

D .....[4]

(b) Describe how the cells lining the bronchus protect the alveoli from damage.

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

[4]

There are elastic fibres between the cells lining the gaseous exchange surface in the alveoli.

(c) Describe the function of the elastic fibres in the alveoli.

.....

.....

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.....

.....

.....[3]

Table 1.1 shows some measurements of a person's breathing. Ventilation rate is the volume of air breathed in during one minute.

**Table 1.1**

tidal volume at rest	500 cm <sup>3</sup>
vital capacity	4 600 cm <sup>3</sup>
breathing rate at rest	12 breaths per minute
ventilation rate during exercise	20 000 cm <sup>3</sup> min <sup>-1</sup>

(d) With reference to Table 1.1,

(i) calculate the ventilation rate at rest;

.....

.....[1]

(ii) explain the meaning of the term *vital capacity*;

.....

.....

.....

.....[2]

(iii) state how the person increased their ventilation rate even though their breathing rate remained constant.

.....

.....[1]

[Total : 15]

- 2 Some athletes find that they recover faster after strenuous exercise by continuing to exercise slowly. This is sometimes called 'warming down'. An investigation was carried out to see if this was due to the removal of lactate from the blood.

A cyclist exercised vigorously on an exercise bicycle for six minutes and then rested for 34 minutes. When fully recovered, the same cyclist repeated the procedure, but this time cycled at a slow speed following the six minutes of fast cycling. Blood samples were taken at intervals and analysed for the concentration of lactate. The results are shown in Fig. 2.1.

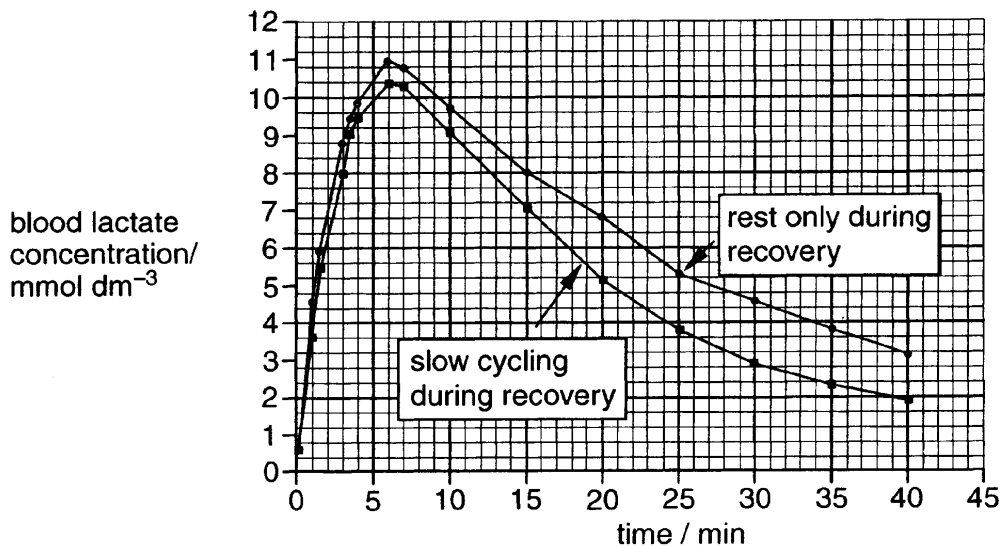


Fig. 2.1

(a) With reference to Fig. 2.1,

- (i) describe the changes in lactate concentration in the blood when the cyclist exercised and then rested during recovery;

.....

.....

.....

.....

.....

.....

.....[3]

(ii) explain the changes you have described in (i);

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

[4]

(iii) suggest how cycling at slow speed during the 'warming down' period helps to lower the concentration of lactate in the blood more quickly than resting completely.

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

[2]

Trained athletes can exercise at much higher levels than untrained people before their blood lactate concentration starts to increase. This is due to changes in the cardiovascular system and in muscles.

(b) Describe the changes that occur in the cardiovascular system and in muscles **during training**.

*cardiovascular system* .....

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

*muscles* .....

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

[5]

[Total : 14]

- 3 (a) Complete the table below to show which of the three statements about disease transmission apply to cholera, tuberculosis (TB) and HIV/AIDS. Put a tick (✓) to show if the statement applies.

statement	cholera	tuberculosis (TB)	HIV/AIDS
causative organism is a bacterium			
transmission is via drinking water			
sexually transmitted			

[3]

- (b) Suggest **two** reasons why antibiotics are **not** suitable for treating all infectious diseases.

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

Tuberculosis is a disease considered to be endemic throughout the world.

- (c) State the meaning of the term *endemic*.

.....  
.....[1]

Table 3.1 shows the estimated number of deaths in 1998 for five diseases in developing countries in South-East Asia and developed countries in Europe.

**Table 3.1**

disease	number of deaths per 100 000	
	developing countries in South-East Asia	developed countries in Europe
tuberculosis	51.90	1.78
HIV/AIDS	23.66	3.05
diarrhoeal diseases, e.g. cholera	36.39	1.01
lung cancer	17.10	53.00
chronic obstructive pulmonary disease e.g. chronic bronchitis and emphysema	11.93	35.67



- 4 During an immune response to a bacterial infection many different antibody molecules may be produced. Fig. 4.1 shows the structure of a typical antibody molecule.

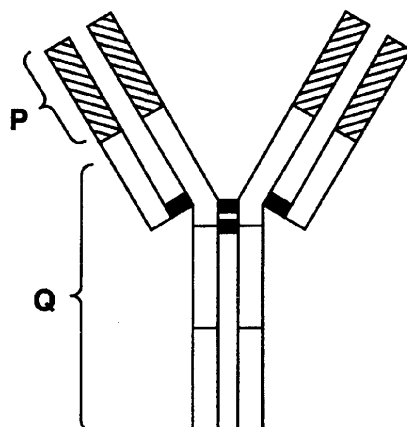


Fig. 4.1

- (a) Name the regions of the antibody molecule labelled **P** and **Q**.

**P** .....

**Q** .....[2]

Antibodies, like enzymes, are highly specific. This is because they are both proteins.

- (b) Explain how the protein nature of antibodies allows the production of many different types.

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

During a bacterial infection, the number of phagocytes in the blood may increase.

- (c) State where in the body phagocytes are made.

.....[1]



Fig. 4.2 is a drawing made from an electron micrograph of a phagocyte engulfing some bacteria.

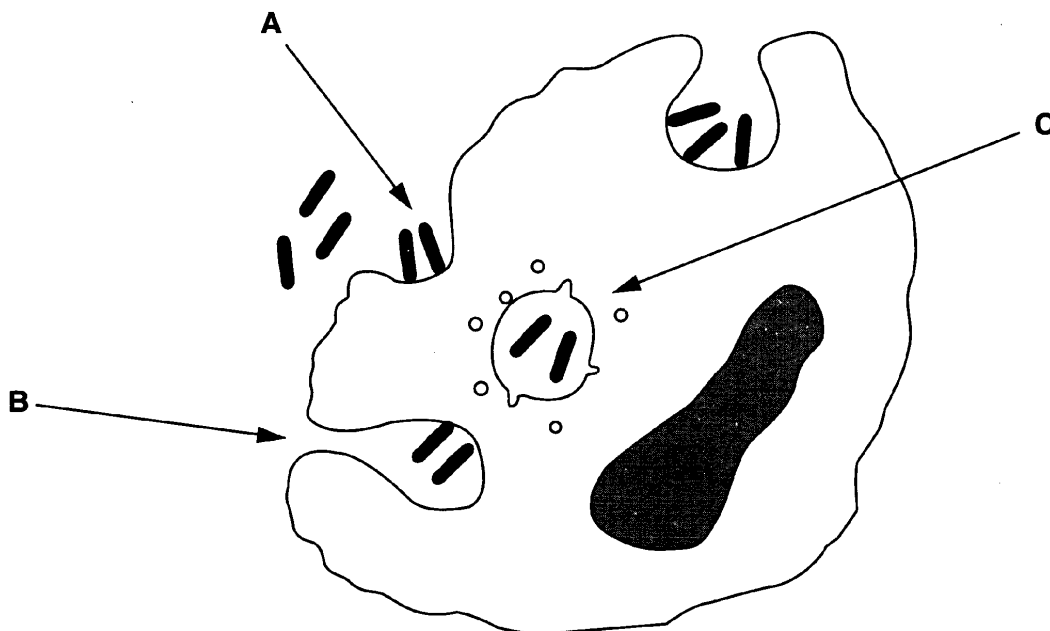


Fig. 4.2

(d) With reference to Fig. 4.2, describe the events that are occurring at **A**, **B**, and **C**.

**A** .....

.....

.....

**B** .....

.....

.....

**C** .....

.....

.....[6]

(e) Explain how antibodies, such as those shown in Fig. 4.1, may help phagocytes engulf bacteria.

.....

.....

.....

.....

.....[3]

[Total : 15]

5 Over 40% of the world's population live in areas where there is a risk of malaria. The disease causes widespread suffering and death especially among children.

(a) Name the organism that causes malaria.

.....[1]

(b) State **two** geographical areas of the world where there is a high risk of malaria.

.....  
 .....  
 .....[2]

Malaria is transmitted by a vector, the mosquito *Anopheles*. Fig. 5.1 shows the life cycle of *Anopheles*.

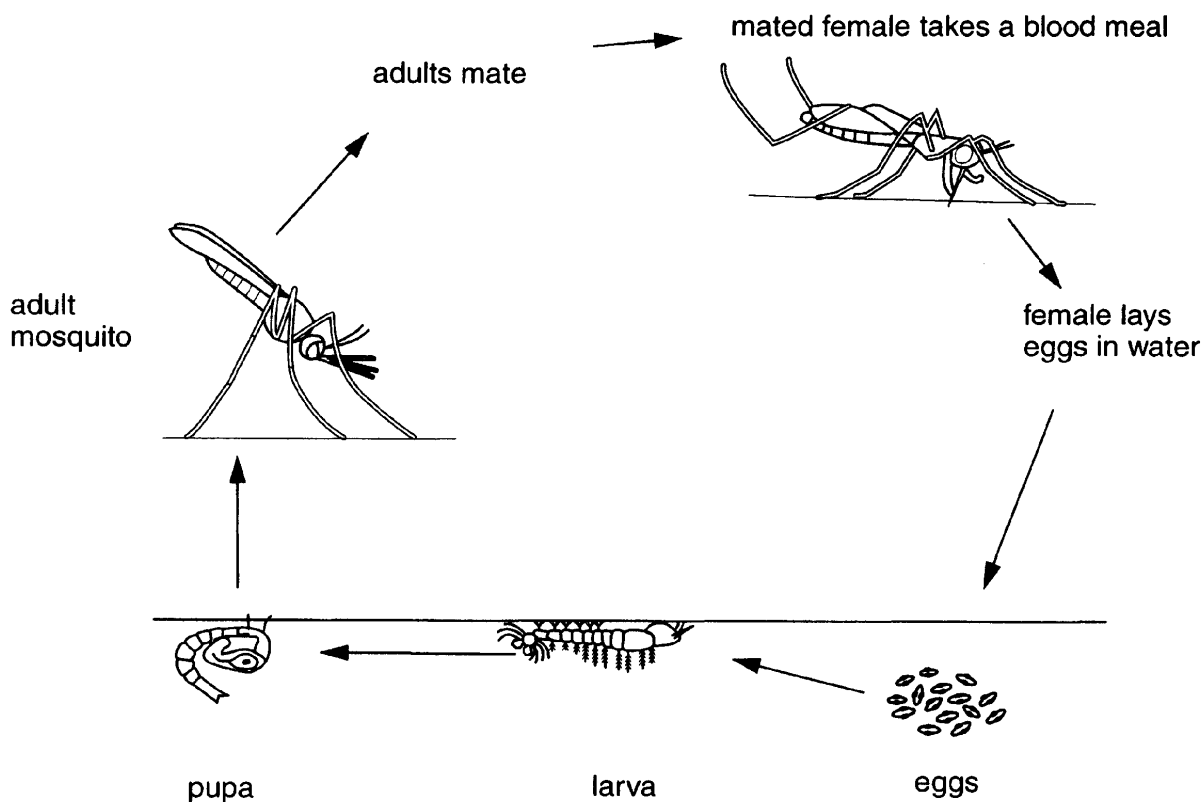


Fig. 5.1

(c) With reference to Fig. 5.1,

(i) describe the role of *Anopheles* in the transmission of malaria;

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



- 6 Tobacco smoke contains over 4 000 different chemicals. Table 6.1 shows the effects of three components of tobacco smoke.

**Table 6.1**

component	effects on the body
tar	deposited in the gaseous exchange system; irritates the lining of the trachea, bronchus and bronchioles.
nicotine	absorbed into the blood; stimulates central nervous system to increase heart rate and blood pressure.
carbon monoxide	absorbed into the blood; binds to haemoglobin to form carboxyhaemoglobin.

- (a) With reference to Table 6.1, explain how long term smoking may lead to

- (i) heart disease;

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

- (ii) chronic bronchitis.

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

In an experiment to investigate the effect of tar on the gaseous exchange system, tar collected from tobacco smoke was painted on to the skin of some laboratory animals. These animals later developed cancerous growths on their skin.

**(b)** Outline the effect that tar had on the skin cells of these animals.

.....

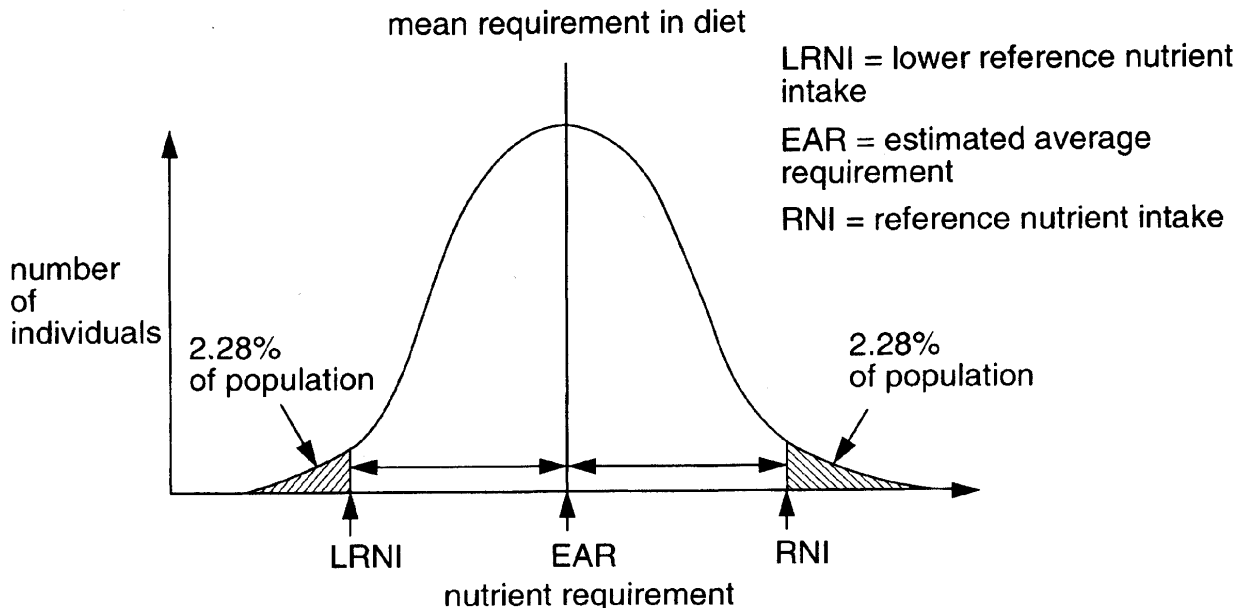
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..... [3]

[Total : 9]

- 7 Surveys of the British population show that requirements for nutrients, such as iron, show a normal distribution. Three Dietary Reference Values (DRVs) are based on this normal distribution as shown in Fig. 7.1.



**Fig. 7.1**

- (a) With reference to Fig. 7.1, state the percentage of the population that has a requirement for iron between the LRNI and the RNI.

.....[1]

Table 7.1 shows the DRVs for iron for males and females aged 17.

**Table 7.1**

	males			females		
	LRNI	EAR	RNI	LRNI	EAR	RNI
iron intake /mg day <sup>-1</sup>	6.1	8.7	11.3	8.0	11.4	14.8

- (b) With reference to Fig. 7.1 and Table 7.1, explain why

- (i) nutritionists recommend that people consume the RNI for nutrients, such as iron;

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

[2]

(ii) the DRVs for iron for females are higher than those for males.

.....  
.....[2]

People with anorexia nervosa are likely to consume much less than the LRNI for iron.

(c) Suggest the likely consequences for people with anorexia nervosa of consuming less than the LRNI for iron over a long time.

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

[Total : 8]

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