OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced Subsidiary GCE

BIOLOGY 2802

Human Health and Disease

Monday **6 JUNE 2005** 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	7	
2	12	
3	8	
4	14	
5	12	
6	7	
TOTAL	60	

This question paper consists of 13 printed pages and 3 blank pages.

Registered Charity Number: 1066969
[Turn over

Answer **all** the questions.

1 Cholera is a water-borne disease caused by a bacterium. It often appears in a population following a natural disaster, such as a major earthquake or flood.

(a) Name the bacterium that causes cholera.

..... [1]

(b) Describe how cholera can spread from person to person.

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..... [3]

(c) Cholera is now almost unknown in the developed world but can still cause large numbers of deaths in less developed countries.

Outline the reasons why cholera is more likely to spread in less developed countries.

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..... [3]

[Total: 7]

For Examiner's Use

2 The smoke produced by burning tobacco leaves contains over 4000 different chemical compounds. Whilst some of these compounds may be harmless, others are addictive or may cause an increased risk of certain diseases.

(a) Name **one** compound in tobacco smoke that is addictive.

..... [1]

(b) Name **two** other harmful substances found in tobacco smoke. For each substance describe briefly the nature of the damage caused to the gaseous exchange system.

substance 1 .....

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substance 2 .....

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..... [5]

[Turn over

(c) Fig. 2.1 shows the results of a study into the effects of smoking patterns in different socio-economic groups in the UK.

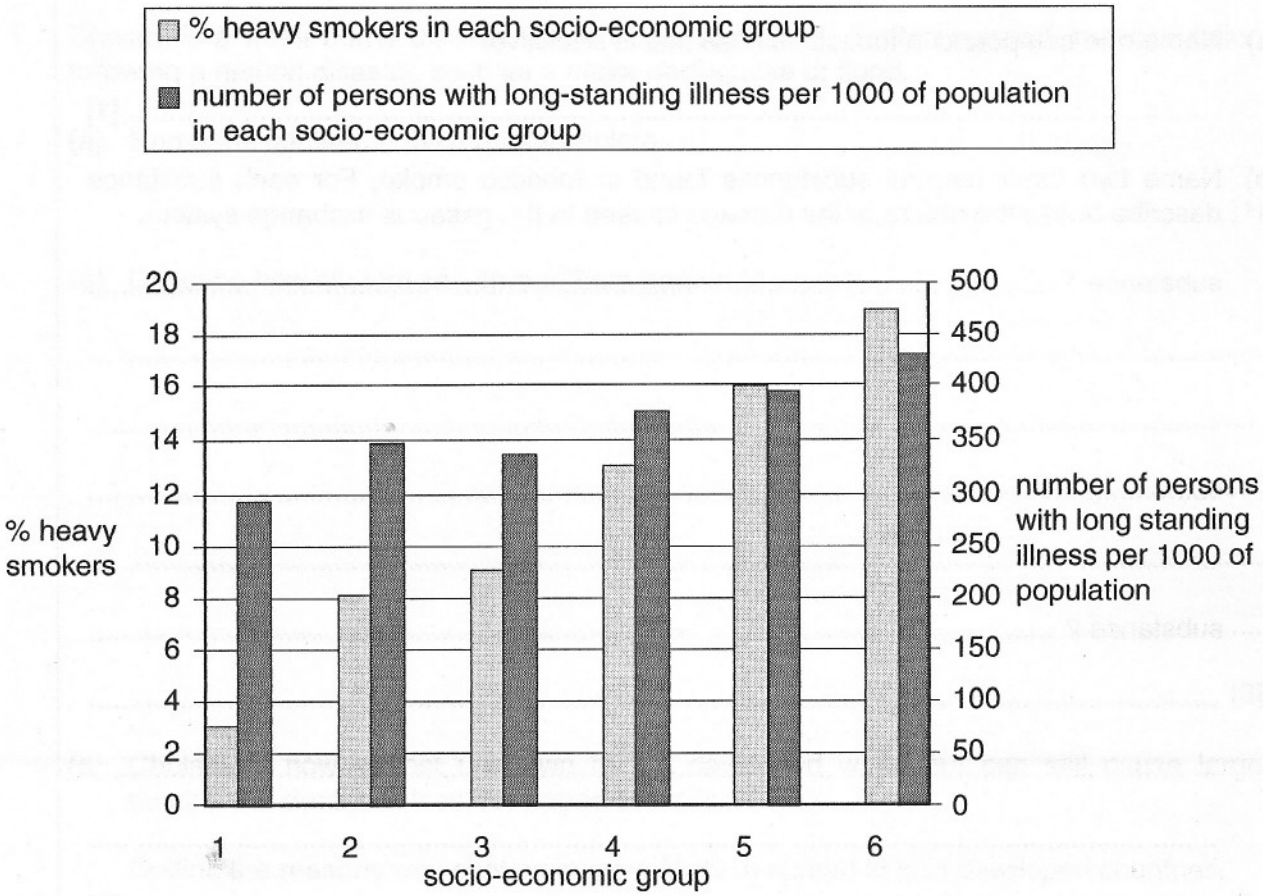

Fig. 2.1

The socio-economic groups shown in Fig. 2.1 are:

1 professional, e.g. doctors, teachers
2 semi-professional, e.g. employers, managers
3 skilled non-manual, e.g. computer technicians
4 skilled manual, e.g. plumbers, bricklayers
5 semi-skilled manual, e.g. painters, decorators
6 unskilled manual, e.g. labourers, delivery drivers

(i) With reference to Fig. 2.1, describe the relationship between socio-economic group and the percentage of heavy smokers.

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..... [2]

(ii) It has been suggested that the proportion of people suffering with long-term illness in each socio-economic group is directly linked to the percentage of heavy smokers in each group.

What evidence is there for or against this view?

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..... [2]

(iii) Suggest **two** other factors that may contribute to the higher rates of long-term illness found in the groups of manual workers as compared to non-manual workers.

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2 .....

..... [2]

[Total: 12]

[Turn over

3 Chromosome 22 was the first chromosome to be decoded as part of the human genome project. This chromosome is known to carry genes involved in the functioning of the immune system, congenital heart disease, several cancers and certain mental disorders, such as schizophrenia.

(a) Explain how knowledge of particular genes, such as those found on chromosome 22, may be used in the field of modern medicine.

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..... [4]

(b) It has been suggested that future testing of our DNA will show our susceptibility to certain diseases and could create a genetic underclass.

Explain the arguments **against** extensive genetic screening of the population.

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..... [4]

[Total: 8]

4 Body mass index (BMI) can be used to place people into categories according to their mass. BMI is calculated by the equation:

$$\text{BMI} = \frac{\text{body mass in kg}}{(\text{height in metres})^2}$$

(a) People with a BMI of greater than 30 are classed as obese. State **two** causes of obesity.

1 .....

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2 .....

..... [2]

As part of a long-term survey into the health of the nation, a random sample of the English population was selected every five years. The BMI of each member of the sample was calculated and the percentage of people fitting into each mass category was recorded. The results are shown in Table 4.1.

Table 4.1

	year				
BMI category	1980	1985	1990	1995	2000
underweight	12	8	6	6	5
acceptable	53	51	46	41	36
overweight	28	32	34	36	39
obese	7	9	14	17	20

(b) Describe the trends shown in Table 4.1.

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..... [4]

For Examiner's Use

(c) In this question, one mark is available for the quality of the use and organisation of scientific terms.

Obesity is one of the risk factors that increases the chance of coronary heart disease (CHD).

Explain how poor diet and obesity can affect the health of the heart.

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Quality of Written Communication [1]

[Total: 14]

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5 A group of six students took part in an investigation into the effect of exercise on heart rate and blood pressure. After measuring their resting pulse rate and blood pressure, each student carried out a series of step-up exercises of increasing intensity. Each exercise lasted two minutes and consisted of regular step-ups at a fixed rate. Immediately after each exercise, pulse rate and blood pressure were measured again and the students were allowed to rest before the next exercise. Their results are shown in Tables 5.1 and 5.2.

Table 5.1

student	pulse rate recorded after exercise / beats minute^{-1}			
	resting	two step-ups per 10 s	six step-ups per 10 s	ten step-ups per 10 s
A	66	77	123	159
B	65	64	94	134
C	73	80	130	153
D	81	91	132	172
E	75	82	124	149
F	71	79	129	156
mean	72	79		154

Table 5.2

student	blood pressure after exercise / kPa			
	resting	two step-ups per 10 s	six step-ups per 10 s	ten step-ups per 10 s
A	16.7	16.7	17.4	19.4
B	14.7	14.7	16.0	18.0
C	16.7	16.8	18.0	19.4
D	17.4	17.6	18.9	20.7
E	16.0	16.0	17.4	18.7
F	16.0	16.0	16.7	18.7
mean	16.3	16.3	17.4	19.2

(a) Calculate the mean pulse rate for six step-ups per 10 s and write your answer in Table 5.1. [1]

For Examiner's Use

(b) (i) Using the information in Table 5.1, describe the effect of increasing intensity of exercise on the pulse rate.

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..... [2]

(ii) Explain why the body needs to respond in this way to exercise.

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..... [3]

(c) One of the students was significantly overweight. Using the information in Tables 5.1 and 5.2, identify the student and give reasons for your identification.

student .....

reasons .....

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..... [4]

(d) Suggest why heart rate and blood pressure are affected by being overweight.

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..... [2]

[Total: 12]

[Turn over

6 **(a)** Fig. 6.1 is a representation of the three-dimensional structure of an antibody molecule. The shaded sections represent the heavy polypeptide chains. The diagram shows two antigen molecules attached to the antibody.

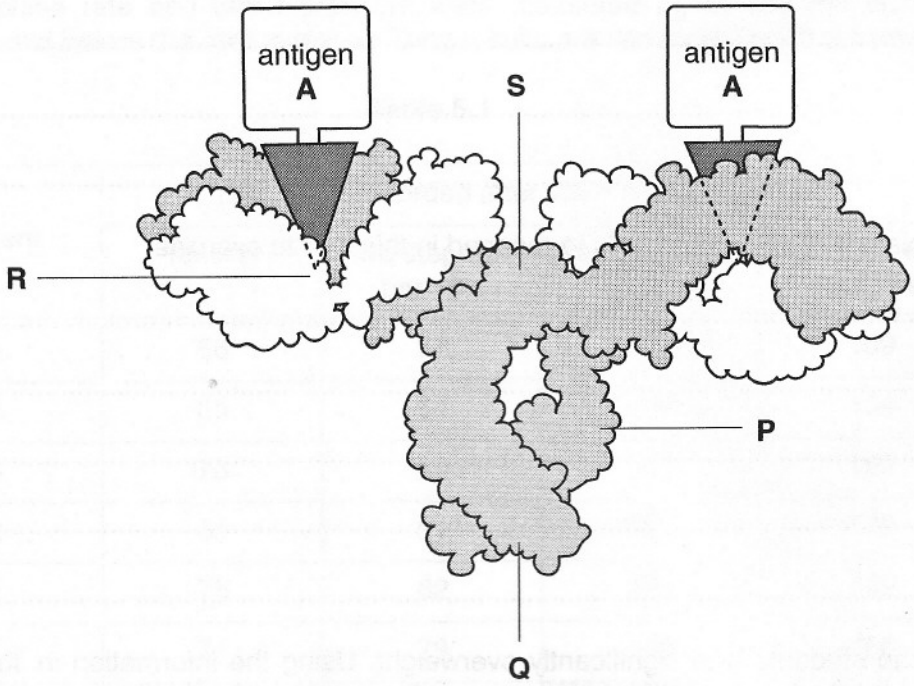

Fig. 6.1

(i) Select the letter **P**, **Q**, **R** or **S**, which identifies the position of a variable region of the antibody shown in Fig. 6.1.

..... [1]

(ii) Explain why this antibody will bind **only** to antigen **A**.

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..... [2]

(b) MMR vaccine is a triple vaccine that contains antigenic material from measles, mumps and rubella. It gives 90% of all children who are vaccinated protection against measles. In the UK, the highest percentage of children in any year group that has been given the MMR vaccine is 92%.

(i) Calculate the percentage of children who were left **unprotected** against measles in the year that a 92% vaccination rate was achieved. Show your working.

Answer = ...% [2]

(ii) Measles has proved to be difficult to eradicate from any country and vaccination programmes have been less successful than with smallpox.

Suggest **two** reasons why measles has been more difficult to eradicate than smallpox.

1 .....

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2 .....

..... [2]

[Total: 7]

END OF QUESTION PAPER