OCR
RECOGNISING ACHIEVEMENT

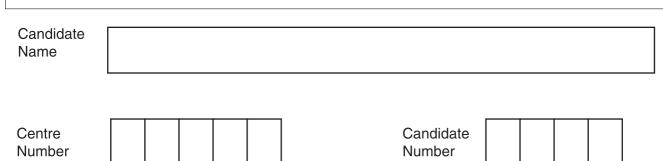**ADVANCED SUBSIDIARY GCE**   **2802**

BIOLOGY

Human Health and Disease

TUESDAY 16 JANUARY 2007   **Afternoon**

                                                              Time: 1 hour

Additional materials:
    Electronic calculator
    Ruler (cm/mm)

Candidate Name	

Centre Number					

Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks for each question 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	9	
2	6	
3	12	
4	8	
5	11	
6	14	
TOTAL	60	

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

    [Turn over

Answer **all** the questions.

1 Over the last few years there has been much public concern over the diet of people in the UK and its effects upon their weight and health.

Body Mass Index is a calculation used by doctors to indicate whether a person is underweight or overweight.

(a) State the medical term used to describe a person whose Body Mass Index is greater than 30.

....[1]

Table 1.1 shows the daily intake of certain components in three diets, **A**, **B** and **C** for men in the UK.

Diet **A** • a normal balanced diet for a typical man

Diet **B** • a weight-reducing low fat diet
• restricted to avoid fats
• includes any fruit, vegetables and proteins
• energy intake is monitored carefully

Diet **C** • a weight-reducing low carbohydrate diet
• restricted to avoid carbohydrates
• excludes fruit as these contain sugars
• includes any non-starchy vegetables, proteins and fats
• energy intake is not counted and may exceed 10 000 kJ on some days

Table 1.1

	Diet **A** normal balanced diet	Diet **B** weight-reducing low fat diet	Diet **C** weight-reducing low carbohydrate diet
energy/kJ	9720	6000	8000
fats/g	87	34	124
carbohydrates/g	275	200	20
proteins/g	88	76	165
combined minerals/g	12	12	18

(b) In any unbalanced diet it is possible that there may be a deficiency of certain nutrients.

Suggest **one** nutrient that may be deficient in diet **B** and **one** in diet **C**.

Diet **B** ....

Diet **C** ....[2]

(c) (i) Explain which diet, **B** or **C**, is likely to cause more rapid weight loss.

....

....

....

....[2]

(ii) State the relationship between energy intake and energy use that would allow a person to lose weight.

....[1]

(d) Doctors suggested that diet **C** may not be very healthy in the long term, as it contains unlimited amounts of fats and no fruit.

Suggest what potential health problems, **other than continued weight loss**, might result in a person who kept to a low carbohydrate diet, similar to diet **C**.

....

....

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....

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....[3]

[Total: 9]

[Turn over

2 Read the following passage and complete each sentence by writing the most appropriate word in the spaces provided.

Health can be defined as a state of complete ...., mental and social well-being. It is not merely the absence of infirmity or .... Many people may consider themselves healthy, even though they do not fully match the above criteria. A young woman can improve her health in a number of ways.

To improve physical well-being she should eat a balanced diet in which the majority of her energy needs come from ....… Her diet should include only small quantities of .... fats and more plant oils, such as olive oil. She should exercise for at least .... minutes on three or more occasions per week. This exercise should be at an intensity that raises her heart rate to .... percent of her maximum heart rate. She should not smoke at all and should avoid passive smoking. [6]

[Total: 6]

3 (a) Table 3.1 lists a number of possible changes to the human body. **Six** of these occur as a result of regular aerobic exercise.

Tick the **six** boxes next to the correct changes.

Table 3.1

permanent increase in blood glucose concentration	
permanent increase in diastolic blood pressure	
increase in number and size of mitochondria in certain cells	
decrease in percentage of body fat	
decrease in blood cholesterol concentration	
reduction in tidal volume at rest	
increase in number of alveoli in the lungs	
change in structure of haemoglobin to become more efficient	
increase in vital capacity	
decrease in the number of capillaries in skeletal muscle	
more glycogen and fat stored in the skeletal muscle	
increase in size of skeletal muscle	

[6]

Table 3.2 shows some of the effects that long-term aerobic training can have on the heart, lungs and blood system of a young athlete.

VO$_2$ max is the maximum rate at which the body can absorb and utilise oxygen.

Table 3.2

> **A table has been removed due to third party copyright restrictions**
>
> Details:
>
> A table showing heart rates of atheletes before and after training

Reproduced with the permission of Nelson Thornes Ltd from   Essential AS Biology   07487 8511 6 Toole & Toole first published in 2004.

(b) (i) Cardiac output is the volume of blood pumped out of the heart in one minute.

Calculate the cardiac output at rest of the athlete after training.

Answer = ... cm^{3}min^{-1} [2]

(ii) Explain how the changes shown in Table 3.2 could contribute to the improved performance of the athlete.

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....[4]

[Total: 12]

[Turn over

4   Fig. 4.1 shows the incidence of coronary events and mortality from coronary heart disease (CHD) in some countries around the world. The incidence of coronary events refers to the number of reported cases of any form of coronary illness per 100 000 of the population.

Fig. 4.1 also shows the prevalence of smoking in the same countries. The prevalence of smoking is the percentage who smoke cigarettes every day.

The figures in Fig. 4.1 refer to men aged from 35 to 64 during the late 1990s.

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Details:

A graph showing the prevalence of smoking in the some countries around the world

Source: British Heart Foundation, www.bhf.org.uk

Fig. 4.1

(a) Fig. 4.1 shows that the   relationship   between the incidence of coronary events and the mortality from CHD is not the same in all the countries shown.

Suggest three reasons why this relationship is not the same.

1 ....

....

2 ....

....

3 ....

....[3]

(b) Using the information in Fig. 4.1, describe the evidence to suggest that smoking is **not** the only factor involved in causing heart disease.

....

....

....

....[2]

(c) Describe **three** steps a **government** might take to try to reduce the mortality from CHD.

1 ....

....

2 ....

....

3 ....

....[3]

[Total: 8]

[Turn over

5 **(a)** **(i)** Name the organism that causes cholera.

....[1]

(ii) Describe how the organism that causes cholera may be transmitted from one person to another.

....

....

....

....[2]

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

Explain the reasons why it has **not** been possible to eradicate cholera in some parts of the world.

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....[7]

Quality of Written Communication [1]

[Total: 11]

[Turn over

6   Fig. 6.1 is a diagram showing the structure of a typical antibody.

A diagram has been removed due to third party copyright restrictions

Details:

A diagram showing the structure of a typical antibody

Fig. 6.1

(a)   Name the type of cell that produces antibodies.

....[1]

(b) (i)   State one function for each of the component parts listed below.

binding site ....

....

disulphide bridge ....

....

constant region ....

....

hinge region ....

....[4]

(ii) Explain why the part of the antibody molecule incorporating the binding site is often called the variable region.

....

....

....

....[2]

Fig. 6.2 shows the concentration of antibodies in the blood following a first infection by a pathogen on day 0.

Fig. 6.2

(c) (i) Explain why there is a delay between the **first** infection by the pathogen and the appearance of antibodies in the blood.

....

....

....

....[2]

(ii) On Fig. 6.2, draw a curve to show the expected concentration of antibodies in the blood following a **second** infection of the **same pathogen** at day 30. [2]

Question 6 continues on page 12

[Turn over

(d) Antibiotics can be used to artificially prevent bacterial infections. However, resistance to antibiotics is common among bacteria. For example, the so-called 'superbug' MRSA (methicillin-resistant *Staphylococcus aureus*) is resistant to many antibiotics.

(i) State the way in which a bacterium develops resistance to an antibiotic.

....[1]

(ii) Suggest **two** measures, **apart from use of antibiotics**, that could be taken in a hospital to combat possible infection with MRSA.

1 ....

....

2 ....

....[2]

[Total: 14]

END OF QUESTION PAPER