OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

HUMAN BIOLOGY

Growth, Development and Disease

F222/TEST

Candidates answer on the question paper

OCR Supplied Materials:
• Insert 1, Advance Notice (inserted)
• Insert 2 (inserted)

Other Materials Required:
• Electronic Calculator
• Ruler (cm/mm)

Monday 1 June 2009
Afternoon

Duration: 1 hour 45 minutes

F222

Candidate Forename		Candidate Surname	

Centre Number					Candidate Number				

INSTRUCTIONS TO CANDIDATES

• Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
• Use black ink. Pencil may be used for graphs and diagrams only.
• Read each question carefully and make sure that you know what you have to do before starting your answer.
• Answer **all** the questions.
• Do **not** write in the bar codes.
• Write your answer to each question in the space provided, however additional paper may be used if necessary.

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 **100**.
• You may use an electronic calculator.
• You are advised to show all the steps in any calculations.
• ✏ Where you see this icon you will be awarded marks for the quality of written communication in your answer.
• This document consists of **24** pages. Any blank pages are indicated.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	16	
2	19	
3	9	
4	15	
5	17	
6	11	
7	13	
TOTAL	100	

OCR is an exempt Charity

Turn over

Answer **all** the questions.

1 (a) (i) This question is based on the case study **'DRUG TREATMENT FOR OBESITY'** **(Case Study 1)**.

You were told in the case study that the drug Rimonabant® had undergone 'randomised, placebo-controlled clinical trials' involving over 5000 people.

Suggest **three** factors that should be considered in selecting a placebo for Rimonabant®.

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.... **[3]**

(ii) Give **two** reasons why large numbers of people need to be recruited to take part in clinical trials.

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.... **[2]**

(b) In the case study, you were told that prospective participants had tests before being allowed to join the trial. These could include measurements of triglycerides, blood cholesterol and blood pressure.

Describe the structure of a triglyceride. You may use a labelled diagram to support your answer.

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.... **[3]**

(c) Cholesterol is carried in the blood in combination with proteins called lipoproteins.
A Total Cholesterol (TC) count can be carried out on blood.

There are different types of lipoproteins, including LDLs (low density lipoproteins) and HDLs (high density lipoproteins). These can be measured individually.

Researchers often use the ratio of TC to HDL as a predictor of the risk of coronary heart disease (CHD).

(i) Table 1.1 shows how the TC:HDL is calculated.

Table 1.1

TC (mmol dm^{-3})	HDL (mmol dm^{-3})	TC:HDL
7.0	2.5	2.8:1.0
8.0	**X**	4.0:1.0
9.0	1.5	**Y**

Calculate the values for **X** and **Y**.

X = ...

Y = ... **[2]**

(ii) Fig. 1.1 shows the combined effect of TC:HDL and systolic blood pressure on the risk of developing CHD within ten years.

less than 15% probability of developing CHD

15% to 30% probability of developing CHD

more than 30% probability of developing CHD
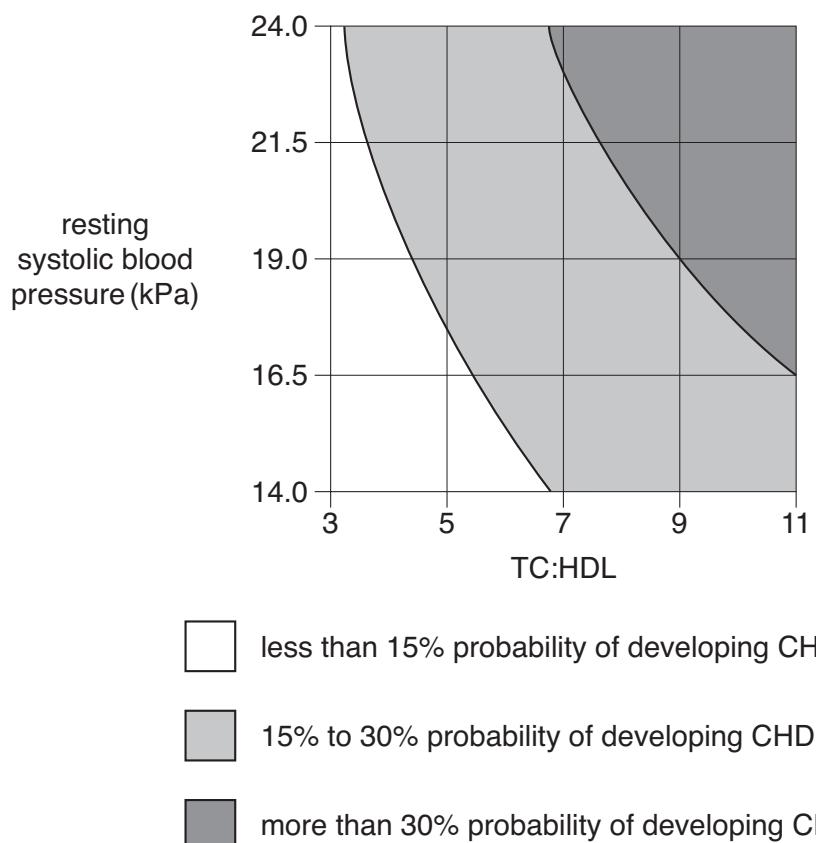
Fig. 1.1

With reference to Fig. 1.1, describe how the TC:HDL **and** systolic blood pressure affect the risk of developing CHD.

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(d) The role of the National Institute for Health and Clinical Excellence (NICE) is discussed in the case study.

Using the information in the case study, suggest why NICE may **not** recommend the use of a drug to control obesity.

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[Total: 16]

Turn over

2 This question is based on the article '**TACKLING CHILDHOOD OBESITY**' (Case Study 2).

You were told in the case study that the Government is committed to reducing childhood obesity. Obesity is usually defined in terms of Body Mass Index (BMI).

(a) (i) State how BMI can be calculated from the measurements taken as part of the National Child Measurement Programme.

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.... **[2]**

(ii) At what BMI would an **adult** be classed as 'obese'?

.... **[1]**

(b) BMI measurements of children in England are compared to United Kingdom reference curves to determine if a child is overweight or obese.

Reference curves are devised from data gathered from populations of children. The curves show how BMI varies with age.

(i) Suggest why BMI charts are different in different parts of the world.

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.... **[2]**

(ii) Fig. 2.1, **on Insert 2**, shows the BMI reference curves for boys in the United Kingdom.

Children with a BMI on or above the 98th centile on the UK National BMI Reference Curve are considered to be obese.

A child is considered overweight if they have a BMI between the 91st and the 98th centile.

Using the information in Fig. 2.1, give the BMI for an **eight**-year-old boy who is overweight but **not** obese.

Answer = ... **[1]**

(c) The equipment to be used to measure weights and heights is specified exactly in the National Child Measurement Programme guidance document issued by the Government.

Suggest **three** ways, in addition to the use of standard equipment, to ensure that the measurements are accurate and reliable.

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.... **[3]**

8

(d) In the case study, Randa states that '*we are at risk of an epidemic of diseases*' unless we control childhood obesity.

One disease linked to rising levels of obesity is Type 2 diabetes.

Explain what is meant by Type 2 diabetes **and** describe procedures that could be used to diagnose this condition.

In your answer, you should make clear the order in which the procedures are carried out.

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(e) In case study 2, you were told that one purpose of the National Child Measurement Programme is to **evaluate** the effectiveness of Government strategies for combating the rise in childhood obesity.

Suggest **two** further uses that could be made of the data collected through the National Child Measurement Programme.

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.... **[2]**

[Total: 19]

3 Fig. 3.1 is a diagram of the stages that occur during the **second** division of **meiosis**.
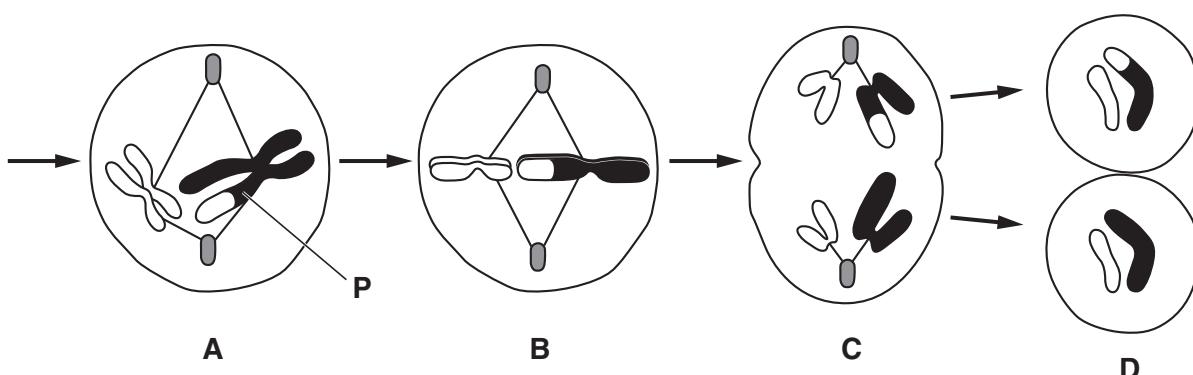

Fig. 3.1

(a) Identify the stages labelled **B** and **C**.

B ....

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

(b) The chromosome labelled **P** in Fig. 3.1 contains a section of genetic material from the chromosome that was homologous to **P**.

The two homologous chromosomes exchanged genetic material during the first division of meiosis.

(i) Identify the stage in the **first** division of meiosis in which exchange of genetic material occurs.

.... **[1]**
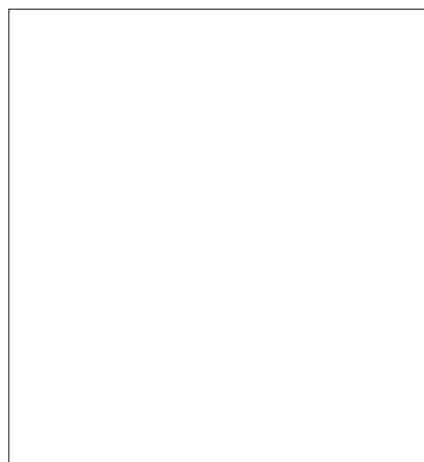
(ii) Fig. 3.2 shows the appearance of chromosome **P**.

In the empty box provided, draw a diagram to show the appearance of the chromosome homologous to **P** after the exchange of genetic material.

On your diagram, you should label the position of the **centromere**.
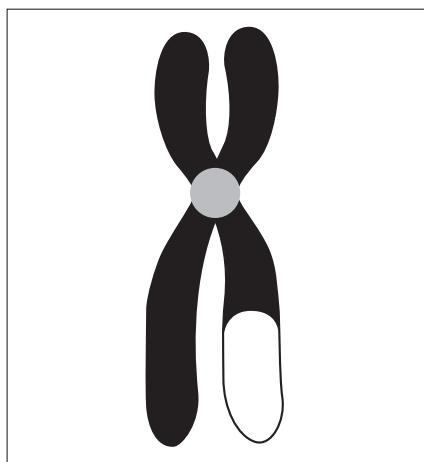
chromosome **P**

chromosome homologous
to **P**

Fig. 3.2

[3]

(c) Explain the importance of meiosis in the human life cycle.

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.... [3]

[Total: 9]

Turn over

4 Changes in DNA can lead to mutations in genes that control cell division. The accumulation of mutations over time may lead to cells becoming cancerous.

Mutations can occur randomly during DNA replication, prior to cell division, and may be due to environmental factors.

(a) (i) State precisely when DNA replication occurs in the cell cycle.

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.... **[2]**

(ii) Describe the process of DNA replication.

In your answer, you should make clear the order in which events occur.

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.... **[8]**

Turn over

(b) In the United Kingdom, 1 in 9 women develop cancer during their lifetime. The risk of cancer increases with age.

Suggest **two** reasons why the risk of cancer increases with age.

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.... **[2]**

(c) Women who are known to be at very high risk of developing breast cancer because of their family history are screened annually.

X-rays are **not** used to screen for breast cancer when a person is known to have a high genetic risk.

(i) Suggest a reason why the use of X-rays is not recommended when screening for inherited forms of breast cancer.

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.... **[1]**

(ii) State two methods, **other than the use of X-rays**, that could be used to **screen** women known to be at high risk of developing breast cancer.

method 1 ....

method 2 .... **[2]**

[Total: 15]

5 As part of the antenatal care programme in the United Kingdom, routine blood tests are carried out on blood samples taken from pregnant women.

The consent of the pregnant woman is required to carry out the following blood tests:

- blood group
- blood cell counts
- rubella status
- syphilis
- hepatitis B
- HIV.

(a) Table 5.1 shows the reaction obtained when four blood samples were mixed with different antibodies (antiserum). The corresponding blood group of the sample is also shown.

Complete the table using either a tick (✓) or a cross (✗) or the blood group.

Table 5.1

blood sample	agglutinates with anti–A antibody	agglutinates with anti–B antibody	agglutinates with anti–rhesus (anti–D) antibody	blood group of sample
1	✓			A rhesus negative
2		✓		B rhesus positive
3			✓	O rhesus positive
4	✓	✓	✗	

[5]

(b) Table 5.2 shows the number of red blood cells (erythrocytes) and white blood cells (leucocytes) found in female adult blood.

Table 5.2

blood cell type	cell count/dm^{-3}
erythrocytes	4.5 to 6.5 × 10^{12}
leucocytes	4.0 to 6.0 × 10^{9}

(i) Name an instrument that could be used to determine blood cell counts such as those given in Table 5.2.

.... [1]

(ii) Suggest why a range of values is given for both the erythrocyte and leucocyte numbers.

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.... [2]

(c) The blood tests for rubella status, syphilis, hepatitis B and HIV can be carried out by looking for the presence of antibodies in the blood samples.

(i) Fig. 5.1 is a diagram of an antibody molecule.
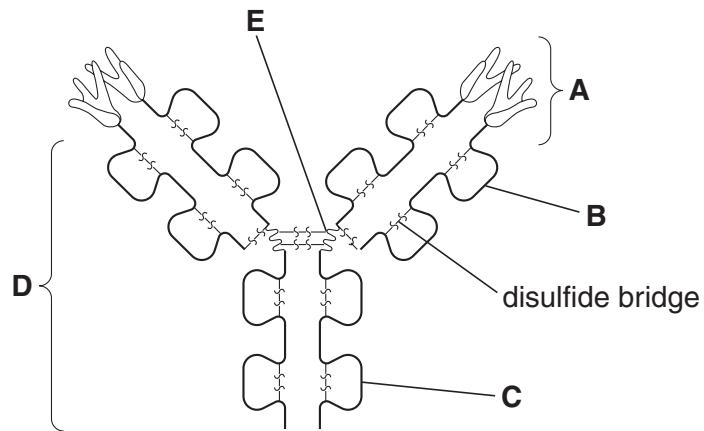
Fig. 5.1

Name the parts labelled **A** to **E** in Fig. 5.1. Write your answers in the table below.

A	
B	
C	
D	
E	

[5]

   (ii) Explain why antibodies for rubella, syphilis, hepatitis B and HIV will be different.

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   .... **[3]**

(d) Suggest **one** reason why a pregnant woman might refuse to be tested for HIV.

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   .... **[1]**

[Total: 17]

6   **Antibiotics** are effective against bacterial cells but do not affect animal or plant cells. This is due to major differences in the structure of bacterial cells compared to animal and plant cells.

   (a) Fig. 6.1 shows a diagram of a bacterial cell.
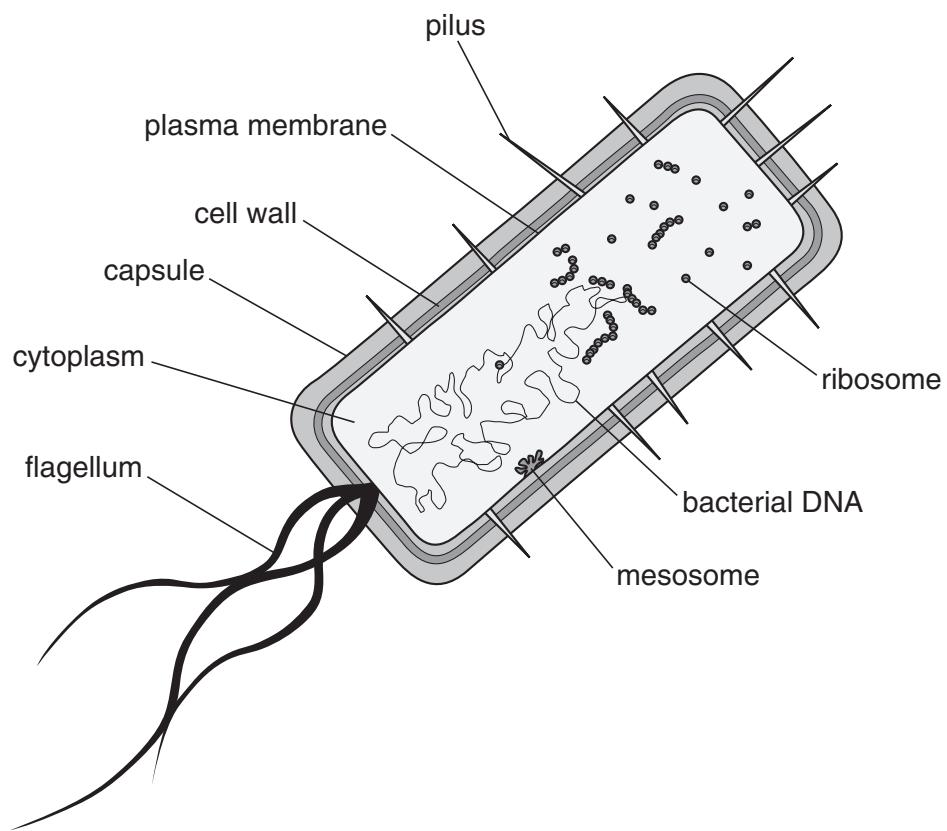
Fig. 6.1

Using Fig. 6.1, complete the following passage that compares a bacterial cell with a palisade mesophyll cell (plant cell) and a leucocyte.

Both palisade mesophyll cells and leucocytes are ………………………………… cells.

They differ in a number of ways from bacterial cells.

In bacteria, the double stranded DNA is free in the cytoplasm and not bound to proteins.

The bacterial DNA molecule is also ………………………………… rather than linear.

The ribosomes in bacterial cells are smaller than those found in plant and animal cells.

In bacterial cells there are no membrane bound …………………………………

such as ……………………………… and ……………………………… .

Bacterial cells do have a cell wall but, unlike plant cells, it is made of peptidoglycan and not

……………………………… . The bacterial cell does, however, have some structures that are

not found in plant and animal cells, such as …………………………………

and ……………………………… . **[8]**

(b) Antibiotics are widely used to treat **some** infectious diseases.

Suggest why antibiotics are **not** used to treat **all** infectious diseases.

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.... **[3]**

[Total: 11]

Turn over

7 Some diseases are endemic. However, epidemics and pandemics can place sudden demands on health resources.

  (a) State what is meant by the following terms:

   (i) endemic;

   ....

   ....

   .... **[2]**

   (ii) epidemic;

   ....

   ....

   .... **[2]**

   (iii) pandemic.

   ....

   .... **[1]**

(b) The World Health Organisation (WHO) coordinates a Global Influenza Programme. WHO has published guidelines in the form of recommended actions that may be needed to combat the threat of a new influenza pandemic arising from H5N1 virus. This virus is also known as 'Avian Flu' and 'Bird Flu'.

Part of the guidelines will be aimed at reducing **morbidity** and **mortality**.

Table 7.1 shows data for **human** cases of H5N1 virus in six countries between 2003 and 2007.

Table 7.1

country	number of cases	number of deaths
China	25	18
Egypt	38	15
Nigeria	1	1
Thailand	25	17
Turkey	12	4
Vietnam	109	46

(i) What is meant by *morbidity* and *mortality*?

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.... **[2]**

(ii) Suggest why the information given in Table 7.1 would **not** allow a valid comparison of morbidity or mortality **rates** between different countries.

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.... **[3]**

(c) Suggest **three** ways in which a country could act to reduce the risk of an H5N1 epidemic developing.

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.... **[3]**

[Total: 13]

END OF QUESTION PAPER

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