OCR
Oxford Cambridge and RSA

Tuesday 6 June 2017 – Afternoon

AS GCE HUMAN BIOLOGY

F222/01/TEST   Growth, Development and Disease

Duration: 1 hour 45 minutes

Candidate forename		Candidate surname	

Centre number					Candidate number				

INSTRUCTIONS TO CANDIDATES

*   An Advance Notice is enclosed for use with this examination.
*   Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
*   Use black ink. HB pencil may be used for graphs and diagrams only.
*   Answer **all** the questions.
*   Read each question carefully. Make sure you know what you have to do before starting your answer.
*   Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
*   Do **not** write in the barcodes.

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.

OCR is an exempt Charity

Turn over

Answer **all** the questions.

1   This question is based on Case Study 1 **'Nice Advice'**.

   (a) NICE provides guidelines for nutritional intake. Dietary Reference Values (DRVs) represent the recommended intake of nutrients and energy for various groups of people.

   Table 1.1 shows:

   •   Dietary Reference Values for pregnant and non-pregnant women
   •   the actual nutritional intake of woman A
   •   the actual nutritional intake of woman B, who is pregnant.

	Energy (MJ)	**Protein (g)**	**Vitamin C (µg)**	**Folic acid (µg)**	**Vitamin A (µg)**
Women (DRV)	8.10	15	40	400	600
Pregnant women (DRV)	8.90	15	50	600	610
Woman A	10.20	16	41	400	450
Woman B (pregnant)	9.00	15	40	410	615

Table 1.1

   (i) Using the information in Table 1.1 suggest two health problems that might result from the nutritional intake of woman A and two health problems that might result from the nutritional intake of woman B.

   Explain your suggestions.

   Woman A

   problem ....

   explanation ....

   ....

   problem ....

   explanation ....

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Woman B

problem ....

explanation ....

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problem ....

explanation ....

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[4]

(ii) NICE issues post-natal guidance on the nutritional needs of infants.

State **two** nutrients that infants require to ensure the healthy development of bones.

1 ....

2 ....
[2]

(b) Health professionals responsible for the care of pregnant women with diabetes will follow the appropriate NICE guidelines and provide dietary advice.

(i) Explain why NICE recommends dietary changes rather than insulin injections for people newly diagnosed with type 2 diabetes.

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.... **[2]**

(ii) Blood glucose concentration can be measured by testing with a biosensor.

Stages in the biosensor test are listed in Table 1.2.

Place the stages **B** to **E in the correct order** to describe the biosensor test for glucose.

A	The person pierces their skin with a lancet.
B	An electrical current is generated.
C	The person disinfects their skin.
D	Blood is squeezed into a test strip on the biosensor.
E	Glucose is converted to gluconolactone.

Table 1.2

            A
………   ……….   ……….   ……….   ……….   **[3]**

(iii) Haemoglobin that has glucose molecules attached is known as glycated haemoglobin.

Suggest how the measurement of a person's glycated haemoglobin indicates how well they are following NICE guidelines for the control of type 2 diabetes.

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.... **[2]**

(c) NICE issues recommendations to reduce the risk of cardiovascular disease.

Three NICE recommendations are listed below.

> Ensure children's salt intake does not exceed age-appropriate guidelines.
>
> Create favourable conditions for industry and agriculture to produce dairy products for human consumption that are low in saturated fat.
>
> Ensure government funding supports physically active modes of travel.

Explain how implementing these three recommendations would reduce the risk of cardiovascular disease.

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.... **[3]**

Turn over

(d) NICE guidelines recommend reducing body mass index (BMI) to lower the risk of cardiovascular disease.

A reduction in BMI can avoid the need for surgical intervention.

(i) A woman has a BMI of 33 and a mass of 76 kg.

Calculate the woman's height.

Show your working. Give your answer to **three** significant figures.

Answer: .... m **[2]**

(ii) Coronary heart disease can be treated using a variety of procedures.

Three options for surgical intervention are:

- coronary bypass surgery
- angioplasty
- heart transplant

Describe one disadvantage of each type of treatment.

coronary bypass surgery

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angioplasty

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heart transplant

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[3]

[Total: 21]

2 This question is based on Case Study 2 **'Factors Affecting Fetal and Infant Growth'**.

(a) Fig. 2.1 on the Case Study insert shows a growth chart for boys with Down syndrome.

(i) Using **only** the data in Fig. 2.1, compare the likely physical appearance of adult men with Down syndrome and adult men without Down syndrome.

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.... **[3]**

(ii) Calculate the growth rate for boys of median height with Down syndrome between the ages of two and nine years.

Show your working.

Select appropriate units for your answer.

Answer: .... units: .... **[3]**

Turn over

(b) A student wrote the following passage to describe the normal pattern of human growth:

> Human growth rate can be measured using absolute or relative growth. Absolute growth rate is a better measure of the efficiency of growth. Relative growth rate tends to decline after the age of 1 but increases during puberty.
>
> Cells differentiate and are organised into organs, which are grouped into tissues. Organ systems show different patterns of growth. The reproductive system develops fastest between the ages of 12 and 20. The lymphatic system grows fastest during the first five years of life. The lymphatic system contains an organ called the thymus where B lymphocytes mature.

Identify four errors made by the student **and** suggest how the passage should be changed in each case.

error 1 ....

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error 2 ....

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error 3 ....

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error 4 ....

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[4]

(c) Down syndrome is one example of a condition caused by chromosome mutation.

Fig. 2.2 shows karyotypes for two **other** conditions caused by chromosome mutation.

(i) Identify the syndrome caused by the chromosome mutation shown in Fig. 2.2a.

.... **[1]**

(ii) State one symptom of the syndrome caused by the chromosome mutation shown in Fig. 2.2b.

.... **[1]**

Fig. 2.2a

Fig. 2.2b

Turn over

(d) Explain why the fetus of a mother who smokes during pregnancy is likely to grow at a reduced rate.

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.... **[3]**
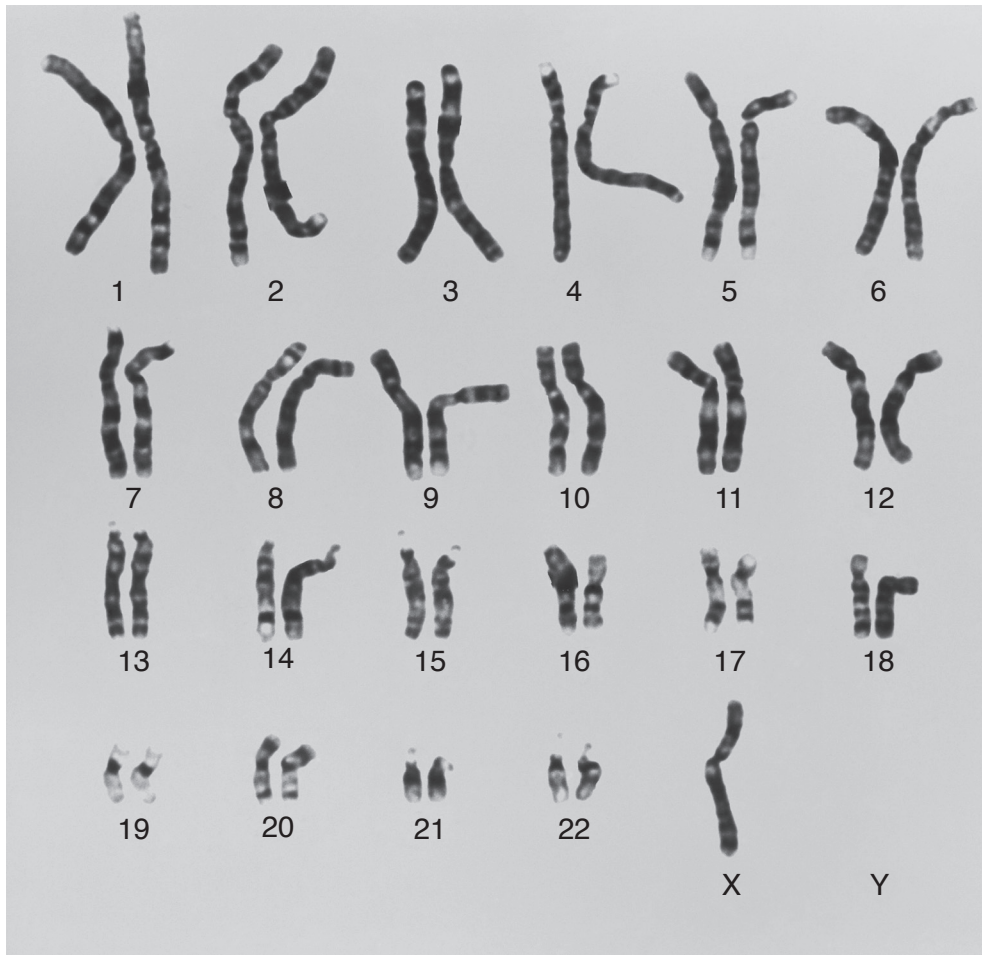
[Total: 15]
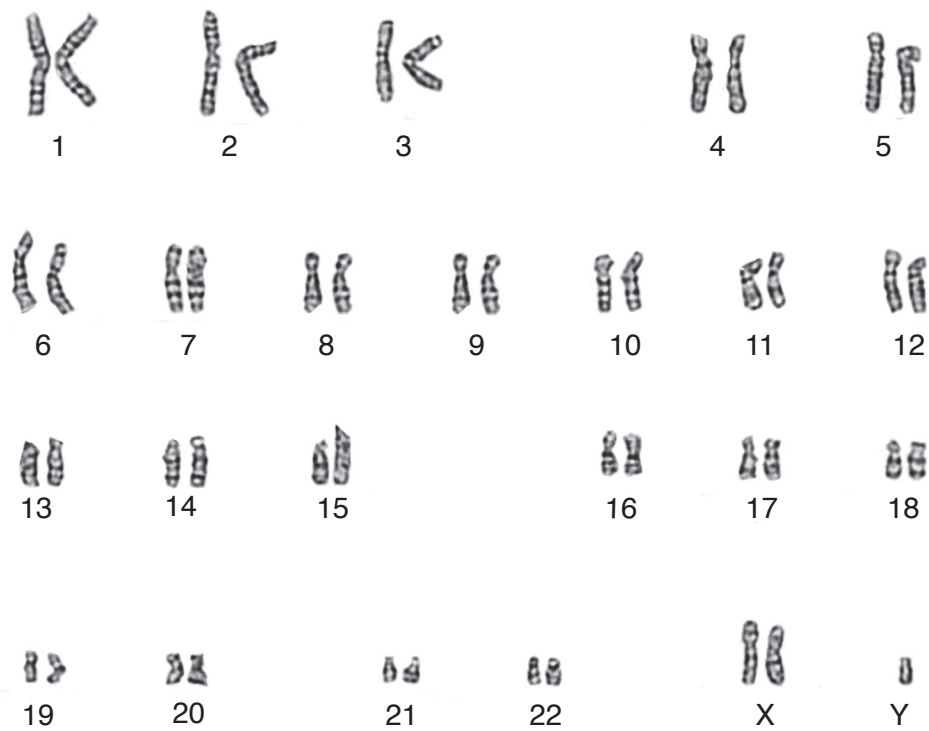
3 Coronary heart disease can lead to heart attack and cardiac arrest.

(a) (i) Explain why the consumption of aspirin can lower the risk of a heart attack.

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.... **[2]**

(ii) Distinguish between the symptoms and treatments of a heart attack and a cardiac arrest.

In your answer you should provide a balanced account of the symptoms and treatment of both conditions.

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.... **[7]**

[Total: 9]

Turn over

4 (a) Fig. 4 shows three pairs of DNA bases.
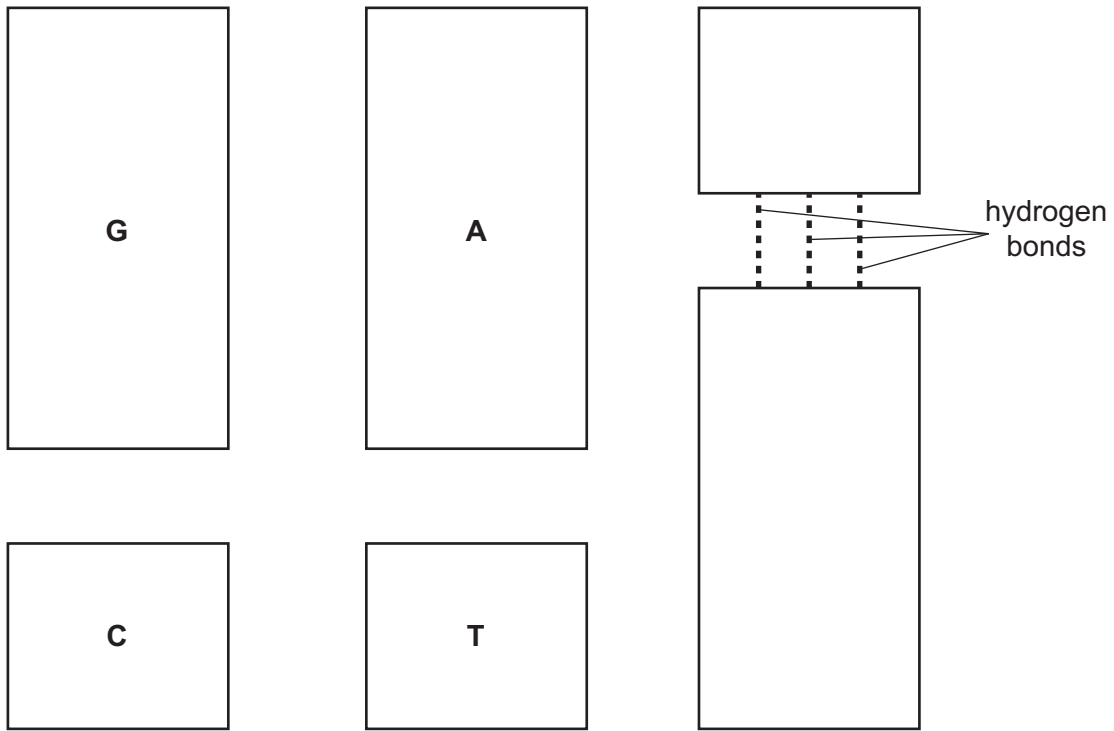
Fig. 4

(i) Complete Fig. 4 by:

- drawing hydrogen bonds between the first two pairs of DNA bases
- labelling the third pair of DNA bases with the correct base letters. **[3]**

.............The answer to this question should be written on Fig. 4..............

(ii) Suggest the biological importance of the double-stranded structure of DNA.

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.... **[2]**

(iii) Outline the role of enzymes in DNA replication.

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.... **[3]**

(b) Table 4 lists statements that relate to biological processes.

Complete Table 4 by placing ticks (✓) in the relevant boxes to indicate whether each statement relates to apoptosis and/or mitosis and/or meiosis.

Statement	Apoptosis	Mitosis	Meiosis
The cell shrinks			
Essential for growth and repair			
Nuclear envelope disintegrates			
Has a set sequence of events			
Results in identical daughter cells			

[3]

Table 4

[Total: 11]

5 Smoking cigarettes has been linked with the development of several diseases.

Fig. 5 shows the relationship between smoking rates and lung cancer rates for both men and women in the UK.

Fig. 5

(a) Describe and explain the relationship between smoking rates and lung cancer rates shown in Fig. 5.

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.... **[4]**

(b) Paclitaxel is a drug used in chemotherapy to treat lung cancer. It destroys actively dividing cells, such as cancerous cells.

(i) Suggest why paclitaxel produces side effects in patients undergoing chemotherapy.

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.... **[2]**

(ii) Describe and explain the role of DNA analysis and seed banks in the search for medicinal drugs such as paclitaxel.

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(iii) Radiotherapy is another treatment for lung cancer.

Suggest why radiotherapy destroys cancerous cells but only causes minimal damage to most healthy cells.

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.... **[1]**

Turn over

(iv) Immunotherapy can also be used to treat cancers by targeting differences in the cell surface membranes of cancerous cells and normal cells.

Suggest what type of molecules act as immunotherapy agents.

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.... **[1]**

(c) Smoking can result in chronic lung diseases other than lung cancer. The passage below outlines some of the potential effects of smoking on the lungs.

Complete the passage using the most appropriate words or phrases.

COPD stands for chronic .... disease. COPD includes the conditions emphysema and chronic bronchitis, which tend to occur together. Emphysema involves damage to alveoli, which causes a reduction in surface area, lowering the rate of gas exchange. Smoking contributes to the development of emphysema by inactivating an elastase .... Chronic bronchitis results from a build-up of mucus. Bronchi and bronchioles are damaged when a person .... to remove the mucus. This leads to the formation of .... tissue.

[4]

[Total: 16]

6 AIDS and herpes are two infectious diseases caused by viruses.

(a) (i) Define the term *infectious disease*.

....

.... **[1]**

(ii) Fig. 6.1 shows a diagram of the herpes simplex virus.

DNA
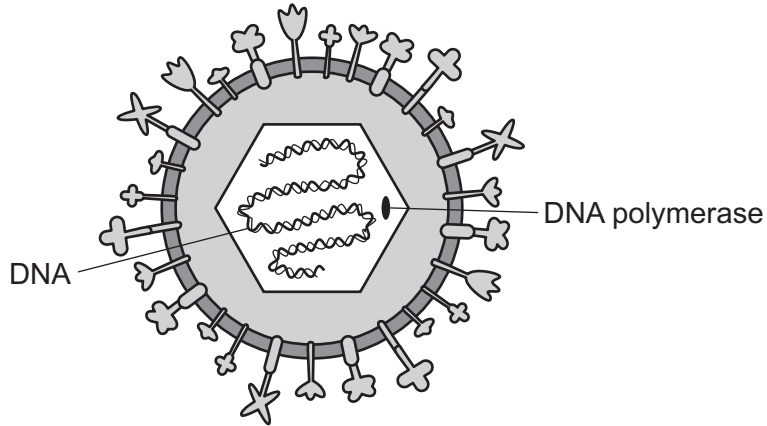
DNA polymerase

Fig. 6.1

Outline the similarities and differences between the herpes simplex virus and the human immunodeficiency virus (HIV).

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.... **[3]**

(iii) Describe the role of the polymerase chain reaction in laboratory tests for HIV.

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.... **[2]**

Turn over

(b) Describe the roles of T and B lymphocytes in the immune response **and** explain why an HIV infection would affect the action of both types of lymphocyte.

In your answer you should link the action of the HIV virus to the roles of both types of lymphocyte.

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.... **[8]**

(c) The immune system produces antibodies against pathogens such as HIV and the herpes simplex virus.
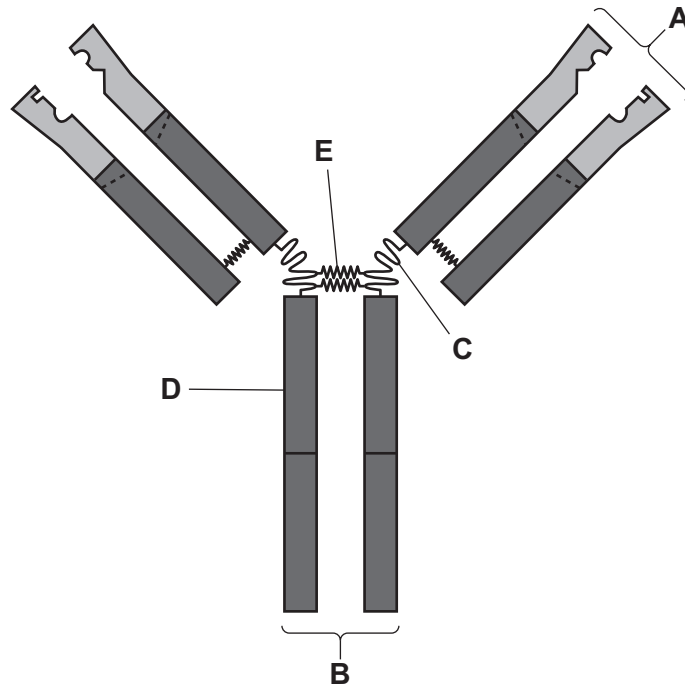
Fig. 6.2 shows the structure of an antibody.

Fig. 6.2

(i) State the roles of parts **A**, **B**, and **C** on Fig. 6.2 **and** explain how their structures are suited to their roles.

A ....

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B ....

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C ....

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[6]

Turn over

(ii) Name parts **D** and **E** in Fig. 6.2.

D ....

E ....

[2]

[Total: 22]

7 Tuberculosis (TB) is a disease of the lungs.

(a) (i) Name the pathogen that causes TB.

.... **[1]**

(ii) State one symptom of TB infection.

.... **[1]**

(b) Incidence rates of TB are often high in cities that have a high population density and high levels of poverty.

Explain this observation.

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.... **[2]**

(c) TB vaccinations are not given to every child in the UK.

(i) Suggest which people are likely to be offered TB vaccination.

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.... **[1]**

(ii) A certain proportion of the population needs to be vaccinated in order to achieve herd immunity. The proportion of the population that is required to be vaccinated varies between diseases.

Suggest why the proportion of the population that needs to be vaccinated to achieve herd immunity varies between diseases.

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.... **[1]**

[Total: 6]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).