

Monday 21 May 2012 – Afternoon

AS GCE HUMAN BIOLOGY

F222/TEST Growth, Development and Disease

Candidates answer on the Question Paper.

OCR supplied materials:

- Advance Notice (inserted)

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 45 minutes




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- The Insert will be found in the centre of this document.
- 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 page at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

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.

Answer **all** the questions

1 This question is based on the case study ‘**SCREENING FOR LUNG CANCER**’ (Case Study 1).

In case study 1 you are told that before screening can be introduced, doctors must have a sensitive and specific test for lung cancer.

(a) (i) What is meant by screening?

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..... [2]

(ii) Suggest why a test used to screen for lung cancer needs to be ‘a sensitive and specific test’.

sensitive

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specific

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..... [2]

(b) People with chronic obstructive pulmonary disease (COPD) have a high risk of developing lung cancer.

The Lung-SEARCH study is using spiral CT scans to detect early stages of lung cancer in people with COPD.

(i) Suggest why people with COPD have a higher risk of lung cancer than the general population.

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(ii) Outline how a CT scan is normally carried out.

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(iii) Spiral CT scans are performed more quickly and result in less exposure to radiation than conventional CT scans.

Suggest **two** reasons why it is an advantage to have the scan performed more quickly and with less exposure to radiation.

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..... [2]

(c) Health care professionals may use a biopsy to diagnose lung cancer.

A biopsy is a medical procedure that involves removing a small amount of tissue so that it can be examined under the microscope.

Fig. 1.1 shows a diagram of normal cells and cancer cells as they appear under a microscope.

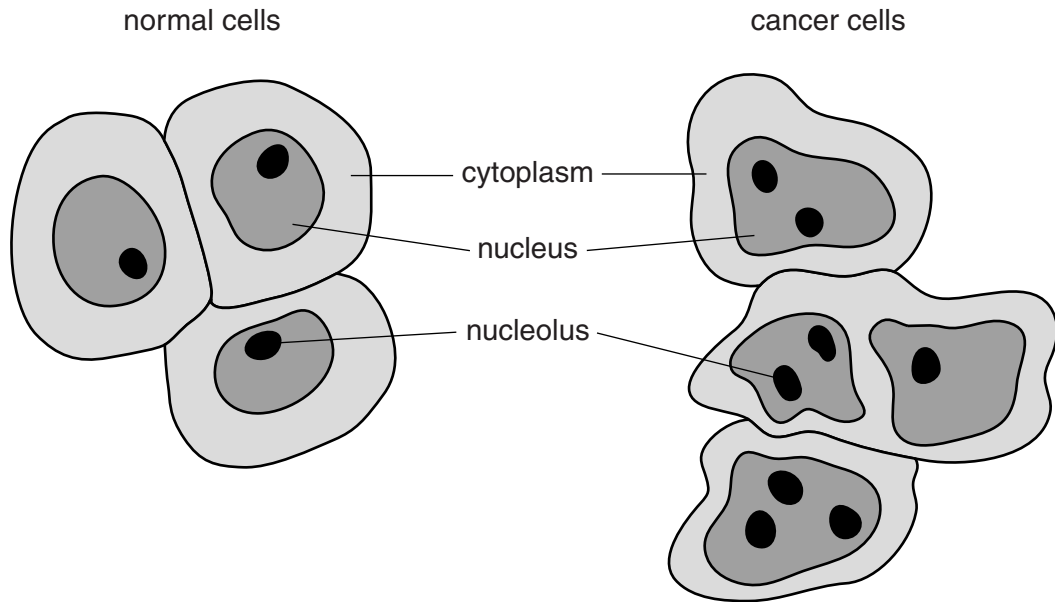


Fig. 1.1

Using the information in Fig. 1.1, state **three** differences between normal cells and cancer cells.

- 1
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- 2
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- 3
- [3]

(d) In the case study you are told that research groups are trying to identify accurate biomarkers for the early detection of lung cancer.

(i) Suggest **two** types of biological molecule that could act as biomarkers.

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..... [2]

(ii) Suggest why researchers are looking at samples of blood and urine to find biomarkers.

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..... [1]

(e) Lung cancer and breast cancer are two of the most common causes of death from cancer.

Fig. 1.2 shows the ten year survival rate for adults in England and Wales in 1972 and 2007.

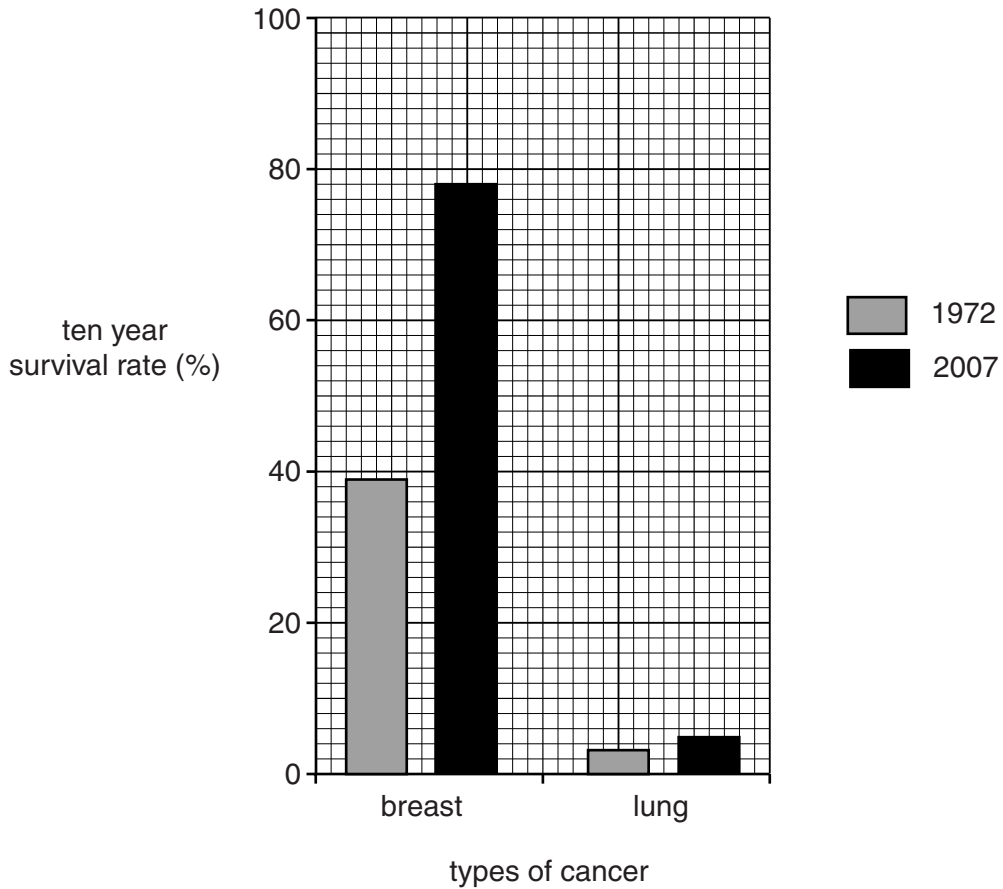


Fig. 1.2

(i) Using the information in Fig. 1.2, calculate the increase in ten year survival rate for breast cancer between 1972 and 2007.

Show your working.

Answer = % [2]

(ii) Suggest **two** reasons why the ten year survival rate is much lower for lung cancer.

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..... [2]

[Total: 21]

2 This question is based on the case study ‘**PREGNANCY BLOG: COUNTDOWN TO DELIVERY**’ (Case Study 2).

(a) In case study 2 you were told that the midwife and Anna discussed diet during pregnancy.

(i) State **two** changes that need to be made to a woman’s diet during pregnancy, other than taking dietary supplements.

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..... [2]

(ii) State **one** reason for advising some pregnant women to take vitamin D as a dietary supplement.

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..... [1]

(iii) In the case study you were told that pregnant women are advised to take iron supplements if their haemoglobin level is below the normal range.

Suggest why it is important that a pregnant woman’s **haemoglobin level** does not fall below the normal range.

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..... [2]

- (c) A gestational diabetes test is offered to some pregnant women who are at an increased risk of developing the condition.

Gestational diabetes can occur in approximately seven out of every 100 pregnancies.

It can lead to problems for the mother and the baby if it is not properly controlled.

- (i) Suggest what is meant by gestational diabetes.

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..... [2]

- (ii) Name a test that could be used to diagnose gestational diabetes.

..... [1]

- (iii) Suggest **two** reasons why some pregnant women may have an increased risk of developing gestational diabetes.

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..... [2]

(d) Ultrasound scans are offered to all pregnant women to monitor fetal growth and to confirm that the fetus and placenta are developing properly.

(i) Suggest why a pregnant woman is asked to drink a lot of water before having an ultrasound scan.

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..... [1]

(ii) Ultrasound scans will show the position of the placenta.

Suggest a problem that may result from the placenta lying too close to the cervix.

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..... [1]

(e) After 25 weeks gestation, a pregnant woman's blood pressure will be measured more regularly and her urine will be tested for protein.

Suggest why it is important to measure blood pressure more regularly **and** test for protein in the urine after 25 weeks gestation.

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..... [2]

[Total: 17]

3 An HIV vaccine used in Thailand has shown some ability to reduce the risk of infection with HIV.

In a trial involving over 16 000 volunteers, half of the volunteers were given the vaccine, whilst the other half were given an inactive chemical. All of the volunteers were HIV negative at the beginning of the trial.

The volunteers were tested for HIV infection every six months for three years.

(a) (i) Explain why half of the volunteers were given an inactive chemical instead of the vaccine.

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..... [2]

(ii) Table 3.1 shows the final results of the HIV vaccine trial.

Table 3.1

volunteers	number of volunteers	number infected with HIV	risk of infection with HIV
given vaccine	8 197	51	0.006
given inactive chemical	8 198	74	

Using the information in Table 3.1, calculate the risk of infection with HIV in the group of volunteers given the inactive chemical.

Show your working.

Answer = [2]

- (iii) The results of this trial are the first promising results, for a decade, in the search for an HIV vaccine.

Why is it proving so difficult to develop an effective vaccine against HIV?

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..... [2]

- (b) Although there is still no cure for HIV infection, it is now a treatable condition.

It is important that individuals considered to be in high-risk groups have an HIV test.

The earlier HIV is detected, the more likely it is that treatment will be successful.

- (i) Describe how the presence of HIV can be detected in an individual.

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..... [3]

- (ii) Suggest **one** reason why an HIV test carried out **less than** 3 months after infection may not give an accurate result.

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..... [1]

(c) A healthy immune system responds to infections caused by bacteria and viruses.

Compare the roles of B lymphocytes and T killer cells in the response of the immune system to infection by bacteria and viruses.



In your answer, you should refer to both similarities **and** differences between the roles of B lymphocytes **and** T killer cells.

..... [8]

[Total: 18]
Turn over

- 4 Women who drink alcohol excessively during pregnancy are at risk of giving birth to infants with malformations of the eye.

Development of the retina in the eye depends upon the processes of both mitosis and apoptosis.

A research study used rats as an experimental model to find out about the effect of prenatal exposure to alcohol on mitosis and apoptosis in the developing retina.

- (a) Fig. 4.1 shows the effect of prenatal exposure to alcohol on the number of cells undergoing mitosis and apoptosis in the development of the retina.

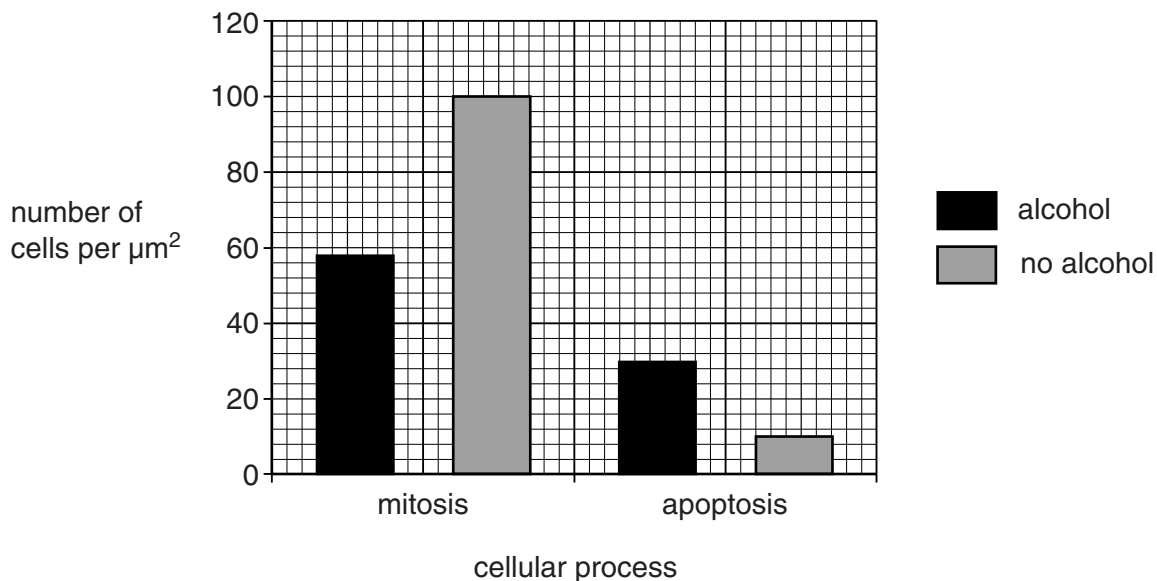


Fig. 4.1

- (i) Using the information in Fig. 4.1, describe the effect of exposure to alcohol on mitosis **and** apoptosis in the cells of the developing retina.

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..... [3]

(ii) Suggest **one** role of mitosis and apoptosis in the growth and development of the retina.

mitosis

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apoptosis

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..... [2]

(iii) With reference to Fig. 4.1, suggest **and** explain how prenatal exposure to alcohol may affect the thickness of the retina in the eye.

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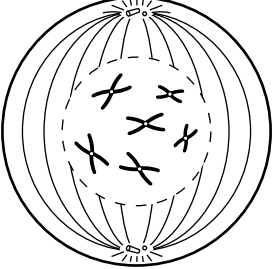
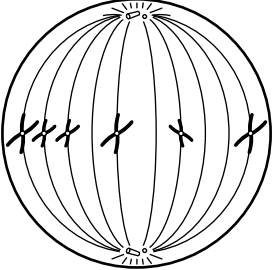
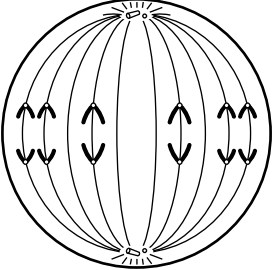
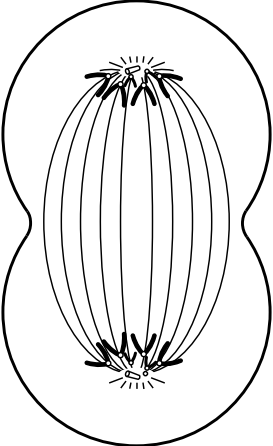
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..... [2]

(b) Table 4.1 shows diagrams of the different stages of mitosis.

Using the information in the diagrams, complete Table 4.1 by adding a description of **two changes** that take place in the cell at each stage.

Table 4.1

stage	description of two changes that take place
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	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

[8]

[Total: 15]

17
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QUESTION 5 STARTS ON PAGE 18

5 Obesity is one of the many factors associated with an increased risk of morbidity and mortality from coronary heart disease (CHD).

(a) Explain what is meant by morbidity and mortality, with reference to CHD.

morbidity

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mortality

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..... [2]

(b) A study was carried out to investigate the effect of body mass index (BMI) and waist circumference (WC) on the risk of developing fatal CHD in women aged 55 – 69.

Table 5.1 shows the results of this study.

Table 5.1

BMI	relative risk of fatal CHD		
	WC less than 80 cm	WC between 80 cm and 88 cm	WC greater than 88 cm
less than 25	1.0	1.0	3.1
between 25 and 30	0.5	1.3	3.3
more than 30	1.8	1.5	2.8

(i) Suggest, from the information that you have been given, one example of an independent variable and one example of a controlled variable.

independent variable

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controlled variable

..... [2]

(ii) Describe one piece of evidence from Table 5.1 that supports the statement:

'Obesity increases the risk of fatal CHD in women.'

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..... [2]

(iii) Describe one piece of evidence from Table 5.1 that supports the statement:

'A build up of fat around the waist increases the risk of fatal CHD in women.'

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..... [2]

- (b) The non-specific immune system also helps the body to respond to the presence of pathogens by producing an inflammatory response and activating phagocytes.

Complete the following passage which describes the inflammatory response and the role of phagocytes.

Leucocytes are attracted to the site of infection. One type of leucocyte, a mast cell, releases by the process of exocytosis. This chemical has a number of effects. It causes vasodilation, which increases the flow of in localised areas. It also makes the walls of capillaries more leading to an accumulation of and swelling.

Other leucocytes, such as neutrophils, engulf bacteria by phagocytosis. The bacteria are then broken down within the cell by found in cell organelles called lysosomes.

[5]

(c) The lymphatic system is important in the development of the **specific immune response**.

Fig. 6.1 shows the growth curve of the lymphatic system compared to the overall growth curve of the body.

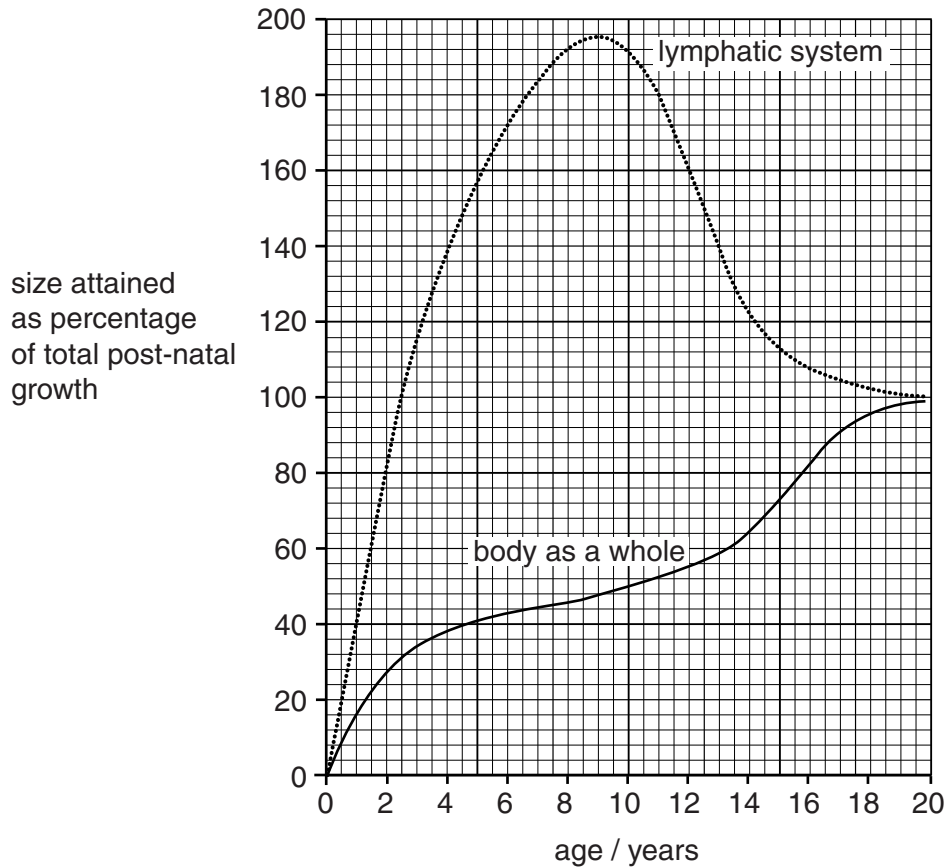


Fig. 6.1

(i) Using the information in Fig. 6.1, describe the pattern of growth of the lymphatic system.

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..... [2]

(ii) Suggest a reason for the pattern of growth shown by the lymphatic system.

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..... [1]

ADDITIONAL PAGE

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

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