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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
ADVANCED SUBSIDIARY GCE**

**F222/TEST**

**HUMAN BIOLOGY**

**Growth, Development and Disease**

**THURSDAY 26 MAY 2011: Afternoon**

**DURATION: 1 hour 45 minutes**

**SUITABLE FOR VISUALLY IMPAIRED CANDIDATES**

**Candidates answer on the question paper.**

**OCR SUPPLIED MATERIALS:**

**Advance Notice (inserted)**

**Insert (inserted)**

**OTHER MATERIALS REQUIRED:**

**Electronic calculator**


**Ruler (cm/mm)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- 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.
- Answer ALL the questions.

## **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.

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**Answer ALL the questions.**

**1 This question is based on the case study  
'SOYA: GOOD OR BAD FOR YOU' (CASE STUDY 1).**

**(a) You were told in the case study that recent research suggests that a high intake of soy food reduces the risk of bowel cancer in post-menopausal women.**

**Suggest TWO OTHER ways in which women may reduce their risk of bowel cancer.**

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**[2]**

(b) Fig. 1.1 shows the incidence and mortality rate for bowel cancer in males and females in England between 1970 and 2005.

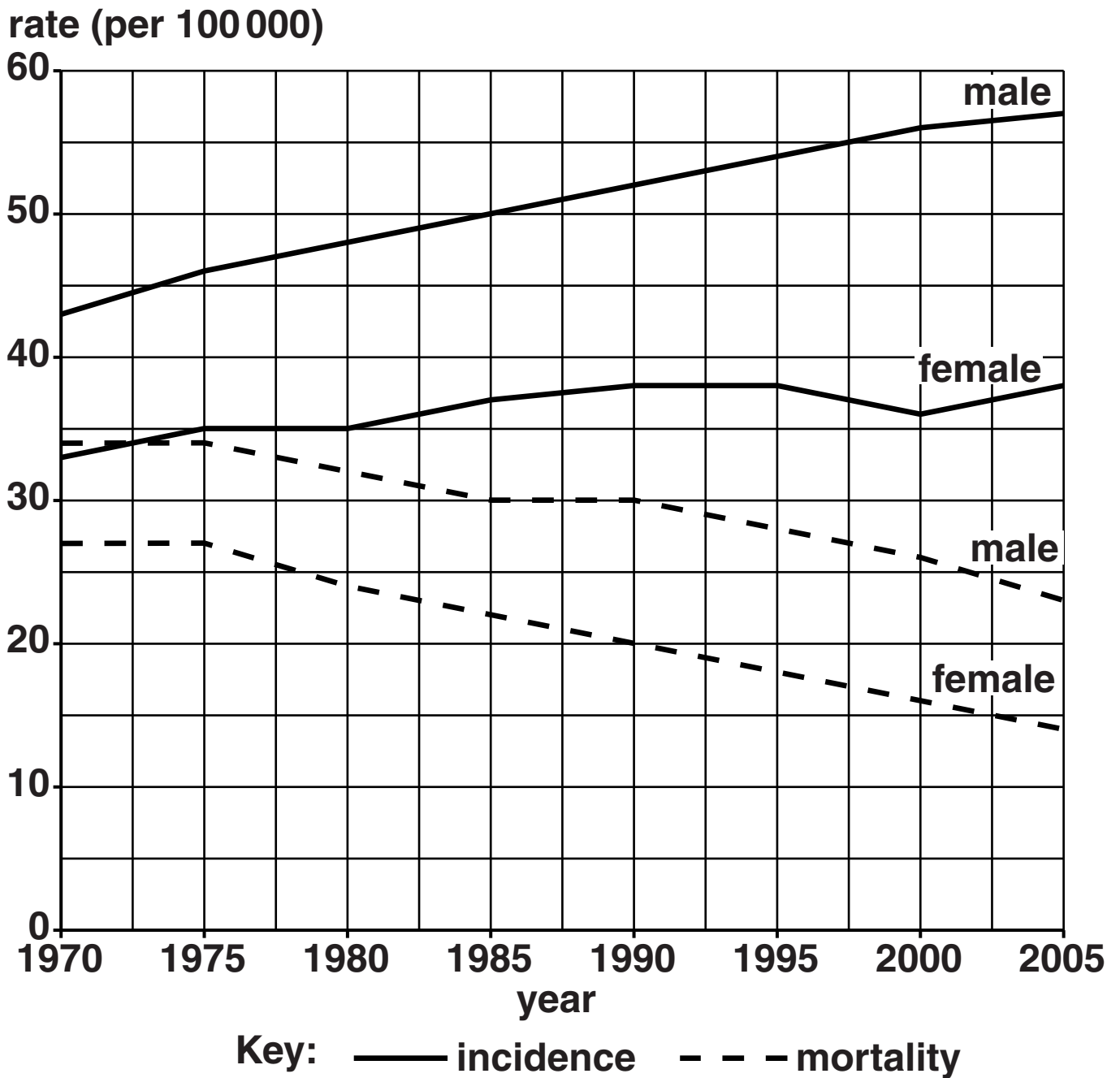


Fig. 1.1



- (c) The National Health Service (NHS) Bowel Cancer Screening Programme in England began in April 2006. In England, people age 60–69 are now offered screening every two years.**

**Suggest TWO reasons for introducing cancer screening programmes, such as the Bowel Cancer Screening programme.**

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\_\_\_\_\_ [2]

- (d) Bowel cancer develops over a period of several years.**

**Statements A to E below describe the stages in the development of bowel cancer.**

- A a primary tumour develops**
- B formation of an oncogene**
- C cancer cells break away from the primary tumour and form a secondary tumour**
- D a mutation occurs in a proto-oncogene in cells lining the bowel**
- E cells lining the bowel continue to divide by mitosis**

**Use the letters to put the stages in the correct order.**

\_\_\_\_\_ [4]

- (e) In the case study, you were told that in Dr Jorge Chavarro's study, the men were divided into four groups depending upon how much soy food they ate.**

**Suggest TWO FURTHER factors that needed to be controlled in Dr Chavarro's study in order to make valid conclusions from the results.**

**1** \_\_\_\_\_

**2** \_\_\_\_\_ **[2]**

- (f) Chemicals called isoflavones, present in soy foods, are thought to affect the action of oestrogen in females.**

**Suggest how isoflavones may affect the action of oestrogen.**

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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ **[2]**



**(g) In the case study, you were told that soy food is a good source of essential amino acids and polyunsaturated fatty acids.**

**Describe the importance of ESSENTIAL AMINO ACIDS and POLYUNSATURATED FATTY ACIDS in maintaining the healthy growth of new tissue.**

**essential amino acids**

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**polyunsaturated fatty acids**

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**[3]**

- (h) In the case study, you were given information about some scientific studies into the effects of soy food on different health conditions.**

**Two of these studies are listed below.**

**STUDY 1**

**Dr Jorge Chavarro's study of the effects of soy food on the sperm counts of 99 men who attended a fertility clinic.**

**STUDY 2**

**Professor Mark Cline's study of the effects of soy food on the development of breast cancer and uterine cancer in monkeys.**

**Suggest why the findings of each of these studies cannot be applied to the wider human population.**

**study 1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**study 2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

**[Total: 21]**

**2 This question is based on the case study  
'MONITORING INFANT GROWTH' (CASE STUDY 2).**

**(a) In the case study, you were told that the new WHO growth charts described optimal growth rather than average growth of babies.**

**Suggest what is meant by OPTIMAL GROWTH and AVERAGE GROWTH.**

**optimal growth** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**average growth** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]



- (c) A baby girl was delivered normally at 40 weeks gestation. She is a contented baby and has been exclusively breast fed.

Her birth weight was 4.29 kg.

The Health Visitor made her first visit when the baby was 2 weeks old and the baby's weight was 3.95 kg.

- (i) Calculate the baby's PERCENTAGE WEIGHT LOSS from birth to 2 weeks.

Show your working and give your answer TO THE NEAREST WHOLE NUMBER.

Answer = \_\_\_\_\_ % [2]

- (ii) Fig. 2.1, ON THE INSERT, shows the growth chart for girls' weight between 0 and 1 year.

Use the information in Fig. 2.1 to give the baby girl's weight centile at 2 WEEKS.

\_\_\_\_\_ [1]

**(iii) Use the information in Fig. 2.1 to state what weight you would expect the baby girl to be at 6 WEEKS old if she continues to develop as expected.**

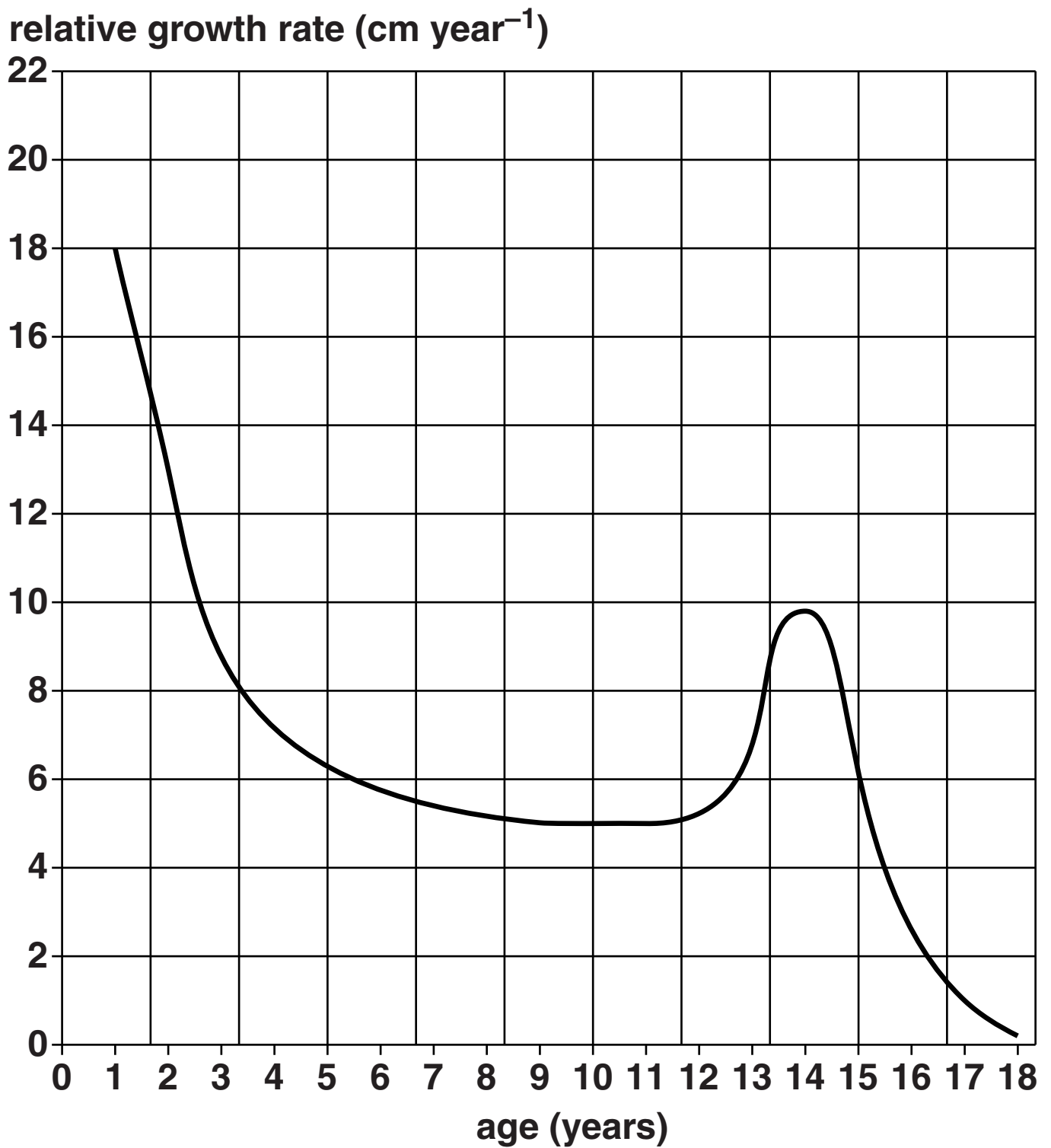
\_\_\_\_\_ [1]

**(iv) Suggest TWO reasons why some babies' growth curves may continue to show a drop in centiles after the first two weeks.**

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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

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(d) Fig. 2.2 shows the **RELATIVE** growth rate curve for boys between 0 and 18 years.



**Fig. 2.2**



- (i) Using the information in Fig. 2.2, describe how the relative growth rate of boys changes with age.**

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**[4]**

- (ii) Draw a line, ON FIG. 2.2, to show the relative growth rate of GIRLS between 0 and 18 years.**

**\_\_\_\_\_ The answer to this question should be drawn on Fig. 2.2. \_\_\_\_\_ [2]**

**(iii) Suggest why Health Visitors use relative growth rate curves instead of ABSOLUTE growth rate curves to assess how fast a child is growing.**

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**[2]**

**[Total: 22]**

**3 Many people think that tuberculosis (TB) is no longer a health threat, but it is still a major cause of premature deaths worldwide.**

**(a) State the FULL name of the organism that causes TB.**

\_\_\_\_\_ [1]

**(b) The Mantoux test is used to detect if a person has been exposed to the bacteria that cause TB.**

**A summary of the Mantoux test is given below.**

- **A small amount of tuberculin is injected under the skin.**
- **The site of the injection is examined a few days later.**
- **An immune response causes a red lump to develop.**
- **If the red lump is MORE than 6 mm in diameter, the test is positive.**
- **If the red lump is LESS than 6mm in diameter, the test is negative.**

**(i) Explain why a positive reaction develops in a person who has been PREVIOUSLY exposed to TB bacteria.**

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**[3]**

**(ii) In addition to previous exposure to TB bacteria, a positive reaction may also develop if a person has active TB.**

**Suggest ONE FURTHER reason why a person may develop a positive reaction to the Mantoux test.**

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**[1]**

**(iii) Suggest ONE reason for a false negative result.**

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[1]

**(c) In some areas of the world, one in four people with tuberculosis (TB) becomes ill with a multidrug-resistant form of the disease (MDR-TB).**

**(i) Suggest what is meant by a multidrug-resistant form of TB.**

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[1]

**(ii) Describe how the organism that causes TB may have evolved to become multidrug-resistant.**



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

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**(d) In the future, new types of medicinal drugs may be needed to treat diseases like TB. Plants are a potential source of new drugs.**

**(i) Suggest why seed banks may be used to provide new medicinal drugs.**

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**[2]**

**(ii) Seed banks are an example of ex situ conservation.**

**What is meant by the term ex situ conservation?**

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**[2]**

**[Total: 19]**

- 4 Research on human embryonic stem cells has shown that when the embryo is a ball of about 80 cells, 'master' stem cells are produced.

These cells are destined to divide and make up all the different types of cells in our body.

- (a) Stem cells go through a sequence of events known as the cell cycle.

Fig. 4.1 shows the sequence of events in one cell cycle.

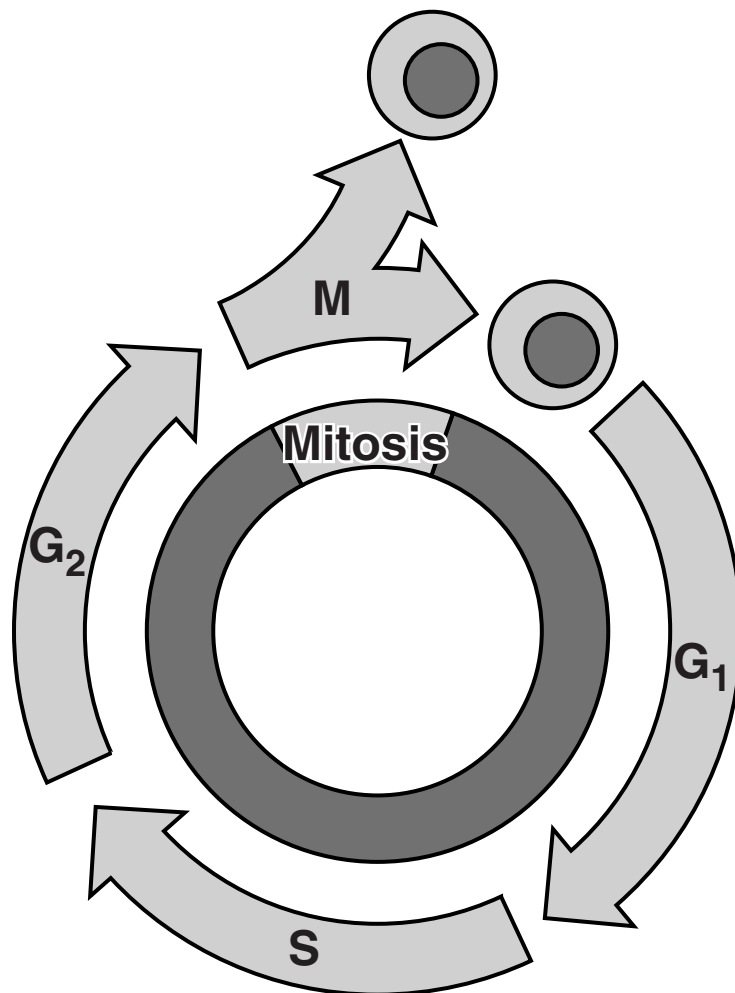


Fig. 4.1



- (i) Name the stage of the cell cycle that includes  $G_1$ , S and  $G_2$ .

\_\_\_\_\_ [1]

- (ii) Name ONE process taking place at each of the following:

$G_1$  \_\_\_\_\_

\_\_\_\_\_

S \_\_\_\_\_

\_\_\_\_\_ [2]

- (b) Scientists think that in the future, embryonic stem cells will be important in developing new therapies to treat a range of degenerative conditions such as Parkinson's disease, heart failure and diabetes.

Some people have concerns about the use of embryonic stem cells.

Suggest TWO ethical concerns that people might have about the use of embryonic stem cells.

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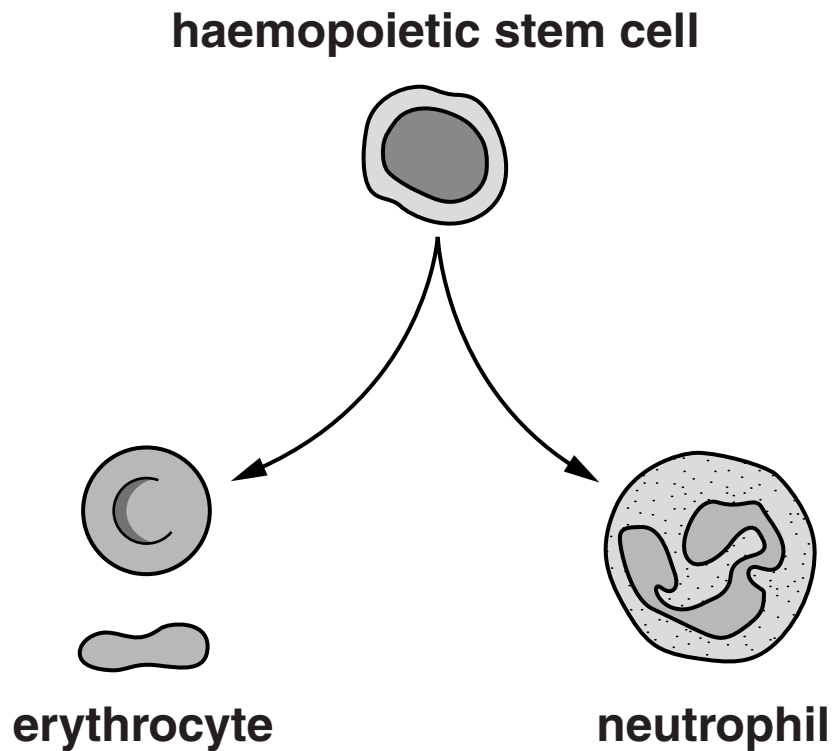
2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

**(c) Haemopoietic cells are stem cells in the bone marrow that give rise to all the different types of blood cells.**

**Fig. 4.2 shows two types of blood cells that are derived from haemopoietic stem cells.**



**Fig. 4.2**

- (i) Describe how mature erythrocytes AND neutrophils are derived from haemopoietic stem cells.**



**In your answer you should include a balanced account of the differentiation of both erythrocytes and neutrophils.**

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[8]

**(ii) Mature erythrocytes have a lifespan of approximately 120 days.**

**Use your knowledge of the differentiation of erythrocytes to suggest why these cells do not live longer than about 120 days.**

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[1]

[Total: 14]

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- 5 In order to promote good health and reduce mortality from Coronary Heart Disease (CHD), a number of large scale studies have been carried out to identify the risk factors for this disease.**

**Genetic inheritance, age and gender are three risk factors that have been identified.**

**Table 5.1 shows the mortality from CHD in males and females in 2007 in the UK.**

**Table 5.1**

<b>age (years)</b>	<b>number of male deaths</b>	<b>number of female deaths</b>
<b>under 35</b>	<b>129</b>	<b>27</b>
<b>35 – 44</b>	<b>783</b>	<b>183</b>
<b>45 – 54</b>	<b>2679</b>	<b>578</b>
<b>55 – 64</b>	<b>6687</b>	<b>1779</b>
<b>65 – 74</b>	<b>11335</b>	<b>4987</b>

**(a) (i) Using the information in Table 5.1, describe the effect of age AND gender on the risk of death from CHD.**

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**[3]**

**(ii) Suggest reasons for the effect of age AND gender on the risk of death from CHD.**

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**[4]**



**(b) One symptom of CHD is a chest pain called angina.**

**(i) Explain why people with angina may feel pain when they start to exercise.**

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**[3]**

- (ii) Angina is often treated by a surgical technique called angioplasty.

Fig. 5.1 shows a diagram of some of the stages in this surgical technique.

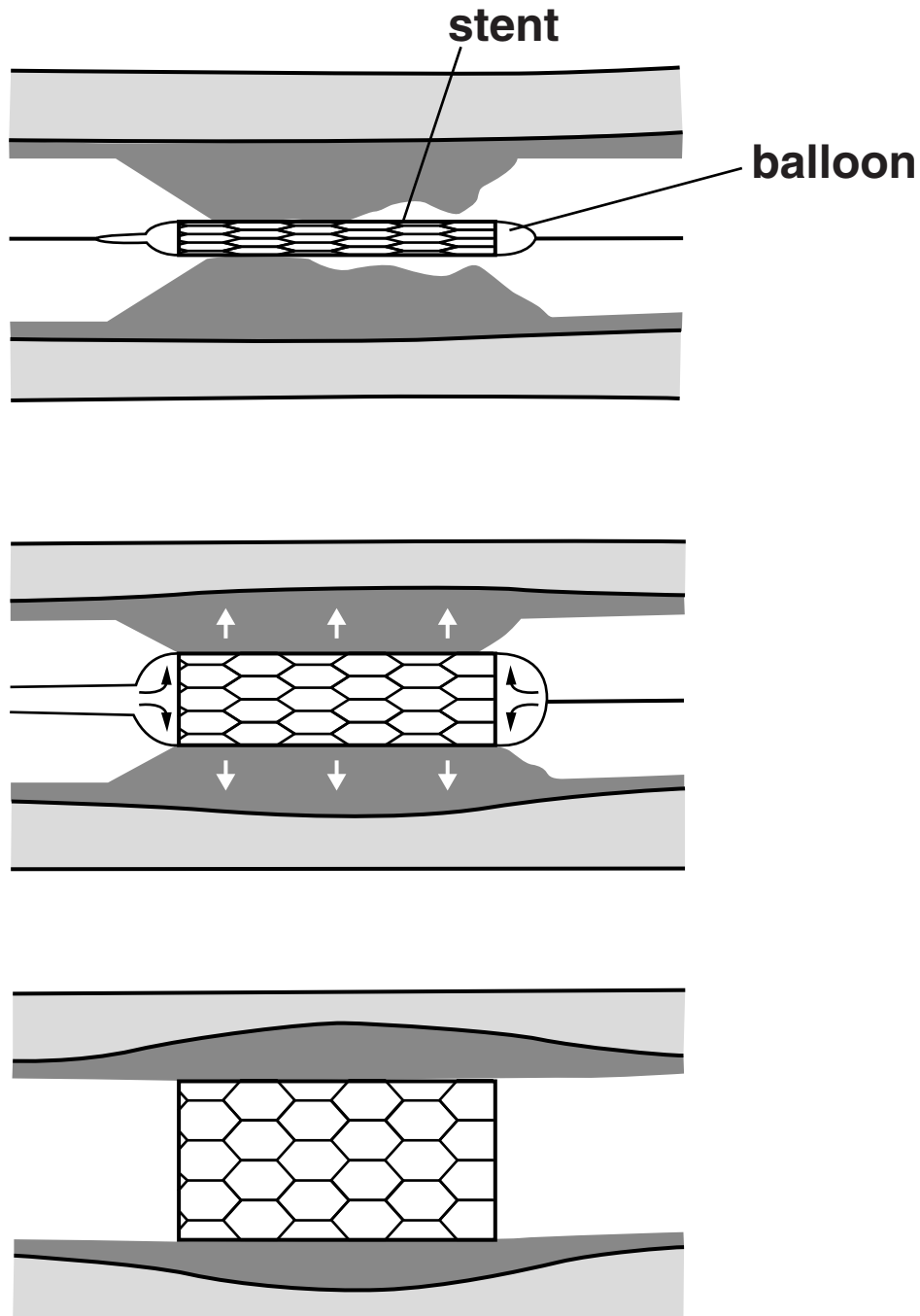


Fig. 5.1

Using the information in Fig. 5.1, describe how angioplasty is carried out.

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[4]

(iii) Name two surgical techniques, OTHER THAN ANGIOPLASTY, that are used to treat CHD.

1 \_\_\_\_\_

2 \_\_\_\_\_ [2]

[Total: 16]

**6 Errors in DNA are responsible for the mutations that lead to inherited genetic conditions.**

**These errors arise when DNA copies itself during DNA replication.**

**(a) Complete the following passage, which describes the process of DNA replication.**

**The DNA double helix unwinds and ‘unzips’ as**

**\_\_\_\_\_ bonds break**

**between the base-pairs. Free DNA nucleotides**

**pair up next to bases on the template strand**

**according to the \_\_\_\_\_**

**base-pairing rule. The nucleotides are joined**

**together by phosphodiester bonds, formed by**

**\_\_\_\_\_ reactions.**

**These reactions are catalysed by the enzyme**

**\_\_\_\_\_, forming new**

**strands. Each of the new DNA molecules contains**

**one ‘old’ and one ‘new’ strand and the process**

**is known as \_\_\_\_\_**

**replication.**

**[5]**

**(b) During DNA replication, mistakes can occur that change the sequence of nucleotides within the DNA molecule.**

**(i) Suggest why it is NOT possible to use karyotyping to detect such mistakes.**

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**[1]**

**(ii) Name TWO conditions that can be detected by karyotyping.**

**1** \_\_\_\_\_

**2** \_\_\_\_\_ **[2]**

**[Total: 8]**

**END OF QUESTION PAPER**





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