OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE

F222/01/TEST

HUMAN BIOLOGY

Growth, Development and Disease

MONDAY 3 JUNE 2013: Morning
DURATION: 1 hour 45 minutes
plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	

Centre number						Candidate number				

Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

Advance Notice (inserted)

OTHER MATERIALS REQUIRED:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (NF/CGW) 2291577371 80210/1

INSTRUCTIONS TO CANDIDATES

- **The Advance Notice will be found in the centre of this document.**
- **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. 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.**

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.**
- **Any blank pages are indicated.**

BLANK PAGE

QUESTION 1 BEGINS ON PAGE 4

Answer ALL the questions.

1 This question is based on the case study 'BRAF MUTATION TRIGGERS MOST MELANOMAS' (CASE STUDY 1).

You were told in the case study that in approximately 97 percent of BRAF gene mutations, the DNA sequence in malignant melanoma cells differed from that of healthy cells by just one base pair.

(a) Fig. 1.1 shows the structure of part of a DNA molecule.

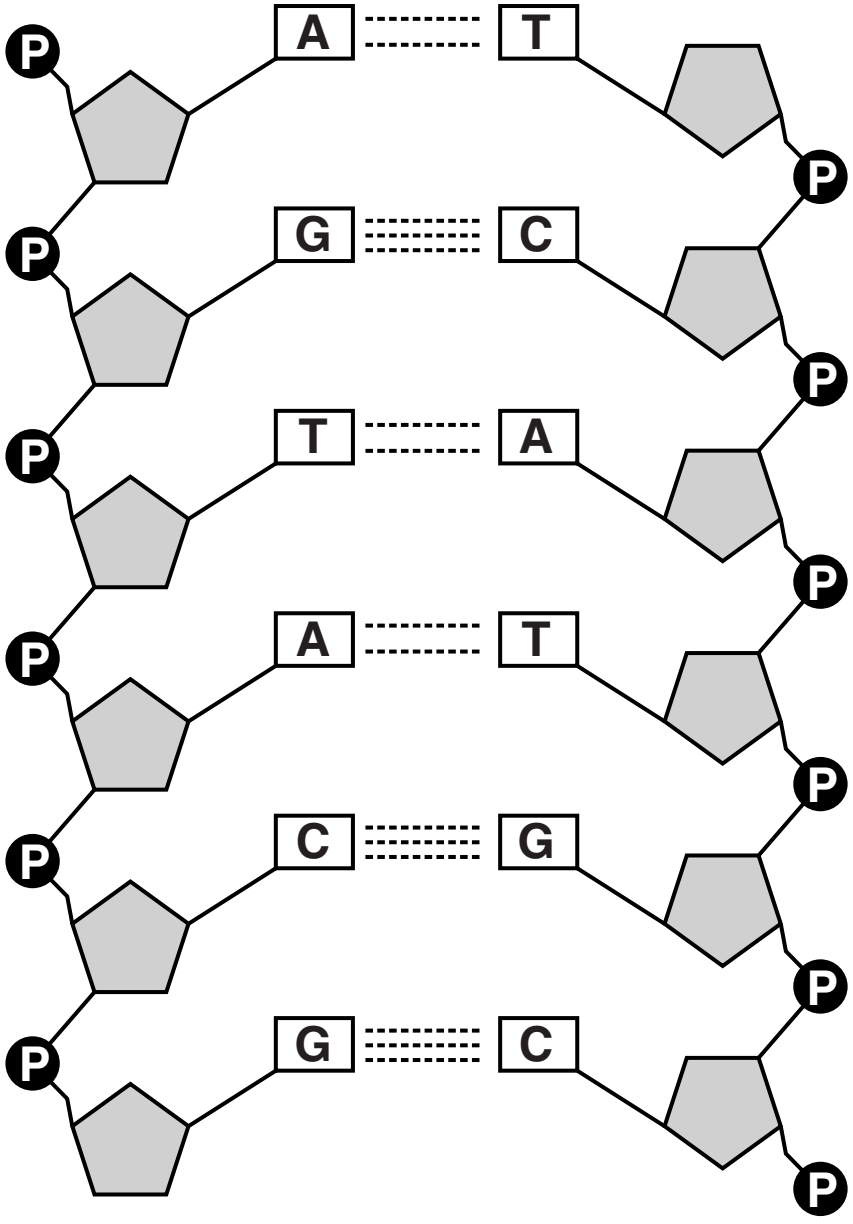

FIG. 1.1

(i) On Fig. 1.1 draw a box around a base pair.

The answer to this question should be drawn on Fig. 1.1. [1]

(ii) Explain the IMPORTANCE of complementary base pairing in DNA.

_____

_____

_____

_____

_____ **[2]**

(b) Suggest why the BRAF gene is known as a proto-oncogene.

_____

_____

_____ **[1]**

(c) Fig. 1.2 shows the incidence of malignant melanoma in males and females, of different ages, in the United Kingdom (UK).

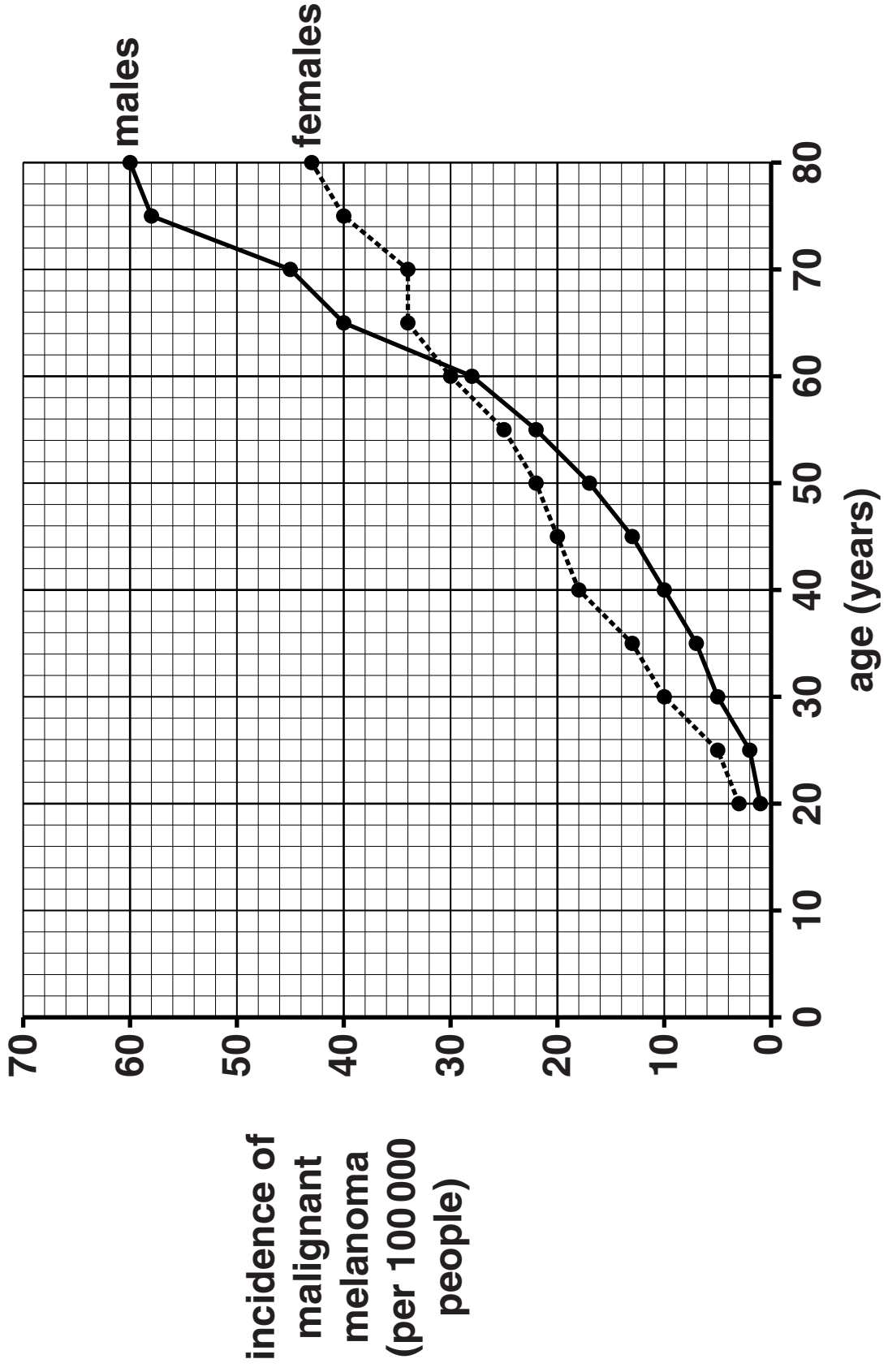

FIG. 1.2

(i) Using the information in Fig. 1.2, describe ONE similarity and ONE difference in the incidence of malignant melanoma in males and females.

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(ii) Suggest ONE reason for the similarity and ONE reason for the difference described in 1(c)(i).

similarity _____

_____

_____

difference _____

_____

_____

[2]

(d) **Cell growth and cell division are controlled by cell signalling pathways.**

Fig. 1.3 shows the BRAF protein and other proteins in a signalling pathway that normally controls cell division.

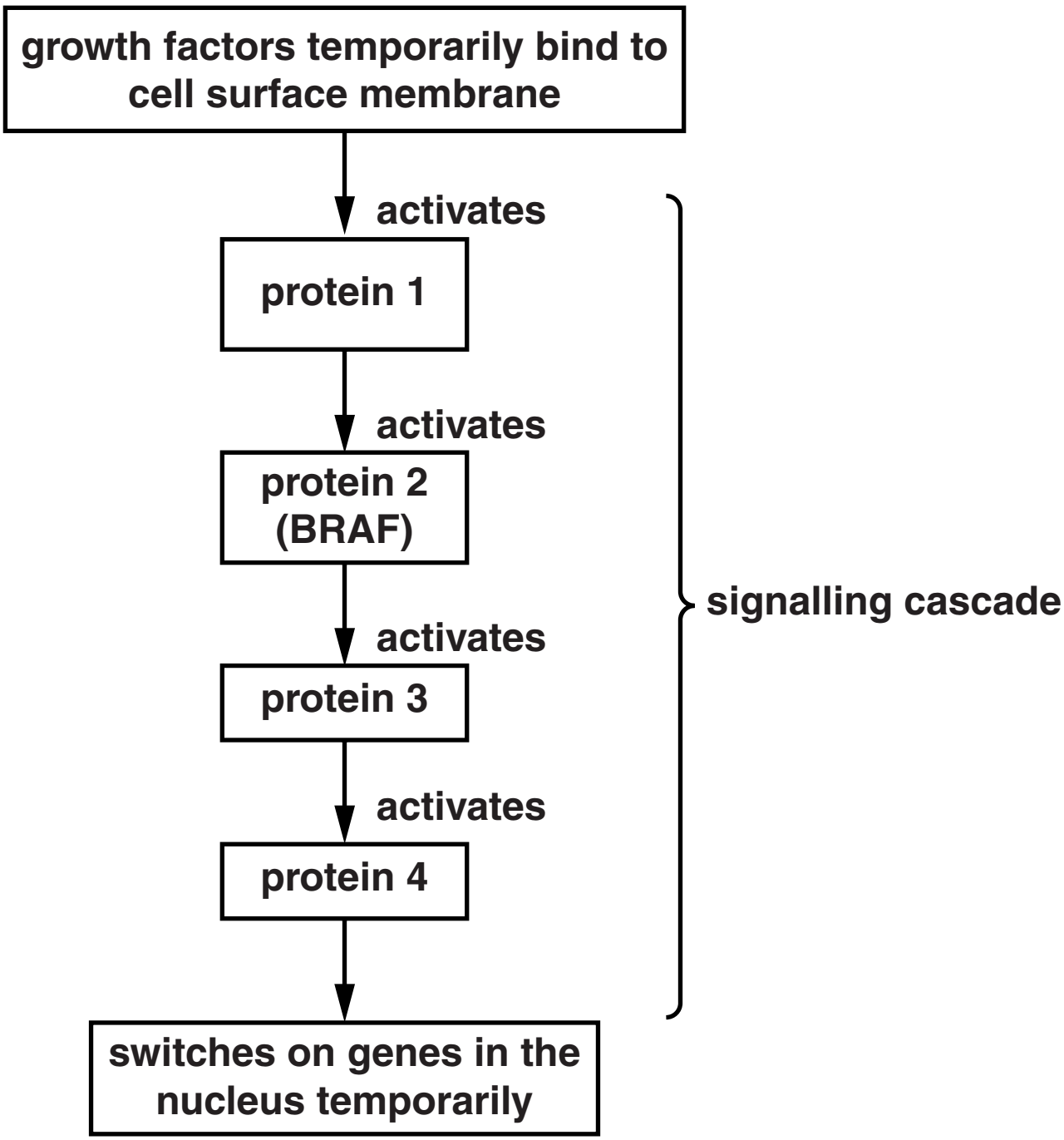

FIG. 1.3

(i) Fig. 1.3 shows that the signalling pathway is normally activated when growth factors bind to the cell surface membrane.

Suggest what feature of the cell surface membrane allows growth factors to bind.

_____

_____

_____

_____ **[2]**

(ii) Describe the effect of the BRAF gene mutation on the signalling pathway.

_____

_____

_____

_____

_____

_____ **[2]**

(e) You were told in Case Study 1 that the altered BRAF protein has a significantly different shape to the normal BRAF protein.

(i) Suggest why this difference in shape makes the altered BRAF protein an excellent candidate for drug targeting.

_____

_____

_____

_____

_____

_____ **[2]**

(ii) The BRAF protein is an enzyme.

Suggest how a drug might act to reduce or stop the activity of the altered BRAF enzyme.

_____

_____

_____

_____

_____

_____ **[2]**

(f) The research team carried out a phase 3 clinical trial to compare the effects of the drugs vemurafenib and dacarbazine, in treating malignant melanoma.

(i) Describe what is meant by a phase 3 clinical trial.

_____

_____

_____

_____ **[2]**

(ii) Most phase 3 clinical trials are randomised.

Suggest how a randomised trial would be set up to compare the effects of vemurafenib and dacarbazine.

_____

_____

_____

_____

_____ **[2]**

[TOTAL: 21]

BLANK PAGE

QUESTION 2 BEGINS ON PAGE 14

2 This question is based on the case study 'THE BURDEN OF CHRONIC DISEASE' (CASE STUDY 2).

(a) (i) Describe what is meant by the term 'chronic' disease.

_____

_____

_____

_____ **[2]**

(ii) State TWO chronic diseases OTHER THAN chronic respiratory diseases and cancer.

1 _____

2 _____

[2]

(b) You were told in Case Study 2 that disability-adjusted life years (DALYs) can be used as an indicator of the overall health of a country.

Table 2.1 shows the AGE-STANDARDISED DALYs from chronic respiratory diseases, for men and women in India and the United Kingdom (UK), in 2004.

Country	Gender	Age-standardised DALYs (per 100 000)
India	female	1167
	male	1387
United Kingdom	female	909
	male	942

TABLE 2.1

(i) Explain why age-standardised figures were used.

_____

_____

_____

_____ **[2]**

(ii) In India, males accounted for 54% of the total age-standardised DALYs.

In the UK, males accounted for a different percentage of the total age-standardised DALYs.

Using figures from Table 2.1, calculate this percentage.

Show your working and GIVE YOUR ANSWER TO THE NEAREST WHOLE NUMBER.

Answer = _____ % [2]

(iii) There are differences between India and the UK in the age-standardised DALYs resulting from chronic respiratory diseases.

Suggest explanations for these differences.

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(c) Asthma is the most common chronic respiratory disease in children.

Fig. 2.1 (on page 19) shows a diagram of the cross-section through a normal bronchiole and a cross section through a bronchiole during an asthma attack.

(i) With reference to Fig. 2.1, describe THREE changes that occur in bronchioles during an asthma attack.

1 _____

_____

2 _____

_____

3 _____

_____

[3]

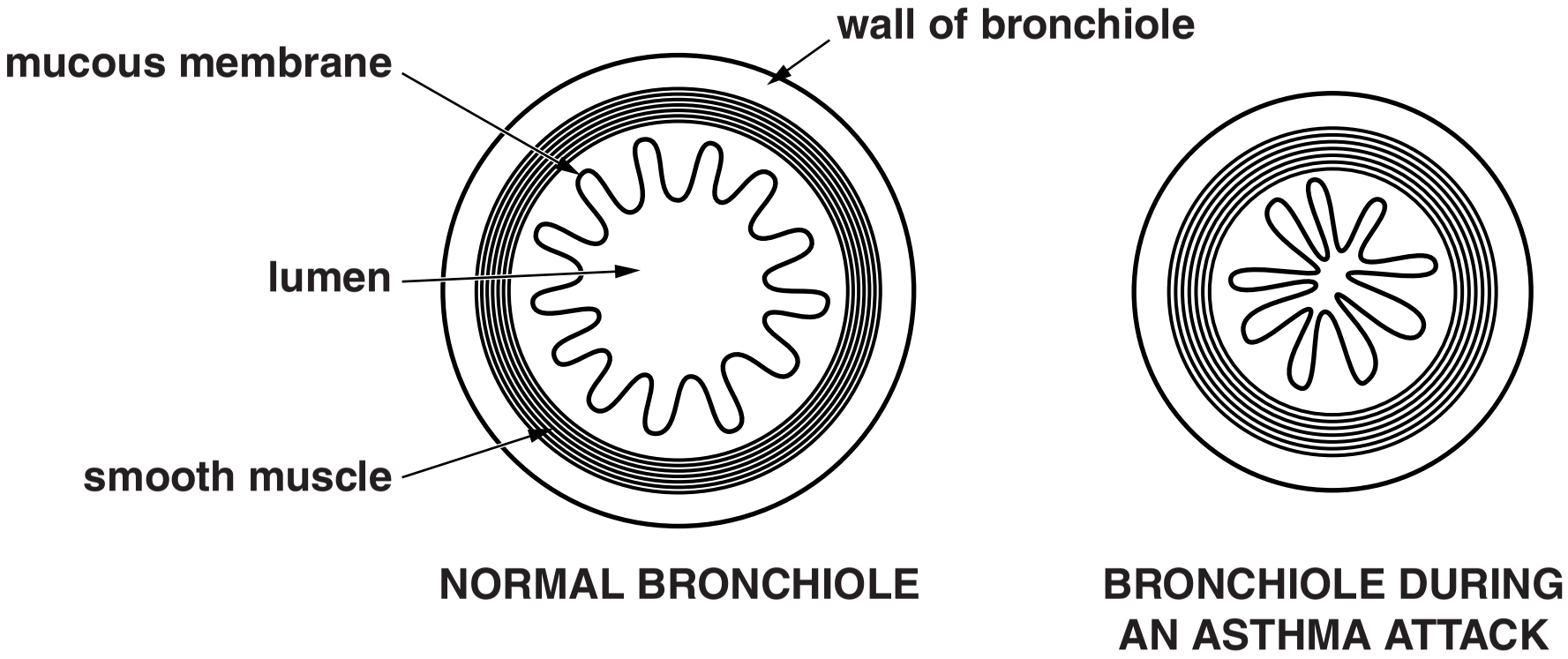
wall of bronchiole
mucous membrane
lumen
smooth muscle
NORMAL BRONCHIOLE
BRONCHIOLE DURING
AN ASTHMA ATTACK

FIG. 2.1

(ii) Two types of drug that are used to treat asthma are steroids and beta-agonists.

Describe how these drugs are introduced into the body AND explain how they relieve the symptoms of asthma.

steroids _____

_____

_____

_____

_____

beta-agonists _____

_____

_____

_____

_____

[5]

(d) The Global Alliance against Chronic Respiratory Diseases (GARD) is trying to reduce the health burden of chronic respiratory diseases.

Suggest TWO policies that countries could introduce to prevent chronic respiratory diseases.

1 _____

_____

_____

2 _____

_____

_____

[2]

[TOTAL: 21]

3 Karyotyping is a test which can help to identify genetic disorders.

(a) Fig. 3.1 shows a karyotype produced from a sample containing fetal cells.

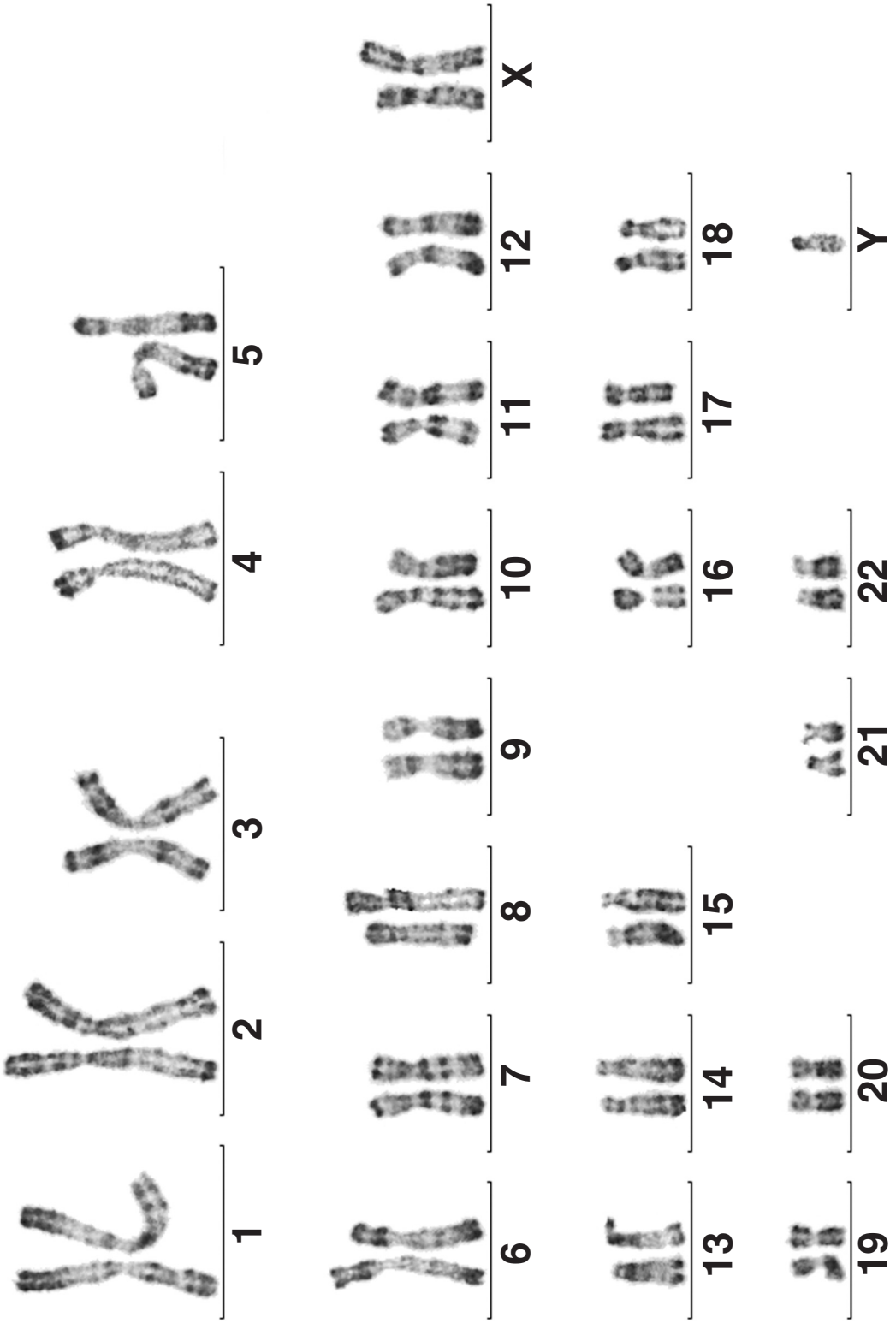

FIG. 3.1

(i) Name the genetic disorder shown in the karyotype in Fig. 3.1.

_____ [1]

(ii) Describe how this karyotype differs from a normal karyotype.

_____

_____ [1]

(b) To check for genetic disorders in the fetus, karyotypes are made from cells isolated from a sample taken from the amniotic fluid or chorionic villi.

Describe how a karyotype is obtained from these cells. [5]

_____

_____

_____

_____

_____

_____

_____

ANSWER LINES FOR THIS QUESTION CONTINUE ON THE NEXT PAGE.

_____

_____

_____

_____

_____

(c) Genetic disorders, such as the one shown in the karyotype in Fig. 3.1, result from mistakes that occur when a gamete-producing cell divides by meiosis.

Fig. 3.2 (on page 25) is a simplified diagram of meiosis in a gamete-producing cell. Only the X chromosomes are shown.

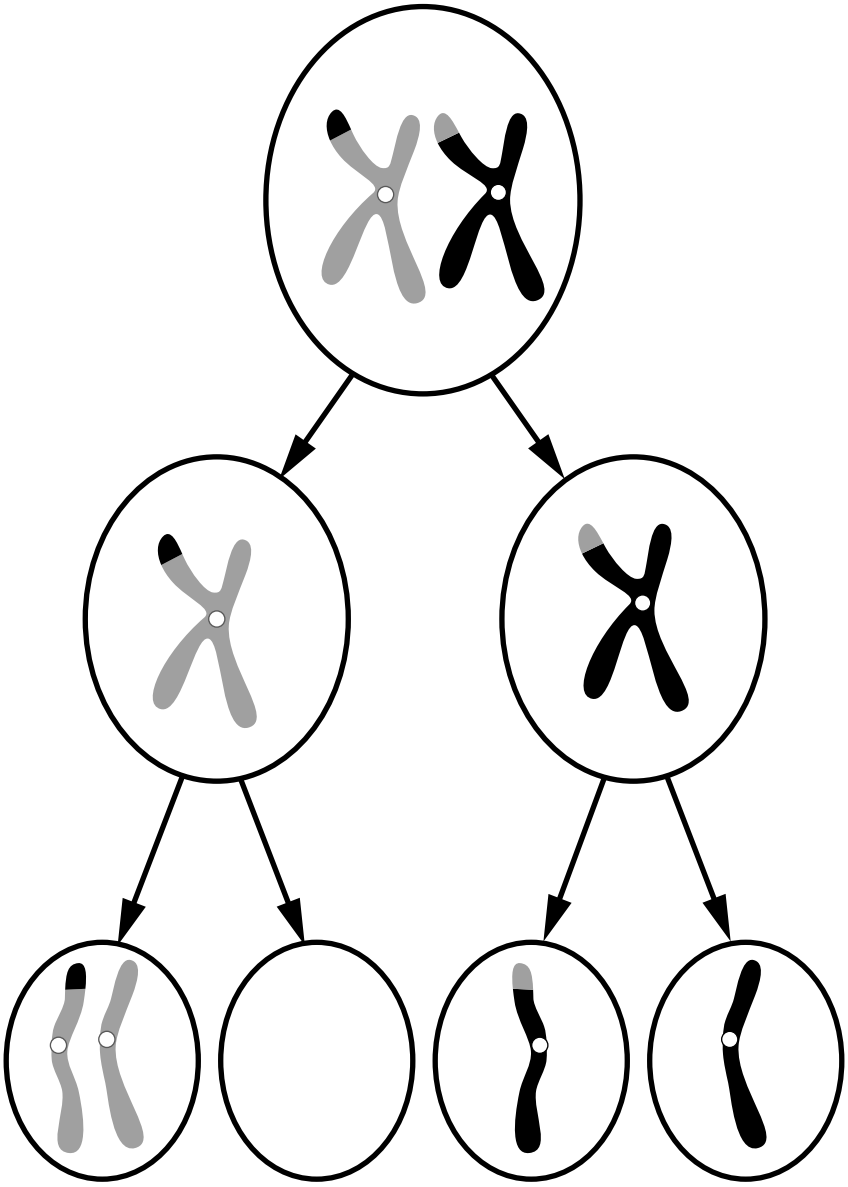

FIG. 3.2

(i) On Fig. 3.2

label the point where non-disjunction occurs

label a diploid cell.

The answers to this question should be drawn on Fig. 3.2.

[2]

(ii) Explain how NON-DISJUNCTION can lead to a fetus having the karyotype shown in Fig. 3.1.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

[TOTAL: 13]

4 Heart attacks are a major cause of death for both men and women worldwide.

Most heart attacks are caused by coronary heart disease (CHD).

(a) The following passage describes how CHD develops and leads to a heart attack.

Complete the passage by using the most appropriate terms.

In CHD, the lining of the coronary artery, known as the _____ becomes damaged and roughened. The _____ of the artery becomes narrower due to a build up of fatty deposits known as _____ . A blood clot may form at this site and grow so large that it blocks the artery. This means that the cardiac _____ is no longer supplied with blood carrying _____ so aerobic respiration can no longer occur. This results in a heart attack. [5]

(b) State TWO symptoms of a heart attack.

_____

_____

_____

_____ **[2]**

(c) A severe heart attack may lead to a CARDIAC ARREST.

(i) Describe TWO signs that indicate that a person is having a cardiac arrest rather than a heart attack.

_____

_____

_____

_____ **[2]**

(ii) Cardiopulmonary resuscitation (CPR) is the first aid treatment for a person suffering from a cardiac arrest.

Describe the treatment given by a first aider, to a person identified as having a cardiac arrest, AND describe what additional treatment may be given by a medically qualified practitioner.

In your answer you should refer to both the treatment given by the first aider and the medical practitioner. [8]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

ANSWER LINES FOR THIS QUESTION CONTINUE ON THE NEXT PAGE.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

[TOTAL: 17]

BLANK PAGE

QUESTION 5 BEGINS ON PAGE 32

5 Immunisation programmes have resulted in dramatic improvements in health.

As a result of immunisation, several infectious diseases which were major causes of ill health are now rare in many countries.

Table 5.1 (on page 33) shows the immunisation programme for young children in the United Kingdom (UK).

The vaccines used in the immunisation programme have code names, as shown in Table 5.1.

One of the vaccines and some of the diseases have been omitted from the table – these are indicated by the shaded areas.

(a) (i) Using the information in Table 5.1, name the vaccine that protects children from measles, mumps and rubella.

_____ **[1]**

(ii) Name FOUR of the diseases that children are protected against by having the DTaP/IPV/Hib vaccine given at 2, 3, 4 months and 3 years 4 months.

_____

_____

_____

_____ **[4]**

Age	Code name of vaccine	Diseases protected against
2 months	DTaP/IPV/Hib (1st dose)	
	PCV (1st dose)	pneumonia
3 months	DTaP/IPV/Hib (2nd dose)	
	MenC (1st dose)	meningitis C
4 months	DTaP/IPV/Hib (3rd dose)	
	PCV (2nd dose)	pneumonia
	MenC (2nd dose)	meningitis C
12–13 months	Hib (4th dose) / MenC (3rd dose)	
		measles, mumps and rubella
	PCV (3rd dose)	pneumonia
3 years 4 months	DTaP/IPV/Hib (pre-school booster)	
		measles, mumps and rubella

TABLE 5.1

(b) (i) Table 5.1 shows that young children need more than one dose of some vaccines.

OUTLINE how a vaccine protects children from infectious disease and EXPLAIN why more than one dose of the vaccine may be required to give full protection.

In your answer, you should make clear how the response to the second dose of the vaccine differs from the response to the first dose of the vaccine. [9]

ANSWER LINES FOR THIS QUESTION CONTINUE ON THE NEXT PAGE.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(ii) Suggest ONE reason why the routine vaccination programme in the UK starts when children are 2 months old.

_____

_____

_____ **[1]**

(iii) Suggest why some parents are worried about their children being vaccinated.

_____

_____

_____ **[1]**

(c) Sometimes a child's immune system does not respond successfully to a vaccine.

In the condition known as PEM (protein-energy malnutrition), a child's diet is low in fat and carbohydrates. This results in protein in the diet being used as an energy source.

Suggest why a vaccine may not produce an immune response in children with PEM.

_____

_____

_____

_____ **[2]**

[TOTAL: 18]

6 Humans are multicellular organisms.

All the cells in the human body develop from a single fertilised egg which divides many times.

(a) Explain how cells become organised to form the RESPIRATORY SYSTEM in the human body.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

(b) Babies and infants need a balanced diet for healthy growth and development.

Complete Table 6.1 by inserting the name of a mineral OR vitamin that is needed for each role in the body. Some minerals and vitamins have more than one role.

Role in body	Mineral or vitamin
for the functioning of the retina in the eye	vitamin A
to make haemoglobin	
for blood to clot	
for the development of strong bones	
to make DNA, RNA and ATP	
necessary for collagen and healthy skin	

TABLE 6.1

[5]

(c) Babies and infants also need a source of essential fatty acids and essential amino acids.

State what is meant by the term 'essential' in this context.

_____

_____ **[1]**

[TOTAL: 10]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

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

ADDITIONAL ANSWER SPACE

BLANK PAGE

BLANK PAGE