Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Time 1 hour 30 minutes

Paper reference **WBI11/01**

Biology

Advanced Subsidiary

UNIT 1: Molecules, Diet, Transport and Health

You must have:
Scientific calculator, ruler, HB pencil

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- The marks available for spelling, punctuation and grammar are clearly indicated.
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure you're answer logically, showing how the points you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 7 1 8 6 8 A 0 1 3 2

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Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Water and carbohydrates are molecules found in all living organisms.

(a) Draw a diagram of a water molecule to show its dipole nature.

(2)

(b) The table gives some statements about carbohydrates.

For each statement, put **one** cross in the appropriate box in each row to match the statement to the correct carbohydrates.

(3)

Statement	Carbohydrates			
	both monosaccharides and polysaccharides	**monosaccharides only**	**polysaccharides only**	**neither monosaccharides nor polysaccharides**
Have the general formula $C_nH_{2n}O_n$	☒	☒	☒	☒
Have glycosidic bonds	☒	☒	☒	☒
Have little effect on water potential	☒	☒	☒	☒

(Total for Question 1 = 5 marks)

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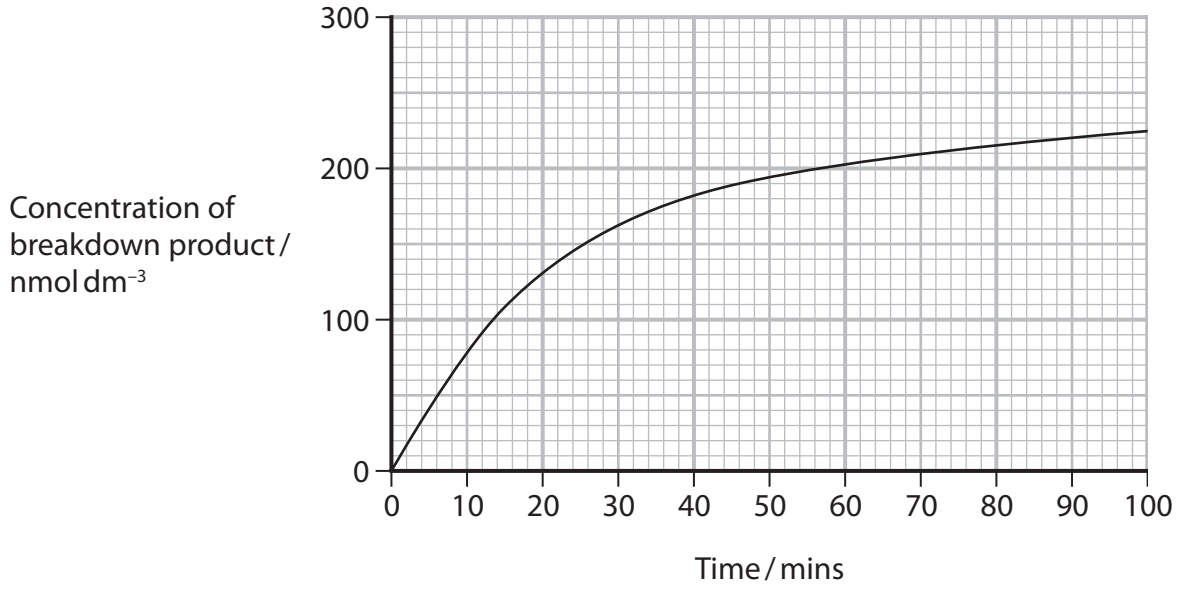
2 Elastin and collagen are proteins found in connective tissue.

(a) Describe the structure of collagen.

(3)

(b) Proteases are enzymes that break down proteins.

The graph shows the effect of a protease solution on a sample of elastin.



(i) Calculate the rate of reaction at 30 minutes.

Draw a tangent to help with your calculation.

(2)

Answer ..... nmol dm^{-3} min^{-1}

(ii) Explain how a protease breaks down elastin.

(3)

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(Total for Question 2 = 8 marks)

3 Cystic fibrosis results from mutations in the CFTR gene.

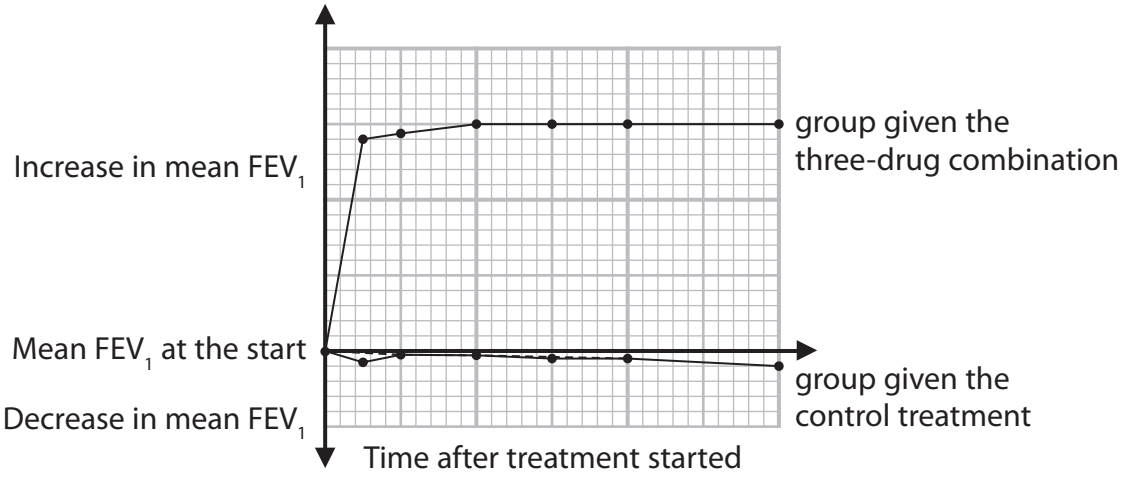
Mutations may occur at a number of positions within the gene, resulting in a range of clinical symptoms and severity of cystic fibrosis.

The effect of combining three different drugs to treat people with cystic fibrosis was investigated.

People with cystic fibrosis were divided into two groups. One group was given the three-drug combination and the other group was given a control treatment.

The volume of air each person could forcefully blow out in one second (FEV_1) was measured.

The graph shows the results of this investigation.



(a) Explain why the change in mean FEV_1 was used in this investigation.

(3)

(b) Explain why the results of this investigation **do not** show that this treatment is more effective than using each drug on its own.

(2)

(c) Suggest why a combination of drugs could be more effective in treating people with cystic fibrosis than each drug used on its own.

(2)

(Total for Question 3 = 7 marks)

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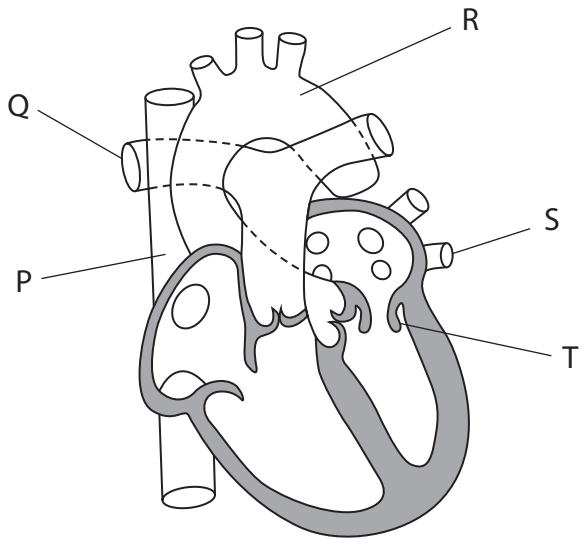
4 (a) The diagram shows the internal structure of a mammalian heart.



(i) How many of the following are correct for blood vessel P?

(1)

- carries blood to the heart
- has valves along its length
- has an endothelial lining

☒ **A** 0

☒ **B** 1

☒ **C** 2

☒ **D** 3

(ii) Why is blood vessel Q classified as an artery?

(1)

☒ **A** because it carries deoxygenated blood

☒ **B** because it carries oxygenated blood

☒ **C** because it carries blood away from the heart

☒ **D** because it carries blood back to the heart

(iii) Which blood vessel does the coronary artery branch from?

(1)

- ☒ **A** P
- ☒ **B** Q
- ☒ **C** R
- ☒ **D** S

(iv) When in the cardiac cycle is valve T open?

(1)

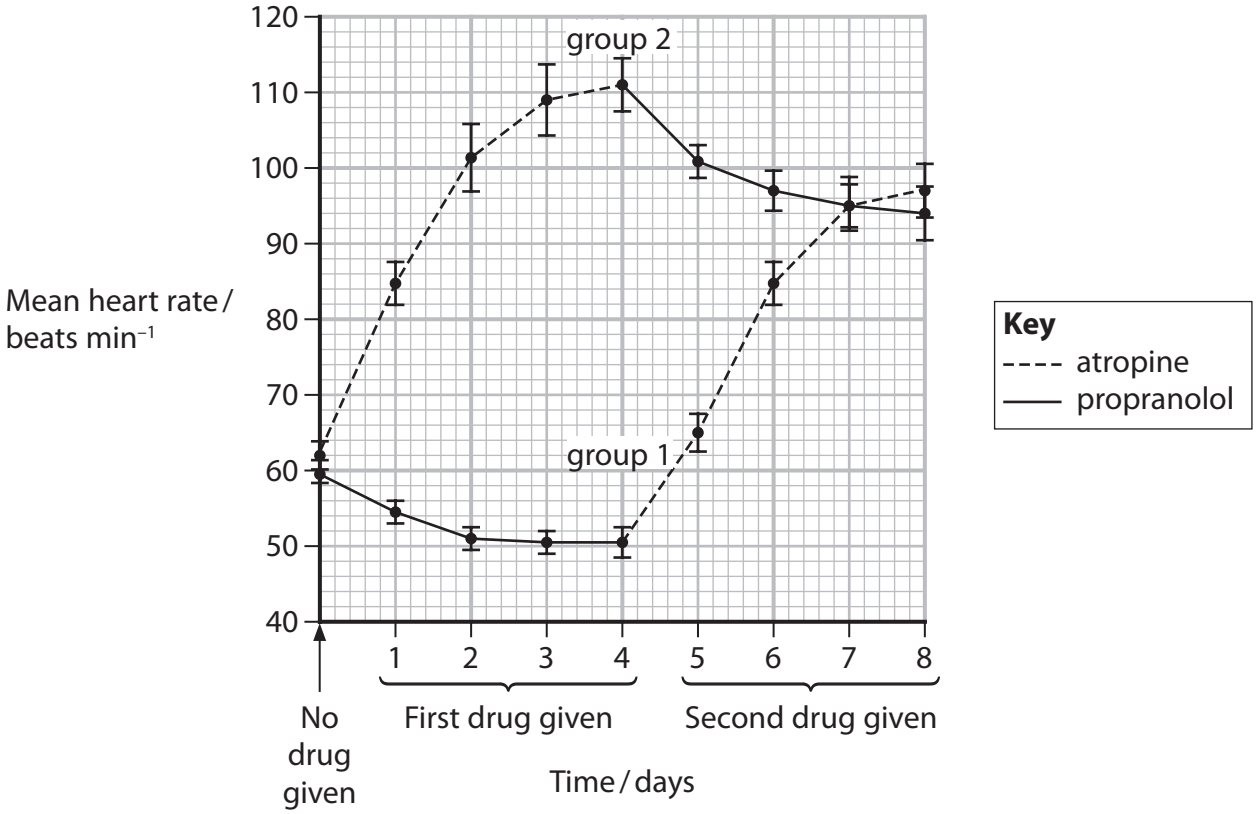
- ☒ **A** atrial systole and cardiac diastole
- ☒ **B** atrial systole only
- ☒ **C** cardiac diastole and ventricular systole
- ☒ **D** ventricular systole only

(b) The effect of atropine and propranolol on heart rate was investigated.

One group of people, group 1, were given propranolol each day for four days followed by atropine for four days.

A second group of people, group 2, were given atropine each day for four days followed by propranolol for four days.

The graph shows the results of this investigation.



(i) Calculate the change in mean heart rate for group 2 after 8 days.

(1)

Answer ..... beats min^{-1}

(ii) Calculate the mean length of the cardiac cycle for group 2 on day 4.

(1)

Answer ..... seconds

(iii) Comment on the conclusions that can be drawn from this investigation.

(3)

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(Total for Question 4 = 9 marks)

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5 The Portfolio diet is a diet that has been shown to lower low-density lipoproteins (LDLs) and other risk factors of cardiovascular disease (CVD).

(a) (i) Which row in the table describes the cholesterol content and antioxidant content of this diet?

(1)

		Cholesterol content	Antioxidant content
☒	**A**	high	high
☒	**B**	high	low
☒	**C**	low	high
☒	**D**	low	low

(ii) Name **two** other dietary risk factors that could be changed in this diet.

(1)

1 .....

2 .....

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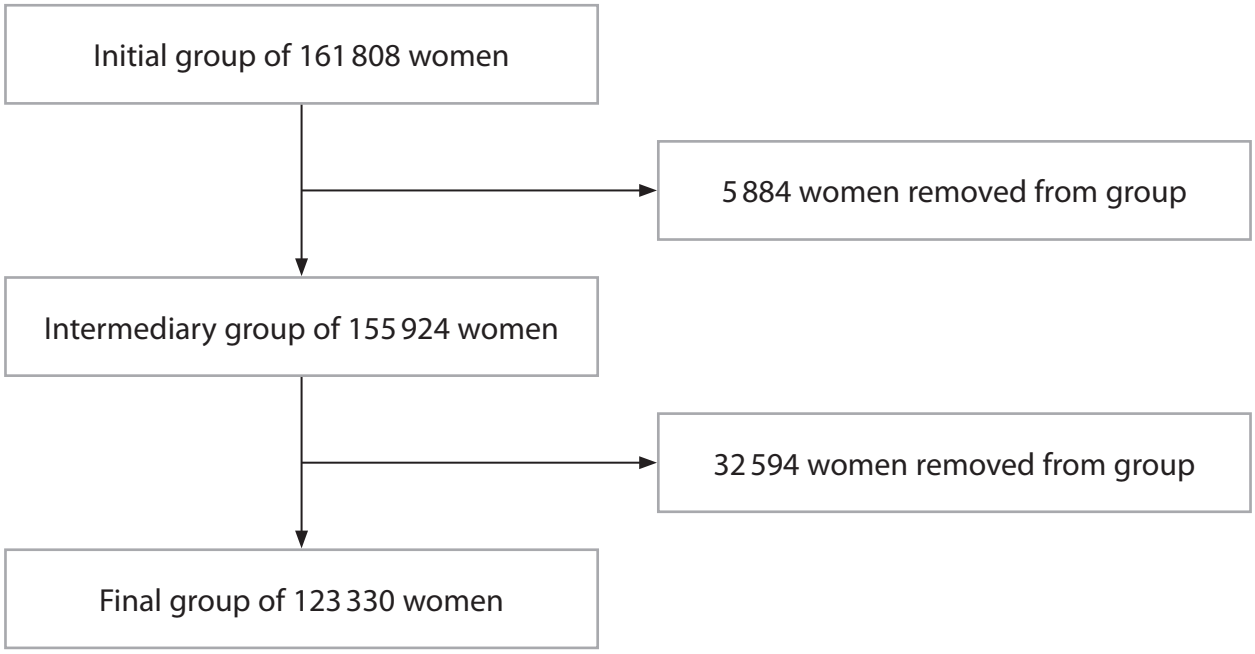
(b) The effect of this diet on the development of CVD in women was investigated.

The diagram shows how 123 330 women were selected from an initial group of 161 808 women.



(i) Some of the women were removed from the initial group because there was information missing about their lifestyles.

Suggest why women with missing lifestyle information were removed from the initial group.

(1)

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(ii) Some of the women were removed from the initial group because they gave unrealistic estimates of their daily energy intake.

Give **two** reasons why some women may have given unrealistic estimates of their daily energy intake.

(2)

1 .....

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2 .....

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(iii) The women removed from the intermediary group had signs of CVD.

Explain why these women were removed from this investigation.

(2)

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(iv) Calculate the percentage of all the women removed from this investigation.

(1)

Answer ..... %

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(c) Explain why a diet that is low in saturated fat is likely to reduce the risk of CVD.

(3)

(Total for Question 5 = 11 marks)

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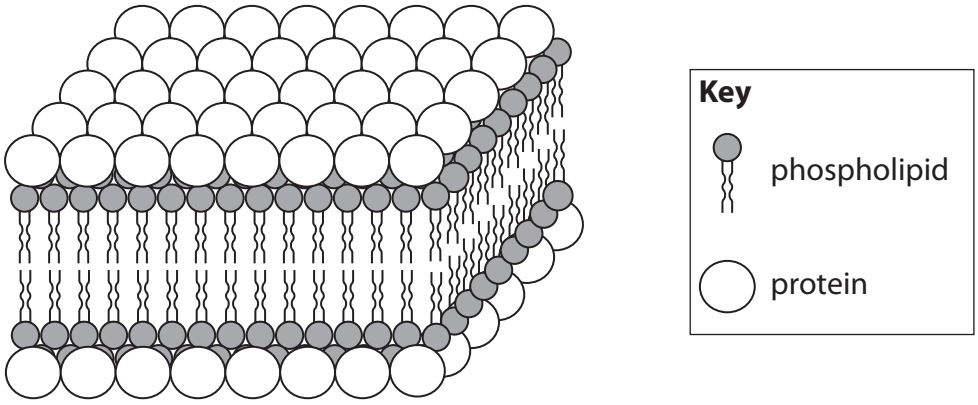
6 The fluid mosaic model of membrane structure was developed to explain the structure and properties of cell membranes.

(a) One model of membrane structure was developed by Davson and Danielli.

The diagram shows the Davson–Danielli model.



(i) Which describes a phospholipid?

(1)

☒ **A** hydrophilic fatty acid head and hydrophobic phosphate tails

☒ **B** hydrophilic phosphate head and hydrophobic fatty acid tails

☒ **C** hydrophobic fatty acid head and hydrophilic phosphate tails

☒ **D** hydrophobic phosphate head and hydrophilic fatty acid tails

(ii) Compare and contrast the structure of the model shown in the diagram with that of the fluid mosaic model of membrane structure.

(4)

(b) The cell membrane is important to the cell and if it gets damaged the cell could die.

(i) Suggest how damage to the cell membrane could result in cell death.

(2)

(ii) Cells can repair damage to the cell membrane.

This involves fusion of parts of the membrane around the edge of the damage.

Explain why parts of the membrane are able to fuse together to repair the damage.

(2)

(iii) Once the membrane has fused together, other processes are needed to complete the repair of the membrane.

Suggest what else the cell needs to do to complete this repair.

(2)

(Total for Question 6 = 11 marks)

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7 The photograph shows a yak.

(Source: Zoonar GmbH / Alamy Stock Photo)

Yaks are cattle that live at high altitudes, such as in the Himalayas.

They are well-adapted for the low temperatures and low levels of oxygen in the air.

These adaptations include:

- a thick layer of fat below the skin
- large lungs and a large heart
- many small red blood cells
- presence of fetal haemoglobin throughout their adult life.

(a) Triglycerides are fats.

Describe the structure of a triglyceride.

(2)

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(b) Explain why large lungs and a large heart would help a yak to survive at high altitudes.

(3)

(c) The table shows some characteristics of the blood of yaks and the blood of humans.

Characteristic of blood	Blood of yaks	Blood of humans
Concentration of red blood cells / cells dm^{-3}	1.0×10^{13}	4.0×10^{6} to 6.0×10^{6}
Volume of one red blood cell / fl	43	90
Concentration of haemoglobin / g dm^{-3}	136	12 to 18

(i) The unit given for the volume of a red blood cell is a femtolitre (fl).

$1 \text{ fl} = 1.0 \times 10^{-15} \text{ dm}^3$

Give the volume of a red blood cell of a yak in cm^3.

Express your answer in standard form.

(1)

Answer ..... cm^3

(ii) The diagram gives some information about two spheres, sphere A and sphere B.

- sphere A has a surface area : volume ratio of 1 : 1.3
- sphere B has a surface area of 768 mm^2

Calculate the surface area : volume ratio of sphere B.

Use the formula:

$$\text{Volume} = \frac{4}{3}\pi r^3$$

where $\pi = 3.0$

(2)

Answer .....

*(iii) Discuss why the blood of yaks enables these animals to live at high altitudes.

Use all the information in this question to support your answer.

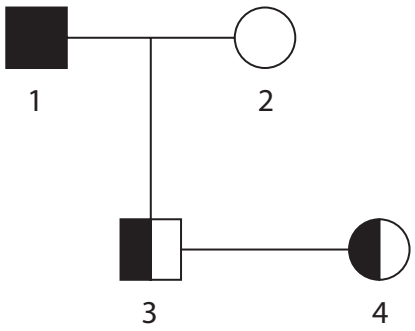
(6)

(Total for Question 7 = 14 marks)

8 Red blood cells have a number of different groups of proteins on the cell surface membrane.

The inheritance of some of these groups of proteins is an example of codominance.

The pedigree diagram shows the blood type of individuals in part of one family. Individuals 1 and 2 are both homozygous for blood type.



Key

- male with blood group M
- female with blood group N
- male with blood group MN
- female with blood group MN

(a) Explain why the inheritance of blood type, shown in this diagram, is an example of codominance.

(2)

(b) Determine the ratio of the possible blood type phenotypes of the children of individuals 3 and 4.

You must draw a genetic diagram.

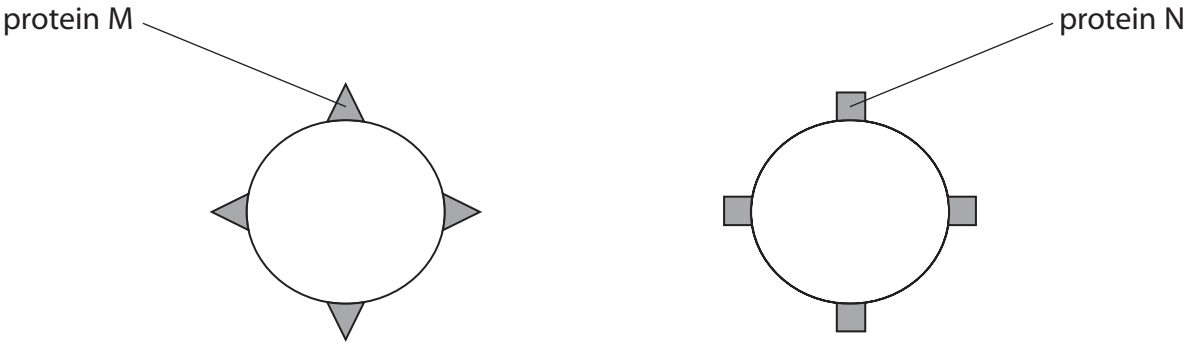
(4)

Genetic diagram:

Ratio.....

(c) The gene that determines this blood type codes for proteins present on the cell membranes of red blood cells.

The diagram shows red blood cells from two members of the family shown in the pedigree diagram.



Individual **1** Individual **2**

(i) Explain how the alleles present in individual **3** result in the proteins found on the surfaces of his red blood cells.

(3)

*(ii) Discuss the possible effects that a mutation in one of the genes coding for this blood type could have on the phenotype of individual **3**.

(6)

(Total for Question 8 = 15 marks)

TOTAL FOR PAPER = 80 MARKS

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