OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

HUMAN BIOLOGY

Molecules, Blood and Gas Exchange

F221

OCE/33343

Candidates answer on the question paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Tuesday 11 January 2011
Morning

Duration: 1 hour

F221

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. 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.
- Do **not** write in the bar codes.

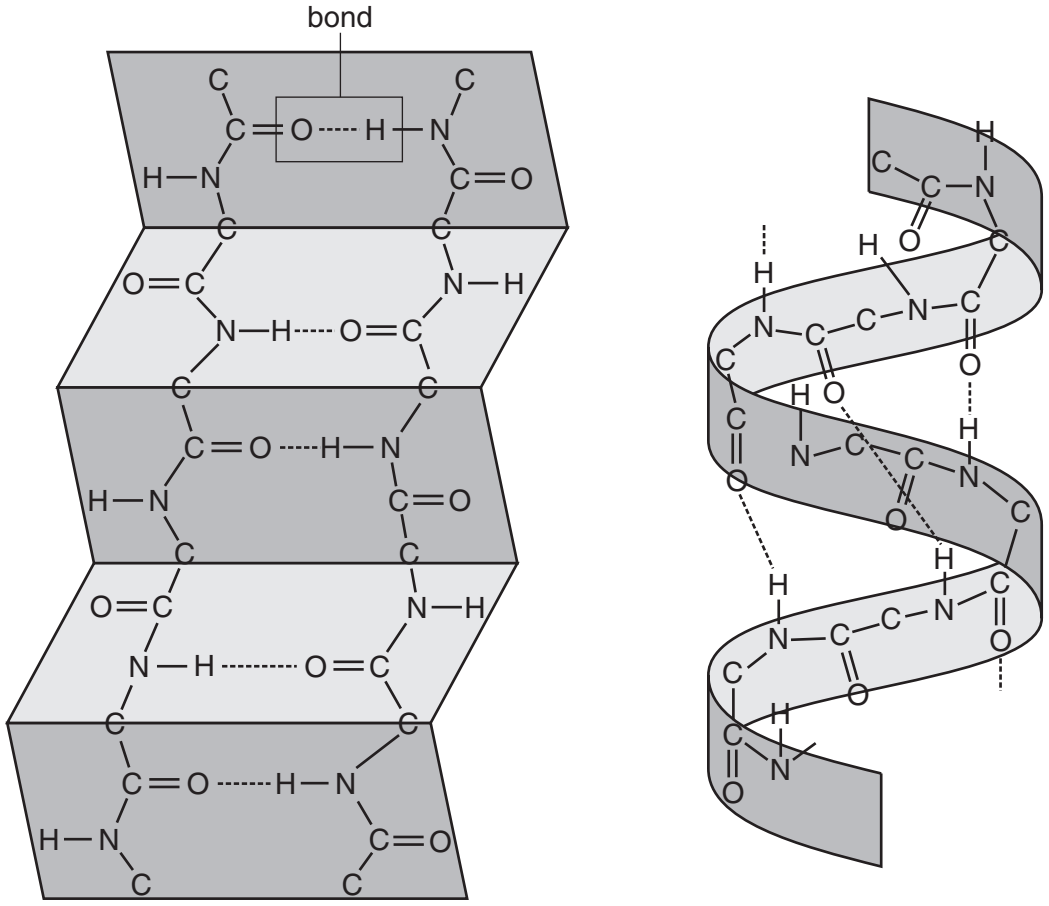
INFORMATION FOR CANDIDATES

- 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 **60**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Many proteins, such as haemoglobin found in erythrocytes (red blood cells), have complex structures.

Fig. 1.1 shows two common types of secondary structure found in proteins.



structure 1 **structure 2**

Fig. 1.1

(a) Name the two types of secondary structure shown in Fig. 1.1 above.

structure 1 .....

structure 2 ..... **[1]**

(b) The type of bond labelled in Fig. 1.1 maintains the shape of these secondary structures.

Name **and** describe this type of bond.

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..... **[3]**

(c) Secondary structures can be further folded to form complex proteins. A student constructed a flow diagram to help with their revision of protein structure and function.

Fig. 1.2 shows part of this flow diagram. Complete the flow diagram by writing the most suitable words in the boxes.

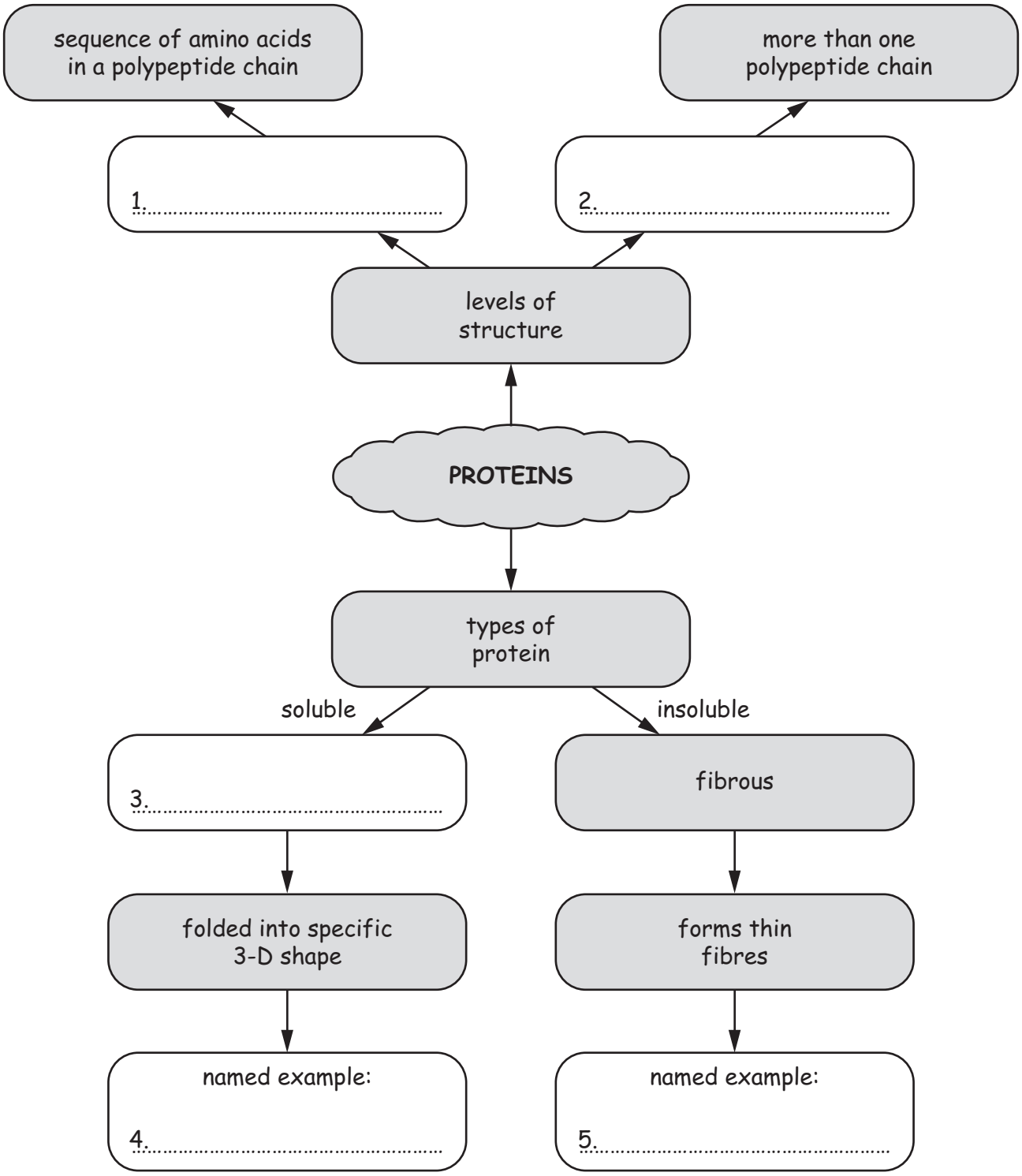

Fig. 1.2 **[5]**

(d) Antibodies are a type of complex protein. Some leucocytes (white blood cells) produce antibodies in response to the presence of bacteria in the body.

State precisely **where** in the leucocyte:

(i) the antibody protein is made;

..... **[1]**

(ii) the protein is modified and packaged to form the final antibody molecule.

..... **[1]**

[Total: 11]

2 Plasma is the liquid part of the blood. It consists mainly of water in which many other components are found, either dissolved or suspended.

(a) Name **two** substances **dissolved** in blood plasma.

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..... **[2]**

(b) Other body fluids, such as tissue fluid and lymph, are produced from blood plasma.

Fig. 2.1 shows the relationship between these three body fluids. The arrows on the diagram represent the direction of movement of these body fluids.

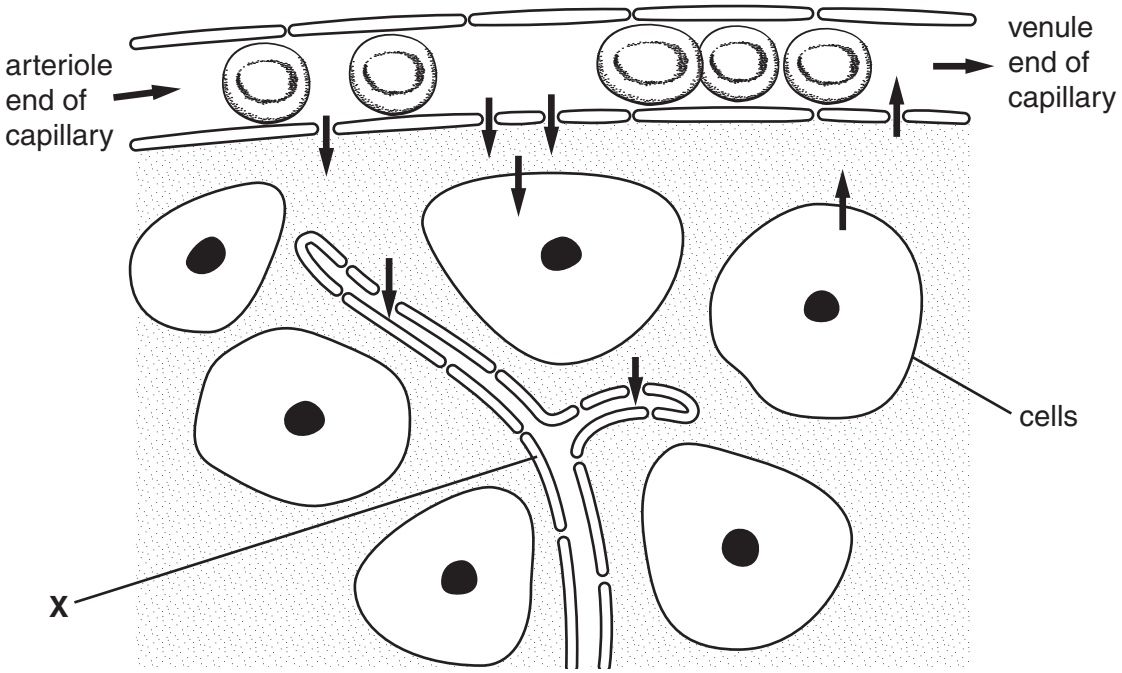

Fig. 2.1

(i) Name vessel **X**.

..... **[1]**

(ii) Complete the table below to compare the composition of blood plasma and tissue fluid.

Place a tick (✓) to show whether the component is present, or a cross (✗) to show whether the component is absent.

component	blood plasma	tissue fluid
erythrocytes		
sodium ions		
fibrinogen		
glucose		

[4]

(c) Donated whole blood can be treated to produce:

- blood plasma, which can be frozen and stored for future use;
- serum, which is the liquid collected after blood has been clotted.

(i) What must be done to **whole blood** to obtain plasma for storage?

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..... **[1]**

(ii) Suggest how serum differs from **stored** blood plasma.

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..... **[1]**

[Total: 9]

3 Fig. 3.1 shows a diagram of the cell surface membrane of an erythrocyte (red blood cell).

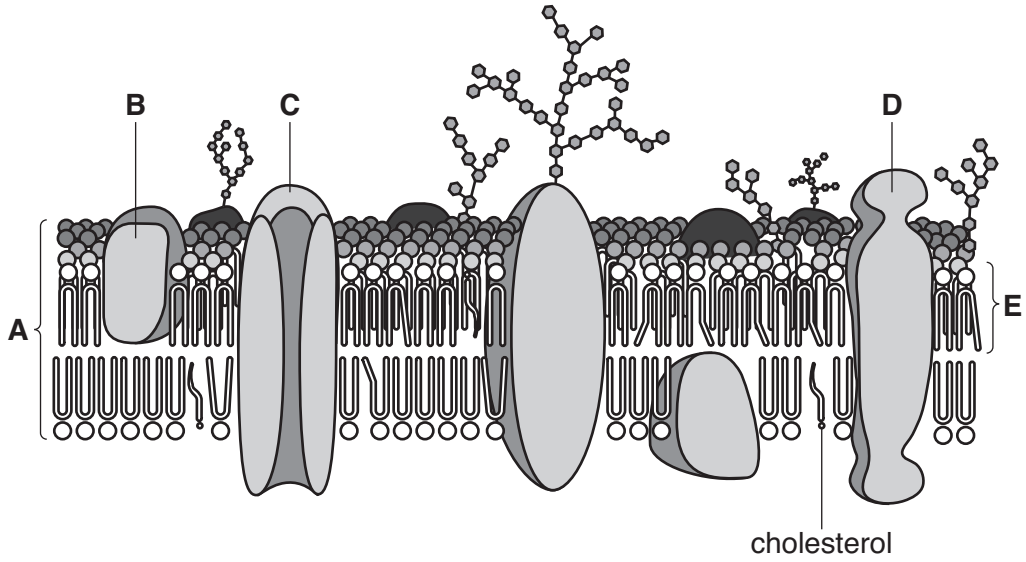

Fig. 3.1

(a) State which of the labelled structures **A** to **E** shows the part most likely for:

(i) oxygen molecules to pass through by passive diffusion;

..... **[1]**

(ii) glucose molecules to pass through by facilitated diffusion.

..... **[1]**

(b) Explain why glucose molecules have to pass through the membrane by facilitated diffusion.

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..... **[2]**

(c) Cholesterol is a molecule that is vital to the functioning of healthy cells.

- Cholesterol is a component of cell membranes.
- Cholesterol is transported through the blood attached to proteins in the form of lipoproteins.
- These lipoproteins can be taken into cells across the cell membrane by the process of endocytosis.

(i) Describe, in detail, the process of endocytosis.

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..... **[4]**

(ii) Suggest what might happen if cells were **not** able to take up cholesterol.

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..... **[1]**

[Total: 9]

4 Fig. 4.1 shows a triglyceride. Triglycerides can be synthesised from fatty acids and stored by fat cells in the body. Triglycerides may be broken down to release free fatty acids.

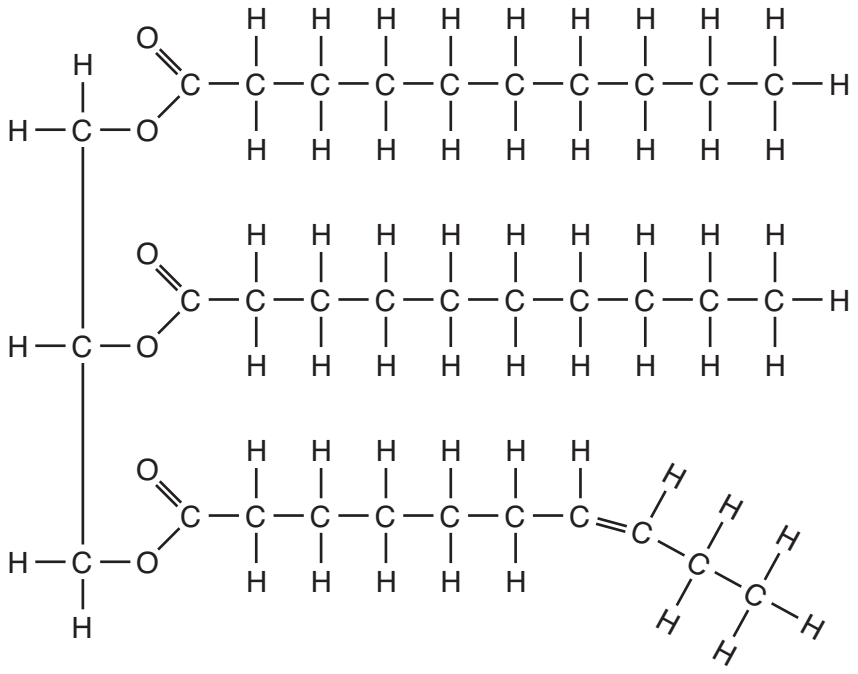

Fig. 4.1

(a) Describe **how** the triglyceride in Fig. 4.1 can be broken down to provide free fatty acids.

In your answer, you should use appropriate technical terms, spelt correctly.

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..... **[4]**

(b) State **two** roles of fatty acids in the body.

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..... **[2]**

(c) Terms used to describe fatty acids include saturated, unsaturated, monounsaturated and polyunsaturated.

(i) Describe the differences between a **saturated** fatty acid and an **unsaturated** fatty acid.

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..... **[2]**

(ii) Suggest a difference between a **monounsaturated** fatty acid and a **polyunsaturated** fatty acid.

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..... **[1]**

[Total: 9]

5 Asthma affects many people in the UK.

- People with asthma may find it useful to monitor their peak expiratory flow rate (PEFR) using a peak flow meter.
- PEFR varies with the height and gender of a person, but also changes with age.

(a) Describe how a peak flow meter is used to measure PEFR.

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..... **[3]**

Fig. 5.1 shows the normal range of PEFR values for men and women with a height of 175 cm.

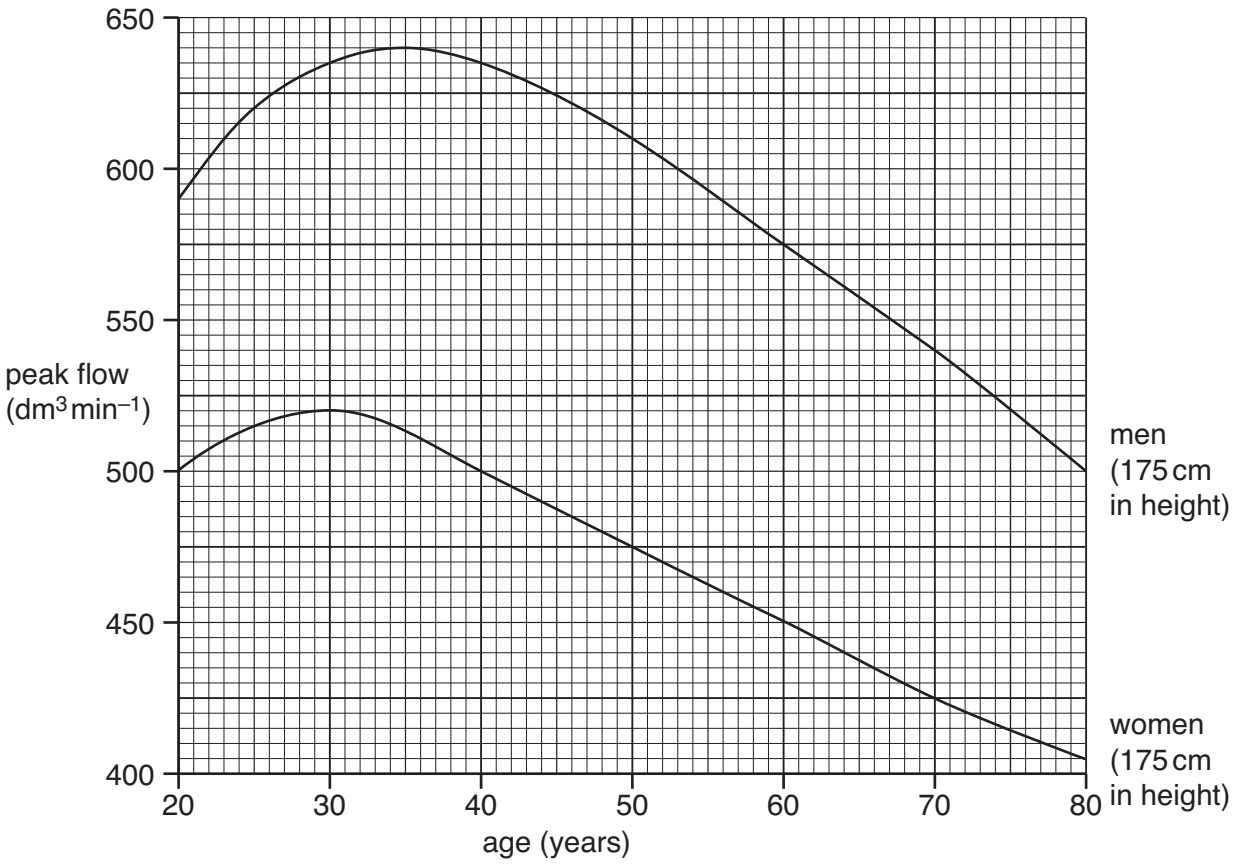

Fig. 5.1

(b) (i) Using Fig. 5.1, describe how the PEFR changes in **men** from the age of 20 years **and** suggest reasons for these changes.

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..... **[4]**

(ii) Using Fig. 5.1, calculate the percentage decrease in PEFR for a **woman** between 40 and 60 years of age.

Show your working and **give your answer to the nearest whole number**.

Answer = ... % **[2]**

(c) Severe asthma can cause respiratory arrest.

(i) Name **two** other causes of respiratory arrest.

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..... **[2]**

(ii) Describe how expired air resuscitation (EAR) is used to help an **adult** in respiratory arrest.

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..... **[3]**

[Total: 14]

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QUESTION 6 STARTS ON PAGE 16

6 In humans, blood is carried inside blood vessels and materials in the blood are transported by mass transport.

(a) (i) State the term used to describe a circulatory system in which blood is only carried inside vessels.

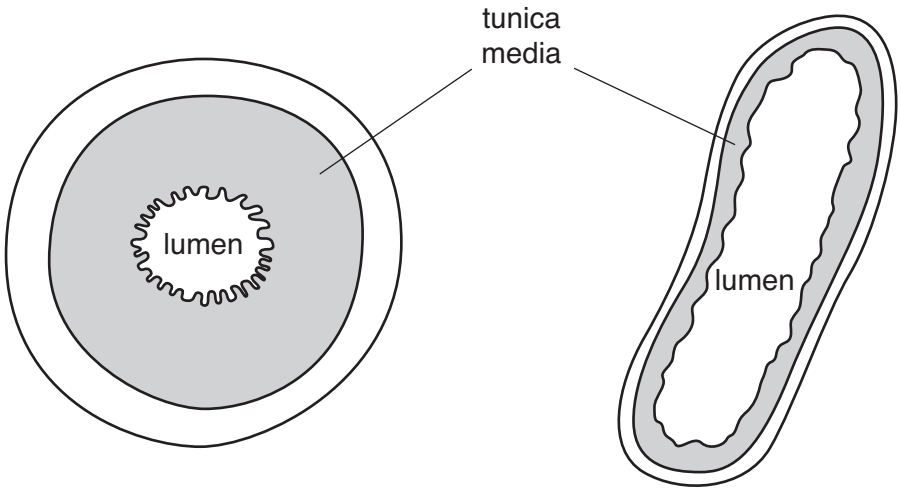
..... **[1]**

(ii) Define the term *mass transport*.

.....

..... **[1]**

(b) Fig. 6.1 shows the structure of an artery and vein.



artery **vein**

Fig. 6.1

(i) Blood leaves the heart and enters the arteries when the ventricles contract.

Describe how tissues in the **tunica media** of the **arteries** work together to maintain blood flow.

In your answer, you should use appropriate technical terms, spelt correctly.

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..... **[4]**

(ii) Fig. 6.1 shows a difference in lumen size between the artery and the vein.

Explain the effect that this difference in lumen size has on blood flow.

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..... **[2]**

[Total: 8]

END OF QUESTION PAPER

ADDITIONAL PAGES

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