Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

ADVANCED SUBSIDIARY GCE

F221

HUMAN BIOLOGY

Molecules, Blood and Gas Exchange

TUESDAY 11 JANUARY 2011: Morning
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (SM/SW) 11MEP01265 41433

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 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.**

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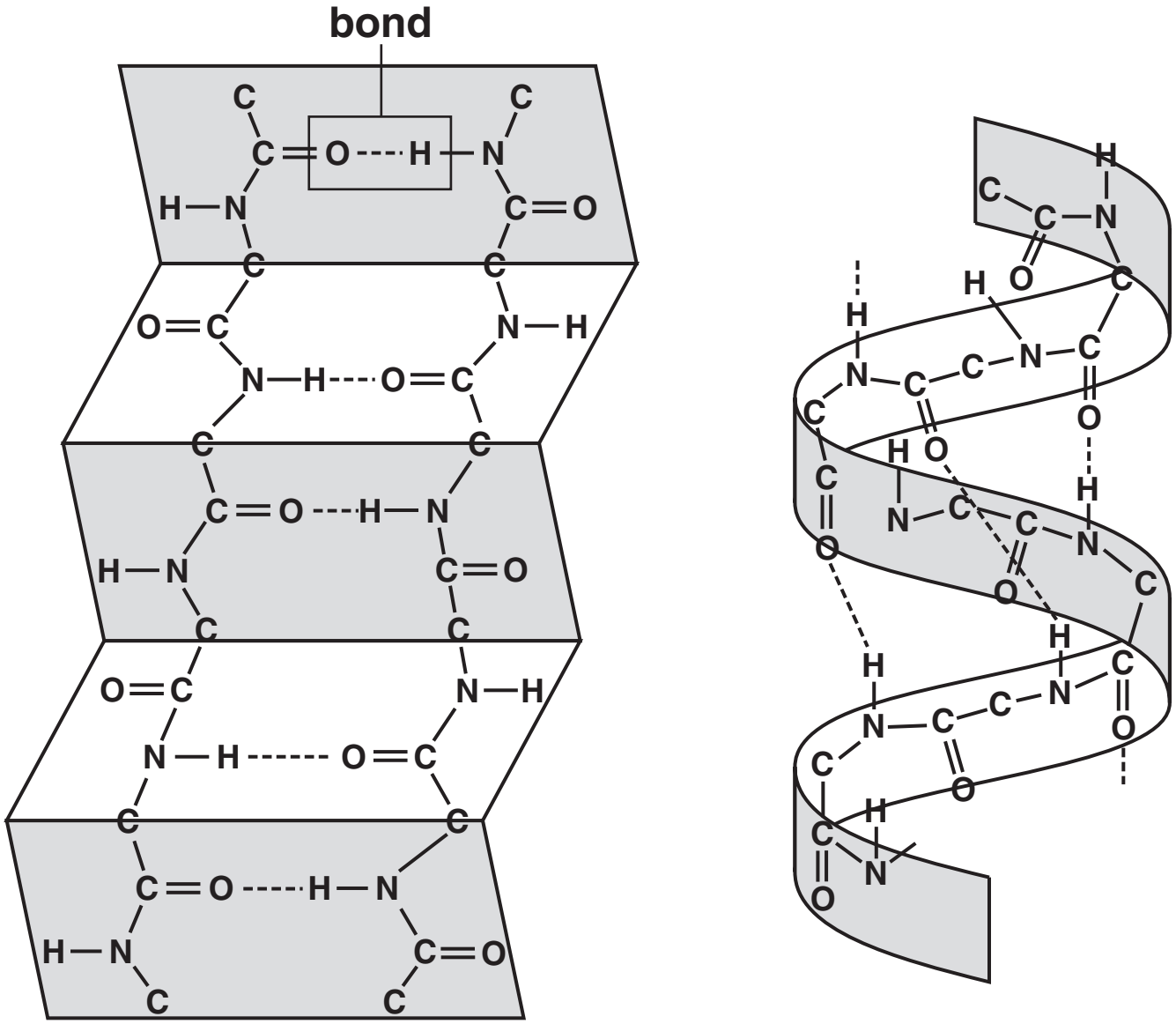
Answer ALL the questions.

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 on page 4 opposite.

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.

_____

_____

_____

_____

_____

_____

_____ **[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 on page 7 opposite shows part of this flow diagram. Complete the flow diagram by writing the most suitable words in the boxes.

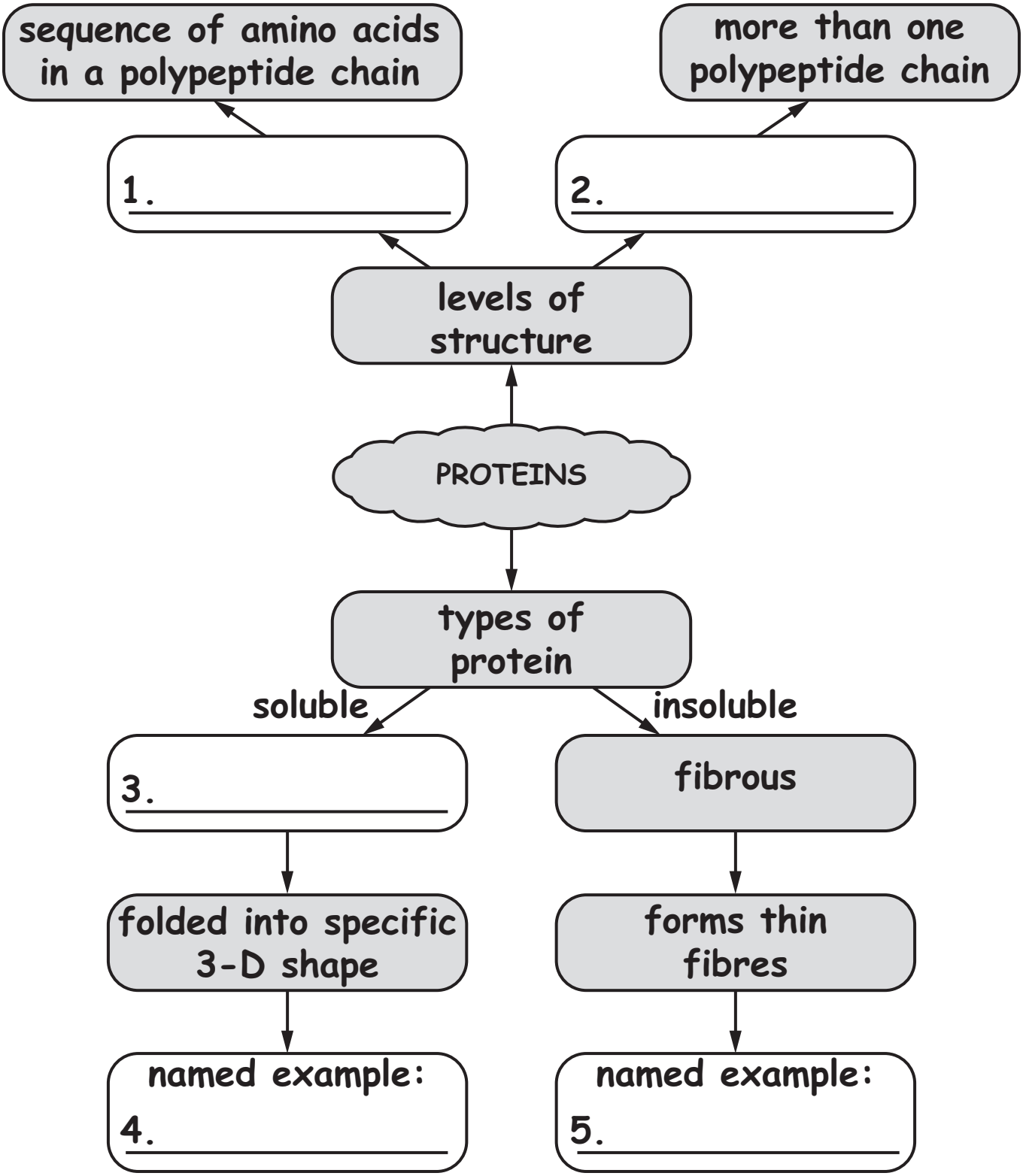

sequence of amino acids in a polypeptide chain
more than one polypeptide chain
1.
2.
levels of structure
PROTEINS
types of protein
soluble
insoluble
3.
fibrous
folded into specific 3-D shape
forms thin fibres
named example:
4.
named example:
5.

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.

_____

_____ **[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.

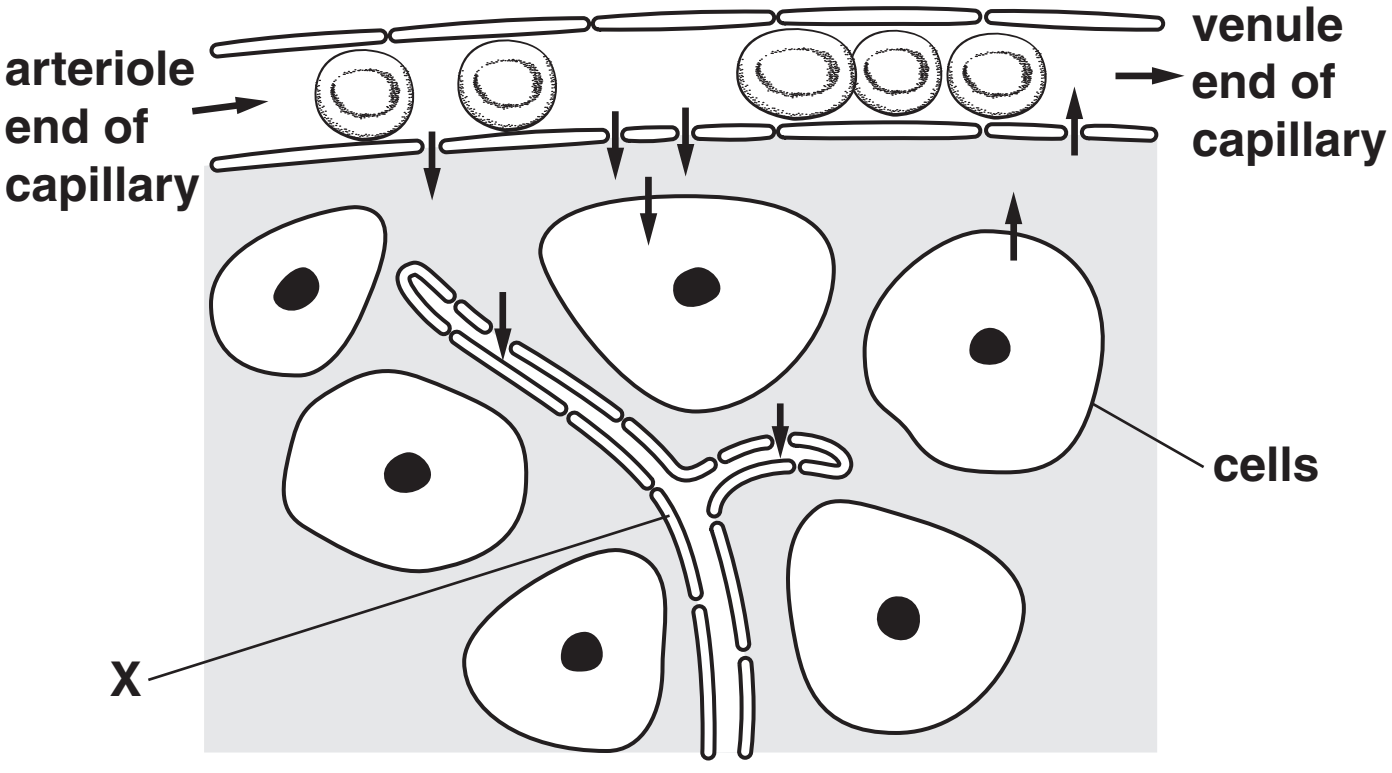


Fig. 2.1

(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?

_____

_____

_____ **[1]**

(ii) Suggest how serum differs from STORED blood plasma.

_____

_____

_____ **[1]**

[Total: 9]

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

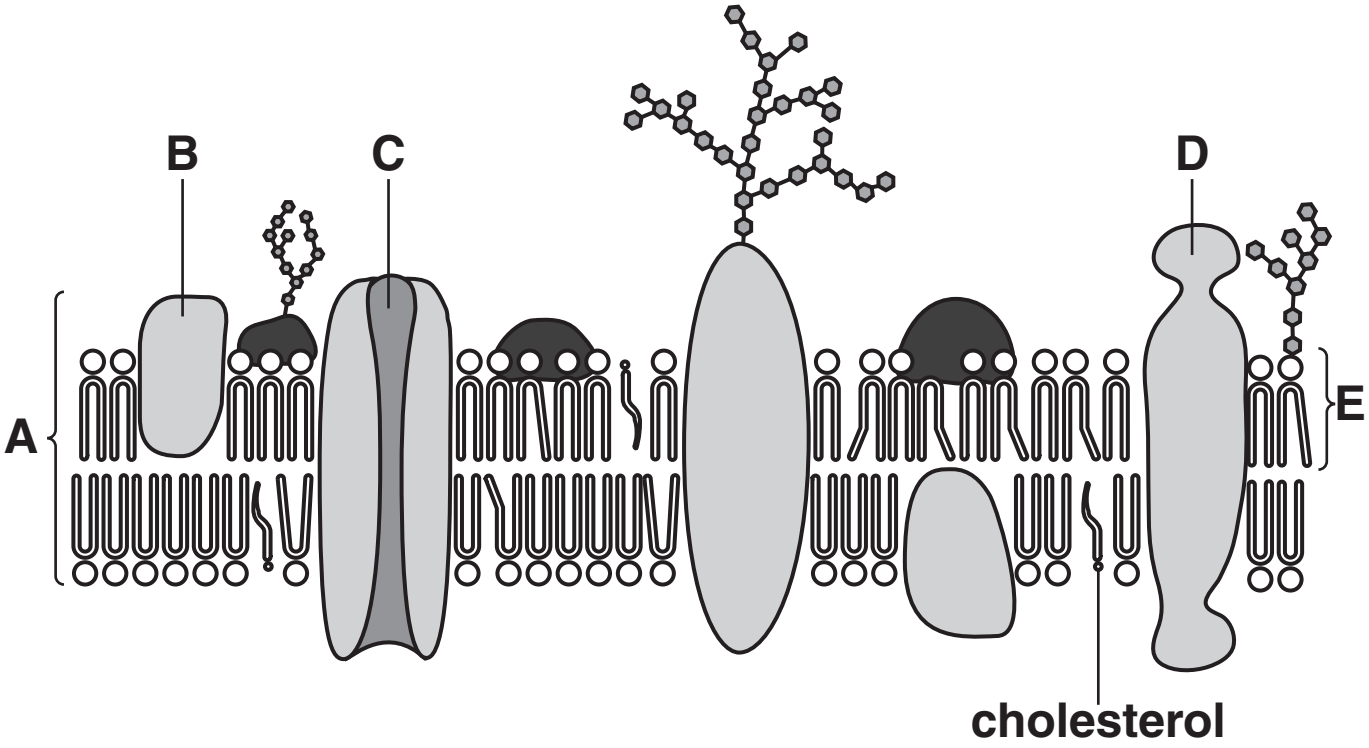


Fig. 3.1

(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.

_____

_____

_____

_____

_____ **[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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_____

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_____

_____

_____ **[4]**

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

_____

_____

_____ **[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.**

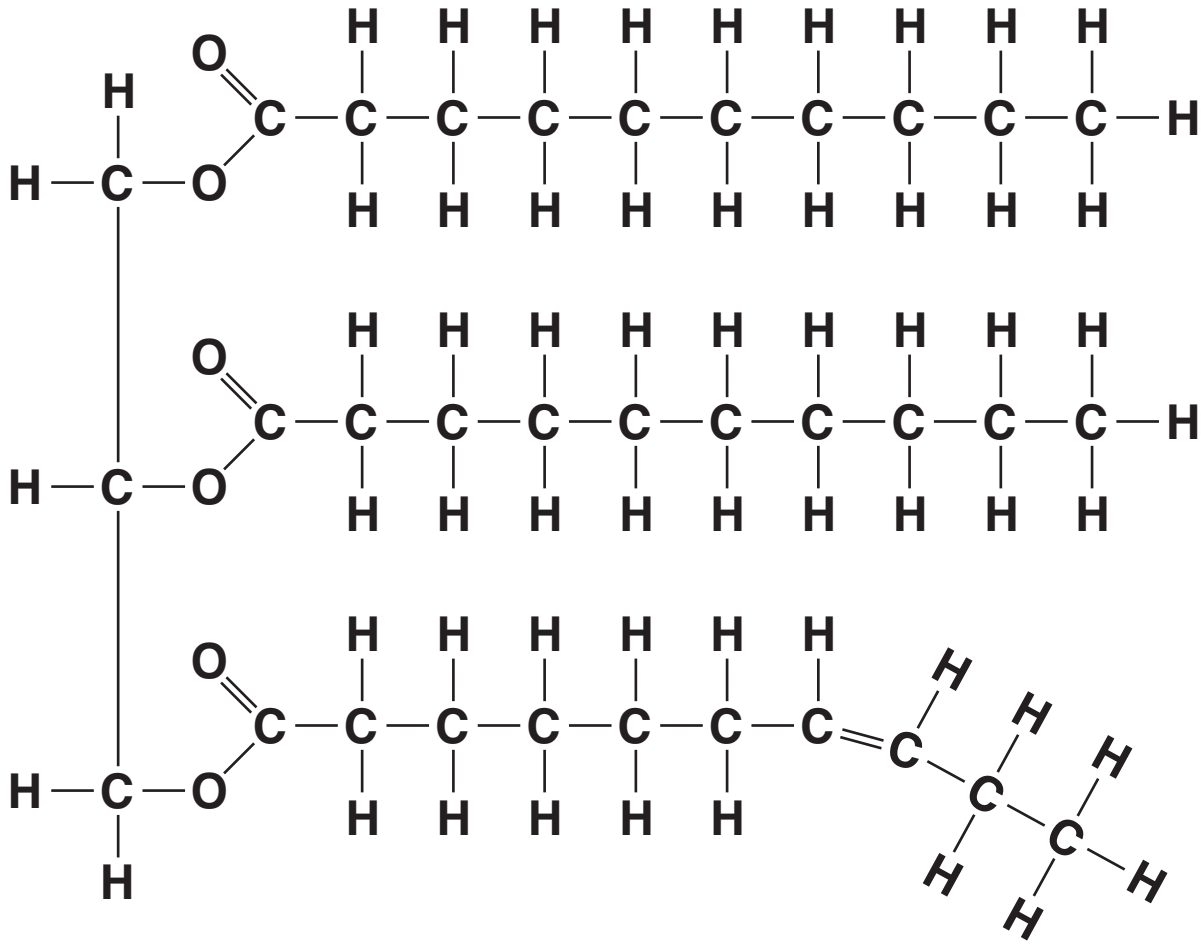

Fig. 4.1

(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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_____

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_____

_____ **[4]**

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

_____

_____

_____

_____ **[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.

_____

_____

_____

_____

_____

_____ **[2]**

(ii) Suggest a difference between a MONOUNSATURATED fatty acid and a POLYUNSATURATED fatty acid.

_____

_____

_____ **[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.

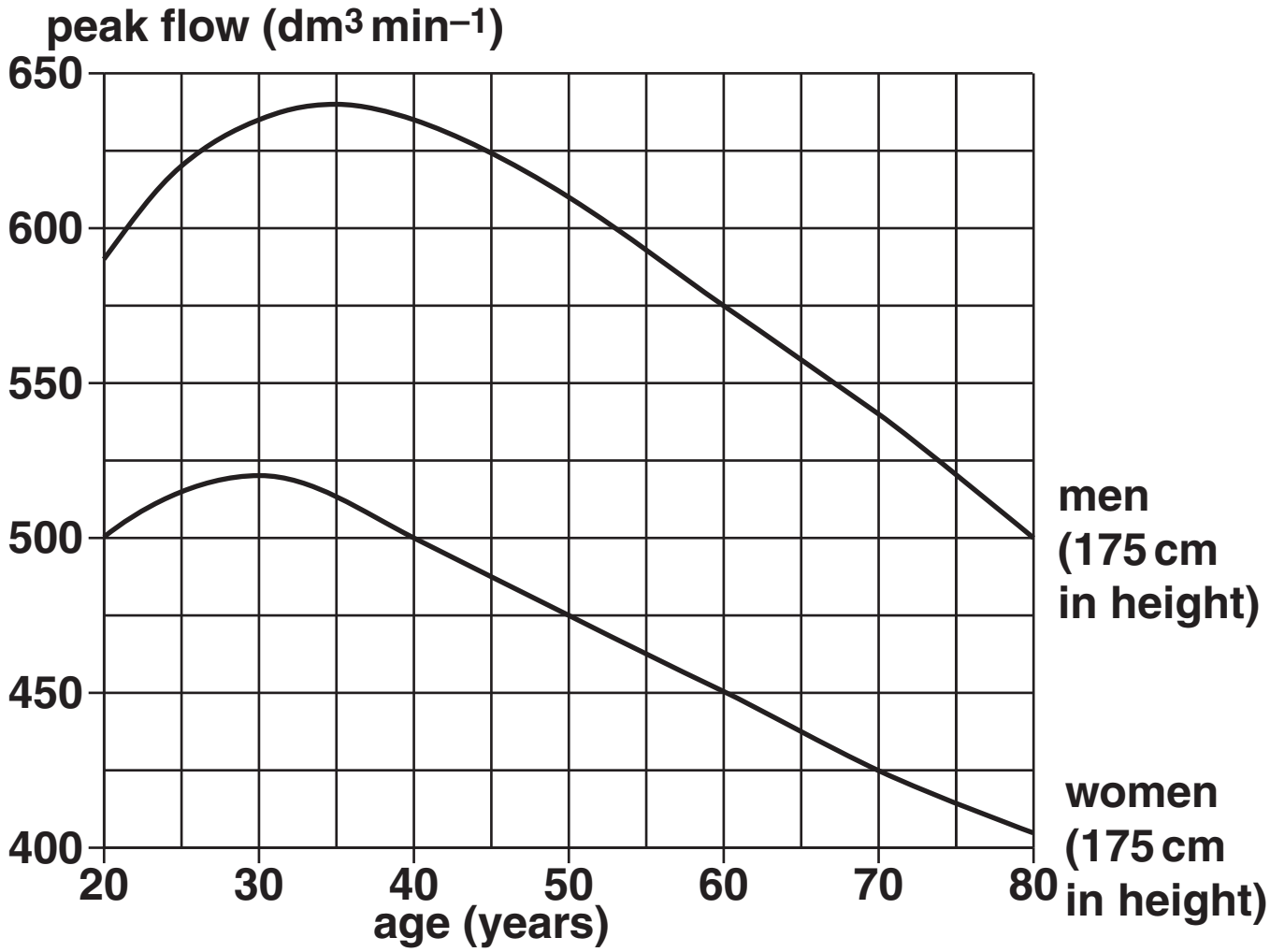

Fig. 5.1

(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.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[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.

_____

_____ **[2]**

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

_____

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_____ **[3]**

[Total: 14]

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.

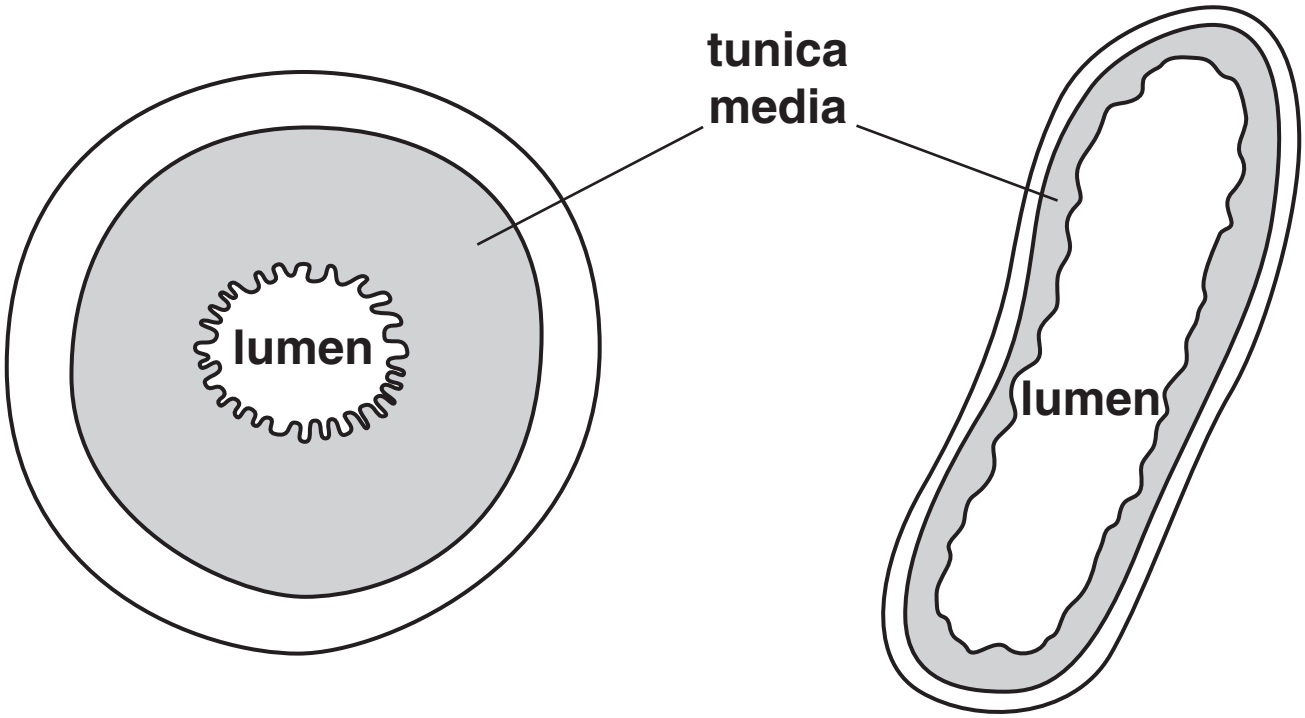

Fig. 6.1

(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.

_____

_____

_____

_____

_____

_____ **[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.