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 12 JANUARY 2010: 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 (CW/CGW) MEP10273 24954/2

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **Write your answer to each question in the space provided, however additional paper may be used if necessary.**

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.**

Answer ALL the questions.

1 (a) The cells in the human body and in plants are eukaryotic cells.

State what is meant by a *eukaryotic cell*.

_____

_____ **[1]**

(b) The different organelles within a cell may be seen using an electron microscope.

Fig. 1.1 on the loose sheet is an electron micrograph of a plant cell showing cell organelles. The organelle labelled D is shown at a higher magnification in Fig. 1.2.

(i) Name the cell organelles labelled A to C in Fig. 1.1.

A _____

B _____

C _____ **[3]**

(ii) State ONE function of each of the organelles labelled D to F.

D _____

E _____

F _____ **[3]**

(c) Fig. 1.3 is an electron micrograph showing a lymphocyte.

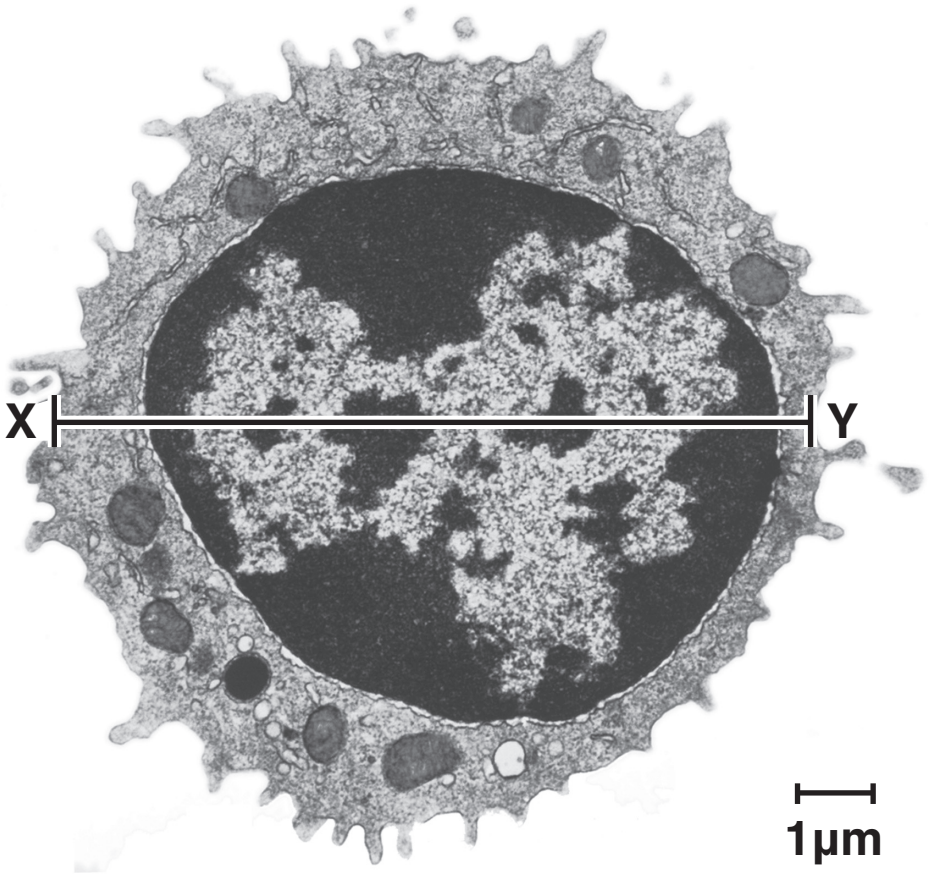

Fig. 1.3

Use the scale bar in Fig. 1.3 to calculate the actual diameter of the cell along the line X – Y.

Show your working <u>AND</u> give your answer <u>TO THE NEAREST WHOLE NUMBER</u>.

Answer = _____ µm [2]

[Total: 9]

BLANK PAGE

TURN OVER FOR QUESTION 2

2 **A student, Jack, is taking part in an investigation into the effect of exercise on heart rate. Jack started to pedal on an exercise bike and stopped pedalling after 5 minutes.**

Jack's heart rate was measured by taking his pulse rate at rest, and then again at one-minute intervals during the five minutes of exercise.

The procedure was repeated three times and the data were recorded in Table 2.1.

Table 2.1

time (min)	pulse rate (beats per minute)			
	replicate 1	replicate 2	replicate 3	mean
0	64	66	65	65
1	68	68	70	69
2	102	92	92	95
3	118	116	124	119
4	138	144	140	141
5	140	148	146	145

(a) Describe how <u>PULSE RATE</u> can be measured by a method <u>OTHER THAN</u> using a pulse rate monitor.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(b) (i) Using the information in Table 2.1, describe the effect of exercise on Jack's <u>HEART RATE</u>.

_____

_____

_____

_____ **[2]**

(ii) Explain the effect you have described in your answer to (i).

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(c) (i) State TWO safety precautions that should have been taken before Jack took part in the investigation.

1 _____

_____

2 _____

_____ **[2]**

(ii) Suggest <u>ONE</u> reason why the procedure was repeated three times.

_____

_____

_____ **[1]**

[Total: 11]

3 A circulatory system transports many materials around the body.

Fig. 3.1 shows a diagram of the double circulatory system of the human body. This system is an example of a closed circulatory system.

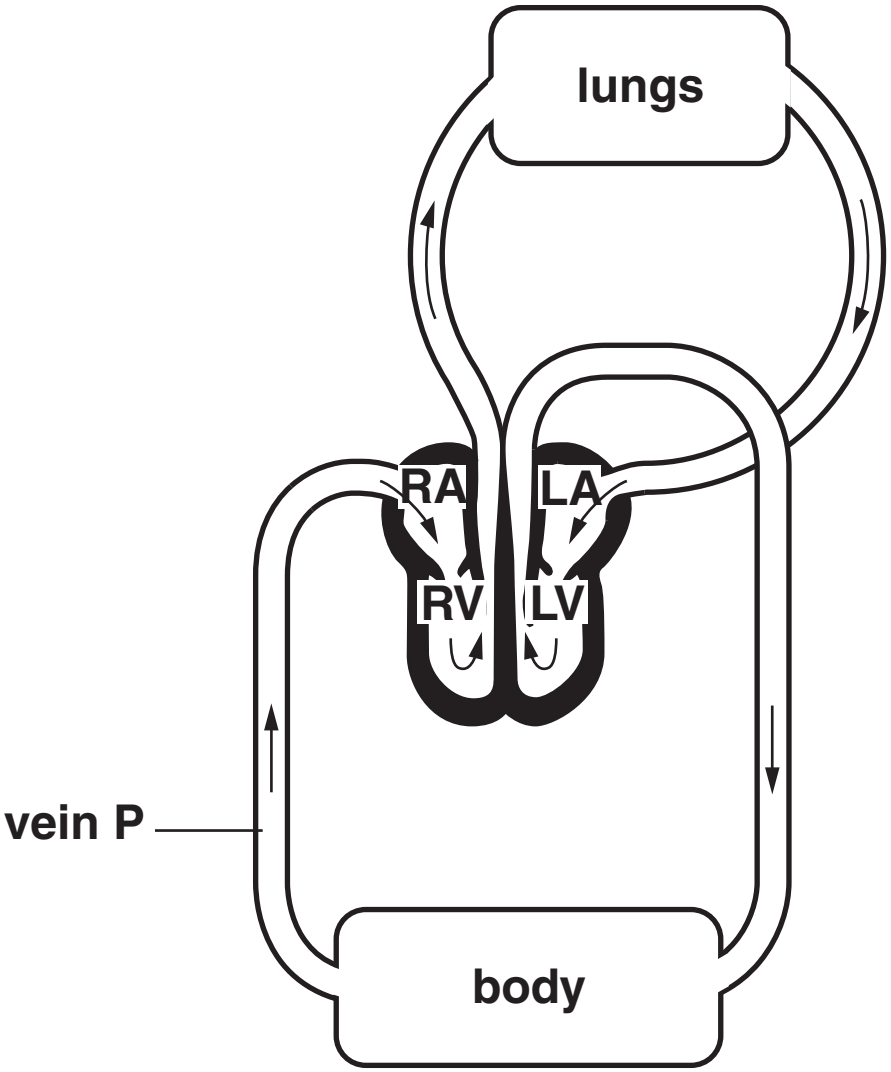

Fig. 3.1

(a) (i) Explain what is meant by the terms 'double circulatory system' and 'closed circulatory system'.

double circulatory system

_____

_____

closed circulatory system

_____

_____ **[2]**

(ii) Give <u>TWO</u> advantages of a double circulatory system.

_____

_____

_____

_____

_____ **[2]**

(iii) Give <u>TWO</u> reasons why large organisms such as humans need a circulatory system.

_____

_____

_____

_____

_____ [2]

(b) Fig. 3.2 is a diagram of a cross section through <u>VEIN P FROM FIG. 3.1</u>.

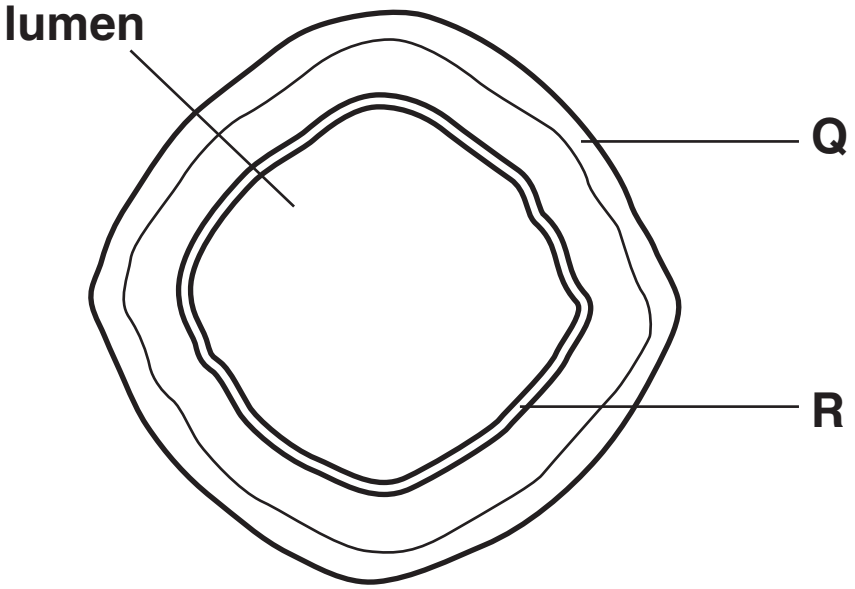

Fig. 3.2

(i) <u>NAME</u> vein P.

_____ [1]

(ii) Name the parts of the vein labelled Q and R in Fig. 3.2.

Q _____

R _____ **[2]**

(iii) Explain how a vein is adapted to carry out its function.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 12]

4 (a) Proteins are an important component of blood plasma. Some of these proteins are enzymes.

Fig. 4.1 shows a diagram of the enzyme, thrombin, found in blood plasma, together with its substrate.

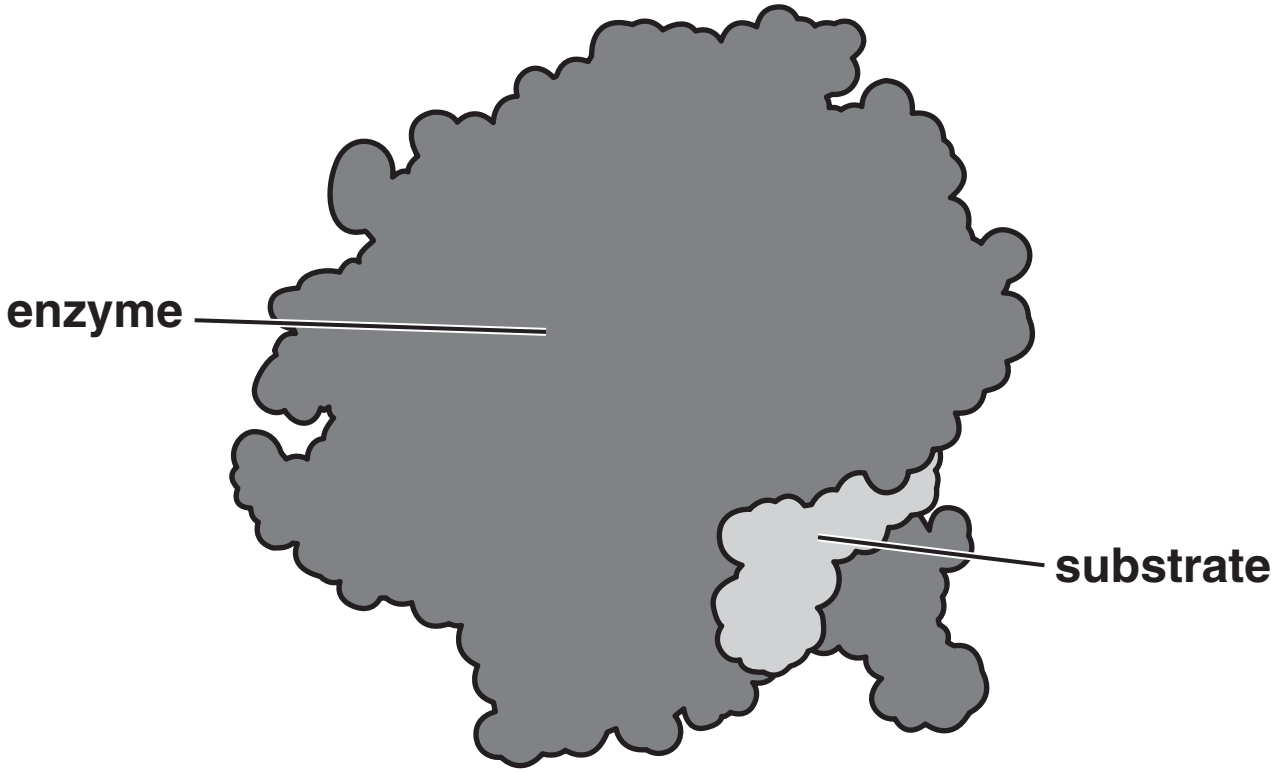

Fig. 4.1

Enzymes such as thrombin are globular proteins.

(i) Describe the <u>TERTIARY</u> structure of a globular protein.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

(ii) Explain how the structure of the enzyme thrombin enables it to catalyse the conversion of fibrinogen to fibrin during the blood clotting process.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(b) Afibrogenaemia is a rare condition in which there is a low concentration of fibrinogen in the blood.

Describe <u>AND</u> explain the effect of a low concentration of fibrinogen on blood clotting time.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

[Total: 11]

5 (a) Humans have a specialised gas exchange surface in the lung.

Fig. 5.1 on the loose sheet is a photomicrograph of the tissue in the lung.

Describe <u>HOW</u> the lung provides each of the following four conditions needed for an efficient gas exchange surface:

- **large surface area**
- **thin surface**
- **steep diffusion gradient across the surface**
- **protection from drying out.**

large surface area

_____

_____

_____

thin surface

_____

_____

_____

steep diffusion gradient across the surface

_____

_____

_____

_____

_____

protection from drying out

_____

_____

_____ **[5]**

(b) Elastic fibres are found in the lung.

(i) State where elastic fibres are found in the lung.

_____ **[1]**

(ii) Describe the role of these elastic fibres.

_____

_____

_____ **[2]**

[Total: 8]

6 Lipids are a group of substances that are insoluble in water.

(a) Triglycerides are examples of lipids that are often used as energy stores in humans.

Fig. 6.1 is a diagram of a triglyceride molecule.

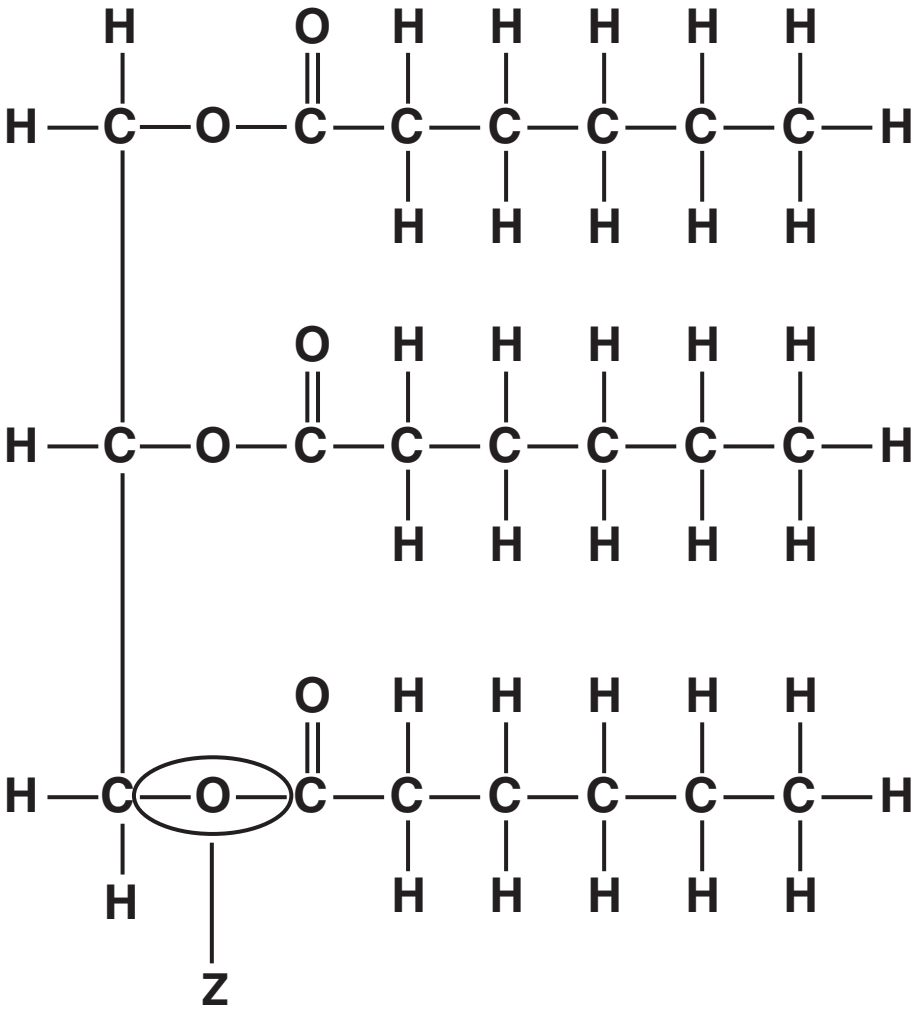

Fig. 6.1

(i) Name the type of bond labelled Z on Fig. 6.1.

_____ **[1]**

(ii) Describe how bond Z is formed.

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

_____

_____

_____

_____

_____

_____

_____ **[3]**

(b) A phospholipid is another example of a lipid molecule.

(i) State <u>TWO</u> ways in which the <u>STRUCTURE OF A PHOSPHOLIPID</u> molecule differs from a triglyceride molecule.

1 _____

_____

2 _____

_____ **[2]**

(ii) Describe the properties of phospholipid molecules that help them to carry out their function in cells.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 9]

END OF QUESTION PAPER

BLANK PAGE