

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE**

F221/01

HUMAN BIOLOGY

Molecules, Blood and Gas Exchange

WEDNESDAY 9 JANUARY 2013: Morning

**DURATION: 1 hour
plus your additional time allowance**

MODIFIED ENLARGED 18pt

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

Insert (inserted)

OTHER MATERIALS REQUIRED:


**Electronic calculator
Ruler (cm/mm)**

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- The Insert 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 **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 following biological molecules are all found in the human body.**

haemoglobin

glycogen

fibrinogen

triglyceride

thrombin

State ONE molecule from the list above that:

- (i) contains the element nitrogen;**

_____ **[1]**

- (ii) has ester bonds;**

_____ **[1]**

- (iii) can be broken down into monosaccharides;**

_____ **[1]**

- (iv) is NOT made of polypeptide chains.**

_____ **[1]**

- (b) All living cells have cell surface membranes. In 1972, Singer and Nicolson proposed a model for the arrangement of molecules in cell surface membranes which was called the **FLUID MOSAIC** model.

Fig. 1.1 represents the structure of a phospholipid molecule which is found in cell surface membranes.

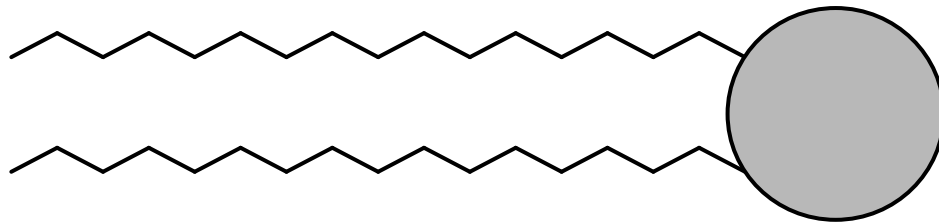


FIG. 1.1

- (i) Describe the arrangement of phospholipid molecules in the fluid mosaic model of the cell surface membrane.**

You may use the space below for a diagram.

[2]

(ii) With reference to the Singer and Nicolson model, explain the meaning of the term FLUID MOSAIC.

[2]

[TOTAL: 8]

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Question 2 starts on page 8

2 Fig. 2.1 shows the external structure of the human heart.

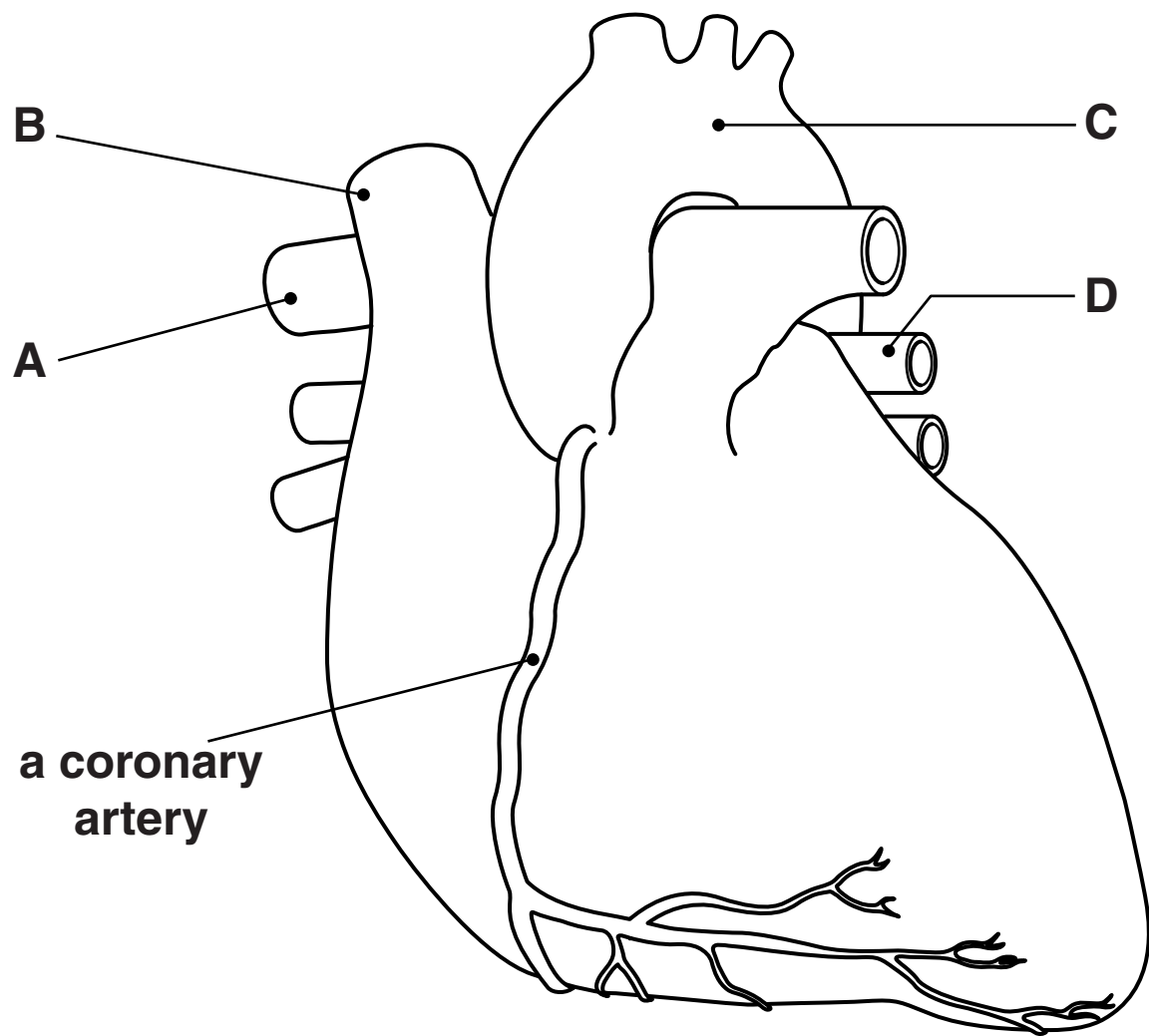


FIG. 2.1

- (a) Information about each of the blood vessels labelled A to D in Fig. 2.1 is shown in the table below.

Blood vessel	Information
A	deoxygenated blood leaves the heart through this vessel
B	blood enters the right atrium through this vessel
C	blood leaves the left ventricle through this vessel
D	oxygenated blood returns to the heart through this vessel

- (i) Using the information in the table and in Fig. 2.1, name blood vessels A to D.

A _____

B _____

C _____

D _____ [4]

- (ii) One of the coronary arteries is shown in Fig. 2.1.

What is the role of the coronary arteries?

_____ [1]

(b) The heart beats continuously throughout life.

The sequence of events that takes place in the heart during one heart beat is described as the CARDIAC CYCLE.

Describe the sequence of events that takes place during the cardiac cycle.

[illegible]

[5]

[TOTAL: 10]

3 During a lesson on First Aid, a student was asked about the emergency procedure for REDUCING BLOOD LOSS from a deep wound.

(a) The student made the following statements about how they would carry out the procedure.

- Place a pad on the wound.**
- Press down firmly and secure the pad in place.**
- If the wound is in a limb, raise the limb above the level of the heart.**
- If blood continues to soak through, do not remove the first pad but place a second pad on top.**

(i) Suggest TWO other statements that might have been included in the emergency procedure.

[2]

(ii) Suggest why the first pad is not removed if blood continues to soak through it.

[1]

- (b) When a blood vessel is damaged, a series of reactions occurs and the blood clots. The clot consists of blood cells trapped in a mesh of protein fibres.**

Fig. 3.1, ON THE INSERT, shows a highly magnified photograph of a blood clot as it appears under a microscope.

- (i) The actual diameter of the erythrocyte, labelled in Fig. 3.1, is $8\mu\text{m}$.**

Using the line between points X and Y on the photomicrograph, calculate the magnification of the erythrocyte.

Show your working. Give your answer to the nearest whole number.

magnification = _____ [2]

- (ii) The fibres shown in Fig. 3.1 are made of protein.**

Name this protein.

_____ **[1]**

- (iii) The protein found in the fibres shown in Fig. 3.1 has primary and secondary levels of protein structure.**

Outline what is meant by the primary and secondary structure of a protein.

Details of the bonds involved are not required.

primary _____

secondary _____

_____ **[2]**

(c) Scientists have recently developed bandages that can prevent excessive blood loss.

These bandages contain chemicals that can speed up blood clotting.

Using your knowledge of the blood clotting process, suggest how these chemical bandages could speed up BLOOD CLOTTING.

[1]

[TOTAL: 9]

4 The tissue lining the respiratory tract contains cells that secrete the glycoprotein that is found in mucus.

(a) Complete the sentences below about the production of mucus.

Mucus is produced by

_____ cells which

are found in _____

epithelial tissue that lines the respiratory tract.

Organelles within these cells work together to

produce the mucus. Firstly, protein is synthesised

by the _____ .

This protein is then transported in

_____ to the

_____ . Here the

protein molecules are modified by adding

_____ to form

glycoproteins.

The completed glycoprotein molecules are then transported towards the cell surface membrane where they are secreted into the extracellular environment by the process of

_____ . [7]

(b) Mucus also contains water and solutes. This ensures that the mucus is sticky enough to trap bacteria, but fluid enough to be removed from the respiratory tract.

(i) Describe how the mucus and bacteria are removed from the respiratory tract.

**_____

_____ [2]**

(ii) Describe how the water molecules found in mucus leave the cells lining the respiratory tract.

[3]

[TOTAL: 12]

- 5 In order to check a person's health, a doctor may arrange for a blood sample to be taken from a patient. This blood sample will then be sent to a hospital laboratory for analysis.**

(a) Describe the procedure for taking a blood sample from a patient.



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

[4]

(b) Blood contains several different types of leucocyte (white blood cell).

Fig. 5.1 shows two leucocytes, X and Y.

These cells are not drawn to the same scale.

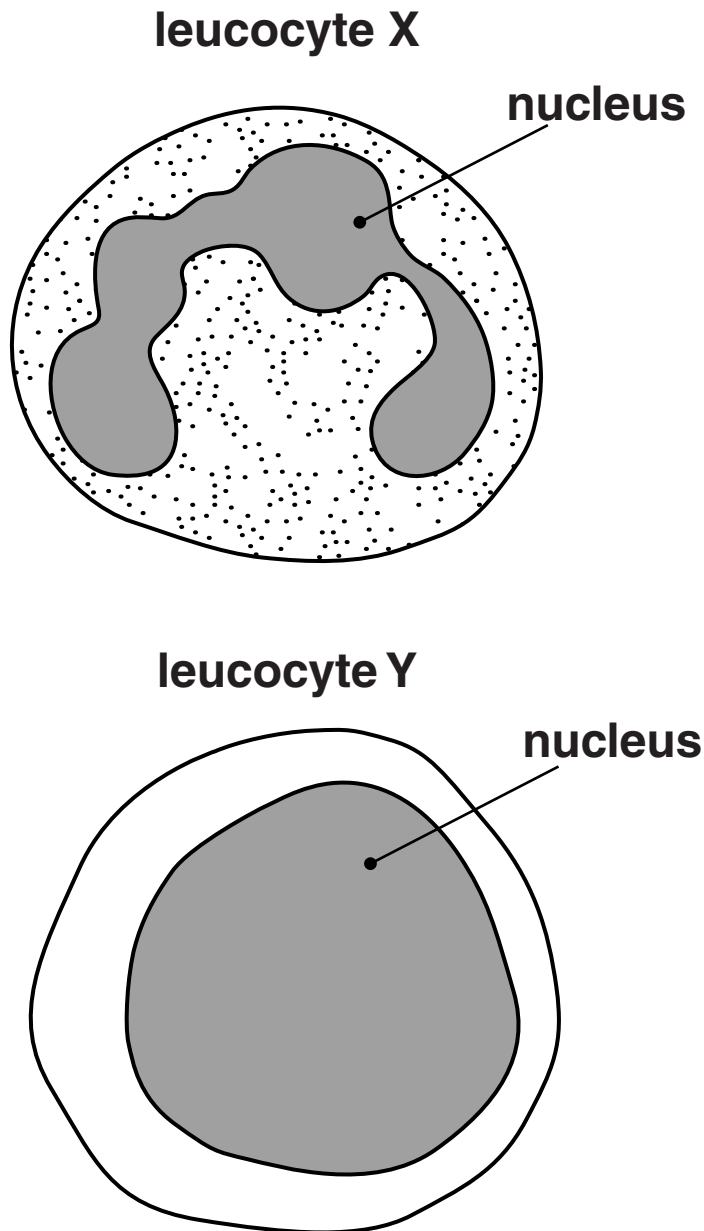


FIG. 5.1

(i) Name leucocytes X and Y.

X _____

Y _____ **[2]**

(ii) Leucocyte X appears to have granules in the cytoplasm. These granules are lysosomes.

Describe the role of lysosomes in leucocyte X.

_____ **[2]**

(c) Certain types of medication can affect the number and types of leucocytes in the blood. It is important for doctors to monitor the leucocyte counts of their patients.

(i) Name a piece of apparatus that could be used to count the number of leucocytes in a blood sample.

_____ **[1]**

- (ii) Both leucocytes and erythrocytes can be counted using the apparatus in (c)(i).

When preparing erythrocytes for counting, the blood sample is diluted with a fluid, such as Dacie's fluid, to a dilution factor of 1 in 200. No stain is used. For leucocytes, this procedure is modified in several ways.

Give ONE reason for each of the following modifications for counting leucocytes:

dilution factor is changed to 1 in 20

a different diluting fluid is used

a stain is added to the diluting fluid

[3]

[TOTAL: 12]

- 6 Some students were carrying out an investigation to compare the heart rates of two athletes.**

They measured the pulse rates of the athletes during exercise and at rest.

- Both athletes were aged 17 years.**
- One of the athletes was recovering from injury and had not been in training for three months.**

(a) Describe how pulse rate can be measured manually.

[3]

(b) Fig. 6.1 shows a bar chart of the results obtained by the students.

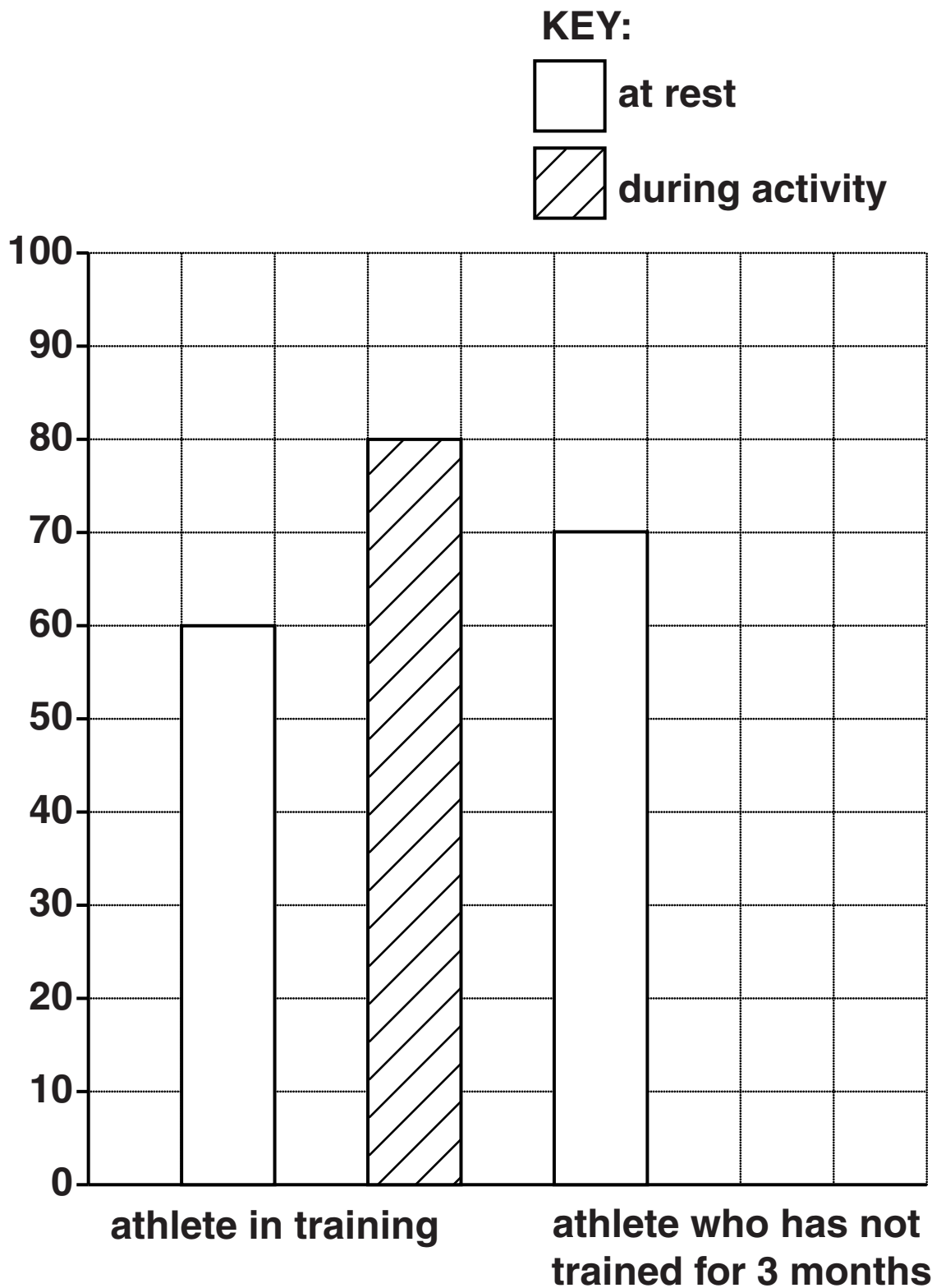


FIG. 6.1

- (i) The students forgot to write down the dependent variable on the y-axis in Fig. 6.1. Write an appropriate label for the y-axis.

_____ [1]

- (ii) Draw a bar, ON FIG. 6.1, to show a value for the pulse rate during exercise of the athlete who has not been in training.

The answer to this question should be drawn on Fig. 6.1. [1]

- (iii) Using Fig. 6.1, and with reference to heart function, suggest an explanation for the difference in RESTING heart rate of the two athletes.

_____ [2]

(iv) Both athletes were aged 17 years.

State TWO other factors that should have been taken into account by the students to ensure the VALIDITY of the data.

1 _____

2 _____

_____ **[2]**

[TOTAL: 9]

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.



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