OCR

Wednesday 21 May 2014 – Morning

AS GCE HUMAN BIOLOGY

F221/01 Molecules, Blood and Gas Exchange

Candidates answer on the Question Paper.

OCR supplied materials:
- Insert (inserted)

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

Duration: 1 hour

* F 2 2 1 0 1 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- The Insert will be found inside this document.
- Write your name, centre number and candidate number in the boxes above. 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 page(s) at the end of this booklet. The question number(s) must be clearly shown.
- 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 Body builders may take supplements containing amino acids to help build proteins and increase muscle mass. Amino acid molecules form proteins by joining together during a condensation reaction.

(a) Fig. 1.1 is a diagram of the amino acid, alanine.

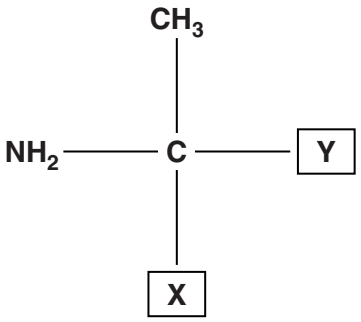

Fig. 1.1

(i) What are the missing components, **X** and **Y**, of the amino acid molecule?

.....

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

(ii) Which parts of amino acid molecules are involved in a condensation reaction to form the primary structure of a protein?

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

(iii) Name the type of molecule formed when **two** amino acids are joined together.

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

(b) (i) The amino acids present in blood plasma affect its water potential.

Explain why the water potential of blood plasma is affected by changes in the amino acid concentration.

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

(ii) Approximately 2% of oxygen is transported dissolved in plasma.

Suggest why this oxygen has no effect on the water potential of blood plasma.

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

(c) Amino acids can be transported into cells by active transport.

Describe the mechanism of active transport.

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

[Total: 9]

2 Blood smears are useful to health professionals for observing different types of blood cell.

(a) Fig. 2.1, **on the insert**, shows a series of photographs**.** These photographs, labelled **A** to **F**, show the procedure for producing a stained blood smear for viewing under a light microscope.

The photographs are not in the correct order. Using letters **A** to **F**, place them in the correct order. The first one is done for you.

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

(b) Fig. 2.2, **on the insert**, shows a stained blood smear as seen under the light microscope.

(i) There are differences in colour between the leucocyte and the erythrocyte labelled in the blood smear.

Explain the differences in colour between these two cells.

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

(ii) Photomicrographs often have a scale bar. Fig. 2.2 has a scale bar on the left hand side of the image.

Calculate the actual length, in μm, represented by the scale bar.

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

Answer = ... μm **[2]**

(c) A laboratory technician was investigating the size of erythrocytes in the blood sample of a patient with microcytic anaemia.

Microcytic anaemia is a blood disorder in which the erythrocytes are often paler and vary more in size than those found in a healthy patient.

- The laboratory technician prepared a blood smear for viewing under the light microscope.
- The diameters of ten erythrocytes in the sample were measured.
- The **mean** diameter was calculated at 5 μm.
- Erythrocytes in a healthy person range from 6–8 μm in diameter.

(i) Suggest **two** safety precautions that the laboratory technician would have taken while preparing the blood smear.

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

(ii) The following conclusion was suggested:

Erythrocytes in the blood of a patient with microcytic anaemia are smaller in diameter than those found in the blood of a healthy person.

Explain why it is necessary to include both the **range** of diameters and the **mean** diameter when using data to support the above conclusion.

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

[Total: 11]

3 Thromboplastin is an enzyme released by platelets. It converts prothrombin into thrombin during the blood clotting process.

(a) Describe **and** explain the effect of varying the concentration of prothrombin on the rate of the reaction catalysed by thromboplastin.

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

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..... **[5]**

(b) Blood can be donated and stored until required for transfusion.

The statements below refer to the ideal storage conditions for certain blood components.

- Packed red cells are refrigerated at 4 °C and kept for a maximum of 42 days.
- Platelets are stored at room temperature and kept for a maximum of 5 days.
- Calcium ions are removed from plasma before storage.

Explain why:

(i) packed red blood cells can be stored for longer than platelets.

.....

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

(ii) calcium ions are removed from plasma before storage.

.....

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

(c) Leucocytes may be removed from whole blood before storage to produce leuco-depleted blood.

Suggest why some patients need to be given leuco-depleted blood.

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

(d) Packed red cells may be frozen and kept for up to 10 years. They are frozen using additives such as glycerol.

Explain why additives are used when freezing packed red cells.

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

(e) If blood products are not screened, patients may be at risk from viral infections.

Outline how blood products are screened to prevent the transmission of viruses, such as HIV.

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

[Total: 12]

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Question 4 begins on page 10

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4 Fig. 4.1 shows the internal structure of the heart.

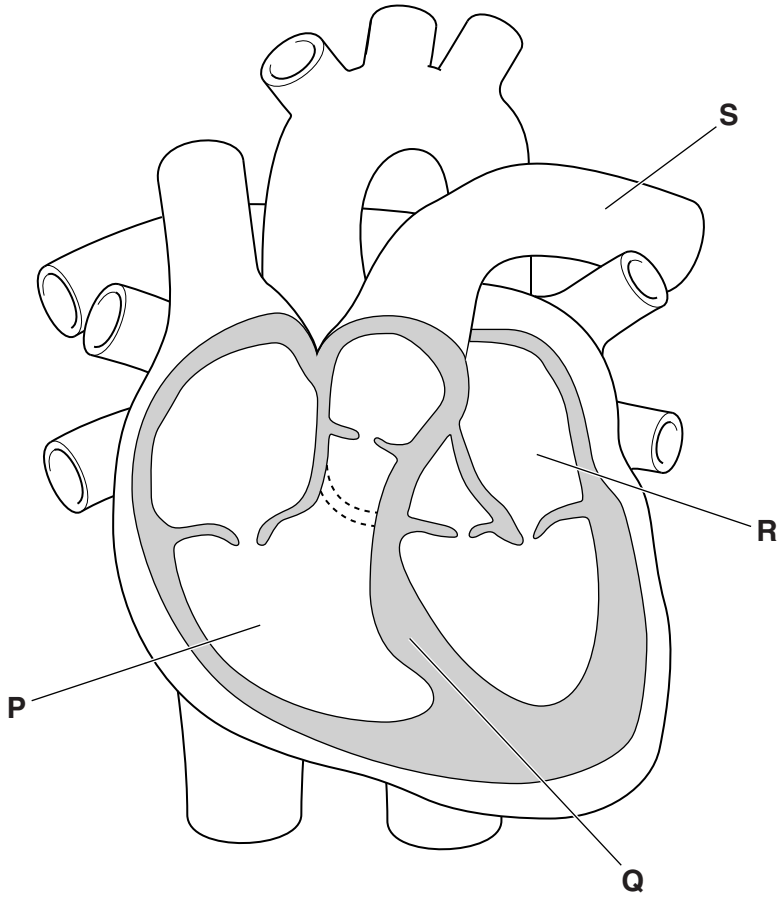

Fig. 4.1

(a) Identify the parts of the heart labelled **P** to **S** in Fig. 4.1.

P .....

Q .....

R .....

S .....

[4]

(b) The wall of the heart is made of cardiac muscle.

Using Fig. 4.1, explain why the thickness of the wall is different for the different chambers of the heart.

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

(c) Fig. 4.1 shows the position of valves found within the heart.

Describe the role of the valves in the heart.

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

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

(d) Atrial fibrillation (AF) is a type of abnormal heart beat.

A health professional can detect AF by comparing the pulse of a patient with that of a person with a normal pulse.

(i) Describe how the health professional would manually measure the pulse **rate** of the patient.

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

(ii) A patient with AF may develop blood clots within the chambers of the heart.

Suggest why AF may cause blood clots in the chambers of the heart.

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

[Total: 13]

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Question 5 begins on page 14

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5 Fig. 5.1 shows the relationship between different types of blood vessels in a capillary network.

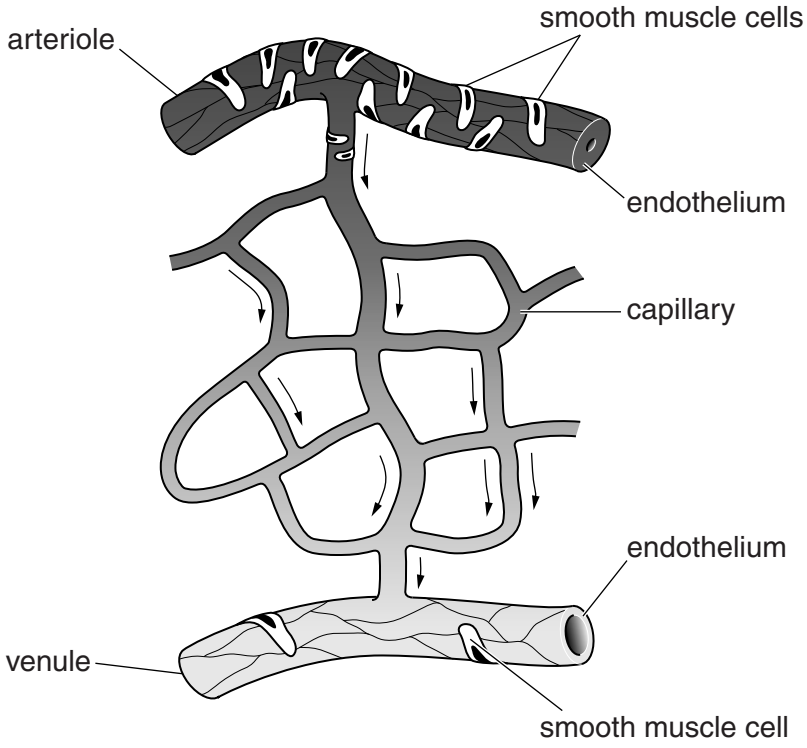

Fig. 5.1

(a) Describe how the structure of each blood vessel, labelled in Fig. 5.1, is related to its function.

arteriole .....

.....

.....

.....

capillary .....

.....

.....

.....

venule .....

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[6]

(b) Blood pressure and rate of flow both decrease as blood flows from the arteriole into the capillary network.

(i) Why does blood pressure decrease as blood flows from the arteriole into the capillary network?

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

(ii) State **one** advantage of having a decrease in the rate of blood flow through the capillaries.

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

[Total: 8]

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6 Approximately 1 in 12 adults in the UK suffer from asthma.

- Asthma can be a cause of respiratory arrest in adults.
- The diagnosis and monitoring of asthma can be done using a peak flow meter.
- The peak flow meter can measure the peak expiratory flow rate (PEFR) of a patient.

(a) (i) Describe what is meant by the terms *respiratory arrest* and *peak expiratory flow rate*.

respiratory arrest .....

.....

peak expiratory flow rate .....

.....

[2]

(ii) Peak expiratory flow rate (PEFR) is one lung function measurement.

State one **other** lung function measurement that could be taken using a peak flow meter.

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

(iii) Name the first aid procedure that may be carried out on an adult in respiratory arrest.

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

(iv) Describe **one** way in which the procedure named in **(a)(iii)** would be different when carried out on a baby.

.....

.....

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

(b) Cyanosis is a condition that may occur in a patient with severe asthma. The lips and skin of a patient with cyanosis appear blue in colour due to changes in blood passing through these areas.

Suggest why the skin and lips of a patient with cyanosis appear blue in colour.

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.....

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

[Total: 7]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.

ADDITIONAL ANSWER SPACE

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AS GCE HUMAN BIOLOGY

F221/01 Molecules, Blood and Gas Exchange

INSERT

Duration: 1 hour

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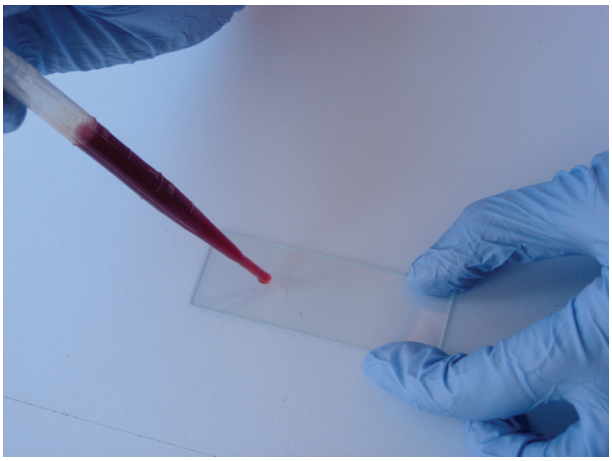
INSTRUCTION TO EXAMS OFFICER / INVIGILATOR

- Do not send this Insert for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.

INFORMATION FOR CANDIDATES

- This Insert contains Fig. 2.1 and Fig. 2.2.
- This document consists of **4** pages. Any blank pages are indicated.

A



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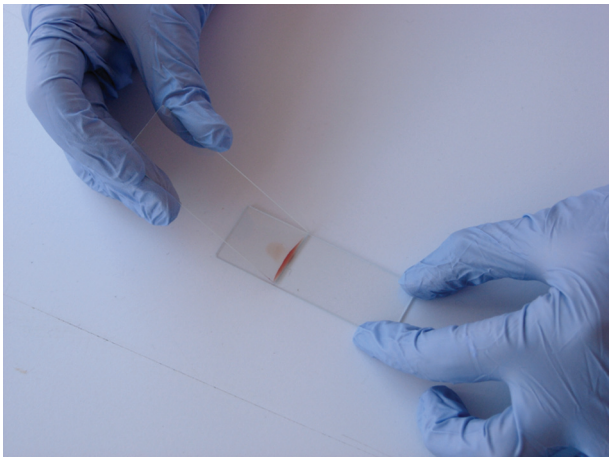

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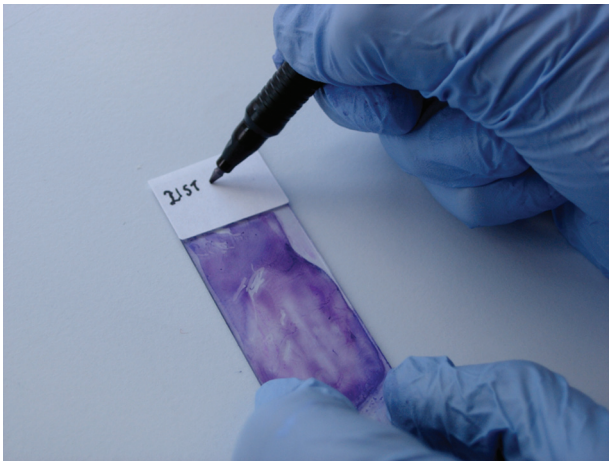

D

E

F

Fig. 2.1

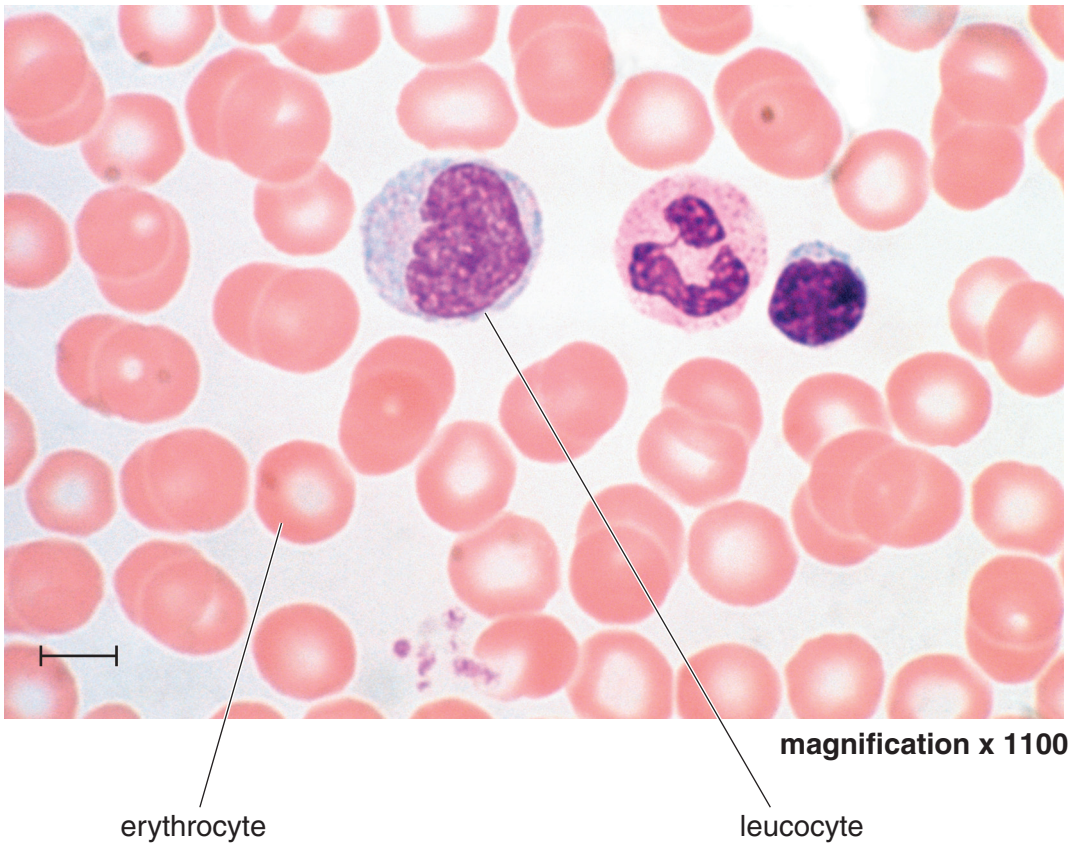

Fig. 2.2