

**ADVANCED SUBSIDIARY GCE
HUMAN BIOLOGY**

2856

Blood, Circulation and Gaseous Exchange

MONDAY 4 JUNE 2007

Morning

Time: 1 hour

Additional materials: Electronic calculator
Ruler (cm/mm)



* GCE / T17920 *

Candidate
Name

Centre
Number

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Candidate
Number

--	--	--	--

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- **WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.**

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	9	
2	10	
3	8	
4	10	
5	10	
6	13	
TOTAL	60	

This document consists of **11** printed pages and **1** blank page.

Answer all the questions.

1 Tuberculosis (TB) is an infectious disease that can damage the respiratory system.

(a) Table 1.1 shows the number of new cases of TB notified to the government each year by two different regions in England.

Table 1.1

A table has been removed due to third party copyright restrictions

Details:

A table showing the number of new cases of TB in London and the South West in the last decade. It shows a steady increase in both areas

Source: Health Protection Agency Communicable Disease Surveillance Centre, 2002

(i) Name the type of organism which causes TB.

..... [1]

(ii) Describe the general trend for notifications of TB in London between 1995 and 2002.

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

(iii) Suggest and explain why the notifications of TB cases are much higher in London than in the South West of England.

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

(b) Describe the treatments available to a patient with TB.

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

[Total: 9]

2 It has been estimated that the area of the human gaseous exchange surface in a healthy adult may be as large as 70 m².

(a) Explain why humans need such a large surface for gaseous exchange.

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

(b) List **four** characteristics of the alveoli, **other than the large surface area**, which make them an efficient gaseous exchange surface.

1
2
3
4 [4]

(c) In the late stages of pregnancy, a chemical is produced by the baby's lungs to prevent the alveoli from sticking together.

Respiratory Distress Syndrome (RDS) occurs in some prematurely born babies who are unable to inflate their lungs on their own when they are born. This is because the alveoli stick together.

Explain why the alveoli stick together in RDS.

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

[Total: 10]

3 Glycogen is an important storage molecule in the body.

Fig. 3.1 shows part of a glycogen molecule.

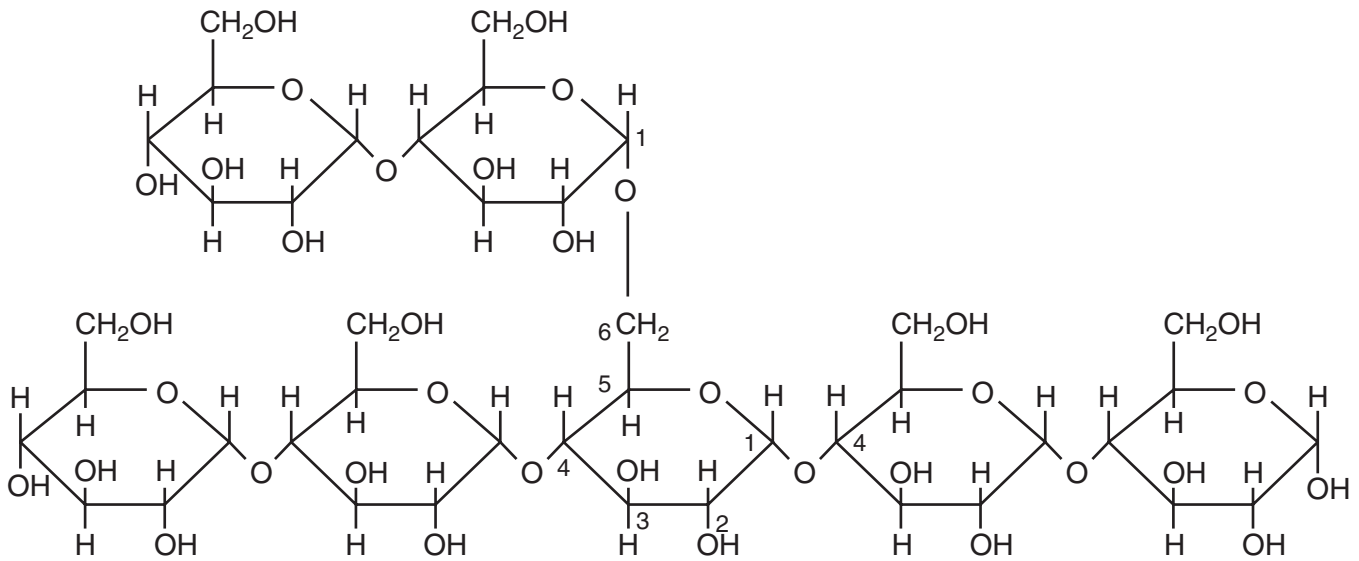


Fig. 3.1

Complete the following passage about glycogen by using appropriate words from the list to fill the gaps.

sugar	condensation	polysaccharide	ester	glucose
muscle	glycosidic	hydrolysis	water	
sucrose	fat	respiration	energy	

Glycogen is a made from hundreds of α molecules. In order to join these molecules together, bonds are formed by a reaction called

This type of reaction requires the removal of a molecule of

We store glycogen in liver cells and cells. These glycogen molecules are a short-term store that the body can use when muscle cells are working hard. The glycogen molecules can easily be broken down to their constituent monosaccharides. Each glycogen molecule has lots of ends and its subunits are easily broken off for use in

[Total: 8]

4 In this question, one mark is available for the quality of use and organisation of scientific terms.

One of the first skills that medical students and trainee nurses learn is the use of a stethoscope. It is an important and quick way to get diagnostic information.

Describe how a stethoscope is used **and** outline the information it can provide about the heart.

Dotted lines for writing answer

Quality of Written Communication [1]

[Total: 10]

6
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5 Three patients were brought into an Accident and Emergency department.

The doctor in charge has arranged for each of them to have an electrocardiogram (ECG).

(a) Fig. 5.1 shows a normal electrocardiogram (ECG) trace.

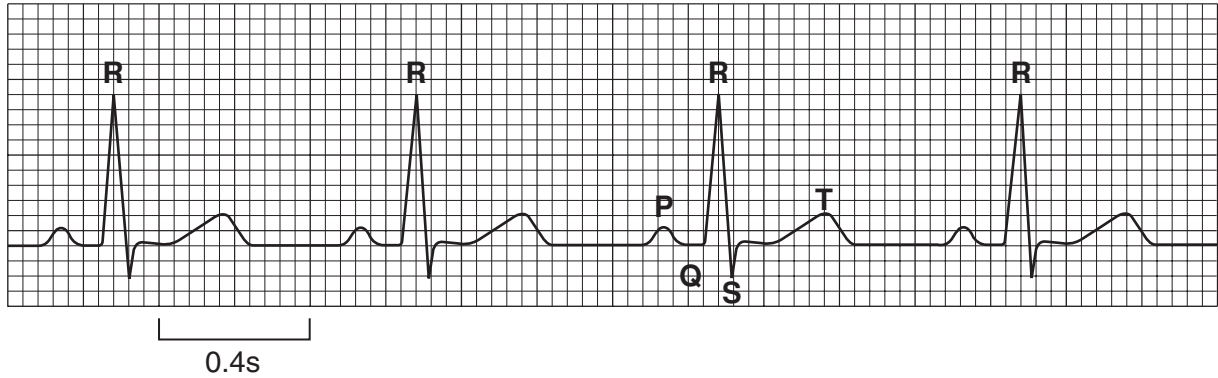


Fig. 5.1

(i) Calculate the time interval between the **R** waves.

Answer = [2]

(ii) State what causes the peak in electrical activity at **R** on the ECG trace.

..... [1]

(iii) Where on the trace would the semilunar (aortic and pulmonary) valves be opening?
Answer this question by placing a tick in the correct box in the table below.

area on ECG trace	answer
P to Q	
Q to R	
R to S	
S to T	

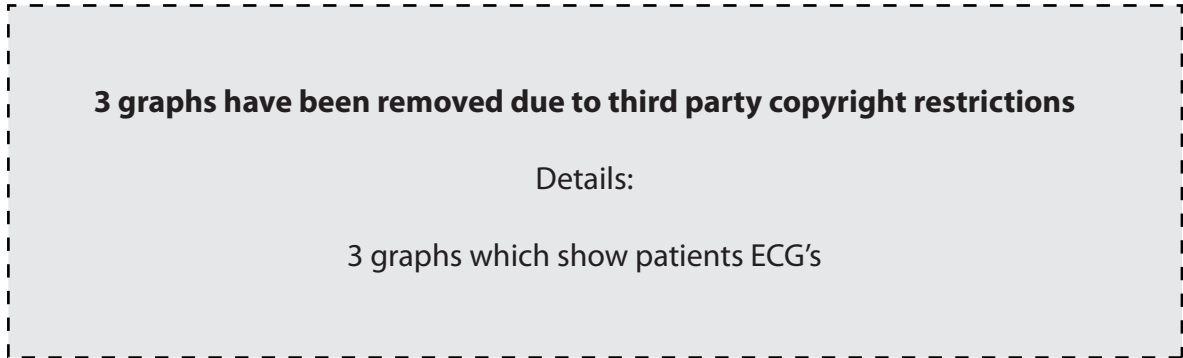
[1]

(b) All three of the patients had abnormal traces.

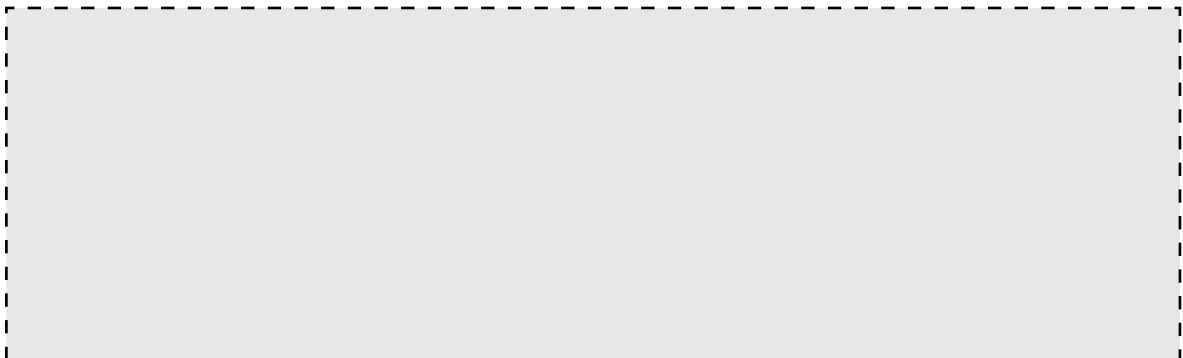
Fig. 5.2 shows the results.

All of the ECG traces were recorded on the same time scale.

patient E



patient F



patient G

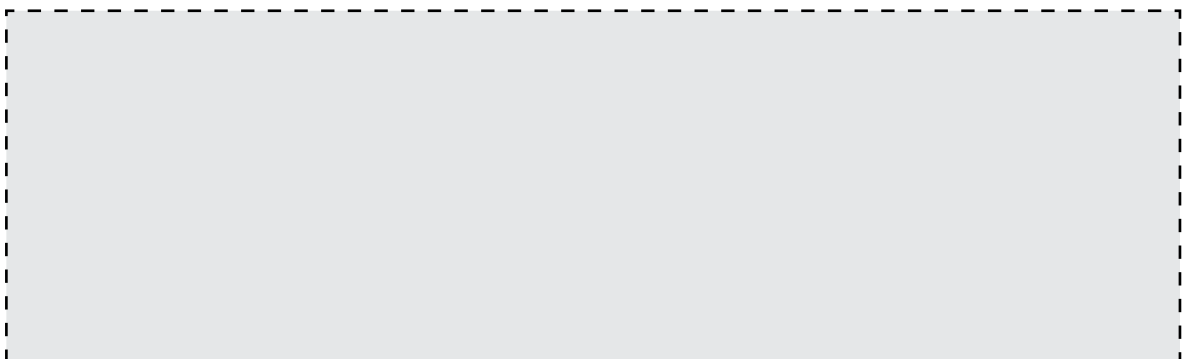


Fig. 5.2

Table 5.1 provides information about the diagnosis, cause and recommended treatment for each of the patients.

Complete the table by filling in the gaps. Some have been done for you.

Table 5.1

patient	diagnosis	cause	treatment
E		sino-atrial node working incorrectly	
F			use a defibrillator
G	heart block		

[6]

[Total: 10]

6 In the UK, scientists working for the National Blood Transfusion Service must have a detailed knowledge of red blood cells and their membrane properties.

(a) Briefly describe the structure of the red blood cell membrane.

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

(b) The four definitions below refer to ways in which molecules and ions may pass through a red blood cell membrane.

- A the movement of water down a water potential gradient through a partially permeable membrane.
- B the net movement of molecules or ions down a concentration gradient.
- C movement against the concentration gradient, which requires an input of energy from the cell.
- D passive movement across a cell membrane with the aid of transport proteins.

Name the processes **A** to **D**.

A
B
C
D [4]

(c) The National Blood Transfusion Service has to be able to store blood products for use in emergency situations.

Under normal conditions in the body, red blood cells actively pump potassium ions into, and sodium ions out of, the cell.

If blood is kept in cold storage, red blood cells lose potassium ions to the external plasma.

Suggest why potassium ions may accumulate in the plasma in cold storage.

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

(d) Before storage, blood is screened for HIV and hepatitis. A prospective donor will be asked questions before giving blood to see if they are suitable.

(i) As part of the screening process, the donor's blood will be mixed with antigens for HIV and hepatitis. If the donor has come into contact with HIV or hepatitis, their blood will react with the antigens.

Suggest and explain why this happens.

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

(ii) Suggest **two** reasons, **other than exposure to HIV or hepatitis**, why a prospective donor may not be allowed to give blood.

1
.....
2
..... [2]

[Total: 13]

END OF QUESTION PAPER

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Fig. 5.2 graphs © Mary Jones and Geoff Jones, *Advanced Biology*, p214, Cambridge University Press, 1997. Reproduced by kind permission of Cambridge University Press

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