OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

APPLIED SCIENCE

Cells and Molecules

G623

OCE/17534

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Electronic calculator
- Ruler (cm/mm)

Thursday 27 May 2010
Afternoon

Duration: 45 minutes

G623

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- 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.
- Do **not** write in the bar codes.
- 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 **45**.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.

  This means, for example, you should:
  - ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;
  - organise information clearly and coherently, using specialist vocabulary when appropriate.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **12** pages. Any blank pages are indicated.

Examiner's Use Only:			
1			
2			
3			
4			
Total			

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Answer **all** the questions.

1 Research biologists use electron microscopy in their work to look at cells.

(a) State two advantages and two disadvantages of electron microscopy compared to using a light microscope.

advantages

1. .....

2. .....

disadvantages

1. .....

2. ..... **[4]**

(b) Fig. 1.1 shows an electron micrograph of a white blood cell.

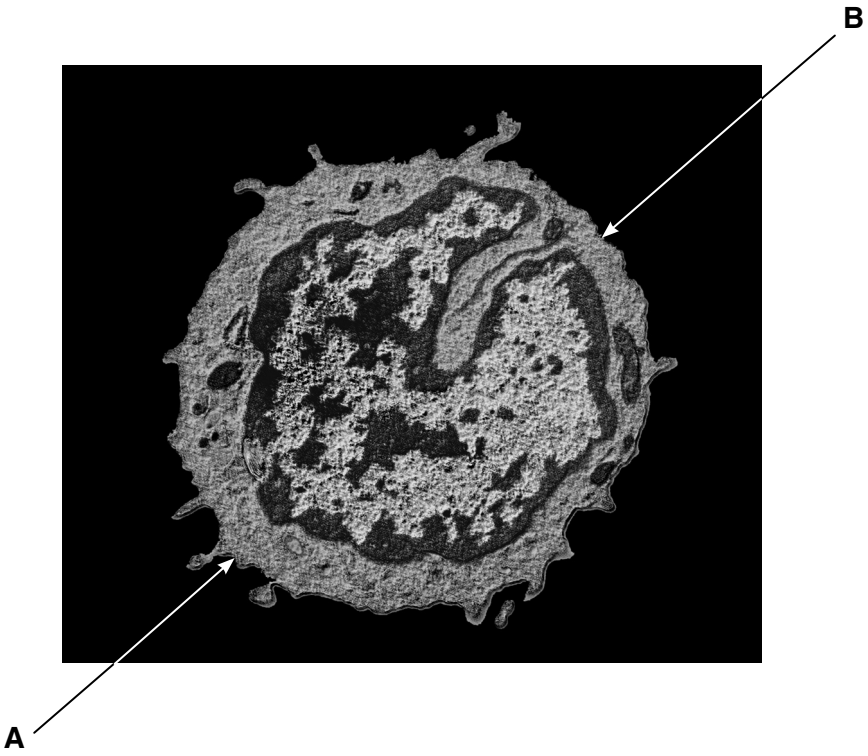


Fig. 1.1

(i) Use Fig. 1.1 to measure the distance between points **A** and **B**.

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

(ii) Use the value in **(b)(i)** to calculate the actual diameter of the white blood cell, in μm, between points **A** and **B**.

The magnification of the white blood cell is ×6800.

Show your working.

diameter of cell = ... μm **[2]**

(c) Fig. 1.2 shows an electron micrograph of an animal cell.

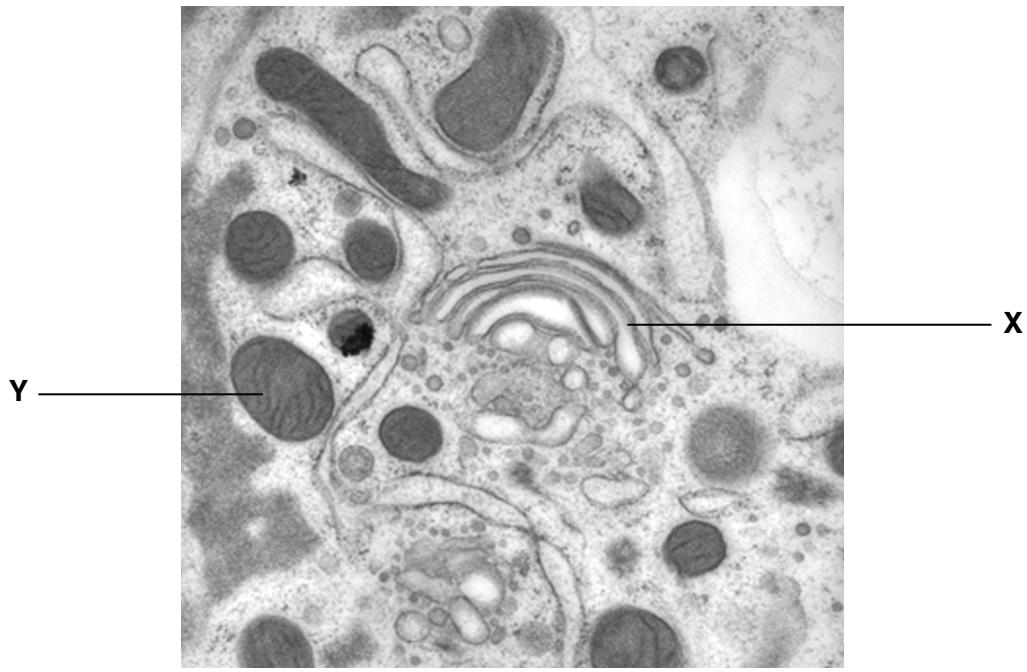


Fig. 1.2

(i) Name the structures **X** and **Y**.

X .....

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

(ii) State the functions of structures **X** and **Y**.

X .....

.....

Y .....

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

[Total: 11]

2 Food technology students were carrying out tests to determine which biological molecules were present in a food sample.

(a) Complete Table 2.1 to summarise the tests they were likely to carry out.

Table 2.1

food chemical	reagent(s) used	result if food chemical is present
starch		blue/black colour
protein		
lipid/fat		milky white emulsion
non-reducing sugar		

[6]

(b) The human body uses a variety of proteins.

Haemoglobin is a protein molecule made from four long chains of amino acids. It is an important protein that helps to carry oxygen in red blood cells.

(i) In the space below, draw a diagram to show the structural formula of an amino acid.

[2]

(ii) State the name of the chemical bond formed between two amino acids.

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

(iii) Name the type of reaction that would break the chemical bond between the two amino acids.

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

(iv) Describe what is meant by the *primary* and *secondary* structure of a protein.

primary structure .....

.....

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

secondary structure .....

.....

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

[Total: 12]

3 A student investigated the activity of the enzyme catalase in potato tissue by measuring the release of oxygen from hydrogen peroxide. The reaction occurs as follows:

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

hydrogen peroxide → water + oxygen

The student added 5 cm^3 of a catalase solution (made from homogenised potato tissue) to 10 cm^3 of a 5% hydrogen peroxide solution and placed the mixture in the apparatus shown in Fig. 3.1.

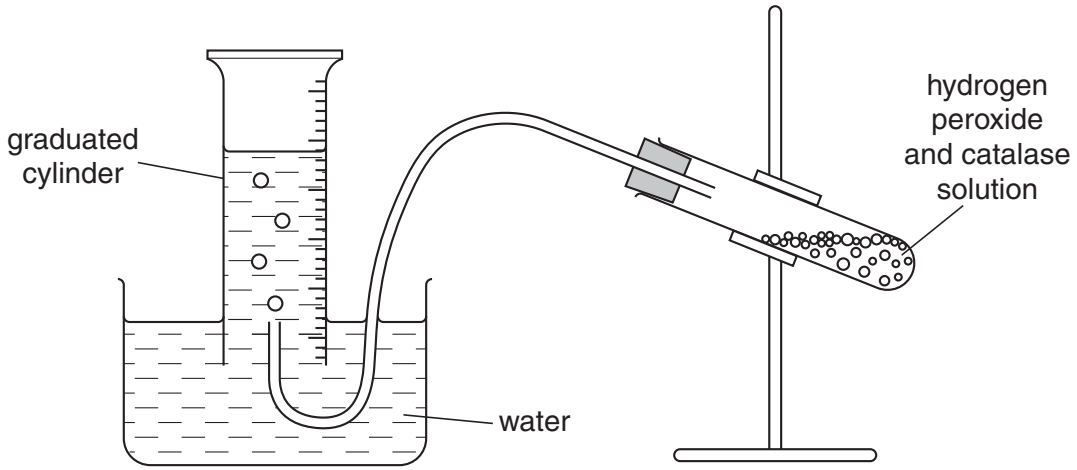


Fig. 3.1

The total volume of gas was recorded every 20 seconds. The results are shown in Table 3.1.

Table 3.1

	time/s							
	0	20	40	60	80	100	120	140
total volume of oxygen/cm^3	0.0	4.3	6.8	8.0	8.6	8.7	8.8	9.0

(a) (i) Use the data in Table 3.1 to plot the results on the axes provided, Fig. 3.2.

The first three points have been plotted for you. **[2]**

(ii) Draw a line to complete the graph. **[1]**

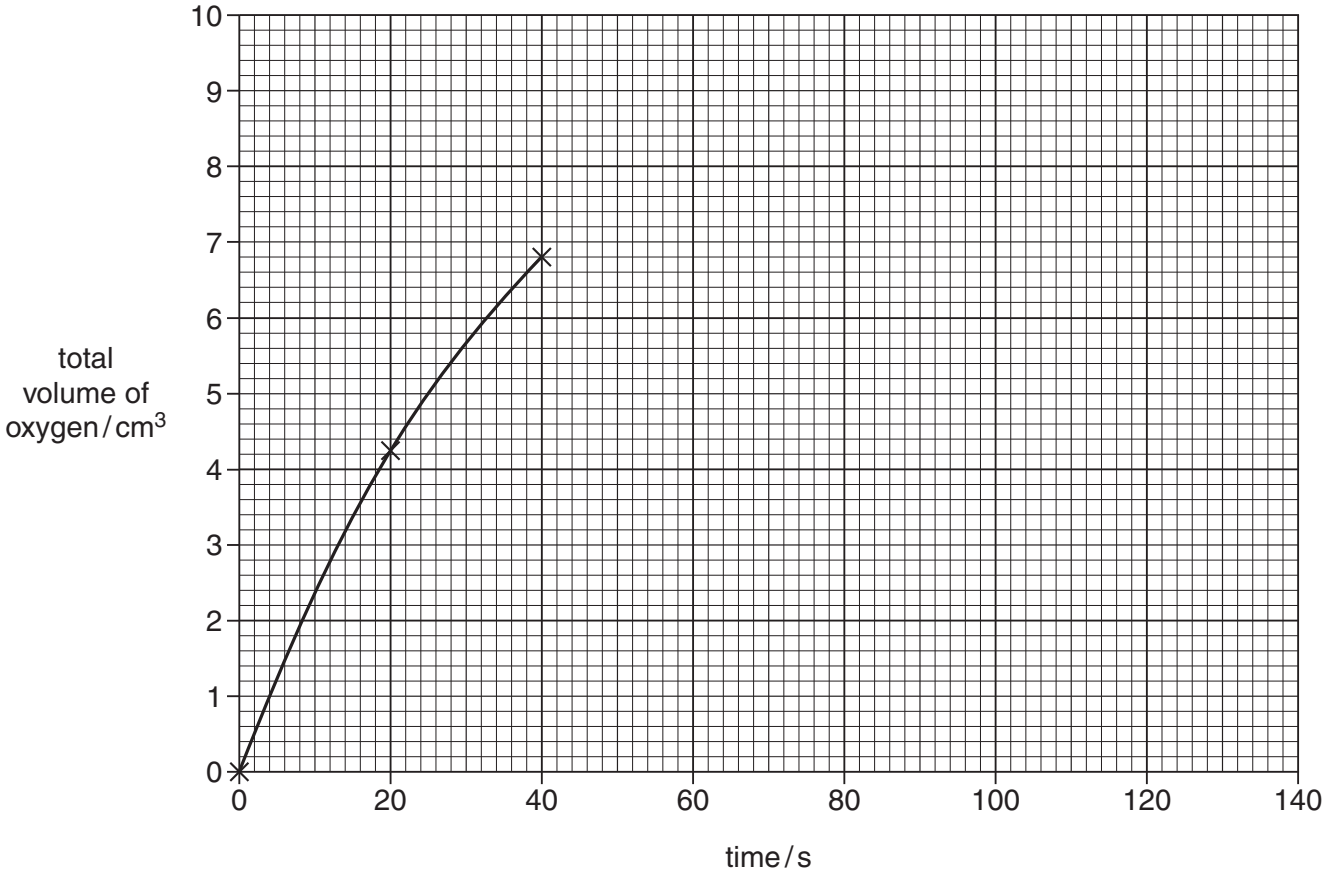


Fig. 3.2

(b) (i) Use Fig. 3.2 to find the total volume of oxygen produced during the first 30 seconds.

volume = ... cm^3 **[1]**

(ii) One way of calculating an average rate of reaction is to use the formula

$$\frac{\text{change in volume of oxygen collected}}{\text{time taken for collection}}$$

Using the value in **(b)(i)** calculate the average rate of reaction, in $cm^3 min^{-1}$, during the first 30 seconds.

rate = ... $cm^3 min^{-1}$ **[2]**

(c) Describe and explain **two** effects of temperature on enzyme activity.

Your answer should include reference to enzyme structure.

.....

.....

.....

.....

.....

.....

.....

.....

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

[Total: 11]

4 **(a)** A pathology technician prepared a microscope slide of a blood sample taken from an 18-year-old girl. The technician needed to accurately measure the dimensions of the cells seen in the blood smear.

Fig. 4.1 shows two scales that the technician might use, as they appear under the microscope. The scales are labelled **P** and **Q**.

(i) Name the **two** pieces of equipment that have scales **P** and **Q** on them. **[2]**

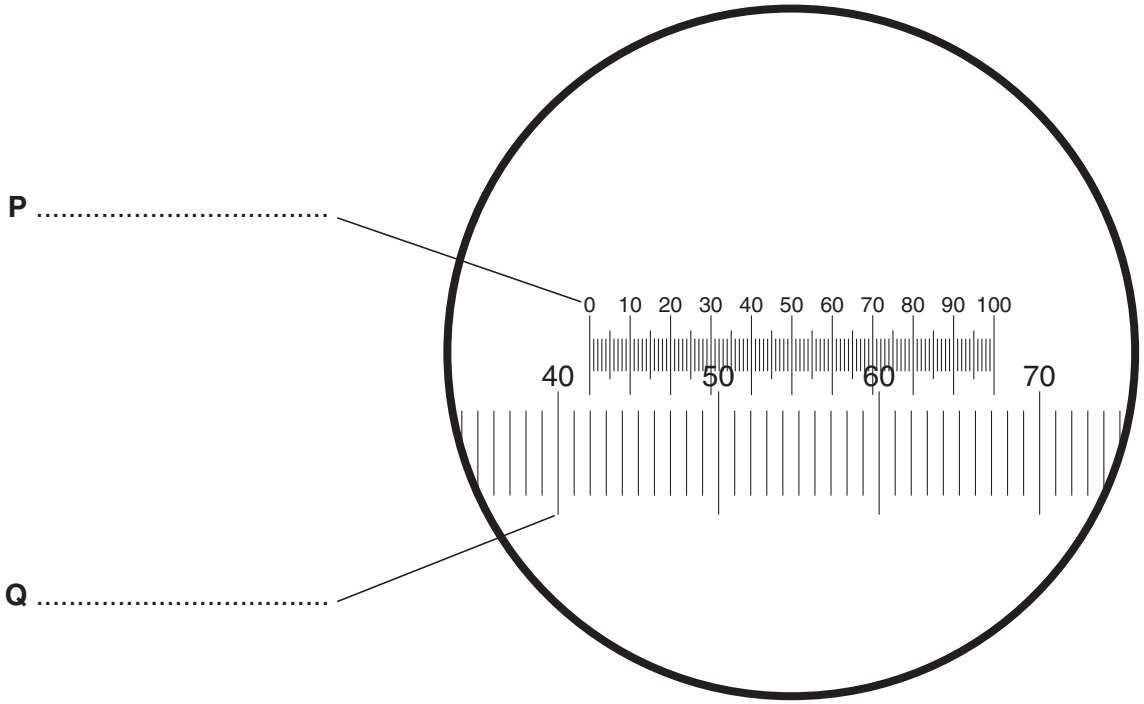


Fig. 4.1

(ii) Explain how scale **Q** could be used to work out the actual diameters of cells in a blood smear.

.....

.....

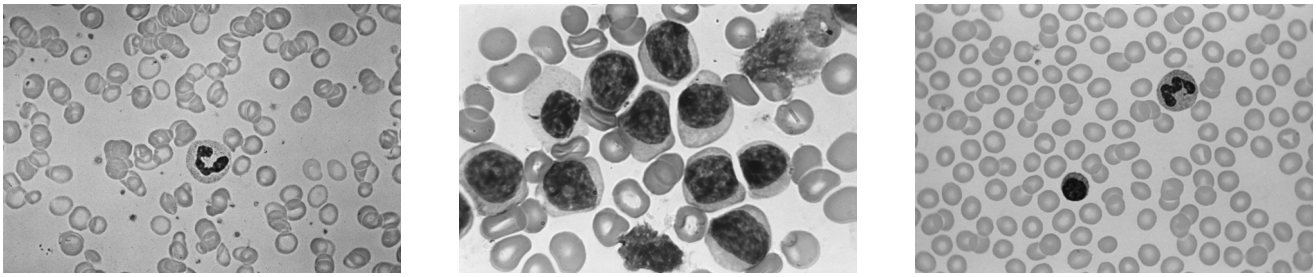
.....

.....

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

(b) The pathology technician also looked at a blood sample from a 7-year-old boy. Photomicrographs of the blood samples from the 18-year-old girl and the 7-year-old boy were then compared to a normal healthy blood sample.

Fig. 4.2 shows the photomicrographs of the three blood samples.



18-year-old girl | 7-year-old boy | healthy blood sample

Fig. 4.2

Use the photomicrographs in Fig. 4.2 to suggest and explain a suitable diagnosis that the technician might make after looking at microscope slides.

(i) the 18-year-old girl

diagnosis .....

explanation .....

.....

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

(ii) the 7-year-old boy.

diagnosis .....

explanation .....

.....

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

(c) The 18-year-old girl has a family history of cystic fibrosis (CF). She is concerned that she might be a carrier of the gene that causes CF. The girl is worried that if she becomes pregnant in the future, the baby might be born with CF. Her doctor suggested that she discuss diagnostic testing for the disorder with a clinical geneticist.

Diagnostic testing for genetic disorders raises moral and ethical issues.

Suggest **two** such issues.

1 .....

.....

2 .....

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

[Total: 11]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE