OCR
RECOGNISING ACHIEVEMENT

Advanced Subsidiary GCE

APPLIED SCIENCE

Unit 4: Cells and Molecules

TUESDAY 16 JANUARY 2007

G623

Afternoon

Time: 45 minutes

Additional materials: Electronic calculator
Ruler (cm/mm)

Candidate
Name

Centre
Number

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 are advised to show all the steps in any calculations.
- You will be awarded marks for the quality of written communication where this is indicated in the question.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
Planning TOTAL	25	
1	24	
2	11	
3	10	
Question Paper TOTAL	45	

This document consists of **9** printed pages and **3** blank pages.

© OCR 2007 [D/102/6776]   Registered Exempt   **[Turn over**

Answer **all** the questions.

1 Micro-biological research scientists use electron microscopy in their work.

(a) List **two** advantages and **two** disadvantages of electron microscopy.

Advantages

1. ....

2. ....

Disadvantages

1. ....

2. .... [4]

(b) Fig. 1.1 shows a plasma cell.
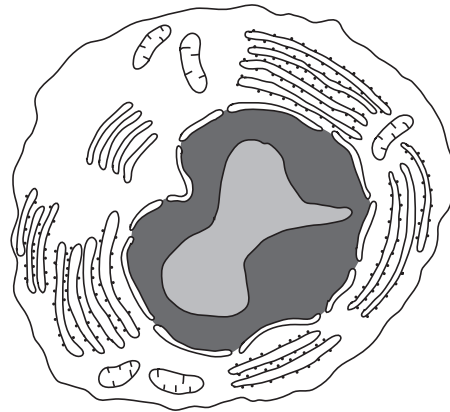
Fig. 1.1

(i) Use label lines and letters **W** – **Z** to label the diagram of the plasma cell in Fig. 1.1.

Label the following structures:

W endoplasmic reticulum;

X Golgi apparatus;

Y mitochondrion;

Z nuclear membrane. [4]

(ii) What is the function of a mitochondrion?

.... [1]

(iii) Fig. 1.2 shows a B lymphocyte and a plasma cell drawn to the same scale.

B lymphocyte   plasma cell

Fig. 1.2

The actual distance between the two arrow heads on the B lymphocyte is 4.0 μm.

Calculate the actual distance between the two arrow heads on the plasma cell.

Show your working.

[4]

(iv) Plasma cells secrete antibodies.

Monoclonal antibodies are extremely useful in biotechnology.

1. What are monoclonal antibodies?

    ....

    .... [2]

2. Explain how monoclonal antibodies can be used to identify genetic diseases.

    ....

    .... [2]

(v) Susan discovered that her grandfather and his sister died of Huntington's disease (Huntington's chorea). Susan's father is in his early 40s and is still unaffected. Now, 21 years old and pregnant, she wants to know if she is affected and has decided to undergo a series of diagnostic tests.

Outline the moral and ethical implications of diagnostic testing for genetic disorders.

In this part of the question, 2 marks are available for the appropriate use of English, spelling, punctuation and grammar.

....

....

....

....

....

....

....

....

....

.... [5 + 2]

[Total: 24]

5

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2 **(a)** **(i)** The following equation represents the formation of maltose, a disaccharide, from a hexose sugar.

$$C_6H_{12}O_6 + C_6H_{12}O_6 \rightleftharpoons C_{12}H_{22}O_{11} + H_2O$$
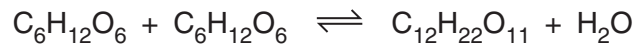
State the meaning of *disaccharide* and *hexose*.

disaccharide ....

.... [1]

hexose..

.... [1]

(ii) 1. Name the **type** of reaction involved in the formation of both a glycosidic bond and a peptide bond.

.... [1]

2. In the space below write the structural formulae of the products when a peptide bond is formed between the amino acids CH_3CHNH_2COOH and $HCHNH_2COOH$.
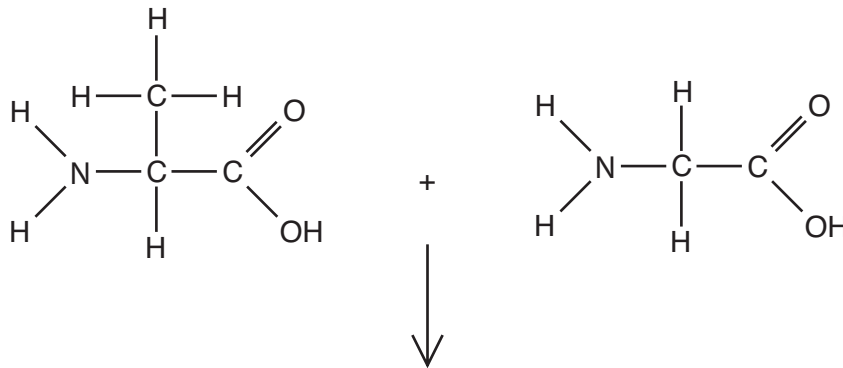
[2]

(b) A student took three test tubes one containing starch, one sucrose solution and the third, an enzyme solution. He forgot to label them.

Describe the chemical tests he might use and the expected results to identify **all three** solutions correctly.

starch ....

....

....

....

sucrose ....

....

....

....

enzyme ....

....

....

.... [6]

[Total: 11]

[Turn over

3 Technicians in hospital laboratories have to be able to count cells accurately.

One method they use involves a haemocytometer slide.

Fig. 3.1 shows part of a haemocytometer slide. The slide is used to count cells in a culture. Cells that overlap the top and left-hand side of the central chamber are included in the total for a square. This is the rule to avoid counting cells twice.
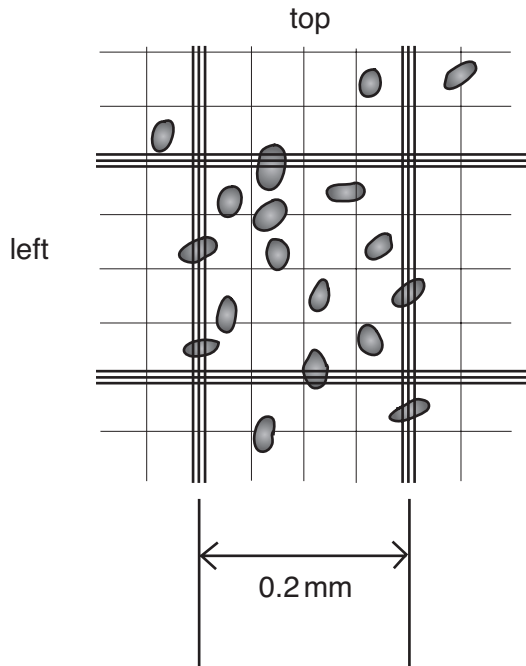
top

left

0.2 mm

Fig. 3.1

The haemocytometer chamber in the slide has a depth of 0.1 mm.

Imagine that you are a technician using the haemocytometer in Fig. 3.1.

(a) How many cells would be included in the count in the central 4 x 4 chamber?

.... [1]

(b) Show that the volume of the central 4 x 4 chamber is 0.004 mm^3.

volume = ... [2]

(c) Using the values from **(a)** and **(b)** calculate the number of cells in $1\,cm^3$.

Show your working.

number of cells in $1\,cm^3$ .... [4]

(d) (i) Suggest **two** reasons why your answer in **(c)** will only provide an estimate of the number of living cells in the culture.

1. ....

....

2. ....

.... [2]

(ii) Suggest **one** way to improve the validity of your estimate.

....

.... [1]

[Total: 10]

END OF QUESTION PAPER

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