OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

APPLIED SCIENCE

Unit 4: Cells and Molecules

TUESDAY 5 JUNE 2007

G623

Afternoon

Time: 45 minutes

Additional materials: Electronic calculator
Ruler (cm/mm)

CUP/T22453

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.

Qu.	Max.	Mark
1	16	
2	13	
3	9	
4	7	
TOTAL	45	

This document consists of **10** printed pages and **2** blank pages.

[Turn over

Answer **all** the questions.

1 **(a)** An agricultural plant scientist was comparing water retention in different crop varieties of potato. The method he used for each variety of potato is shown below.

A cylinder of potato tissue from a tuber of one of the potato varieties in the study was removed using a cork borer.

The cylinder was then cut into uniform discs 1 mm thick.

The discs were sorted into seven groups, each group having the same number of discs.

Each group was weighed and the mass recorded.

One group was placed into distilled water. The other six groups were each placed into one of six different concentrations of sucrose solution.

After 60 minutes the discs were removed, blotted dry with filter paper and reweighed.

The percentage change in mass was determined.

The results are shown in Table 1.1.

Table 1.1

group	1	2	3	4	5	6	7
concentration of sucrose solution / mol dm^{-3}	0.0	0.1	0.2	0.3	0.4	0.5	0.6
percentage change in mass	+22.0	+17.0	+9.0	+3.0	–3.0	–10.0	–15.0

(i) Plot the results on the axes provided in Fig. 1.1.

Use a ruler to draw a line of best fit.

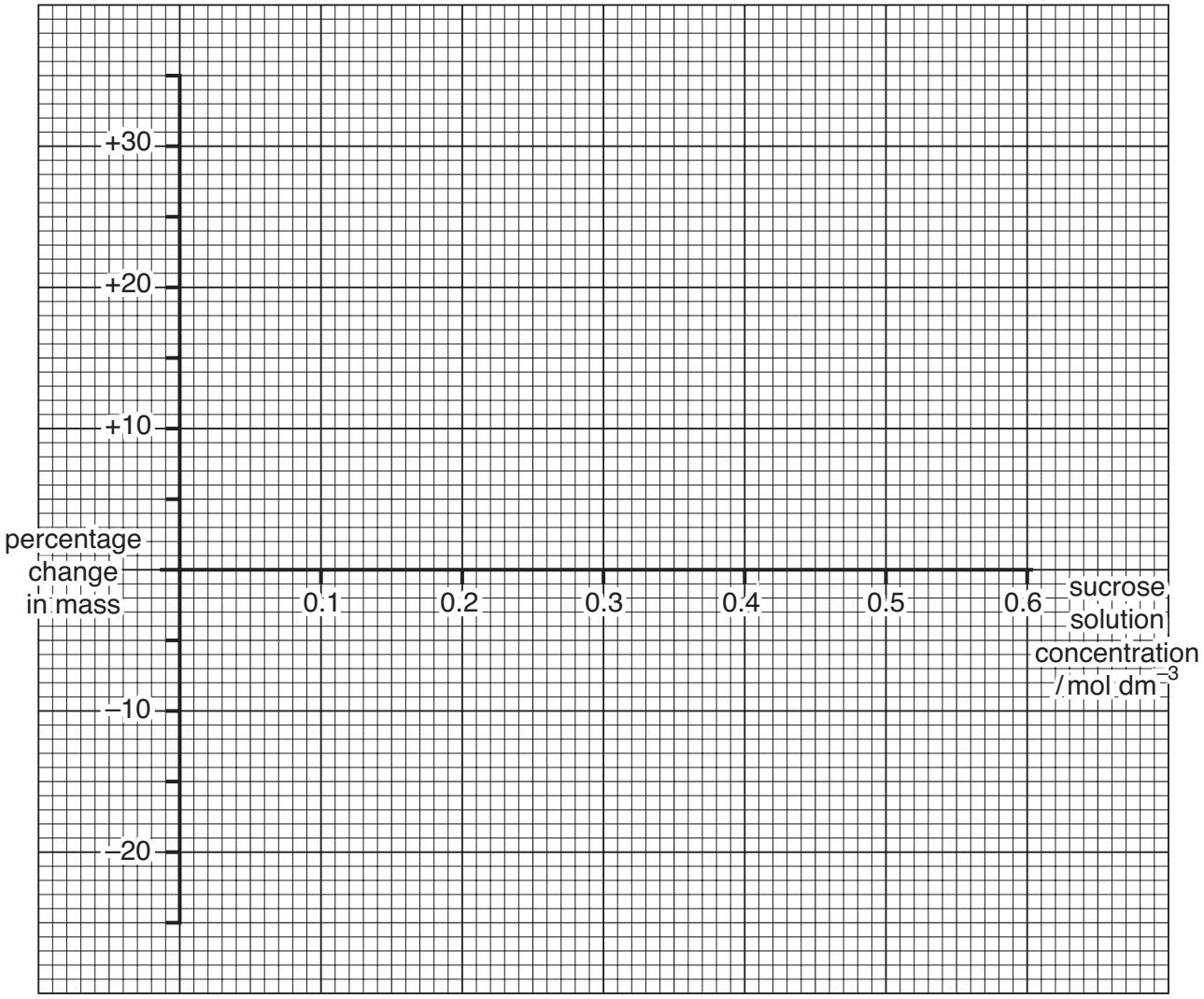

Fig. 1.1 [4]

(ii) Use the graph to find the concentration of sucrose solution that had the same water potential as the potato tissue.

..... mol dm^{-3} [1]

(iii) Describe and explain the processes that would have to take place for the potato discs to show a zero percentage change in mass.

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..... [6]

(iv) State why it was necessary to record change in mass as a percentage change.

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..... [1]

(b) Crop plants producing high yields of starch can be used as a raw material to manufacture sweeteners. The flow diagram below shows the major steps in the production of the sweetener 'fructose syrup' from starch.

starch suspension in water $\xrightarrow{\text{step } \mathbf{1}}$ maltose $\xrightarrow{\text{step } \mathbf{2}}$ glucose $\xrightarrow{\text{step } \mathbf{3}}$ fructose syrup

(i) Name the type of enzyme involved in steps **1** and **2**.

..... [1]

(ii) Name the type of reaction that would be needed to **reverse** step **2**.

..... [1]

(iii) 1. Name a test reagent for a reducing sugar.

..... [1]

2. State the observations that would be expected if a reducing sugar was present.

..... [1]

[Total: 16]

2 A student was preparing a test on microscopy and cell structure for others in his group.

(a) Complete Table 2.1 using the most appropriate word, words or numbers.

Table 2.1

feature	student microscope	electron microscope
beam	light	
lenses		
state of specimen	dead or alive	
maximum magnification		500 000
approximate resolution		

[7]

(b) Explain the role (function) of the following cellular organelles.

(i) endoplasmic reticulum

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(ii) mitochondrion

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(iii) ribosomes

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..... [6]

[Total: 13]

3 Technicians working in research laboratories have techniques available to them to measure and count cells.

(a) Fig. 3.1 is a diagram of a phagocyte ingesting some bacteria.

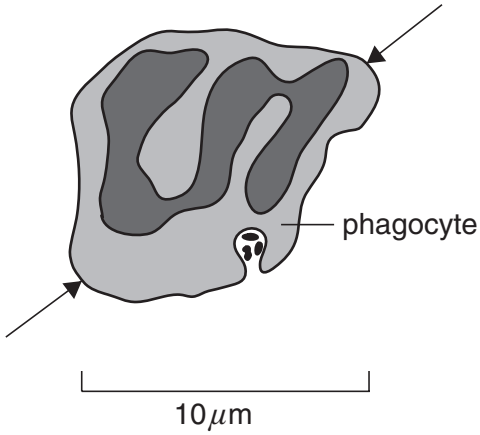

Fig. 3.1

Use a ruler and the scale provided to work out the actual distance between the points on the phagocyte indicated by the arrow heads.

Show your working.

[4]

(b) Fig. 3.2 shows the growth curves of two populations of cells. They have been grown in a laboratory using two different systems.

The viability values indicate the percentage of the cells in the system that are alive.

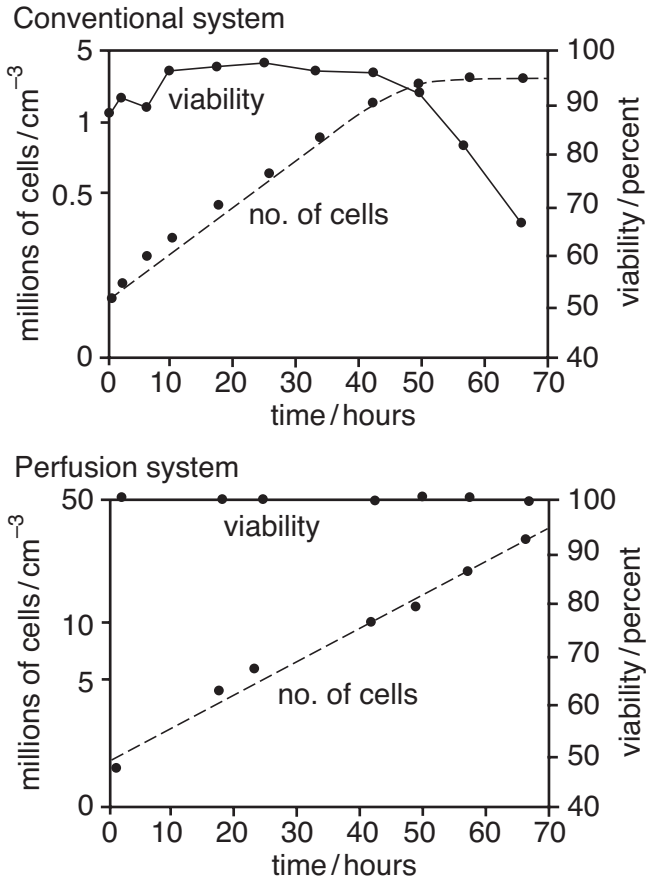

Fig. 3.2

(i) One method available to count cells uses a haemocytometer.

Suggest **two** reasons why a haemocytometer is not likely to have been used to count these cells.

1. .....

2. ..... [2]

(ii) When a Coulter counter is used it gives a more accurate estimate of viable cell numbers for the perfusion system than the conventional system after 60 hours culture time.

Use your knowledge of the way a Coulter counter works to explain why.

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..... [3]

[Total: 9]

4 Helen and her husband both have relatives who have suffered from cystic fibrosis (CF). Their 18 month old daughter Anna, is showing some of the characteristic symptoms of CF and they are worried that she too may have inherited the disorder. They visited their doctor for advice. Together they constructed a family tree to identify the possibilities.

Towards the end of the consultation Helen told the doctor that she was pregnant. The doctor said that he would refer them to a clinical geneticist for counselling if the couple wanted to discuss prenatal, diagnostic testing.

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

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

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..... [5]

Quality of Written Communication [2]

[Total: 7]

END OF QUESTION PAPER

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