OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

APPLIED SCIENCE

G623

Cells and Molecules

OCE/25773

Candidates answer on the question paper.

OCR supplied materials:
None

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

Tuesday 11 January 2011
Morning

Duration: 45 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- 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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- 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 **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.

For Examiner's Use			
1			
2			
3			
4			
Total			

DC (SHW 00566 12/09) 25773/3

Answer **all** the questions.

1 A group of students was revising work on cell structure. They were asked to look at a photograph of cells, taken using an electron microscope, shown in Fig. 1.1.

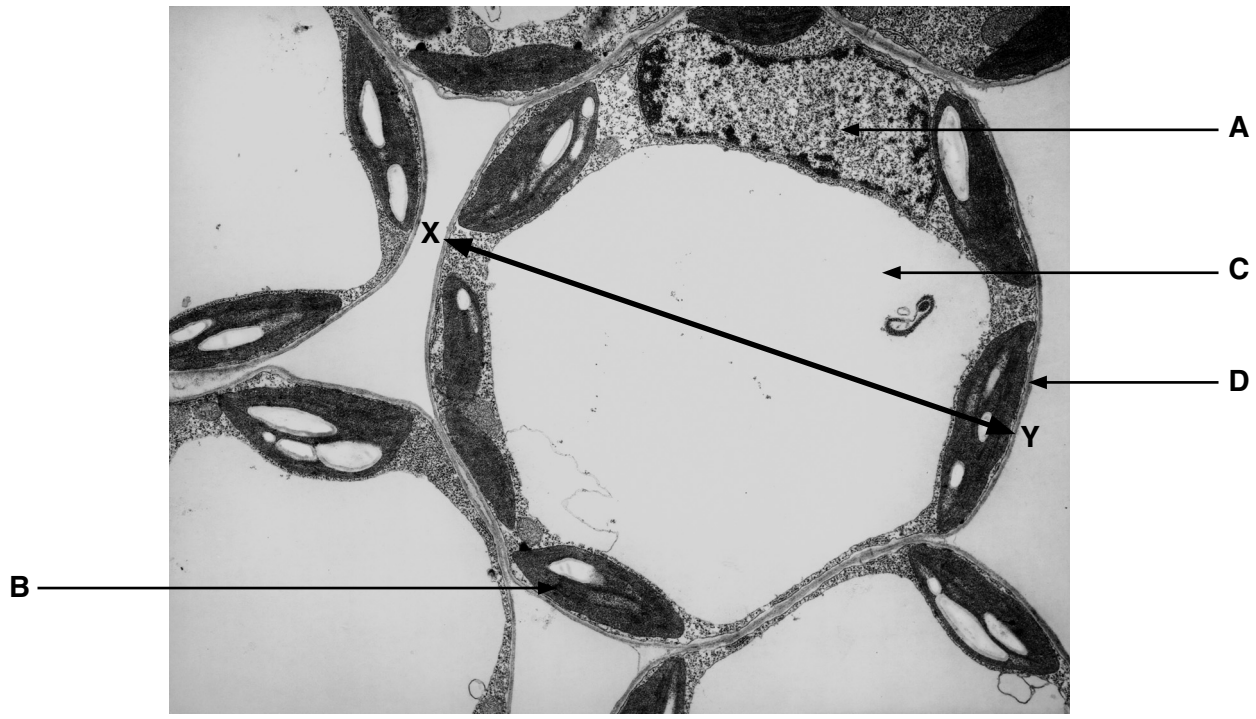


Fig. 1.1

(a) Name the structures **A** to **D**.

A .....

B .....

C .....

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

(b) The photograph of the cells in Fig. 1.1 has a magnification of ×1500.

Measure the observed distance between **X** and **Y** on Fig. 1.1 and use this measurement to calculate the actual distance between **X** and **Y** across the cell.

observed distance ..... mm

actual distance = ... mm **[2]**

(c) Fig. 1.2 is a diagram of plant cells when viewed through a microscope with an eye piece graticule. The microscope has the low power objective lens in place and the eye piece graticule is in arbitrary units.

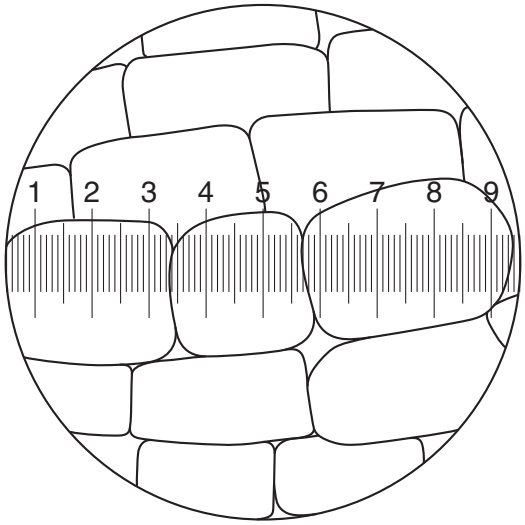


Fig. 1.2

(i) Describe a method that you would use to find the average actual length of these cells.

.....

.....

.....

.....

.....

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

(ii) If one of the cells was viewed under the eye piece graticule scale using the high power objective lens of the same microscope, how would its appearance change in relation to the scale?

.....

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

[Total: 10]

2 Plant scientists carried out an experiment to find the water potential of plant cells. Discs of potato tuber, about 1 mm thick, were cut out and weighed. Repeat samples were taken and placed in a series of sucrose solutions ranging from 0.0 to 0.6 mol dm^{-3} in covered dishes at a constant temperature of 20 °C. After 1 hour the samples were blotted rapidly between sheets of filter paper and re-weighed.

The results they obtained are shown in Table 2.1.

Table 2.1

concentration of sucrose solution / mol dm^{-3}	0.0	0.1	0.2	0.3	0.4	0.5	0.6
mean percentage change in mass (%)	+22	+17	+9	+3	–3	–10	–15

(a) (i) Plot these figures on the graph paper, Fig. 2.1. **[2]**

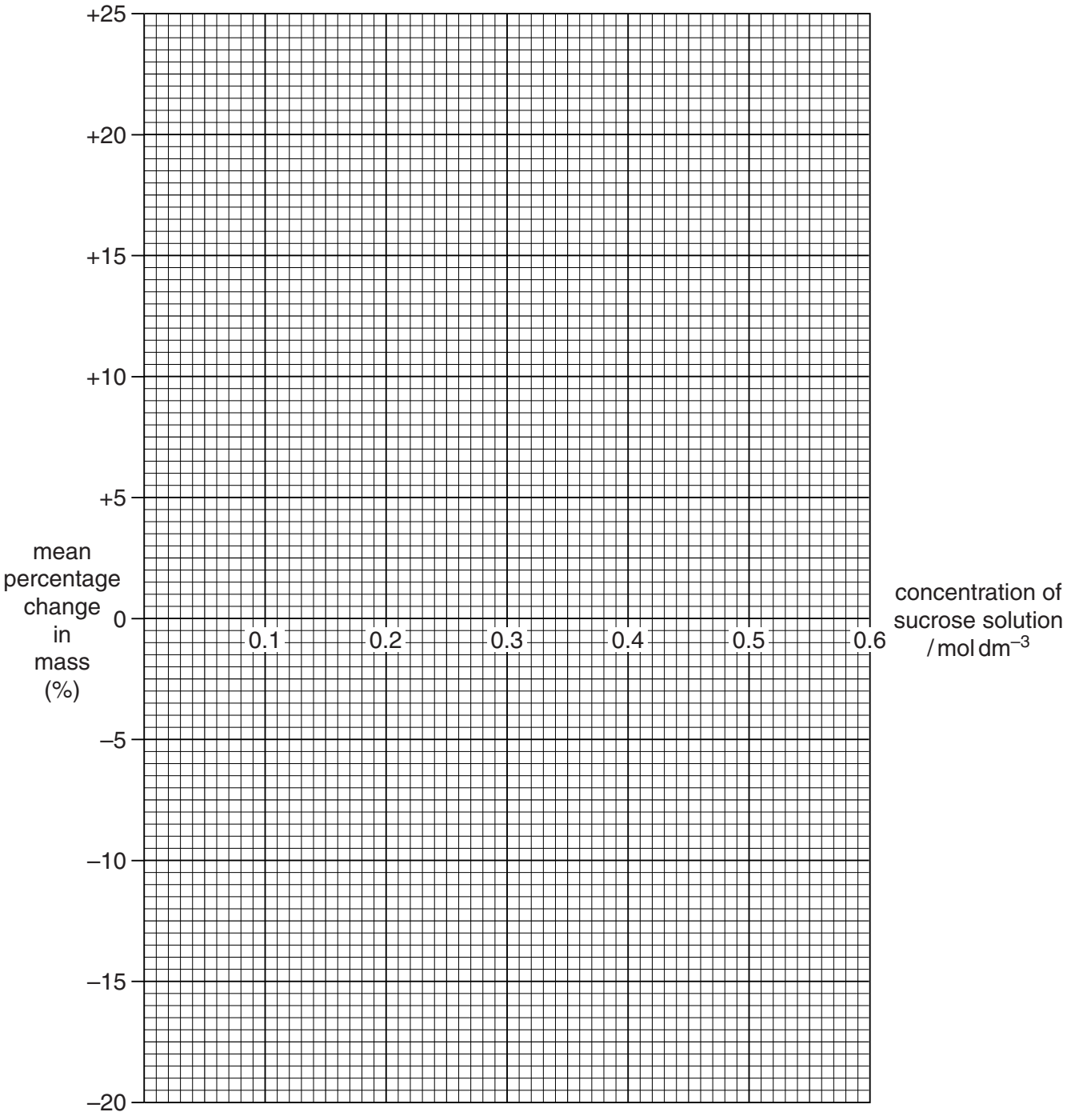


Fig. 2.1

(ii) Draw a line of best fit on Fig. 2.1. **[1]**

(b) Use the graph to work out the concentration of sucrose solution equal to the water potential of the potato cells.

concentration of sucrose solution = ... $mol\,dm^{-3}$ **[1]**

(c) Why were the dishes containing the discs and sucrose solution covered during the experiment?

.....

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

(d) Suggest **two** reasons for expressing the change in mass as a percentage change.

.....

.....

.....

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

[Total: 7]

3 **(a)** Some cell biologists work in pathology laboratories.

(i) Diagnostic genetic testing is carried out by cell biologists.

Suggest **one** reason why performing a diagnostic test may lead to moral and ethical issues.

.....

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

(ii) State two other diagnostic procedures that may be carried out on blood samples by cell biologists.

1. .....

.....

2. .....

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

(b) The scientists who work in hospital pathology laboratories use light microscopes to look at cervical (Pap) smears to help diagnose cervical cancer.

(i) State two reasons why a light microscope may be used to observe cells in cervical smears, in preference to an electron microscope.

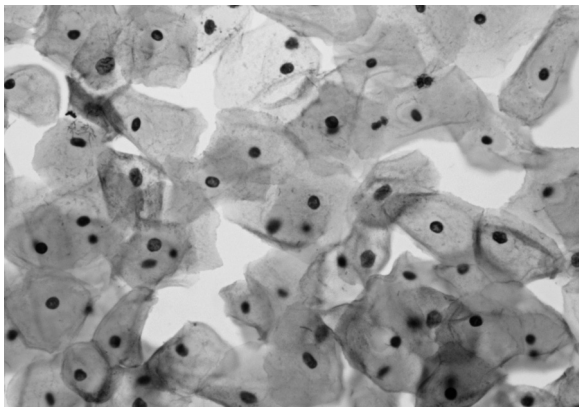
reason 1 .....

.....

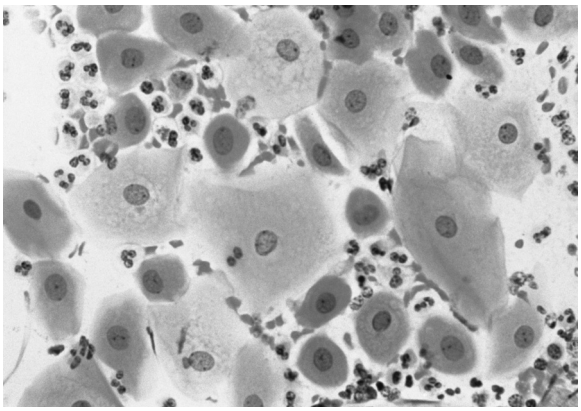
reason 2 .....

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

(ii) Fig. 3.1 shows healthy cells from the outer wall of a cervix in photograph **A** and abnormal cells from the outer wall of a cervix in photograph **B**.



photograph **A** – healthy cells



photograph **B** – abnormal cells

Fig. 3.1

Use Fig. 3.1 to describe and explain the evidence that scientists might observe to diagnose precancerous or cancerous cells in the Pap smear.

evidence .....

.....

explanation .....

.....

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

(c) Scientists in hospital laboratories may use monoclonal antibodies to identify diseases. Monoclonal antibodies can also be used to confirm pregnancy.

Human chorionic gonadotrophin (hCG) is a glycoprotein found in a woman's urine during early pregnancy.

Explain how monoclonal antibodies may be used to identify pregnancy.

.....

.....

.....

.....

.....

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

[Total: 10]

4 A group of students started to learn about some of the molecules found within cells.

(a) Their teacher wanted them to revise their work on chemical food tests. She produced a crossword for the students to complete. This is shown in Fig. 4.1.

Imagine you are one of the students. Use the clues to complete the crossword.

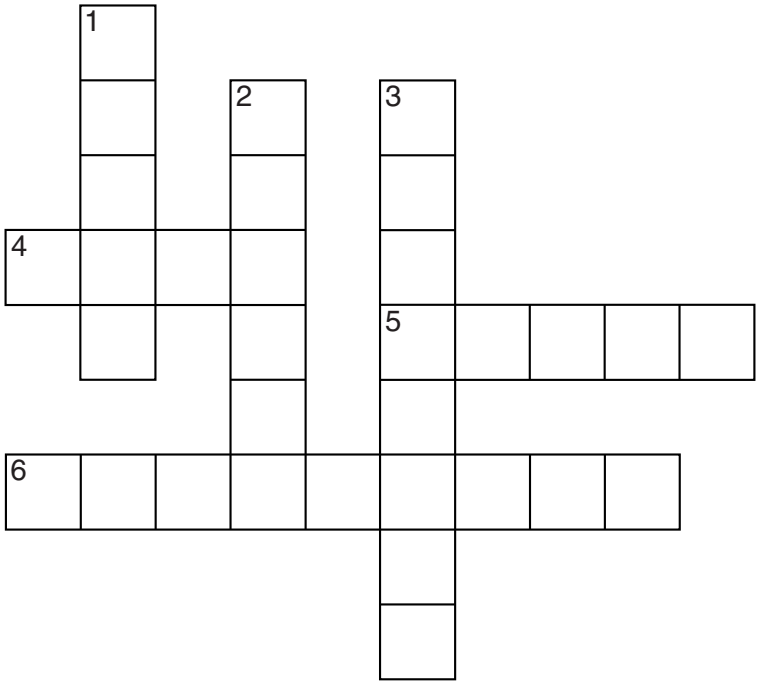


Fig. 4.1

ACROSS

4. Type of hydrolysis needed to test for a non-reducing sugar.
5. Colour seen when protein is added to biuret solution.
6. Reagent (chemical) used to test for a reducing sugar.

DOWN

1. Colour observed for a positive starch test.
2. Reagent (chemical) used to test for starch.
3. Formed when ethanol containing fat is added to water.

[6]

(b) The students went on to learn about DNA.

Fig. 4.2 shows part of a DNA molecule.

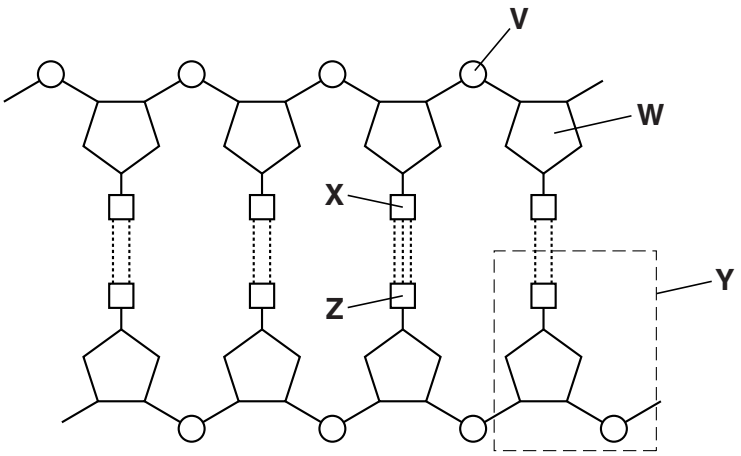


Fig. 4.2

(i) Name structures **V** to **Y**.

V .....

W .....

X .....

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

(ii) What do the dotted lines between **X** and **Z** represent?

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

TURN OVER FOR PART (c)

(c) Haemoglobin is a globular protein found in red blood cells. Fig. 4.3 shows a sequence of amino acids in part of a molecule of haemoglobin and the messenger RNA (mRNA) base sequence that codes for the three amino acids in the haemoglobin sequence.

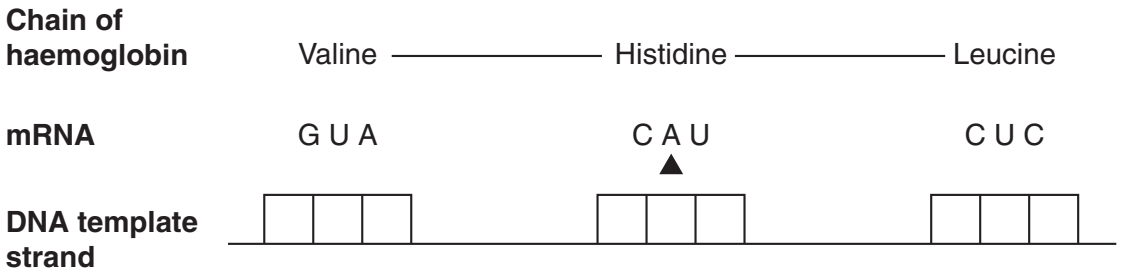


Fig. 4.3

(i) State the name given to a sequence of three bases on a molecule of messenger RNA.

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

(ii) State the base sequence on the DNA strand from which the above section of mRNA was transcribed. Write your answers in the spaces on Fig. 4.3. **[3]**

(iii) Use Fig. 4.3 to suggest two consequences of removing the base A (indicated ▲) from the messenger RNA base sequence above on the polypeptide produced.

Give one reason for your answer.

consequence 1 .....

.....

consequence 2 .....

.....

reason .....

.....

.....

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

[Total: 18]

END OF QUESTION PAPER

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE