

**Thursday 24 May 2012 – Morning**

**AS GCE APPLIED SCIENCE**

**G623** Cells and Molecules

Candidates answer on the Question Paper.

**OCR supplied materials:**

None

**Other materials required:**

- Electronic calculator
- Ruler (cm/mm)

**Duration:** 45 minutes




Candidate forename		Candidate surname	
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Centre number							Candidate number				
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**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. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- 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).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

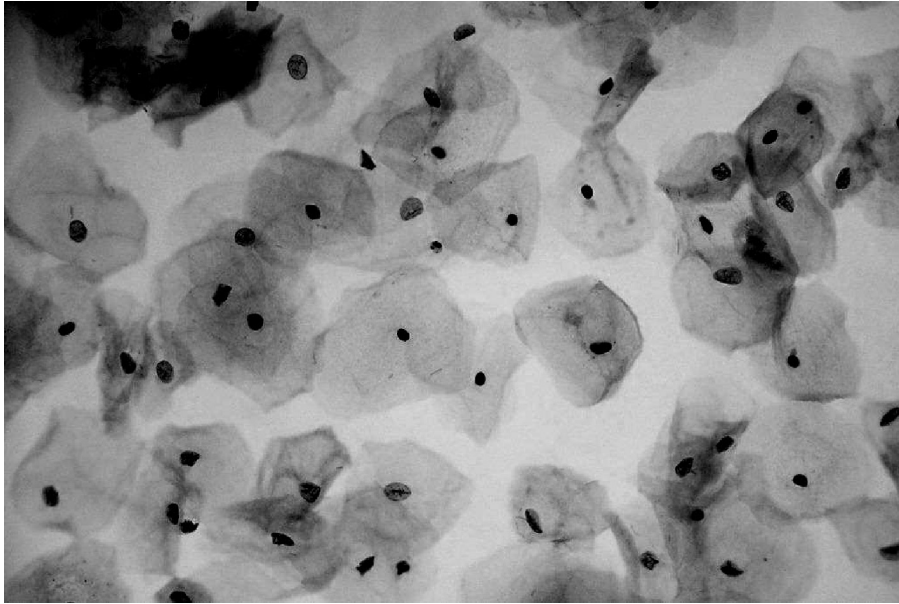
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **45**.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer. This means, for example, you should:
  - ensure 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			
<b>Total</b>			

Answer **all** the questions.

- 1 Cervical smear tests (Pap smears) are analysed in hospital pathology laboratories as part of a screening programme for pre-cancerous or cancerous cells of the cervix.

Fig. 1.1 shows cells collected from the cervix during a routine smear test.



**Fig. 1.1**

- (a) (i) State the type of microscope which was used to observe the cells in Fig. 1.1.

..... [1]

- (ii) Suggest **one** reason why this type of microscope was used to observe the cells in Fig. 1.1.

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



- (iii) Suggest how these cells may have been prepared for observation using this type of microscope after they had been taken from the cervix.

.....  
.....  
.....  
.....  
.....  
.....  
..... [4]

(iv) Name and describe the role of two **additional** cellular organelles that may be seen in the cells in Fig. 1.1 if the magnification was increased to  $\times 500\,000$ .

1. name .....

role .....

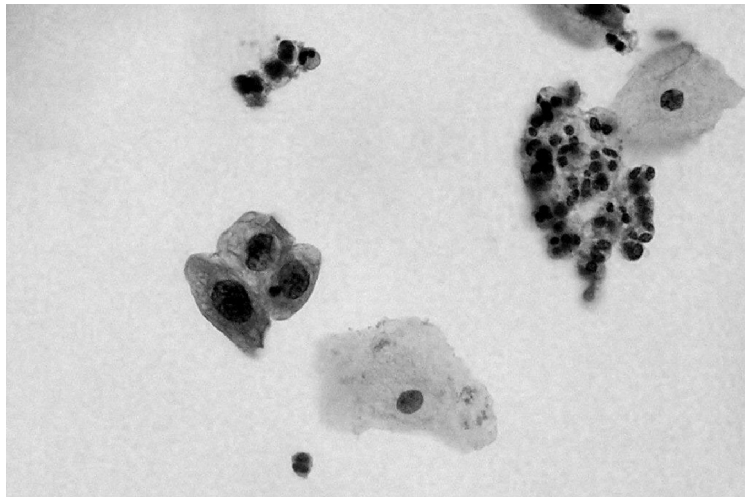
.....

2. name .....

role .....

..... [4]

(b) Fig. 1.2 shows cells at the same magnification as Fig. 1.1 which were taken from the cervix of another woman during a routine smear test.



**Fig. 1.2**

Describe **two** differences in the structure of the cells in Fig. 1.2 compared to the cells in Fig. 1.1.

1. ....

.....

2. ....

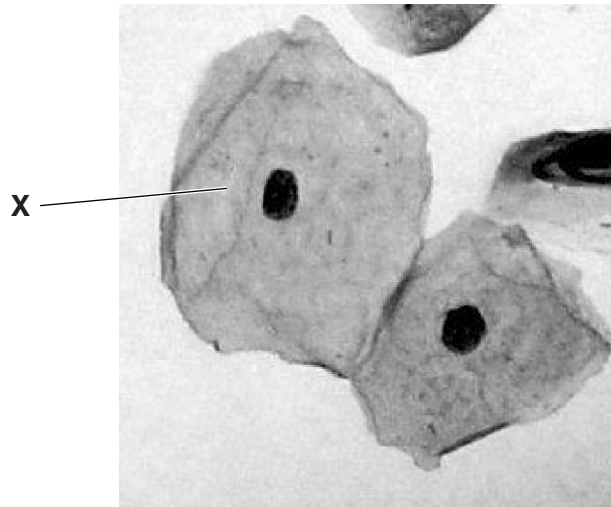
..... [2]

(c) Use Fig. 1.1 and Fig. 1.2 to suggest a suitable conclusion or diagnosis that a pathology technician might make about the cells in Fig. 1.1 and Fig. 1.2.

cells in Fig. 1.1 .....

cells in Fig. 1.2..... [2]

- (d) A pathology technician needs to record the actual maximum diameter of the cell labelled **X**, taken from the cervix, shown in Fig. 1.3.



**Fig. 1.3**

The pathology technician may use an eye-piece graticule and a stage micrometer to determine the maximum actual diameter of cell **X**.

The list of statements (**A** to **I**) represents some of the steps which describe how an eye-piece graticule and a stage micrometer can be used to determine the actual maximum diameter of the cell labelled **X**.

The statements are not in the correct order.

- A** The stage micrometer is removed from the stage of the microscope.
- B** Cell **X** is lined up with the eye-piece graticule (epg) scale.
- C** The stage micrometer is placed on the stage of the microscope at a set magnification.
- D** The stage micrometer is used to measure the actual length of the epg scale.
- E** Each epg division can be converted to micrometres.
- F** The number of epg divisions which cover the maximum diameter of cell **X** are converted to micrometres.
- G** A microscope slide of cells, shown in Fig. 1.3, is placed on the stage of the microscope.
- H** The number of epg divisions which cover the maximum diameter of cell **X** are counted.
- I** The scale on the epg is lined up with the scale on the stage micrometer.

Put the list of statements (**A** to **I**) in order.

Write the correct letter in each of the boxes.

Three have been done for you.

<b>C</b>				<b>A</b>				<b>F</b>
----------	--	--	--	----------	--	--	--	----------

[3]

[Total: 17]

2 Carbon, hydrogen and oxygen are essential elements in biological molecules. Hydrogen and oxygen are the two elements found in water.

(a) Some of the properties of water are listed below.

Draw a line to link **each** property of water to its importance to living organisms.

property of water	importance to living organisms
Large amount of energy is needed to change liquid into vapour	Maintains circulation of water in ponds and increases survival chances of aquatic organisms
Large amount of energy is needed to raise the temperature of water	Maintains membrane stability
Small polar molecule	Chemical reactions in cells occur within a narrow temperature range
Water below 4 °C is less dense than water above 4 °C	Control of body temperature by sweating in mammals

[3]

(b) State **one** type of bonding in carbon and explain how this type of bonding is important in biological molecules such as proteins, lipids or carbohydrates.

type of bond .....

explanation .....

.....

..... [3]

[Total: 6]

- 3 A major use of enzymes in the food industry is to increase the sweetness of foods. Invertase is an enzyme that is used to produce fructose syrup. It can also be used to make soft-centred chocolates. Invertase solution catalyses the conversion of sucrose to glucose and fructose.

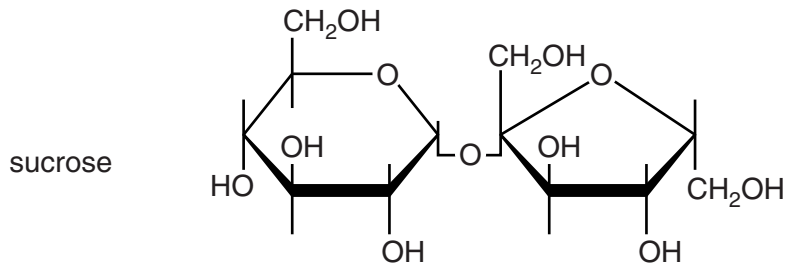


Fig. 3.1

- (a) Name the type of reaction and the bond that is broken when sucrose is converted to glucose and fructose.

reaction.....

bond ..... [2]

- (b) Suggest how the use of invertase helps the manufacture of soft-centred chocolates.

.....

..... [1]

- (c) (i) State the name of the chemical reagent that would be used to test for the presence of a reducing sugar in a solution.

..... [1]

- (ii) A test for the presence of a reducing sugar gave a slight positive result when a mixture of glucose and fructose was tested.

A second test was carried out on another sample of the mixture to test for the presence of a non-reducing sugar.

State the additional chemical reagents used for the second test.

.....

..... [2]

- (iii) What observation would be made after the second test?

.....

..... [1]

(d) The food industry uses other chemical tests in the analysis of food products.

(i) Name the reagent(s) used to test for protein.

..... [1]

(ii) Describe a chemical test and the result that would indicate the presence of a lipid in food.

test .....

result .....

..... [2]

**[Total: 10]**

4 Students were given some information during a revision lesson about the structure and role of DNA in living cells. Afterwards they were asked to complete the following passage.

(a) Imagine you are one of the students. Fill in the blank spaces in the passage below with the most appropriate biological word from the list.

cytosine	messenger	ribose
deoxyribose	mitochondria	ribosomes
disulphide	nucleolus	thymine
hydrogen	protein	transfer

A molecule of DNA is composed of many polymerised units called nucleotides. Each nucleotide consists of one of four organic bases joined to a ..... sugar and a phosphate group. The DNA consists of two strands running anti-parallel to each other and coiled into a double helix. The strands are held together by ..... bonds.

In RNA, the base ..... is replaced by uracil, and the sugar present is ..... Three varieties of RNA exist in cells. One sort, ribosomal RNA, is found in large amounts in the part of the cell called the ....., where it is probably synthesised. The pores in the nuclear envelope are important in allowing ..... RNA to pass out to the ..... located on the endoplasmic reticulum. The third type of RNA is ..... RNA and this combines with amino acids in the cytoplasm in order to assemble them correctly during ..... synthesis. [9]

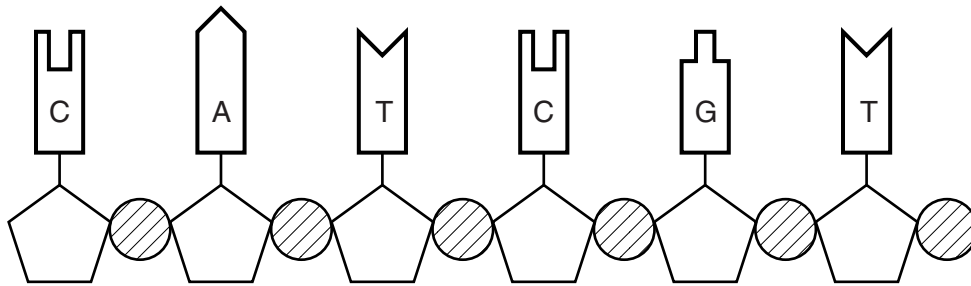
(b) An analysis of a sample of DNA extracted from a tissue showed that 38% of the bases were adenine. What percentage of the bases in the DNA would be guanine?

Show your working.

% guanine = ..... [2]



(c) Fig. 4.1 shows a section of one strand of a gene on a DNA molecule.



**Fig. 4.1**

State, with a reason, how many amino acids this section of DNA codes for.

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

**[Total: 12]**

**END OF QUESTION PAPER**

**10**  
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