

**Tuesday 20 May 2014 – Morning**

**AS GCE APPLIED SCIENCE**

**G623/02** Cells and Molecules

Candidates answer on the Question Paper.

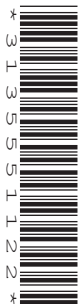
**OCR supplied materials:**

None

**Other materials required:**

- Electronic calculator
- Ruler (cm/mm)

**Duration:** 45 minutes




Candidate forename		Candidate surname	
--------------------	--	-------------------	--

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. 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. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

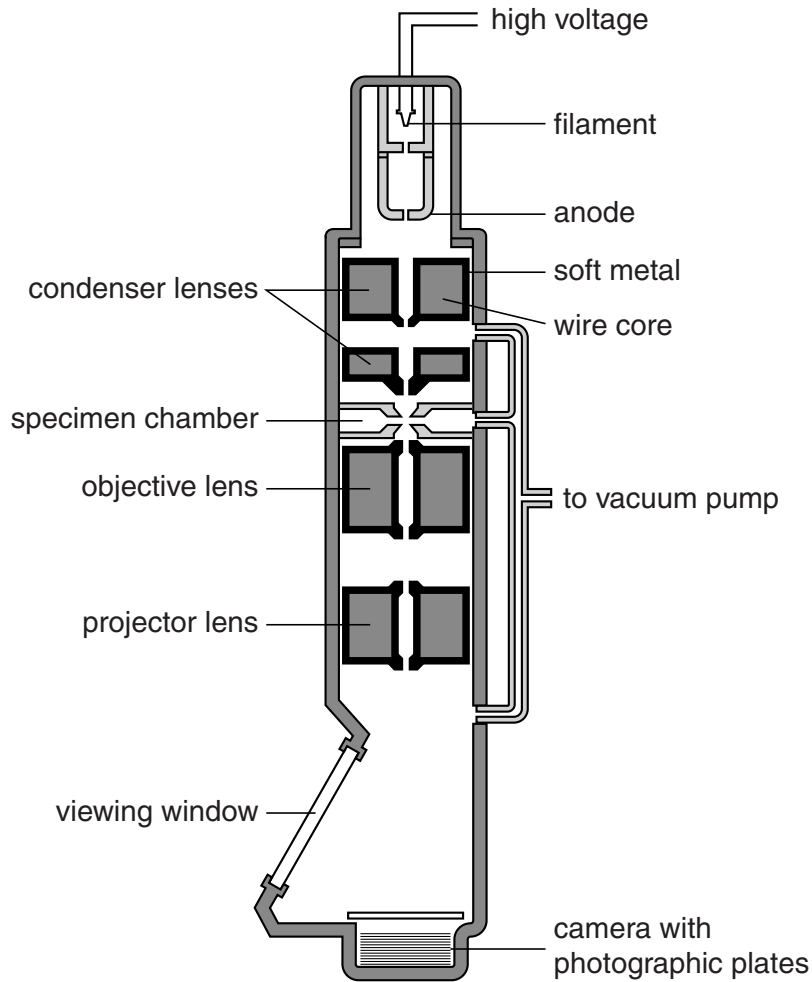
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **45**.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer. This means, for example, you should:
  - ensure 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 **16** pages. Any blank pages are indicated.

For Examiner's Use			
1			
2			
3			
4			
<b>Total</b>			

Answer **all** the questions.

- 1 A group of students training in a pathology laboratory were preparing a presentation about electron microscopy.

Fig. 1.1 shows a diagram of an electron microscope, used by the students in their presentation.



**Fig. 1.1**

- (a) State **one** advantage of using an electron microscope, instead of a light microscope, to view cells.

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

- (b) Using Fig. 1.1, state **one** way that an **image** is formed by an electron microscope, which differs from the way an image is formed by a light microscope.

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

(c) Why does the specimen in an electron microscope have to be placed in a vacuum?

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

(d) The students looked at blood cells taken from a hospital patient. One white blood cell is shown in Fig. 1.2.

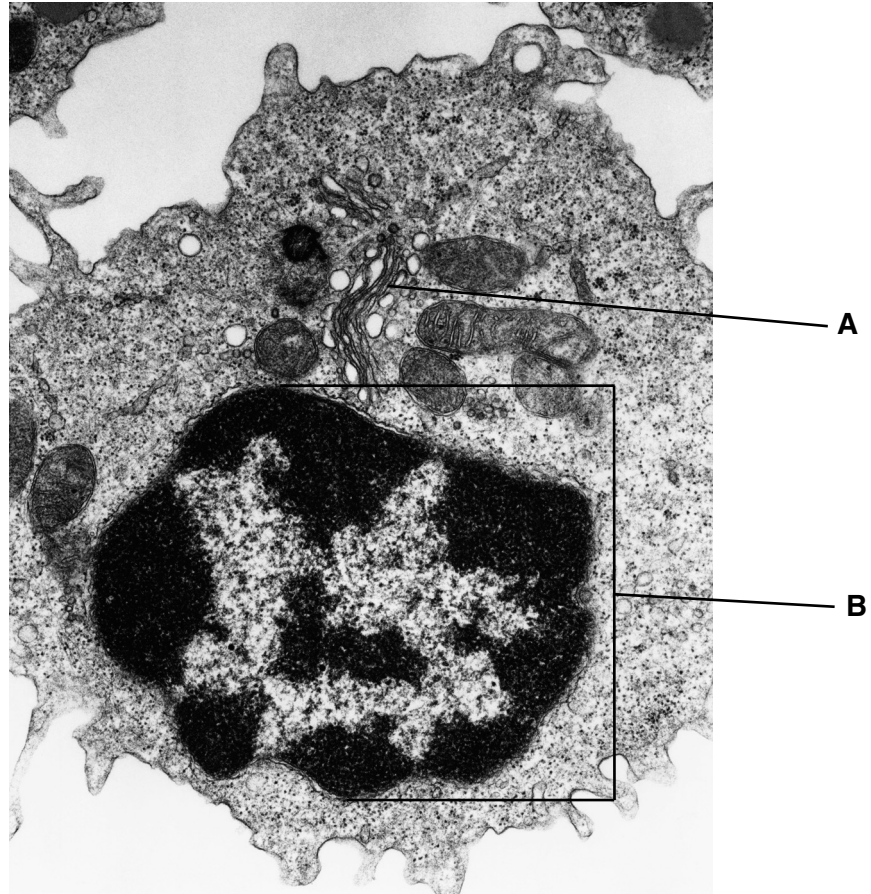


Fig. 1.2

Name the structures **A** and **B** and describe **one** function of each structure.

structure **A** .....

function .....

.....

structure **B** .....

function .....

.....

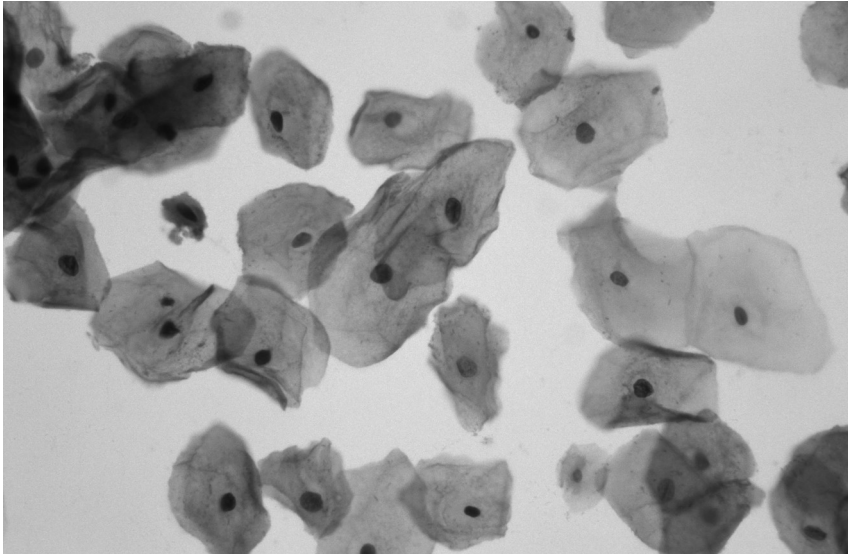
[4]

- (e) Suggest **one** reason why scientists in pathology laboratories would choose to use a light microscope instead of an electron microscope to view blood cells.

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

- (f) Cervical smear tests (Pap Smears) are also analysed in hospital pathology laboratories.

Fig. 1.3 shows cells collected from the cervix of a woman during a routine smear test, as part of a screening programme for precancerous or cancerous cells of the cervix.



**Fig. 1.3**

Suggest how these cells may have been prepared for observation using a light microscope after they were placed on a glass slide.

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

(g) Fig. 1.4 shows cells that were taken from the cervix of another woman during a routine smear test.

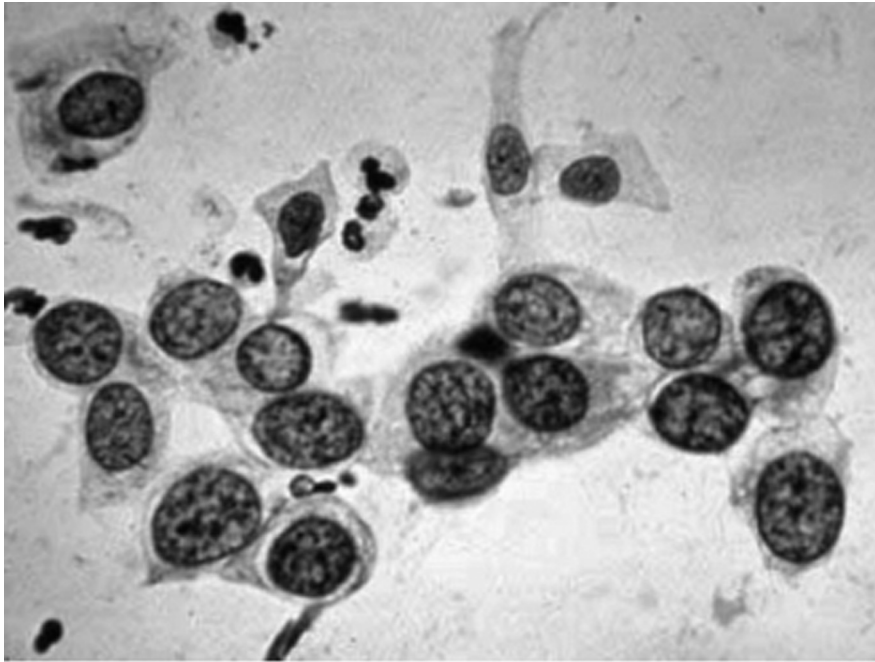


Fig. 1.4

(i) Use Fig. 1.3 and Fig. 1.4 to suggest a suitable conclusion or diagnosis that a pathology technician might make about the cells in Fig. 1.4.

..... [1]

(ii) Describe **two** pieces of evidence for the diagnosis in (g)(i).

1 .....

.....

2 .....

.....

[2]

[Total: 14]



(b) Full blood counts are common clinical procedures carried out in hospital laboratories.

State **one** method used in hospital laboratories to obtain a full blood count from a blood sample and give **one** advantage of this method.

method .....

advantage .....

.....

.....

.....

[2]

(c) Table 2.1 compares the results of blood samples taken from three patients.

	Patient 1	Patient 2	Patient 3
Number of white blood cells per dm <sup>3</sup>	$5.0 \times 10^9$	$5.3 \times 10^9$	$100 \times 10^9$
Number of red blood cells per dm <sup>3</sup>	$4.5 \times 10^{12}$	$3.0 \times 10^{12}$	$4.7 \times 10^{12}$
Haemoglobin/g dm <sup>-3</sup>	150	80	150

Table 2.1

(i) Calculate the percentage decrease in blood haemoglobin levels in patient 2 compared with patient 1.

percentage decrease = ..... % [2]

(ii) One patient has anaemia and one patient has a form of cancer.

Use the data in Table 2.1 to identify the patient with a form of cancer and give a reason for your answer.

patient .....

reason .....

.....

.....

[2]

- (d) Technicians in hospital laboratories use a stage micrometer and a graticule to determine the relative sizes of red blood cells. This helps to diagnose cases of anaemia.

The following list includes some statements about how to use a stage micrometer and a graticule. Some of the statements are correct and some are not correct.

Put a tick (✓) in the box next to each **correct** statement.

The width that each division on the graticule represents, changes with magnification.

The stage micrometer is placed in the eyepiece of the microscope.

The intervals between the lines on the stage micrometer scale are usually 0.5 cm.

The graticule and stage micrometer scales are superimposed for each objective lens of the microscope.

Once calibrated, the scale on the graticule can be used to measure cell dimensions.

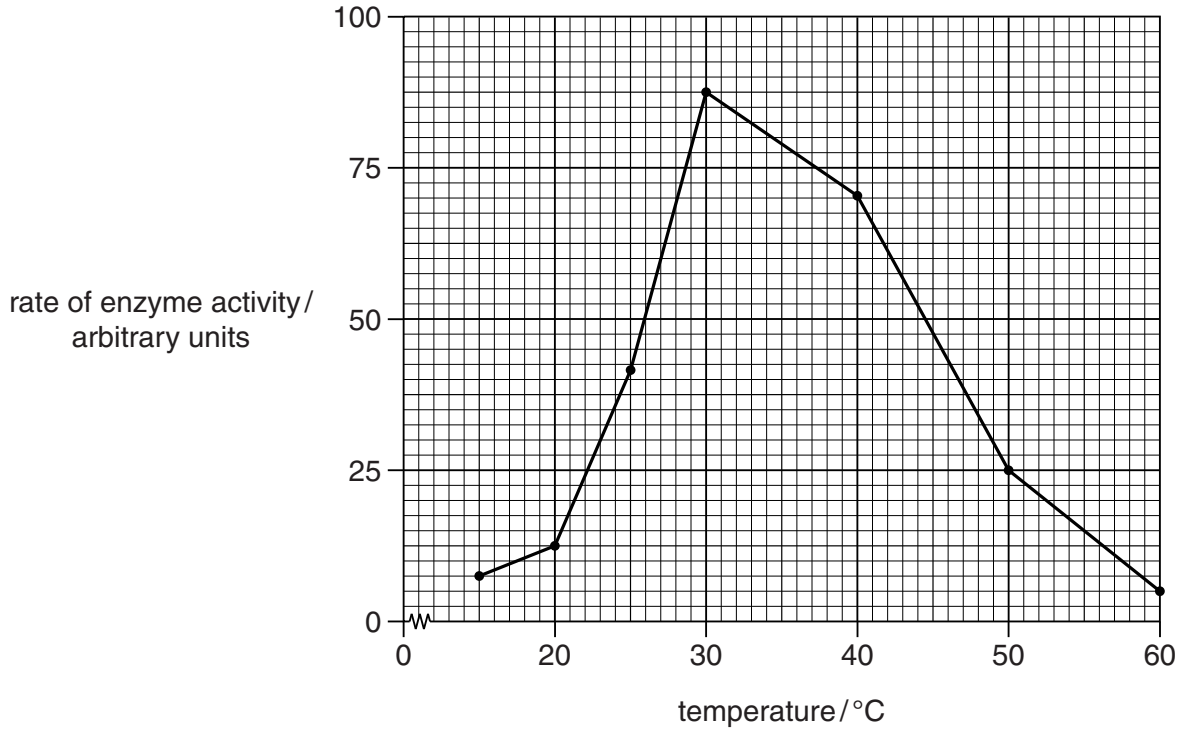
[2]

[Total: 12]



- 3 The enzyme polyphenol oxidase is released when the cells of plants are damaged. This enzyme causes colourless chemicals called phenols to be converted into brown products called melanins. The brown colour develops when fruits such as apples are peeled or cut into slices.

Fig. 3.1 shows the effect of temperature on the activity of polyphenol oxidase, as measured by the quantity of melanins produced over a fixed time at each temperature.



**Fig. 3.1**

- (a) Describe **two** effects of increasing the temperature on the activity of the enzyme polyphenol oxidase. Use data from Fig. 3.1 in your answer.

.....

.....

.....

.....

.....

.....

.....

..... [3]



- 4 (a) A teacher produced a series of revision cards for students to complete.

Imagine you are one of the students. Use the clues to complete the boxes in the revision cards below.

example:

A storage polysaccharide found in plant cells.

s t a r c h

1. A double layer of phospholipids in the cell membrane.

--	--	--	--	--	--	--	--

2. The name that describes 'water hating' molecules.

--	--	--	--	--	--	--	--	--	--

3. Type of covalent bond formed between glycerol and a fatty acid.

--	--	--	--	--

4. Type of reaction that occurs between two amino acids to form a dipeptide.

--	--	--	--	--	--	--	--	--	--	--	--

5. Name of the model used to describe the structure of the cell membrane.

--	--	--	--	--	--	--	--	--	--	--

6. The reagent used to test for a reducing sugar.

--	--	--	--	--	--	--	--	--

7. Name of the C–O–C bond formed between two monosaccharide molecules.

--	--	--	--	--	--	--	--	--	--

8. A type of chemical that catalyses the hydrolysis of a protein.

--	--	--	--	--	--

[8]

(b) The students then revised their learning about food tests.

Imagine you are one of the students. Complete Table 4.1 below.

Name of food molecule	Reagent(s) used	Observation if test is positive
Starch	Iodine solution	
		Milky emulsion
	Biuret solution	

**Table 4.1**

**[5]**

**[Total: 13]**

**END OF QUESTION PAPER**

**ADDITIONAL ANSWER SPACE**

If additional answer space is required, you should use the following lined pages. The question number(s) must be clearly shown in the margins.

A large area of lined paper for writing answers. It features a vertical solid line on the left side, creating a margin. The rest of the page is filled with horizontal dotted lines, providing space for writing. The lines are evenly spaced and extend across the width of the page.





A large area of the page is reserved for writing, featuring a vertical solid line on the left side and horizontal dotted lines extending across the page.



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.