

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
ADVANCED SUBSIDIARY GCE**

**G623**

**APPLIED SCIENCE**

**Cells and Molecules**

**THURSDAY 26 MAY 2011: Morning**

**DURATION: 45 minutes**

**SUITABLE FOR VISUALLY IMPAIRED CANDIDATES**

**Candidates answer on the question paper.**

**OCR SUPPLIED MATERIALS:**

**Insert (inserted)**

**OTHER MATERIALS REQUIRED:**

**Electronic calculator**


**Ruler (cm/mm)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

- **Write your name, centre number and candidate number in the boxes on the first page. 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.**

## **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.**

**Answer ALL the questions.**

- 1 Students were learning about the electron microscope and how it is used to study the structure of cells.**

**They were given a crossword about the electron microscope to complete at the beginning of one of their lessons. This is shown in Fig. 1.1.**

- (a) Imagine you are one of the students. Answer the clues and complete the crossword.**

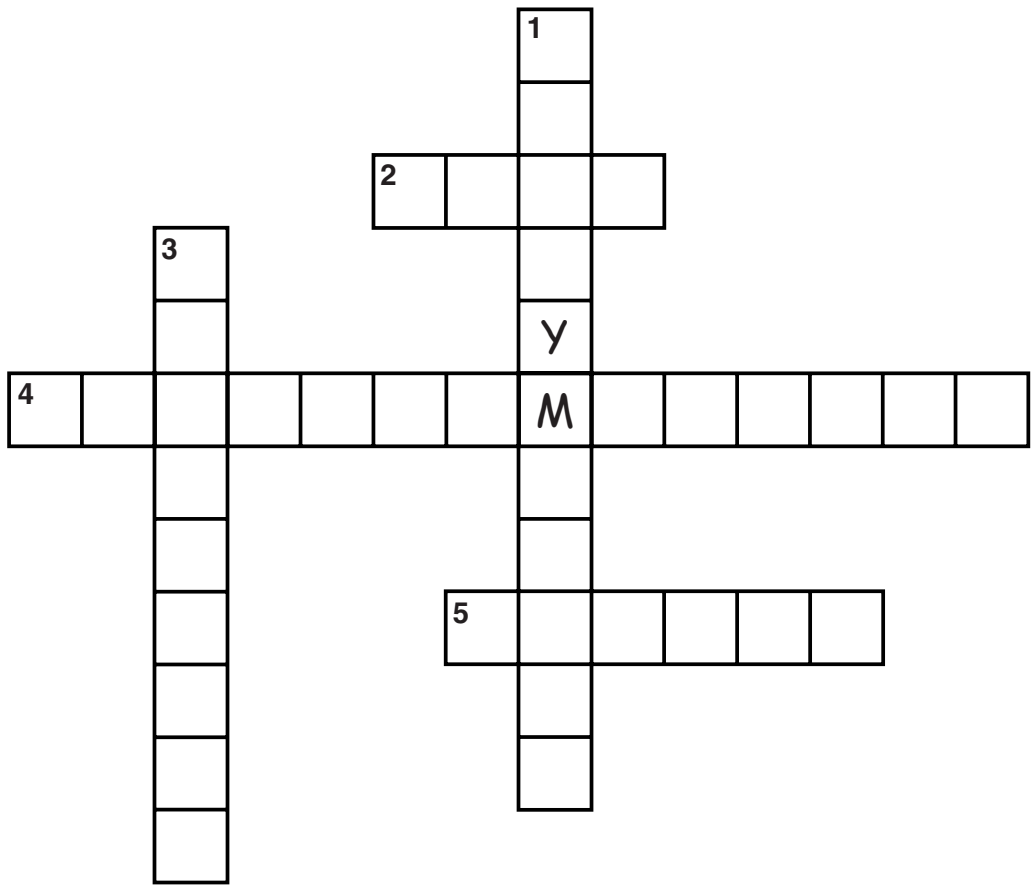
**ACROSS**

- 2. The state of the specimen when observed  
(4) \_ \_ \_ \_**
- 4. Used to focus the beam  
(14) \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_**
- 5. Type of environment inside the electron microscope (6) \_ \_ \_ \_ \_ \_**

**DOWN**

- 1. Used for staining the specimen  
(5,6) \_ \_ \_ \_ \_ \_ \_ \_ \_ \_**
- 3. Fired from a tungsten gun (9) \_ \_ \_ \_ \_ \_ \_ \_ \_**

**[5]**



**Fig. 1.1**

**(b) Explain why the specimen in an electron microscope has to be thin in section.**

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**[2]**

**(c) State ONE advantage and TWO disadvantages of using an electron microscope.**

**advantage** \_\_\_\_\_

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**disadvantages** \_\_\_\_\_

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**[3]**

**[Total: 10]**

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**TURN OVER FOR QUESTION 2(a)**

2 The students went on to learn about the use of yeast cells in the brewing industry.

The students were given a drawing of an electron micrograph of the yeast *Saccharomyces cerevisiae*. This is shown in Fig. 2.1.

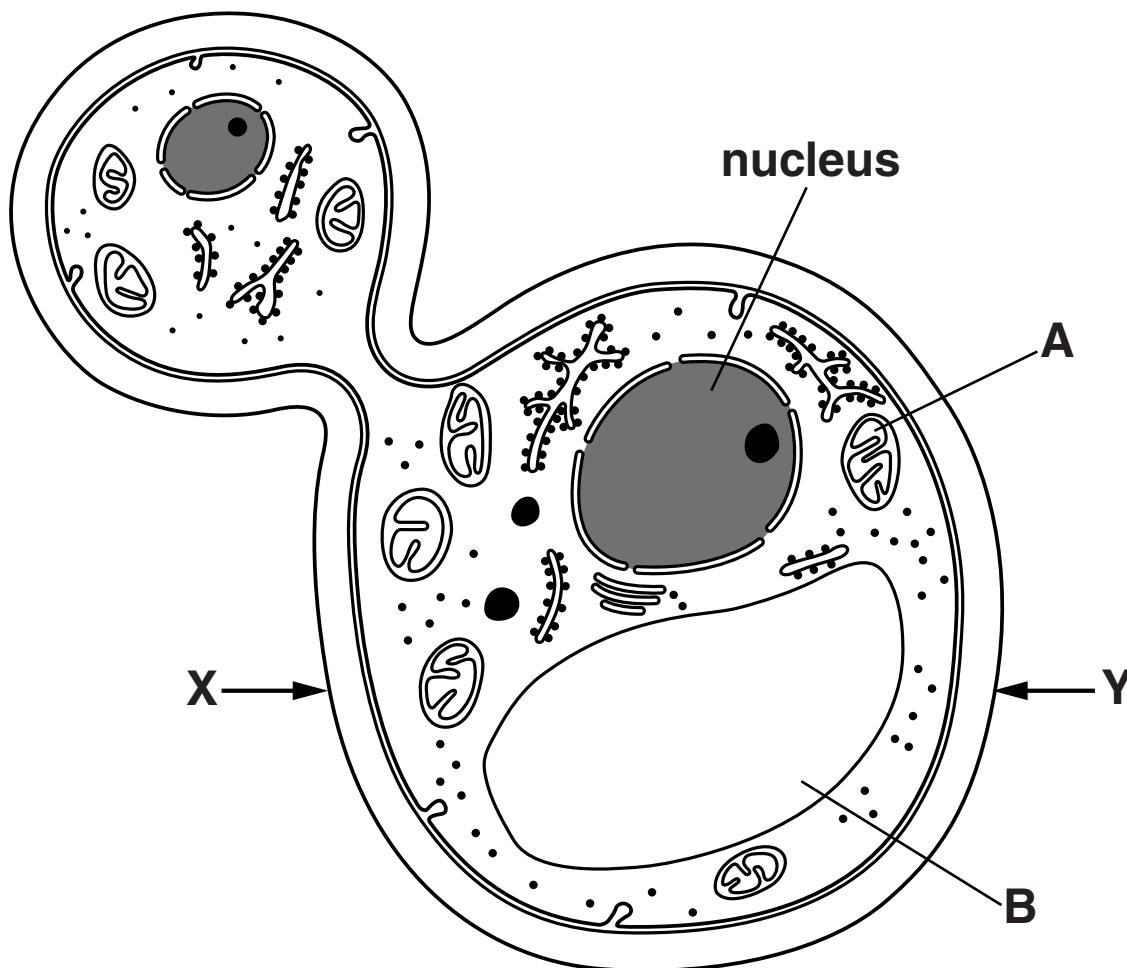


Fig. 2.1

(a) Identify the structures labelled A and B.

A \_\_\_\_\_

B \_\_\_\_\_ [2]



**(b) The actual distance between X and Y is 24  $\mu\text{m}$ .**

**Measure the distance between X and Y on Fig. 2.1 to calculate the magnification of the diagram.**

**distance between X and Y = \_\_\_\_\_ mm**

**magnification of the diagram = \_\_\_\_\_ [3]**

**(c) Glucose concentration affects the growth of yeast cells. The students were asked to count yeast cells in a given sample over a period of time using a haemocytometer.**



**Describe how the students would obtain RELIABLE yeast cell counts using a haemocytometer.**

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**[4]**

**(d) Some scientists in the brewing industry work in laboratories. One of their roles is to monitor the growth of yeast cells in a large number of samples.**

**(i) Suggest one OTHER factor that may be monitored by these scientists.**

\_\_\_\_\_ [1]  
\_\_\_\_\_

**(ii) Why do scientists in the brewing industry use a Coulter counter rather than a haemocytometer to monitor the numbers of yeast cells?**

\_\_\_\_\_ [1]  
\_\_\_\_\_

**(iii) Suggest one reason why the use of a Coulter counter may give unreliable data.**

\_\_\_\_\_ [1]  
\_\_\_\_\_

**[Total: 12]**

- 3 Biological washing powders contain enzymes. An investigation was carried out to determine the effect of a biological washing powder known as 'Bio-White' in digesting a protein stain, such as egg, from cotton fabric. Standard samples of stained fabric were soaked in 1% Bio-White at different temperatures.**

The results are given in Table 3.1.

**TABLE 3.1**

<b>TEMPERATURE/°C</b>	<b>15</b>	<b>25</b>	<b>35</b>	<b>45</b>	<b>55</b>	<b>65</b>	<b>75</b>
<b>TIME TAKEN FOR DIGESTION OF STAIN/HOURS</b>	<b>4.0</b>	<b>1.4</b>	<b>0.71</b>	<b>0.50</b>	<b>1.0</b>	_____	<b>5.0</b>
<b>RATE OF DIGESTION/HOUR<sup>-1</sup></b>	<b>0.25</b>	<b>0.71</b>	<b>1.4</b>	_____	<b>1.0</b>	<b>0.40</b>	<b>0.20</b>

- (a) Name a simple chemical test for a protein and give the result that would indicate that protein is present.**

**name** \_\_\_\_\_

**chemical result** \_\_\_\_\_ **[2]**

- (b) Albumen is a protein found in egg. It is known as a globular protein. It has a specific tertiary structure.**

**Describe and explain what is meant by the tertiary structure of a globular protein.**

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**[3]**

- (c) (i) Use Table 3.1 to calculate the missing values for the rate of digestion at 45 °C and the time taken for digestion of the stain at 65 °C. Enter the missing values in the table. [2]**

- (ii) Use the data in Table 3.1 to plot the results on the axes provided in Fig. 3.1 on the loose A4 sheet.**

**The first three points have been plotted for you. [2]**

- (iii) Draw a suitable line to complete the graph, Fig. 3.1. [1]**

**(d) Explain how the experiment could be extended to find more precisely, the optimum temperature at which 'Bio-White' digests protein stains.**

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**[1]**

**(e) Use the graph, Fig. 3.1, to describe and explain the effect of temperature on 'Bio-White' activity between 45 °C and 75 °C.**

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**[3]**

**[Total: 14]**

**4 Cystic fibrosis (CF) is an inherited condition that affects over 8500 people in the UK. It is caused by mutations in the CFTR (cystic fibrosis transmembrane regulator) gene.**

**(a) Name the biological molecule in which mutations are likely to occur and suggest how a STRUCTURAL change in this biological molecule could take place.**

**name** \_\_\_\_\_

**structural change** \_\_\_\_\_

\_\_\_\_\_ **[2]**

**(b) The CFTR gene codes for a protein that is essential for the movement of chloride ions between cells.**

**Use your knowledge of osmosis to explain why people with CF produce mucus which is abnormally thick and sticky.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ **[2]**

**(c) Cystic fibrosis affects epithelial cells in the pancreas and respiratory tract and causes congestion of the lungs.**

**(i) Describe three consequences of congestion of the lungs.**

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_ [3]

**(ii) Suggest two reasons why people with cystic fibrosis need to take tablets containing digestive enzymes.**

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_ [2]

**[Total: 9]**

**END OF QUESTION PAPER**



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