

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced Subsidiary GCE

APPLIED SCIENCE

G623

Unit 4: Cells and Molecules

Tuesday

6 JUNE 2006

Afternoon

45 minutes

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number												
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TIME 45 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers in the spaces provided on the question paper.
- Read instructions and questions carefully.

INFORMATION FOR CANDIDATES

- You may use a calculator.
- 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.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
Planning	25	
1	8	
2	9	
3	22	
4	6	
TOTAL	70	

This question paper consists of 10 printed pages and 2 blank pages.

Answer **all** the questions.

- 1 Students were preparing a presentation about electron microscopy. Fig. 1.1 shows one diagram in their presentation.

Electron Microscope

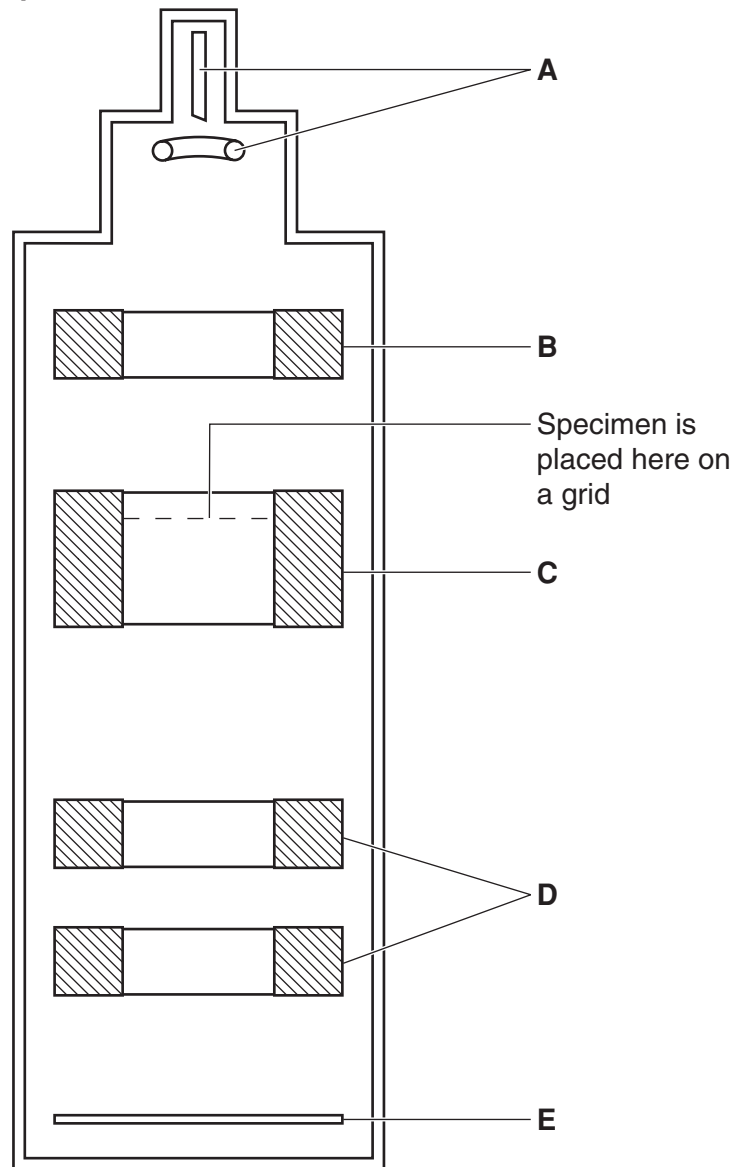


Fig. 1.1

Fig. 1.2 shows another presentation slide. The slide shows a work sheet the students prepared to use during their presentation. Complete the worksheet.

WORKSHEET

(a) Complete the table naming the parts of the electron microscope and their functions.

label	part	function
A	electron gun and anode
B	condenser electromagnetic lens
C	produces an image
D	projector electromagnetic lens
E	screen/photographic plate	shows image

[4]

(b) Why does the specimen in an electron microscope have to be viewed in a vacuum?
.....
..... [1]

(c) State **one** advantage and **two** disadvantages of electron microscopy.
 advantage
 disadvantage 1
 disadvantage 2 [3]

SLIDE 2

Fig. 1.2

[Total: 8]

2 One important technical skill is the ability to count the number of cells in a given volume of liquid.

A haemocytometer can be used to contain a fixed volume of culture. The total number of cells present is then counted.

Coulter counters may be used in pathology laboratories to count bacterial cells.

(a) Explain how a Coulter counter works.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [5]

(b) How does a technician benefit from using a Coulter counter rather than a haemocytometer? Give **two** advantages.

advantage 1

.....

advantage 2

..... [2]

(c) A haemocytometer or a Coulter counter used correctly by a trained technician could lead to an over estimate of the number of living bacteria in a culture.

Suggest **two** reasons why this might occur.

reason 1

.....
.....
.....

reason 2

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

[Total: 9]

- 3 Cystic fibrosis (CF) is caused by mutations in the gene coding CFTR (cystic fibrosis transmembrane regulator). CFTR is a channel that permits passive chloride movement across the membrane of some epithelial cells.

The normal gene product is a 1480-amino acid integral (intrinsic) membrane protein. Mutations can affect the CFTR protein either quantitatively, qualitatively, or both.

The disease affects cells which produce mucus. They produce mucus that is abnormally thick and sticky. In particular the epithelia of the respiratory tract, pancreatic ducts and the intestine are affected.

CF is a complex multisystem disease. Congestion of the lungs and blockages of the pancreatic duct and gut are common symptoms.

CF is inherited as a recessive gene.

- (a) Explain, giving examples, why CF is described as a multisystem disease.

.....

 [3]

- (b) Describe the consequences of congestion of the lungs and blockage of the pancreatic duct to someone with CF.

congestion of the lungs

.....

blockage of the pancreatic duct

.....

 [6]

(c) Using knowledge of DNA, explain what is meant by the following terms: 'mutation', 'coding' and 'recessive'.

mutation

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

coding

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

recessive

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

(d) Use the fluid mosaic model to explain why CFTR is described as an integral (intrinsic) membrane protein.

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

- 4 Imagine that you are a technician working in a laboratory.

You have been asked to carry out tests to identify the food chemicals present in a snack food.

Assume that you have carried out the tests and are completing the following table as part of a report form.

Complete Table 4.1.

reagent(s) used	expected result if suspected chemical present	decision
		starch present
		fat present
		protein absent

Table 4.1

[6]

[Total: 6]

END OF QUESTION PAPER

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