OCR
Oxford Cambridge and RSA

Tuesday 24 May 2016 – 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 page(s) 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 **12** pages. Any blank pages are indicated.

For Examiner's Use			
1			
2			
3			
4			
Total			

Answer **all** the questions.

1 Technicians who work in haematology laboratories in hospitals study blood and blood-forming tissues such as bone marrow.

(a) A blood sample was taken from a patient and sent to the haematology laboratory for analysis. A blood count was carried out by machine.

Suggest **one** reason why a blood count is done.

.....

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

(b) The blood count revealed some abnormalities and one of the technicians decided to view some of the blood cells under the light microscope.

(i) Suggest **one** reason why technicians in haematology departments would choose to use a light microscope instead of an electron microscope to view blood cells.

.....

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

(ii) Describe how these cells may have been prepared for observation using a light microscope **after** a drop of blood is placed on a glass slide.

.....

.....

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

(c) **(i)** State the name of the equipment used in haematology laboratories to obtain a count of the number of white blood cells in a specific volume of blood.

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

(ii) This equipment, when used correctly by a trained haematology technician, could still result in inaccurate cell counts.

Suggest **one** reason why this might happen.

.....

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

(d) After observing the blood cells under the light microscope, the sample revealed a large proportion of white blood cells.

Suggest **two** suitable conclusions or diagnoses that the haematology technician might make about the blood sample from the patient.

1 .....

2 .....

[2]

(e) Further observation of the white blood cells from the patient was necessary using an electron microscope.

The electron microscope allows cells to be seen with greater magnification and resolution than with a light microscope.

Explain the meaning of the following words:

(i) Magnification

.....

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

(ii) Resolution

.....

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

[Total: 11]

2 Amylase is an important enzyme used in the brewing industry. It is used to catalyse the breakdown of starch to maltose in barley. Maltose is a reducing sugar.

(a) (i) State the chemical bond which must be broken by amylase during the breakdown of starch.

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

(ii) State the reagent that would be used to carry out a test for a reducing sugar.

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

(iii) State the colour you would expect to see if you carried out the reducing sugar test before and after the action of amylase on starch.

Before .....

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

(b) Suggest a reason why a knowledge of the optimum temperature at which amylase breaks down starch is important in the brewing industry.

.....

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

(c) In an investigation into the action of amylase, a fixed volume of starch solution and an excess of amylase solution were mixed. The quantity of maltose produced was measured during the course of two separate experiments, one carried out at 17 °C and the other at 24 °C.

The results are shown in Fig. 2.1.

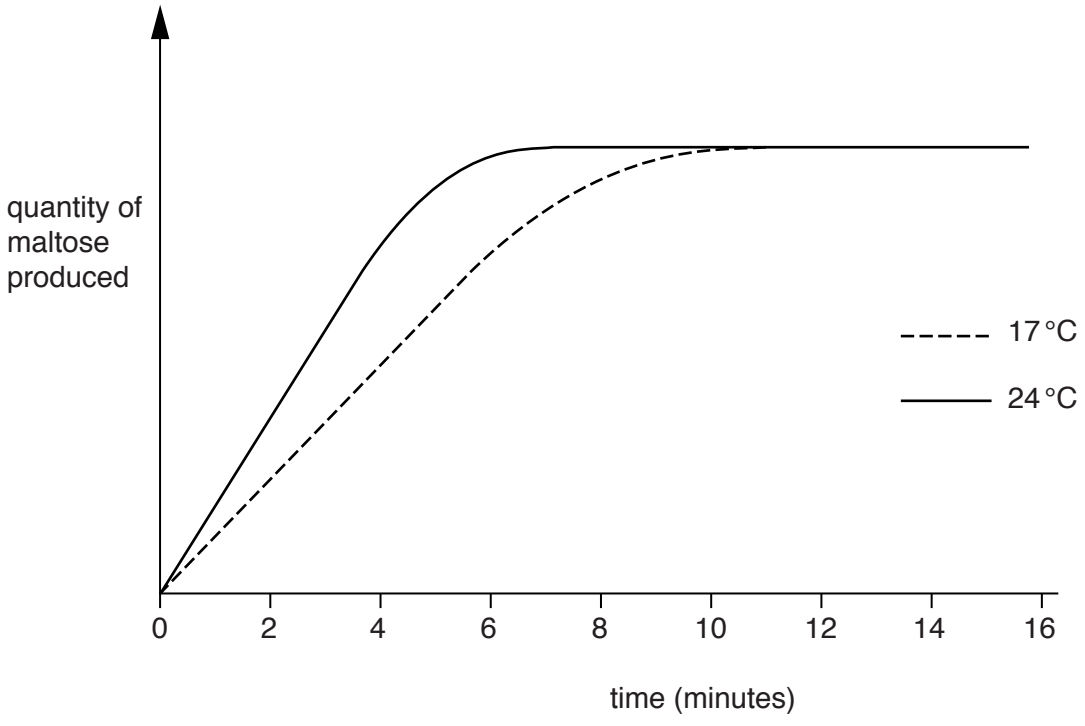

Fig. 2.1

(i) Explain why the quantity of maltose did not change after six minutes **at 24 °C**.

.....

.....

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

(ii) Explain why after three minutes, more maltose had been produced at 24 °C than at 17 °C.

.....

.....

.....

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

(d) The experiment was repeated at 24 °C using the same volume of starch solution but at a higher concentration.
The volume of amylase used was still in excess of the starch solution.
The concentration of amylase used was also the same.

Sketch on Fig. 2.1 the curve you would expect to obtain. **[2]**

(e) Scientists working in the brewing industry monitor the number of yeast cells in the brewing process.

(i) State **one** reason why a Coulter counter is used to count the number of yeast cells.

.....

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

(ii) Describe and explain how a Coulter counter is used to count yeast cells.

.....

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.....

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.....

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

[Total: 15]

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3 Plasma cells are a type of white blood cell. They produce and release large quantities of proteins known as antibodies.

One plasma cell is shown in Fig. 3.1.

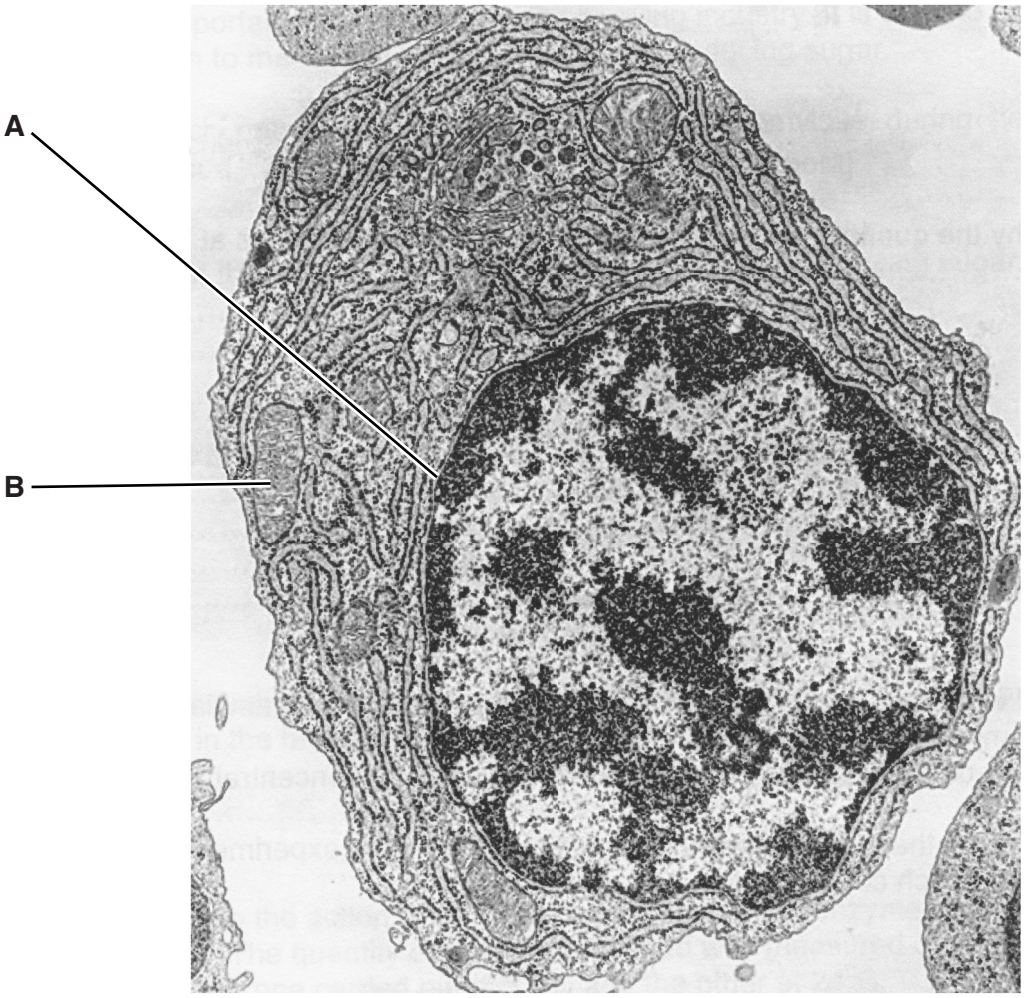

Fig. 3.1

(a) (i) Name the structures labelled **A** and **B**.

A .....

B .....

[2]

(ii) Use Fig. 3.1 to suggest and explain how the **internal structure** of the plasma cell is adapted to secrete large quantities of antibodies.

.....

.....

.....

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

(b) During protein synthesis, amino acids are carried by transfer RNA (tRNA) molecules to ribosomes, where the tRNA binds to messenger RNA (mRNA).

Table 3.1 shows the tRNA triplet codes (anticodons) for some tRNA molecules and the amino acid each one carries.

tRNA triplet code (anticodon)	Amino acid carried
AAU	leucine
GCG	arginine
UAC	methionine
CCC	glycine
GGG	proline
AGC	serine
AUA	tyrosine
CAA	valine
CGC	alanine
AGG	serine

Table 3.1

Fig. 3.2 shows a stage in the synthesis of a polypeptide. The ribosome moves along the mRNA molecule and the second and third tRNA molecules are lined up with the mRNA.

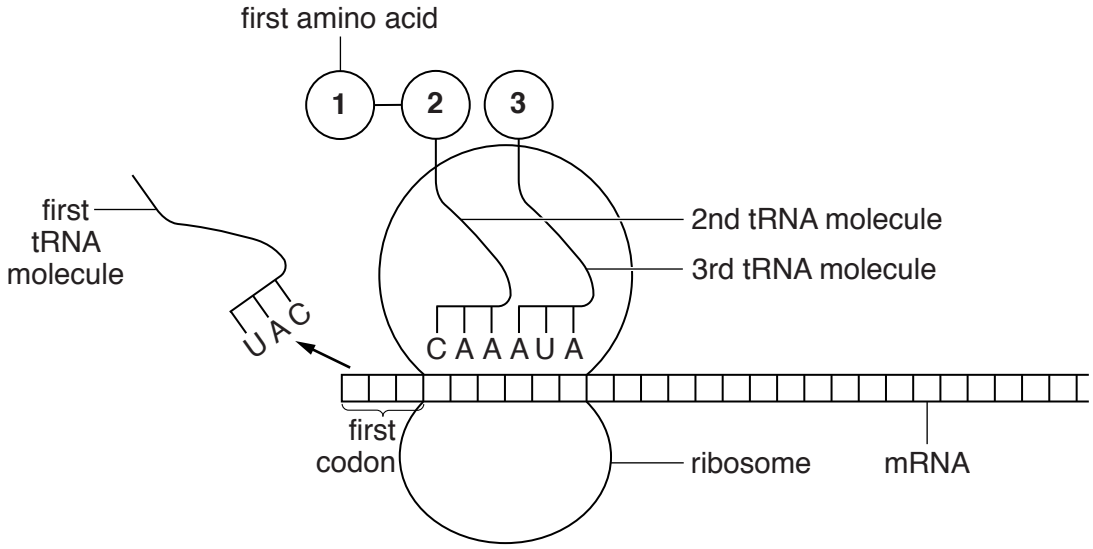

Fig. 3.2

(i) Identify the amino acids labelled 1 and 2.

amino acid 1 .....

amino acid 2 .....
[2]

(ii) In mRNA, the base thymine (T) is replaced with the base uracil (U).

State the **two** mRNA triplet codons with which the second and third tRNA molecules pair.

second codon .....

third codon .....
[2]

(iii) State the chemical bond and the type of reaction which must occur to form the primary structure of a protein.

chemical bond .....

type of reaction .....
[2]

[Total: 10]

Turn over for the next question

4 Cystic fibrosis (CF) and Huntington's disease (Huntington's chorea) are inherited conditions caused by gene mutations.

Cystic fibrosis affects epithelial cells in the pancreas and respiratory tract, and causes congestion of the lungs.

(a) (i) State **three** moral and/or ethical implications which a pregnant woman would need to consider if diagnostic testing was carried out for cystic fibrosis during her pregnancy.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) Describe **four** consequences of congestion of the lungs.

1 .....

.....

2 .....

.....

3 .....

.....

4 .....

.....

[4]

(b) The symptoms of Huntington's disease usually develop when people are between 30 and 50 years old. One of the early symptoms is progressive chorea (jerky movements).

State two **additional** clinical symptoms which might be indicators of this genetic disease.

1 .....

.....

2 .....

.....

[2]

[Total: 9]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

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