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Answer ALL questions in the spaces provided.

1. The table below refers to two proteins, insulin and collagen. If the statement is correct, place a tick (✓) in the appropriate box and if the statement is incorrect, place a cross (✗) in the appropriate box.

Statement	Insulin	Collagen
Is a fibrous protein		
Molecule has repeating sequences of amino acids		
Is an enzyme		
Is insoluble in water		

(Total 4 marks)

Q1

2. Read through the following account on biochemical tests, then write on the dotted lines the most appropriate word or words to complete the account.

Benedict's reagent can be used to test for reducing sugars. This reagent changes

colour from to if it is

heated with a reducing sugar. A non-reducing sugar needs to be boiled

with before it will test positive with Benedict's reagent.

The presence of starch can be detected using solution.

A chemical solution called is used to test for protein.

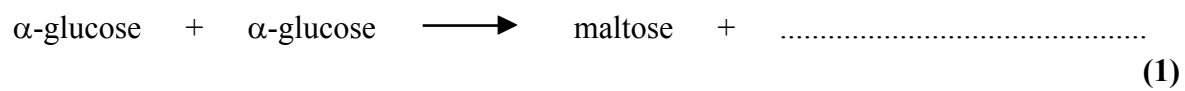
(Total 5 marks)

Q2



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3. (a) Maltose is a disaccharide formed by a reaction between two alpha (α) glucose molecules. Complete the word equation below, which represents this reaction.



- (b) Draw the structure of a molecule of alpha glucose.

(3)

- (c) Describe a function of maltose.

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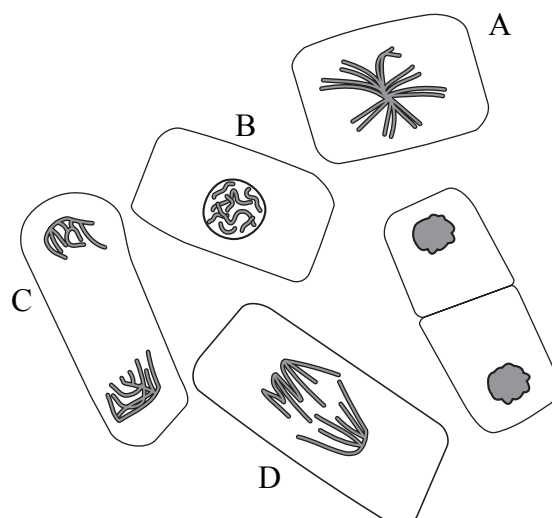
(2)

Q3

(Total 6 marks)



4. The diagrams below show some cells in different stages of mitosis.



(a) Name the stages of mitosis shown by the cells labelled A, B and C.

A

B

C

(3)

(b) Describe the events that occur in the stage of mitosis shown by cell D.

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(2)

(c) Explain the significance of the stage shown by cell D.

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(1)

(Total 6 marks)

Q4

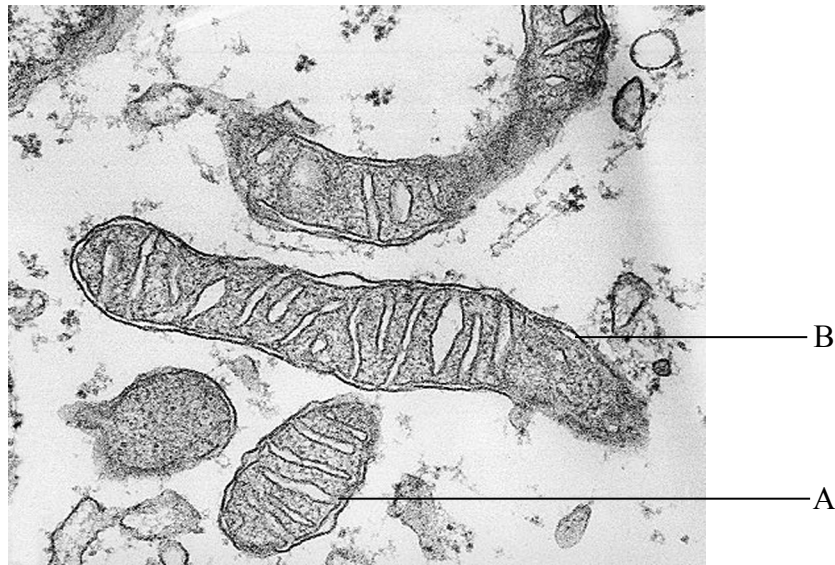


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5. The photograph below shows a group of mitochondria viewed using an electron microscope.



Dr Gopal Murti/Science Photo Library

- (a) State the role of mitochondria in a cell.

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(1)

- (b) In the space below, make an accurate drawing of the mitochondrion labelled A, enlarged $\times 3$. On your drawing label the matrix and the cristae.

(4)



(c) Suggest why both the inner and outer membrane are **not** clearly visible all around the mitochondrion labelled B.

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(2)

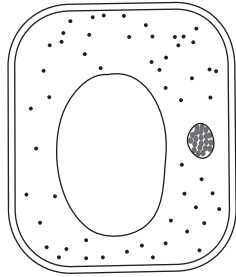
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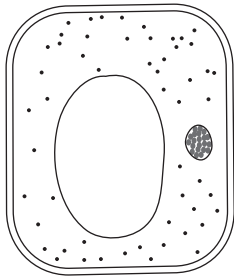
Q5



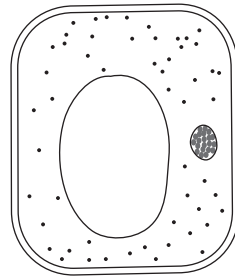
6. (a) The water potential (ψ) of four plant root cells is shown below.



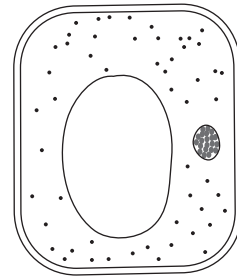
Cell A
 $\psi = -1700 \text{ kPa}$



Cell B
 $\psi = -2000 \text{ kPa}$



Cell C
 $\psi = -1500 \text{ kPa}$



Cell D
 $\psi = -1200 \text{ kPa}$

Each cell was placed into a sucrose solution with a water potential of -540 kPa . All of the cells took in water from this solution.

(i) State which cell would initially take in water at the fastest rate. Explain your answer.

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(3)

(ii) Explain why the water potential of a cell is usually a negative value.

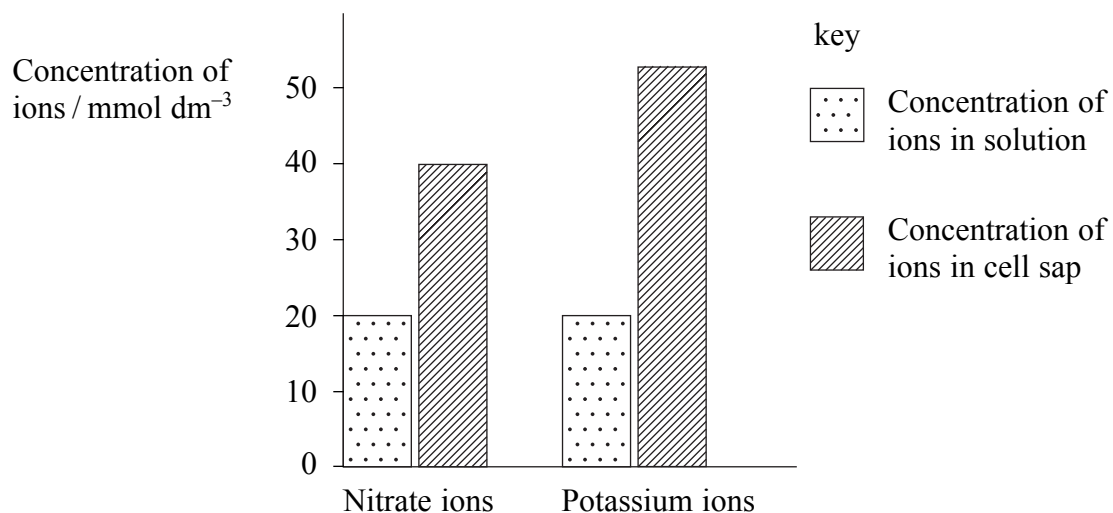
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(2)



(b) Mineral ions can move into plant root cells by facilitated diffusion or active transport across the cell surface membranes.

In an investigation, barley roots were immersed in a solution containing nitrate ions and potassium ions. After several hours the roots were removed and the concentrations of these ions in the cell sap were measured. The results are shown in the bar chart below.



(i) Explain how the evidence in the bar chart shows that the uptake of both of these ions is by active transport.

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(ii) Nitrate ions and potassium ions move across the cell surface membrane through transport proteins. State the evidence in the bar chart that supports the view that the two types of ions may move through different proteins.

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(1)

(Total 8 marks)


Q6




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7. (a) In the space below draw a diagram to show two mononucleotides joined together in a single strand of DNA (polynucleotide). Use the symbols shown for each component in your diagram.

Phosphate group: 

Deoxyribose: 

Base: 

Covalent bonds: 

(3)



(b) Describe how two strands of DNA are joined to form a DNA molecule and how this molecule is organised in a chromosome.

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(5)

(c) The table below shows the percentage content of one of the four bases in a molecule of DNA.

Name of base	Percentage content
Adenine	14
Cytosine	
Guanine	
Thymine	

(i) Use the information in the table to calculate the percentage content of the other three bases in this molecule of DNA. Write your answers in the table.

(3)

(ii) State what percentage of the bases in this molecule of DNA are purines.

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(1)

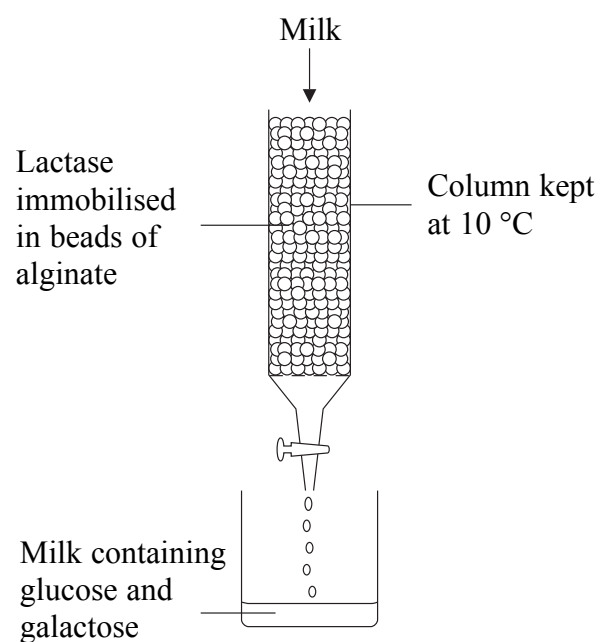
(Total 12 marks)

Q7



8. Lactose is the sugar present in milk. Some people do not produce the enzyme lactase, which digests this sugar, and they become ill if they drink milk.

During one commercial process, the lactose content of milk is reduced by passing milk over lactase immobilised in beads of sodium alginate. This is shown in the diagram below.



(a) (i) Describe **two** advantages of immobilising the lactase in this commercial process.

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(2)



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(ii) The column has to be kept at a low temperature. Explain why this means that it is necessary to pass the milk through the column a number of times before the enzyme has reduced the lactose content to the required low level.

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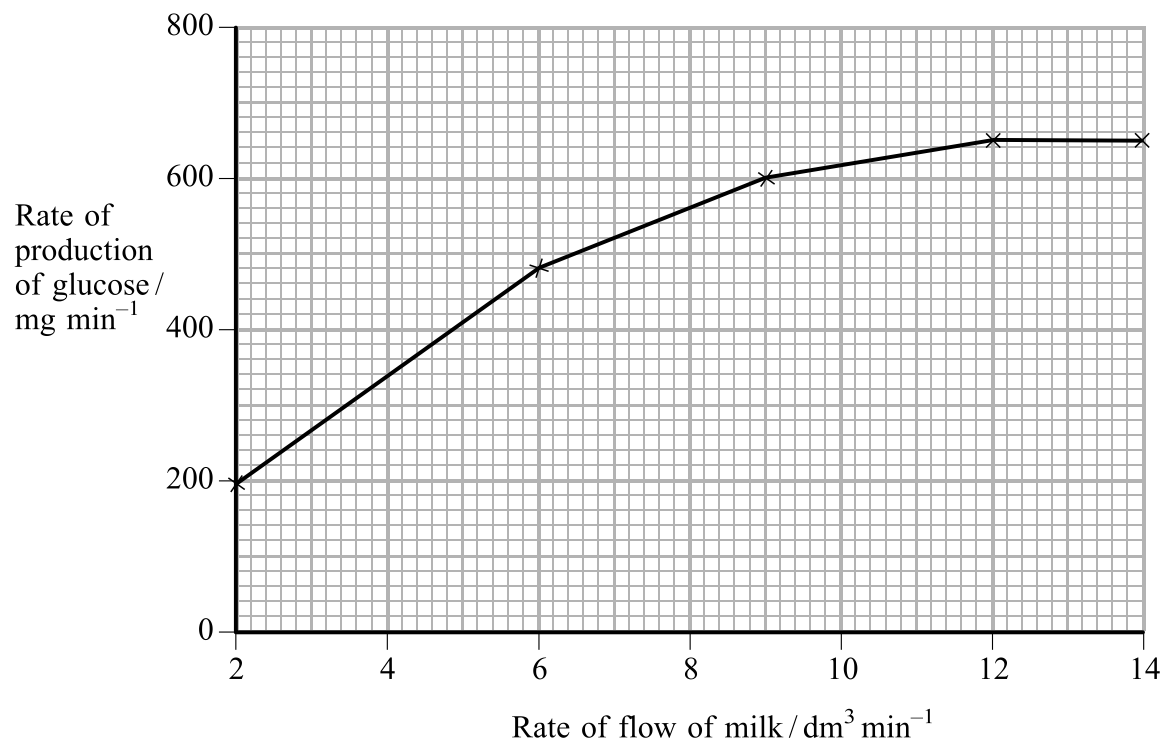
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(3)

QUESTION 8 CONTINUES OVERLEAF



(b) The rate of conversion of lactose to glucose and galactose can be monitored by measuring how much glucose has been produced in the milk. The graph below shows the effect of changing the rate of flow of milk through the column on the production of glucose.



(i) Name the type of reaction by which lactose is converted to glucose and galactose.

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(1)

(ii) Calculate the percentage increase in the rate of production of glucose when the flow rate of the milk is increased from 2 to 9 dm^3 per minute. Show your working.

Answer%

(3)



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(iii) Suggest why there was no increase in the rate of production of glucose when the flow rate of milk was increased from 12 to 14 dm³ per minute

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(2)

(c) If the column is filled with smaller beads the rate of reaction increases.

Give **one** reason for this.

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(1)

Q8

(Total 12 marks)

TOTAL FOR PAPER: 60 MARKS

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