

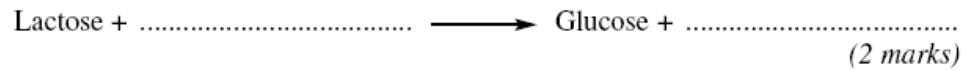
1)

- (a) Some people cannot digest lactose when they are adult. They could digest lactose when they were children.

Use your knowledge of water potential to explain why these adults get diarrhoea when they drink milk.

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.....
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(2 marks)

- (b) (i) The equation shows the reaction catalysed by the enzyme lactase. Complete this equation.



- (b) (ii) Name the type of chemical reaction shown in this equation.

.....
(1 mark)

(c) Lactase is an enzyme. Lactose is a reducing sugar.

- (c) (i) Describe how you could use the biuret test to distinguish a solution of the enzyme, lactase from a solution of lactose.

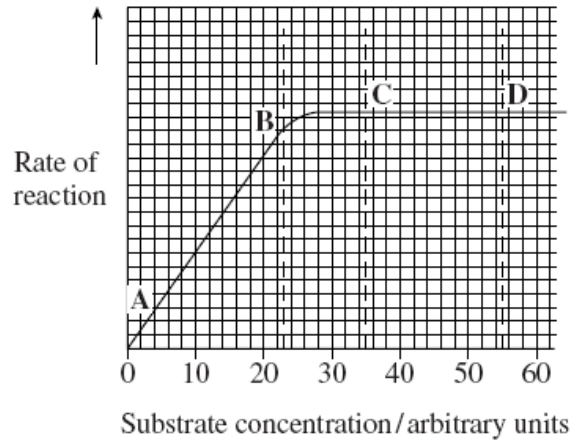
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(1 mark)

- (c) (ii) Explain the result you would expect with the enzyme.

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(1 mark)

2)

The graph shows the effect of substrate concentration on the rate of an enzyme-controlled reaction.



- (a) (i) Describe what the graph shows about the effect of substrate concentration on the rate of this enzyme-controlled reaction.

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(2 marks)

(Extra space)

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- (a) (ii) What limits the rate of this reaction between points A and B? Give the evidence from the graph for this.

(2 marks)

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- (a) (iii) Suggest a reason for the shape of the curve between points **C** and **D**.

.....

 (1 mark)

- (b) Sketch a curve on the graph to show the rate of this reaction in the presence of a competitive inhibitor.
 (1 mark)

- (c) Methotrexate is a drug used in the treatment of cancer. It is a competitive inhibitor and affects the enzyme folate reductase.

- (c) (i) Explain how the drug lowers the rate of reaction controlled by folate reductase.

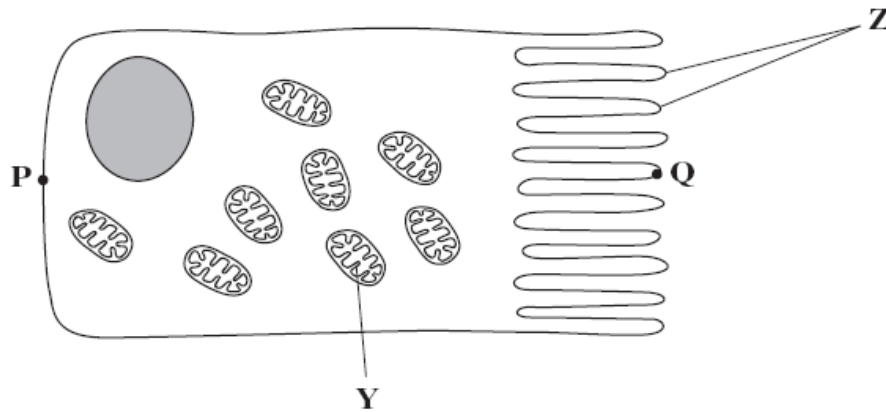
 (2 marks)

- (c) (ii) Methotrexate only affects the rate of the reaction controlled by folate reductase. Explain why this drug does not affect other enzymes.

 (1 mark)

3)

The diagram shows an epithelial cell from the small intestine.



- (a) (i) Name organelle **Y**.

 (1 mark)

- (a) (ii) There are large numbers of organelle **Y** in this cell. Explain how these organelles help the cell to absorb the products of digestion.

 (2 marks)

- (b) This diagram shows the cell magnified 1000 times. Calculate the actual length of the cell between points **P** and **Q**. Give your answer in μm . Show your working.

Answer μm
(2 marks)

- (c) Coeliac disease is a disease of the human digestive system. In coeliac disease, the structures labelled **Z** are damaged.

Although people with coeliac disease can digest proteins they have low concentrations of amino acids in their blood.

Explain why they have low concentrations of amino acids in their blood.

..... (2 marks)

4)

Students investigated the effect of different concentrations of sodium chloride solution on discs cut from an apple. They weighed each disc and then put one disc into each of a range of sodium chloride solutions of different concentrations. They left the discs in the solutions for 24 hours and then weighed them again. Their results are shown in the table.

Concentration of sodium chloride solution / mol dm^{-3}	Mass of disc at start / g	Mass of disc at end / g	Ratio of mass at start to mass at end
0.00	16.1	17.2	0.94
0.15	19.1	20.2	0.95
0.30	24.3	23.2	1.05
0.45	20.2	18.7	1.08
0.60	23.7	21.9	
0.75	14.9	13.7	1.09

- (a) (i) Calculate the ratio of the mass at the start to the mass at the end for the disc placed in the 0.60 mol dm^{-3} sodium chloride solution.

Answer
(1 mark)

- (a) (ii) The students gave their results as a ratio. What is the advantage of giving the results as a ratio?

..... (2 marks)

- (a) (iii) The students were advised that they could improve the reliability of their results by taking additional readings at the same concentrations of sodium chloride. Explain how.

.....
(2 marks)

- (b) (i) The students used a graph of their results to find the sodium chloride solution with the same water potential as the apple tissue. Describe how they did this.

.....
(2 marks)

- (b) (ii) The students were advised that they could improve their graph by taking additional readings. Explain how.

.....
(2 marks)

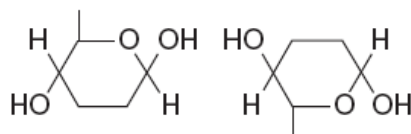
5)

- (a) The table shows some substances found in cells. Complete the table to show the properties of these substances. Put a tick in the box if the statement is correct.

Statement	Substance			
	Starch	Glycogen	Deoxyribose	DNA helicase
Substance contains only the elements carbon, hydrogen and oxygen				
Substance is made from amino acid monomers				
Substance is found in both animal cells and plant cells				

(4 marks)

- (b) The diagram shows two molecules of β -glucose.



On the diagram, draw a box around the atoms that are removed when the two β -glucose molecules are joined by condensation.

(2 marks)

(c) (i) Hydrogen bonds are important in cellulose molecules. Explain why.

.....
(2 marks)

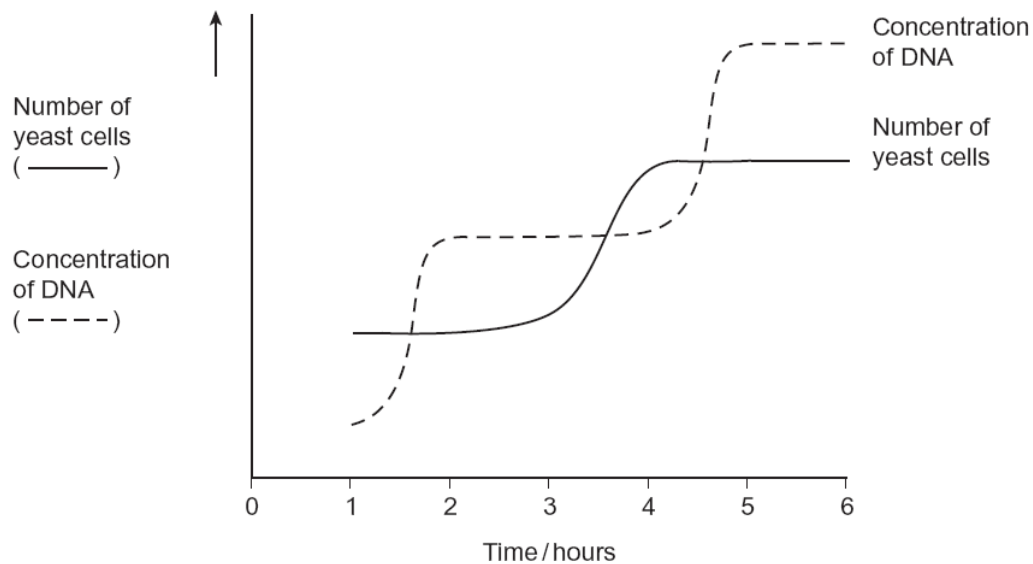
(c) (ii) A starch molecule has a spiral shape. Explain why this shape is important to its function in cells.

.....
(1 mark)

6)

Yeast is a single-celled eukaryotic organism. When yeast cells are grown, each cell forms a bud. This bud grows into a new cell. This allows yeast to multiply because the parent cell is still alive and the new cell has been formed.

Scientists grew yeast cells in a culture. They counted the number of cells present and measured the total concentration of DNA in the culture over a period of 6 hours. Their results are shown in the graph.



(a) Use your knowledge of the cell cycle to explain the shape of the curve for the number of yeast cells

(a) (i) between 1 and 2 hours

.....
(1 mark)

(a) (ii) between 3 and 4 hours.

.....
(1 mark)

(b) Use the curve for the concentration of DNA to find the length of a cell cycle in these yeast cells. Explain how you arrived at your answer.

Length of cell cycle

Explanation
(3 marks)

7 (a) Many different substances enter and leave a cell by crossing its cell surface membrane. Describe how substances can cross a cell surface membrane.

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(5 marks)
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