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**Answer ALL the questions in the spaces provided.**

1. The table below refers to two carbohydrate molecules, glycogen and cellulose. 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	Glycogen	Cellulose
Consists of $\beta$ glucose		
Contains 1,4 glycosidic bonds		
Is a branched molecule		
Is a structural carbohydrate		

Q1

(Total 4 marks)



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2. Read through the following account of the transport of molecules across a cell surface membrane, then write on the dotted lines the most appropriate word or words to complete the account.

Some molecules cross a cell surface membrane by passing down a concentration gradient through the phospholipid layer. This process is called .....

Some polar molecules cross the membrane by combining with transport proteins which can change their shape. When this movement occurs down a concentration gradient, the process is called .....

and when it occurs against a concentration gradient the process is called .....

Most movement of molecules against a concentration gradient uses energy in the form of .....

**(Total 4 marks)**

**Q2**



3. (a) Insulin and collagen are both proteins that have a primary structure made up of amino acids joined together by peptide bonds.

(i) Explain what is meant by the term **primary structure** of a protein.

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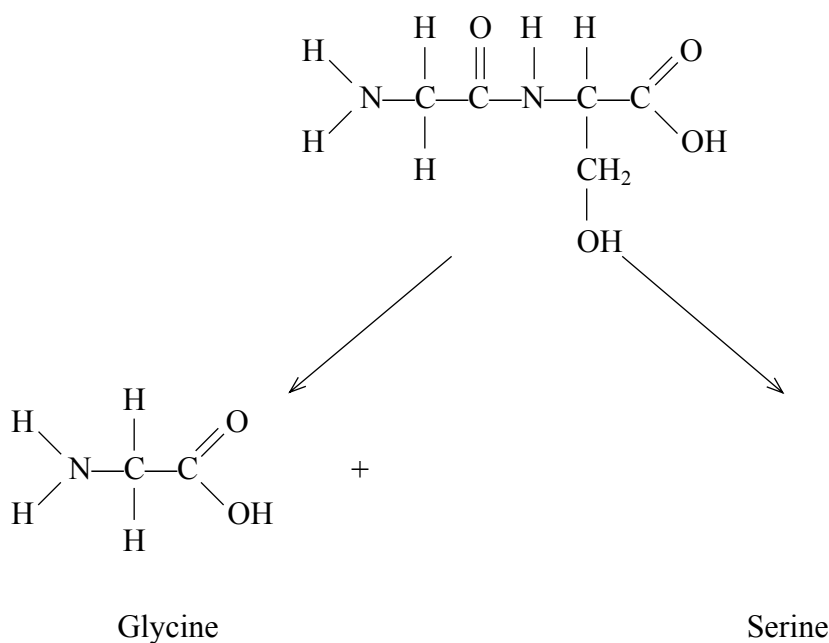
(1)

(ii) Name the type of reaction that occurs when a peptide bond is broken causing a dipeptide to split into two amino acids.

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(1)

(b) Insulin and collagen both contain the amino acids glycine and serine. The diagram below shows a dipeptide formed from these two amino acids. Complete the diagram to show the structure of serine when the peptide bond breaks.



(1)



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(c) In the table below give **three structural** differences between the molecules of collagen and insulin.

	<b>Collagen</b>	<b>Insulin</b>
1		
2		
3		

(3)

Q3

(Total 6 marks)



4. (a) Explain what is meant by the term **tissue**.

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(2)

(b) The photograph below shows a section through part of the digestive system, as seen using the low power of a light microscope.



In the space below, draw a **plan** of this section. The magnification of your drawing should be  $\times 1$ .

(3)

(Total 5 marks)

Q4

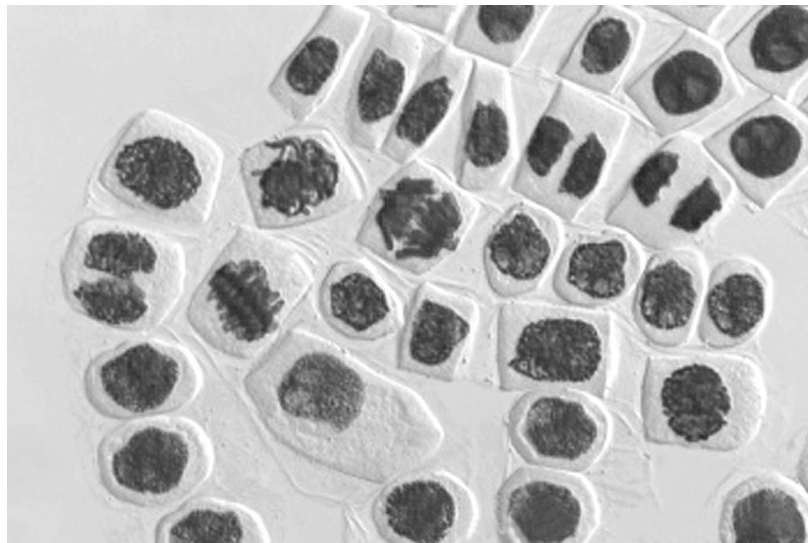


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5. (a) The cell cycle includes interphase and mitosis. Mitosis has four phases: prophase, metaphase, anaphase and telophase. The photograph below shows plant root cells at various stages of the cell cycle.



- (i) Draw a line to indicate a cell in the photograph that is undergoing **anaphase** and label this line **A**. (1)
- (ii) Draw a line to indicate a cell in the photograph that is undergoing **telophase** and label this line **T**. (1)
- (iii) How many of the cells shown in the photograph are in **telophase**?

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(b) Give an account of the events that take place during prophase and metaphase of mitosis.

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(5)

Q5

(Total 8 marks)



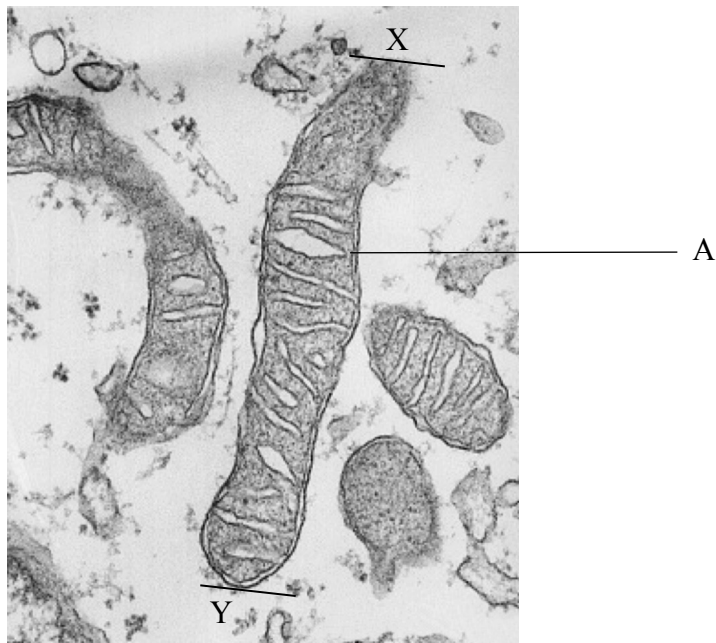
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6. (a) In the space below, draw and label a diagram to show the structure of a chloroplast, as seen using an electron microscope.

(4)



(b) The photograph below shows a group of mitochondria in a liver cell, as seen using an electron microscope. The magnification is  $\times 50\,000$ .



(i) Measure the length of the mitochondrion labelled **A** between X and Y. Calculate the actual length of this mitochondrion in  $\mu\text{m}$ . Show your working.

Actual length of A .....  $\mu\text{m}$ .  
**(3)**

(ii) Suggest **one** other structure that might be visible in the cytoplasm of this liver cell if the magnification used was higher.

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**(1)**

(iii) Suggest one reason why the double membrane is not clearly visible all around the mitochondrion labelled **A**.

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**(1)**

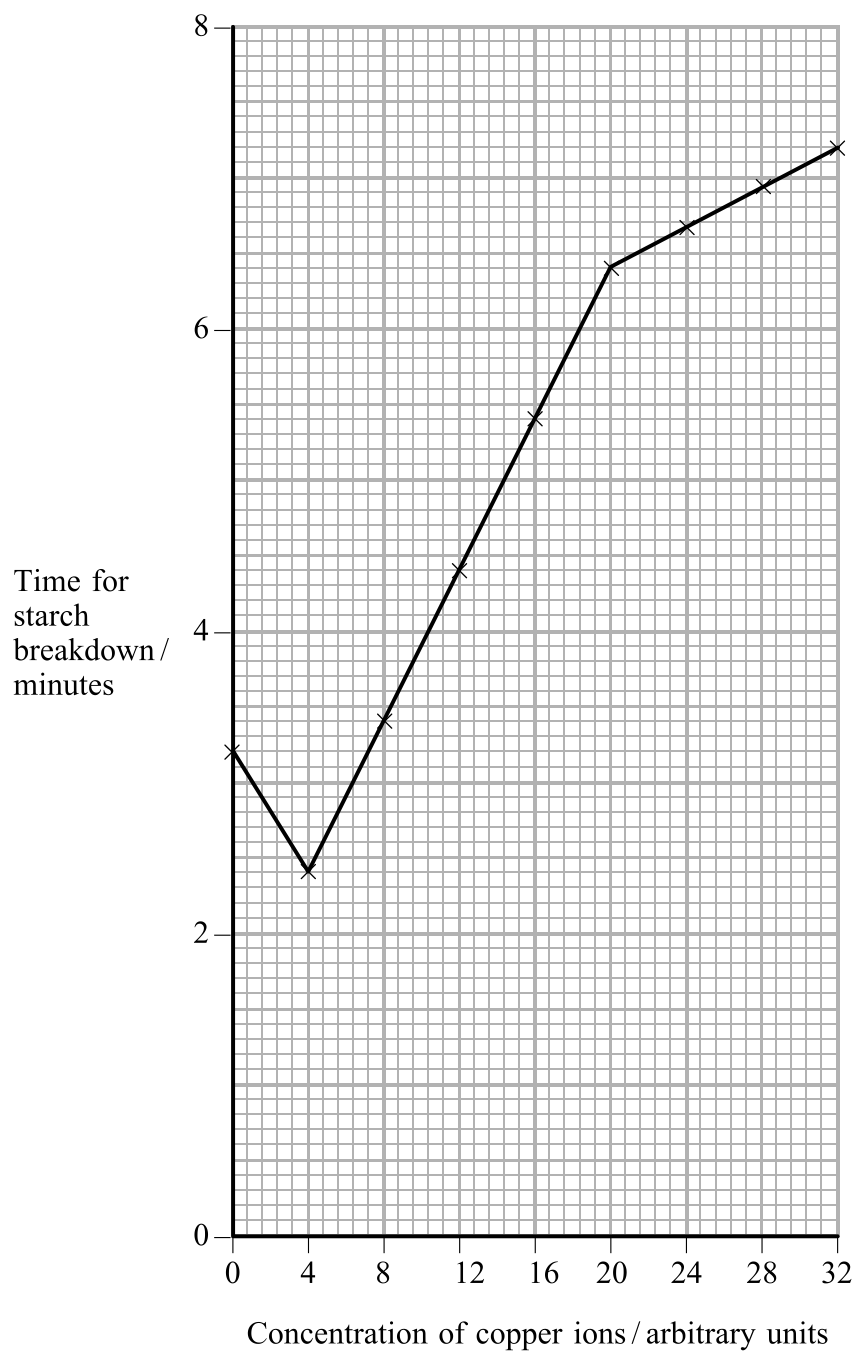
**(Total 9 marks)**

**Q6**



7. Amylase is an enzyme that breaks down starch to maltose. A student carried out an investigation to determine the effect of copper ions on the activity of this enzyme. She added different concentrations of copper ions and timed how long it took the amylase to break down starch.

The results of this investigation are shown in the graph below.



(a) Describe a test that could be used to show that starch has been broken down.

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(3)

(b) Describe the effect that an increase in concentration of copper ions has on the **activity** of amylase.

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(3)

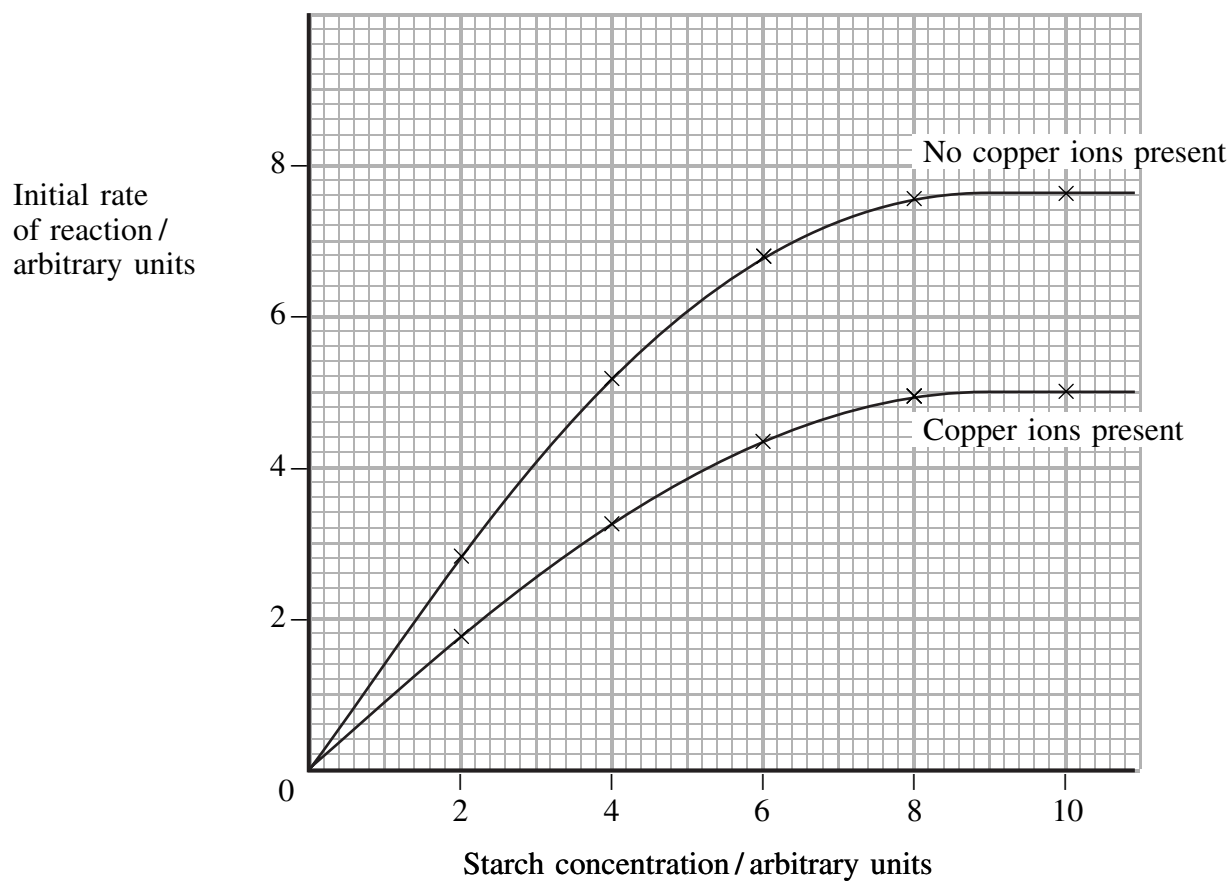
(c) The student suggested that the copper ions were acting as an active site-directed inhibitor at concentrations above 4 arbitrary units. Explain what is meant by the term **active site-directed inhibition**.

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(3)



(d) The student then investigated the initial rate of reaction using amylase and different concentrations of starch. She did this first with copper ions present then with no copper ions present. Her results are shown in the graph below.



(i) Suggest why the **initial** rate of reaction was measured in this investigation.

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(2)



(ii) State why the results do **not** support the hypothesis that copper ions are an active site-directed inhibitor of amylase.

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(1)

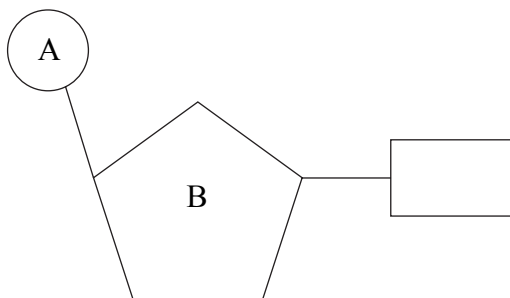
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Q7



8. (a) The diagram below shows the structure of a mononucleotide from a DNA molecule.



Name the parts of the mononucleotide labelled **A** and **B**.

A .....

B .....

**(1)**

(b) The table below shows the percentage of different bases present in the DNA from two organisms.

Organism	Percentage of each base present			
	Adenine	Guanine	Thymine	Cytosine
Yeast	31	19	31	19
Cow			29	

(i) Complete the table to show the percentage of adenine, guanine and cytosine in the DNA of a cow.

**(1)**

(ii) Explain how you worked out the percentage of guanine present in the DNA of a cow.

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**(3)**





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- (c) DNA and messenger RNA (mRNA) have different properties. DNA is very stable but mRNA breaks down quickly and most of it will be broken down within a day of it being produced. Suggest why it is important for DNA to be more stable than mRNA.

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(2)

- (d) Protein synthesis involves transcription and translation. Describe the process of **transcription**.

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Q8

(Total 12 marks)

**TOTAL FOR PAPER: 60 MARKS**

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