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Answer ALL questions in the spaces provided.

1. The table below refers to the processes of natural and artificial cloning. 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	Natural cloning	Artificial cloning
Involves mitosis		
Occurs in both plants and animals		
Produces offspring that are genetically identical		
Produces offspring by sexual reproduction		

(Total 4 marks)

Q1

2. Read through the following passage about water, then write on the dotted lines the most appropriate word or words to complete the passage.

A water molecule consists of two hydrogen atoms and one oxygen atom held together by bonds. There is an unequal distribution of charge over the molecule. This is called a and results in water being a good for many substances such as sodium ions.

Bonds called bonds form between water molecules. As a result water has a high meaning that a lot of energy is needed to cause a small rise in temperature.

(Total 5 marks)

Q2



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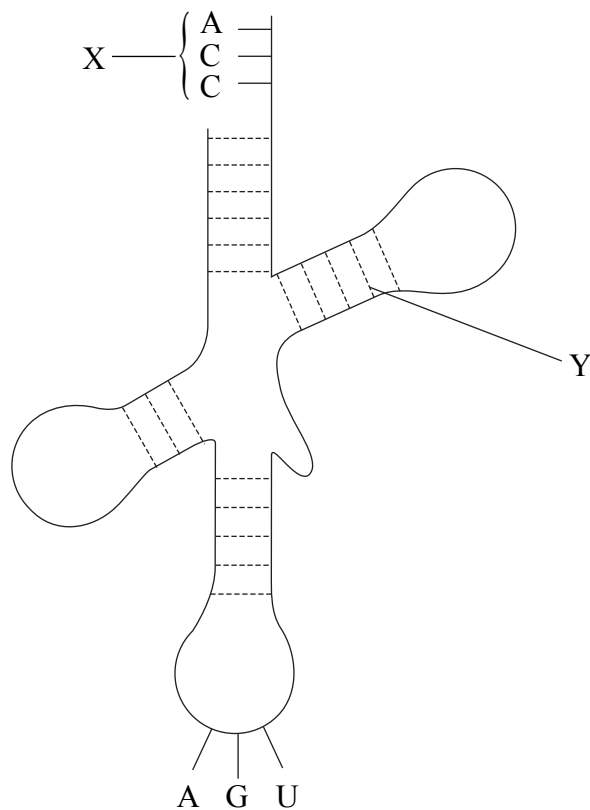
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3

Turn over

3. (a) The diagram below represents a transfer RNA (tRNA) molecule.



(i) Name the type of bond labelled **Y**.

..... (1)

(ii) Name the molecule that is attached to position **X** during protein synthesis.

..... (1)

(iii) Explain the meaning of the term **anticodon**.

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..... (2)



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(b) State **two** ways in which the structure of a tRNA molecule differs from the structure of a messenger RNA (mRNA) molecule.

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(2)

Q3

(Total 6 marks)



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4. The table below describes some structures found in eukaryotic cells.

Complete the table below by writing the name of the structure in the box next to its description.

Description	Name of structure
Cylindrical organelle made up of microtubules, involved in spindle organisation.	
Site where ribosomal RNA is made and the subunits of the ribosomes are assembled.	
Organelle consisting of stacks of cisternae and vesicles, concerned with the modification of proteins.	
Small spherical structures surrounded by a single membrane, containing hydrolytic enzymes.	

(Total 4 marks)

Q4



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N 2 4 7 1 8 A 0 7 2 0

7

Turn over

5. (a) DNA in eukaryotic organisms is a double helix. Bases on one strand bond to bases on the second strand to form base pairs. During protein synthesis, one strand of DNA (the coding strand) acts as a template to make mRNA. The second strand is known as the non-coding strand.

The base sequence of a small section of the coding strand of a DNA molecule is shown below.

AGACTTGCAACTTGACATGTA

(i) How many codons are shown in this sequence?

..... (1)

(ii) Give the sequence of the **first five** bases that would be present in each of the following:

1. the mRNA molecule transcribed from this DNA strand

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2. the non-coding strand of this DNA

..... (2)



(b) A sample of DNA from a locust was analysed to determine the percentage of each base present. The percentage of adenine was found to be 29.4%.

Calculate the percentage of cytosine in this sample. Show your working and give an explanation for your answer.

Percentage of cytosine =

Explanation:

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(5) **Q5**

(Total 8 marks)



6. (a) Describe the structure of a plant cell wall.

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(3)

(b) An experiment was carried out to determine the effect of two enzymes, enzyme A and enzyme B, on the yield of apple juice.

An apple was cut into small pieces and blended in a food processor to produce apple pulp.

Four samples of apple pulp of equal mass were mixed with various combinations of enzyme A, enzyme B and water, as detailed in the table below. Both enzyme solutions were at the same concentration.

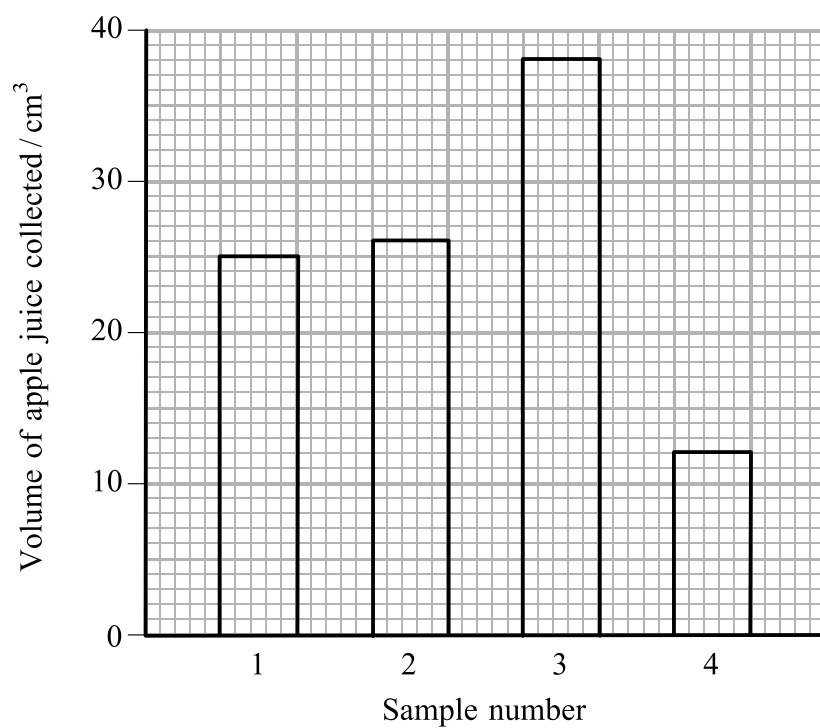
Sample number	Mixture
1	Apple pulp + 5 cm ³ enzyme A + 5 cm ³ water
2	Apple pulp + 5 cm ³ enzyme B + 5 cm ³ water
3	Apple pulp + 5 cm ³ enzyme A + 5 cm ³ enzyme B
4	Apple pulp + 10 cm ³ water

The samples were incubated at 30 °C for 15 minutes.

Each sample was then placed in a separate filter funnel and the apple juice collected into a measuring cylinder. The volumes of the apple juice collected from each sample are shown in the bar chart opposite.



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- (i) Suggest why the apple pulp incubated with water only (sample 4) yielded some apple juice.

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(1)

- (ii) Describe the effect that enzymes A and B have on the yield of apple juice in samples 1, 2 and 3.

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(2)

QUESTION 6 CONTINUES OVERLEAF.



N 2 4 7 1 8 A 0 1 1 2 0

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(iii) Suggest how these enzymes increase the yield of apple juice.

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(4)

Q6

(Total 10 marks)



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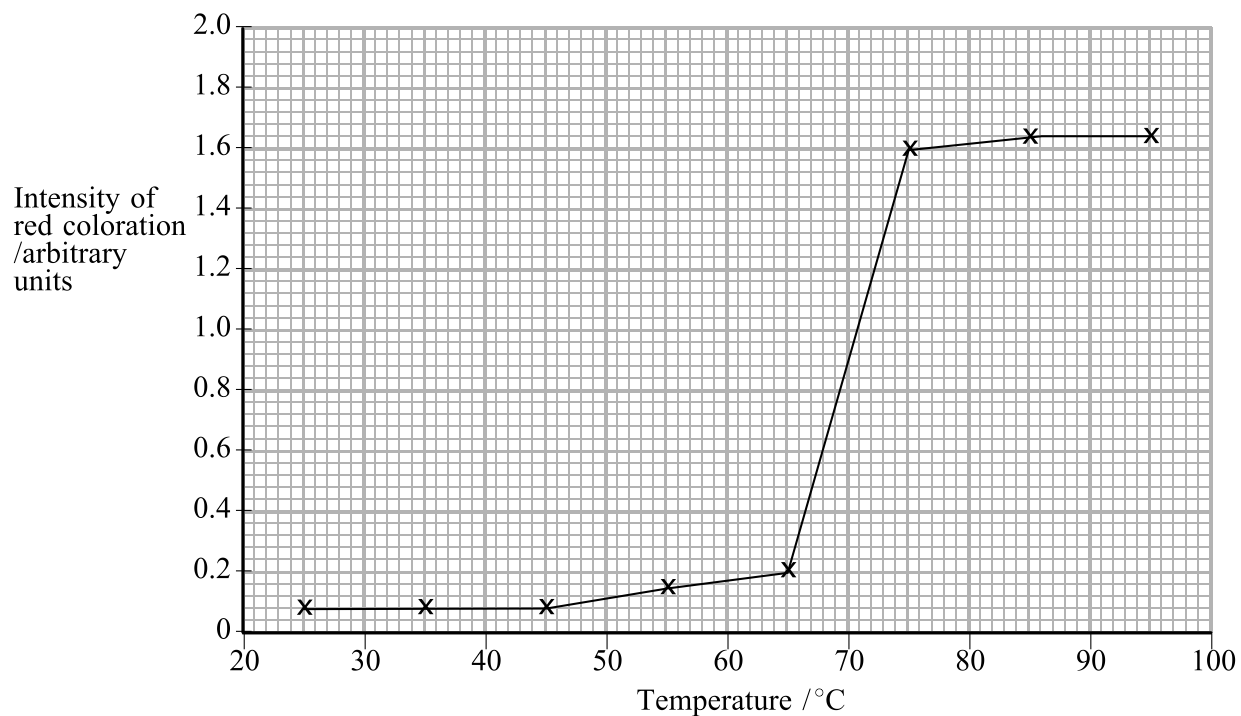
7. (a) Beetroot cells contain a red water-soluble pigment in their vacuoles. This pigment cannot pass through membranes. If the membrane is damaged, red pigment will leak out of the cell.

An experiment was carried out to test the effect of different temperatures on beetroot cell membranes. Eight equal-sized discs of beetroot were cut and carefully rinsed in distilled water.

One disc was transferred to a test tube containing 10 cm³ of distilled water maintained at a temperature of 25 °C and left for 30 minutes. After this time, the intensity of red coloration of the liquid in the test tube was measured using a colorimeter.

Each of the other seven discs was treated in a similar way but maintained at a different temperature.

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



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(i) Describe the effect of increasing temperature on the intensity of the red coloration of the solution.

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(3)

(ii) Suggest an explanation for these results.

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(3)

QUESTION 7 CONTINUES OVERLEAF.



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(b) Some substances pass through membranes by active transport. Describe the process of **active transport**.

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(5)

(Total 11 marks)

Q7



8. Amylase is an enzyme that catalyses the breakdown of starch into maltose. An experiment was carried out to investigate the effect on amylase by keeping it at a high temperature before it was used.

A 1% solution of amylase was prepared and placed in a waterbath at 60 °C. Immediately, 2 cm³ of this amylase solution was put into a test tube and placed in another waterbath set at 20 °C. Five more 2 cm³ samples of amylase were removed at 1 minute intervals from the amylase solution kept at 60 °C. These samples were also placed in the 20 °C waterbath.

The activity of each amylase sample was then determined.

(a) Describe how the test for starch can be used to compare the activity of these amylase samples.

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(3)

QUESTION 8 CONTINUES OVERLEAF.



(b) The results of this experiment are shown in the table below.

Length of time that amylase was in the 60 °C waterbath / mins (Incubation time)	Activity of amylase / arbitrary units
0	12.5
1	4.9
2	2.3
3	0.2
4	0.1
5	0.0

Describe the effect of increasing the length of the incubation time at 60 °C on the activity of amylase.

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(3)



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(c) (i) Enzymes are proteins. Describe the **tertiary structure** of an enzyme.

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(ii) Suggest an explanation for the change in amylase activity with increased incubation time at 60 °C.

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(3)

(Total 12 marks)

Q8

TOTAL FOR PAPER: 60 MARKS

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