2021 ASSESSMENT MATERIALS

A- Level
BIOLOGY

Biological Molecules/Cells

Total number of marks: 48

1 0 . 3 Describe the chemical reactions involved in the conversion of polymers to monomers and monomers to polymers.

Give **two** named examples of polymers and their associated monomers to illustrate your answer.

[5 marks]

0 1 . 1 The action of the carrier protein **X** in **Figure 1** is linked to a membrane-bound ATP hydrolase enzyme.

Explain the function of this ATP hydrolase.

[2 marks]

0 1 . 2 The movement of Na^+ **out** of the cell allows the absorption of glucose **into** the cell lining the ileum.

Explain how.

[2 marks]

0 1 . 3 Describe and explain **two** features you would expect to find in a cell specialised for absorption.

[2 marks]

0 1 . 4 Draw phospholipids on **Figure 2** to show how the carrier protein, SGLT1, would fit into the cell-surface membrane.

Do **not** draw more than eight phospholipids.

[2 marks]

0 1 . 5 **Figure 2** shows the SGLT1 polypeptide with NH_2 at one end and COOH at the other end.

Describe how amino acids join to form a polypeptide so there is always NH_2 at one end and COOH at the other end.

You may use a diagram in your answer.

[2 marks]

0 4 . 1 Formation of an enzyme-substrate complex increases the rate of reaction.

Explain how.

[2 marks]

0 4 . 2 A scientist measured the rate of removal of amino acids from a polypeptide with and without an enzyme present. With the enzyme present, 578 amino acids were released per second. Without the enzyme, 3.0×10^{-9} amino acids were released per second.

Calculate by how many times the rate of reaction is greater with the enzyme present. Give your answer in standard form.

[2 marks]

Answer = _____ times faster

Another scientist investigated an enzyme that catalyses the following reaction.

$$ATP \rightarrow ADP + Pi$$

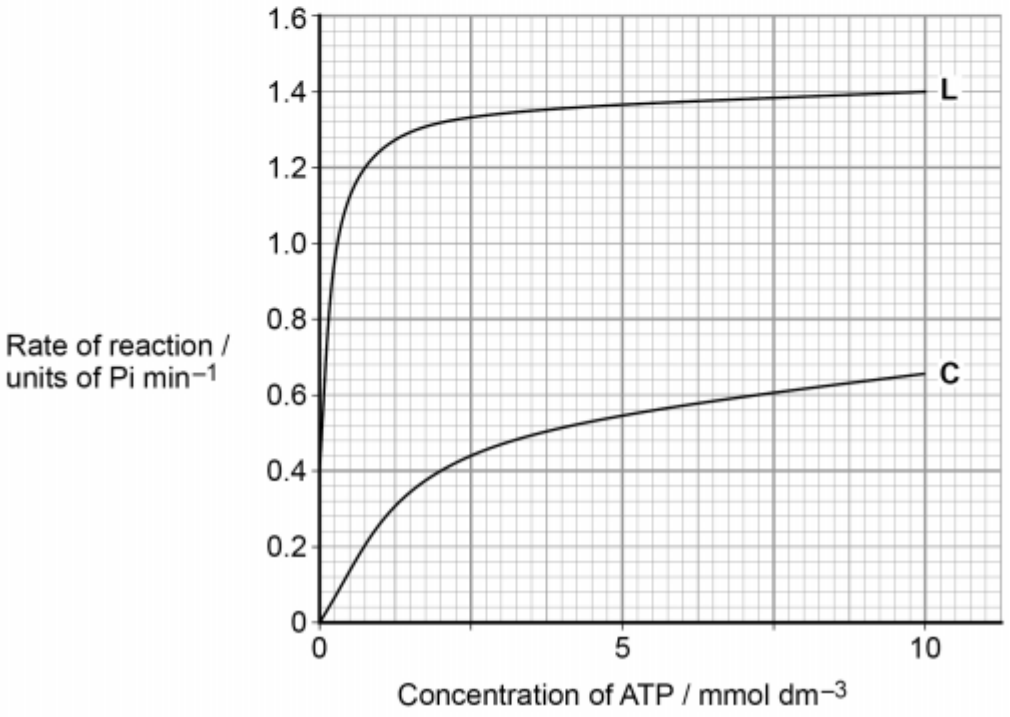
The scientists set up two experiments, **C** and **L**.

Experiment **C** used
- the enzyme
- different concentrations of ATP.

Experiment **L** used
- the enzyme
- different concentrations of ATP
- a sugar called lyxose.

The scientists measured the rate of reaction in each experiment. Their results are shown in **Figure 5**.

Figure 5



0 4 . 3 Calculate the rate of reaction of the enzyme activity with no lyxose at 2.5 mmol dm^{-3} of ATP as a percentage of the maximum rate shown with lyxose.

[2 marks]

Answer = _____ %

0 4 . 4 Lyxose binds to the enzyme.

Suggest a reason for the difference in the results shown in **Figure 5** with and without lyxose.

[3 marks]

0 7 . 1 Alpha-gal is a disaccharide found in red meat.

Alpha-gal is made of two galactose molecules. Galactose has the chemical formula $C_6H_{12}O_6$

Give the chemical formula for the disaccharide, alpha-gal, and describe how it is formed from two galactose molecules.

[2 marks]

Formula _____

Description _____

1 0 . 2 Mucus produced by epithelial cells in the human gas exchange system contains triglycerides and phospholipids.

Compare and contrast the structure **and** properties of triglycerides and phospholipids.

[5 marks]

0 9 . 1 Describe the role of **two** named enzymes in the process of semi-conservative replication of DNA.

[3 marks]

0 8 . 1 Complete **Table 2** to show **three** differences between DNA in the nucleus of a plant cell and DNA in a prokaryotic cell.

[3 marks]

Table 2

DNA in the nucleus of a plant cell	DNA in a prokaryotic cell
1	
2	
3	

0 2 . 1 **Table 1** shows cell wall components in plants, algae, fungi and prokaryotes.
Complete **Table 1** by putting a tick (✓) where a cell wall component is present.

[3 marks]

Table 1

Cell wall component	Plants	Algae	Fungi	Prokaryotes
Cellulose				
Murein				
Chitin				

0 6 Scientists investigated the cell cycle in heart cells taken from mice 6 days before their birth and then at 4, 14 and 21 days after their birth.

Their results are shown in **Table 4**. Age 0 days = day of birth.

Table 4

Age / days	Percentage of heart cells undergoing mitosis	Percentage of heart cells undergoing DNA replication
–6	13.9	8.5
4	8.5	2.6
14	1.6	0.2
21	0.6	0.0

0 6 . 1 Describe and explain the data in **Table 4**.

[2 marks]

0 8 . 1 The scientists needed solutions of known water potential to generate their calibration curve.

Table 5 shows how to make a sodium chloride solution with a water potential of −1.95 MPa

Complete **Table 5** by giving all headings, units and volumes required to make 20 cm^3 of this sodium chloride solution.

[2 marks]

Table 5

Water potential / MPa	**Concentration of sodium chloride solution / mol dm^{-3}**	**Volume of 1 mol dm^{-3} sodium chloride solution / _____**	**_____ / _____**
−1.95	0.04		

Table 6 shows some of the concentrations of sodium chloride solution the scientists used and the water potential of each solution.

Table 6

Concentration of sodium chloride solution / mol dm^{-3}	**Water potential / MPa**
0.04	−1.95
0.10	−4.87
0.12	−5.84

0 8 . 2 There is a linear relationship between the water potential and the concentration of sodium chloride solution.

Use the data in **Table 6** to calculate the concentration of sodium chloride solution with a water potential of −3.41 MPa

[2 marks]

Answer = _____ mol dm^{-3}

The water potential of leaf cells is affected by the water content of the soil.

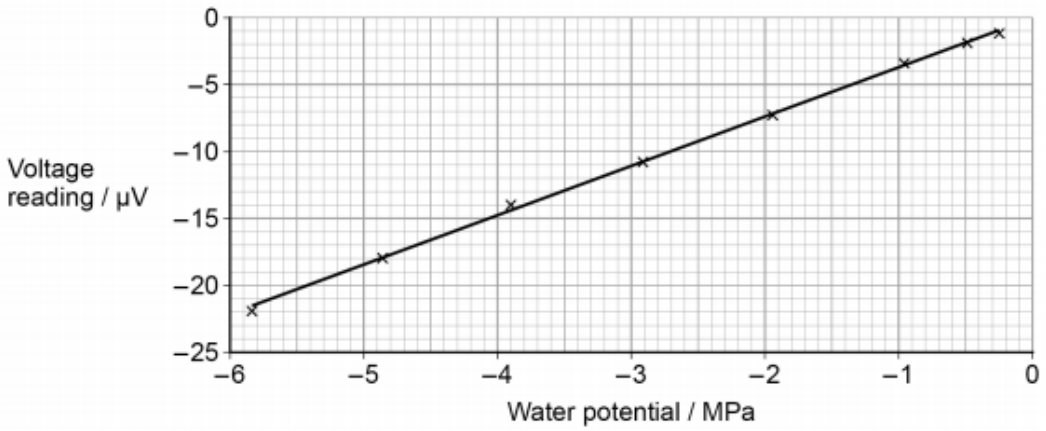
Scientists grew sunflower plants. They supplied different plants with different volumes of water.

After two days, they determined the water potential in the leaf cells by using an instrument that gave a voltage reading.

The scientists generated a calibration curve to convert the voltage readings to water potential.

Figure 8 shows their calibration curve.

Figure 8

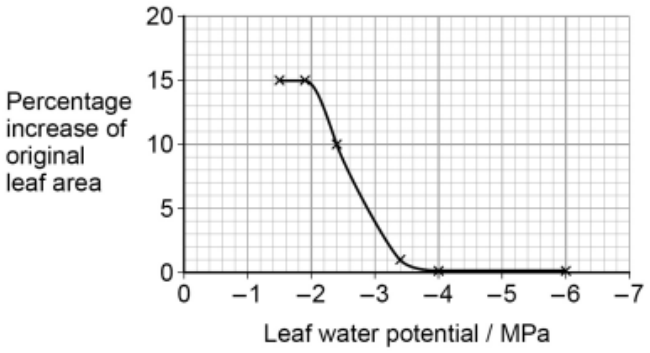


In addition to determining the water potential in the leaf cells, the scientists measured the growth of the leaves.

They recorded leaf growth as a percentage increase of the original leaf area.

Their results are shown in **Figure 9**.

Figure 9



0 8 . 3 One leaf with an original area of 60 cm^2 gave a voltage reading of −7 µV

Use **Figure 8** (on page 28) and **Figure 9** to calculate by how much this leaf increased in area.
Give your answer in cm^2

[2 marks]