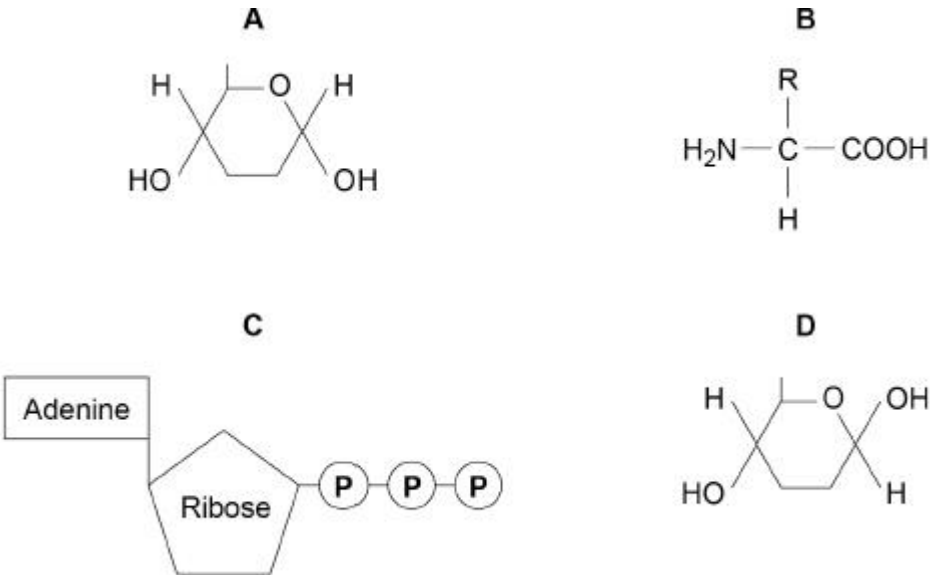
Q1.

The diagram below shows the structure of molecules found in organisms.



(a) Complete the table below by putting the correct letter, **A**, **B**, **C** or **D**, in the box next to each statement. Each letter may be used once, more than once, or not at all.

Letter	Statement
	is a monomer in an enzyme's active site
	is a monomer in cellulose
	is produced during photosynthesis and respiration
	forms a polymer that gives a positive result with a biuret test

(4)

(b) Raffinose is a trisaccharide of three monosaccharides: galactose, glucose and fructose. The chemical formulae of these monosaccharides are:

- galactose = $C_6H_{12}O_6$
- glucose = $C_6H_{12}O_6$
- fructose = $C_6H_{12}O_6$

Give the number of carbon atoms, hydrogen atoms and oxygen atoms in a molecule of raffinose.

Number of carbon atoms _____

Number of hydrogen atoms _____

Number of oxygen atoms _____

(1)

(c) A biochemical test for reducing sugar produces a negative result with raffinose solution.

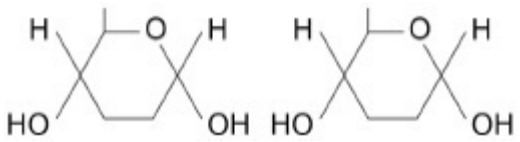
Describe a biochemical test to show that raffinose solution contains a non-reducing sugar.

(3)

(Total 8 marks)

Q2.

The diagram shows the structure of two α-glucose molecules.



(a) On the diagram, draw a box around one chemical group in each glucose molecule used to form a glycosidic bond.

(1)

(b) A precipitate is produced in a positive result for reducing sugar in a Benedict's test.
A precipitate is solid matter suspended in solution.

A student carried out the Benedict's test. Suggest a method, other than using a colorimeter, that this student could use to measure the **quantity** of reducing sugar in a solution.

(2)

In an investigation, a student wanted to identify the solutions in two beakers, **A** and **B**. She knew one beaker contained maltose solution and the other beaker contained glucose solution. Both solutions had the same concentration.

She did two separate biochemical tests on a sample from each beaker.

Test 1 – used Benedict's solution to test for reducing sugar.

Test 2 – added the enzyme maltase, heated the mixture at 30 °C for 5 minutes, and then
used Benedict's solution to test for reducing sugar.

Maltose is hydrolysed by maltase.

The student's results are shown in the table below.

	Colour of solution after testing with Benedict's solution	
Beaker	**Test 1**	**Test 2**
A	red	red
B	red	dark red

(c) Explain the results for beakers **A** and **B** in the table.

Beaker A

Beaker B

_____

_____

_____

(2)

(d) Use of a colorimeter in this investigation would improve the repeatability of the student's results.

Give **one** reason why.

_____

_____

_____

_____

(1)

In **Test 1**, the student used a measuring cylinder to measure 15 cm^3 of solution from a beaker. The measuring cylinder gives a volume with an uncertainty of ±1 cm^3. She used a graduated syringe to measure 5.0 cm^3 of Benedict's solution. The graduated syringe gives a volume with an uncertainty of ± 0.5 cm^3. She mixed these volumes of liquid to do the biochemical test.

(e) Calculate the percentage error for the measurements used to obtain a 20 cm^3 mixture of the solution from the beaker and Benedict's solution. Show your working.

(2)

Answer = _____%

(Total 8 marks)

Q3.

(a) What is a monomer?

_____

_____

_____

_____

_____

(1)

(b) Lactulose is a disaccharide formed from one molecule of galactose and one molecule of fructose.

Other than both being disaccharides, give one similarity and one difference between the structures of lactulose and lactose.

Similarity _____

_____

_____

_____

_____

Difference _____

_____

_____

_____

_____

(2)

Q4.

(a) Glycogen and cellulose are both carbohydrates.
Describe **two** differences between the structure of a cellulose molecule and a glycogen molecule.

1. _____

_____

_____

2. _____

_____

_____

(2)

(b) Starch is a carbohydrate often stored in plant cells.
Describe and explain **two** features of starch that make it a good storage molecule.

1. _____

_____

_____

2. _____

_____

_____

2)

(c) Tick (✓) the box that identifies the test which would be used to show the presence of starch.

Acid hydrolysis test	☐
Benedict's test	☐
Emulsion test	☐
Iodine/potassium iodide test	☐

(1)

Q5.

In mammals, in the early stages of pregnancy, a developing embryo exchanges substances with its mother via cells in the lining of the uterus. At this stage, there is a high concentration of glycogen in cells lining the uterus.

(a) Describe the structure of glycogen.

_____

_____

_____

_____

_____

_____

_____

_____

(2)

(b) During early pregnancy, the glycogen in the cells lining the uterus is an important energy source for the embryo.

Suggest how glycogen acts as a source of energy.

Do **not** include transport across membranes in your answer.

_____

_____

_____

_____

_____

(2)

Q6.

(a) Name the monomers from which a maltose molecule is made.

_____

(1)

(b) Name the type of chemical bond that joins the **two** monomers to form maltose.

_____

(1)

A student wanted to produce a dilution series of a maltose solution so he could plot a calibration curve. He had a stock solution of maltose of concentration 0.6 mol dm^{-3} and distilled water. He made a series of dilutions from 0.1 to 0.6 mol dm^{-3}.

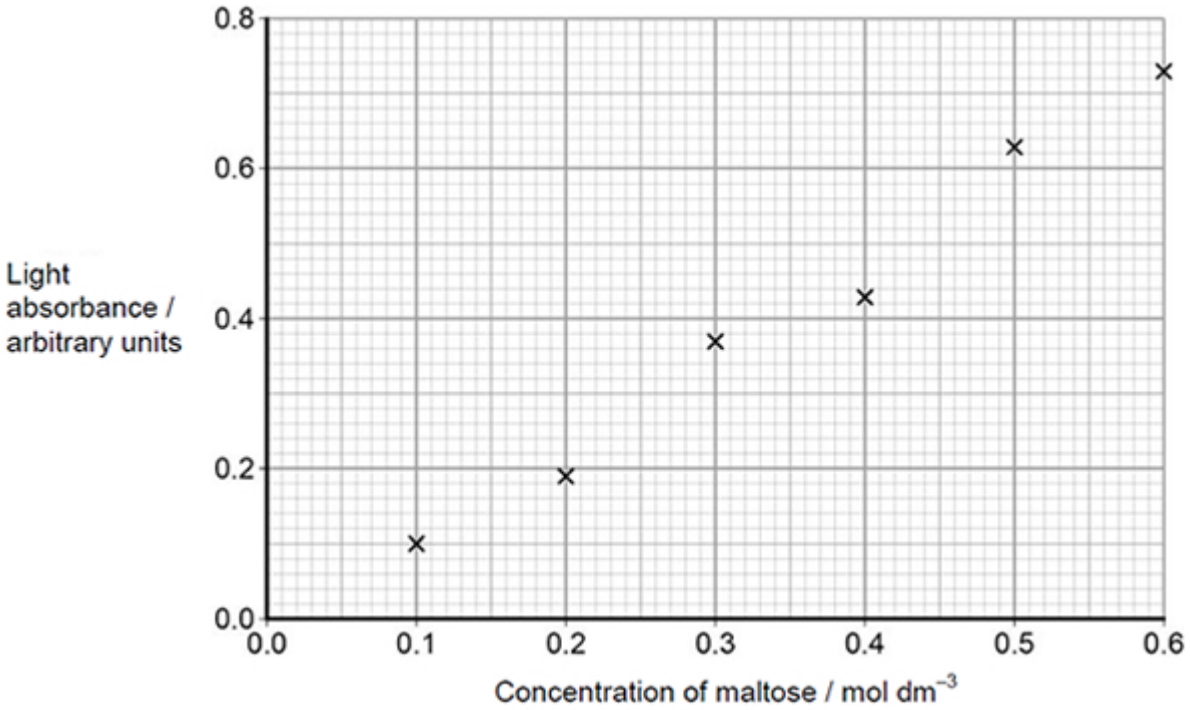
(c) Complete the table below by giving all headings, units and the concentration of the maltose solution produced.

Concentration of maltose solution / _____	**Volume of 0.6 mol dm^{-3} maltose solution / cm^3**	**_____ / _____**
_____	5	10

(2)

The student performed the Benedict's test on six maltose solutions ranging from 0.1 mol dm^{-3} to 0.6 mol dm^{-3}. He placed a sample of each solution in a colorimeter and recorded the light absorbance.

His results are shown in the graph below.



(d) Explain how you would use the graph to determine the maltose concentration with a light absorbance of 0.45 arbitrary units.

_____

_____

_____

_____

_____

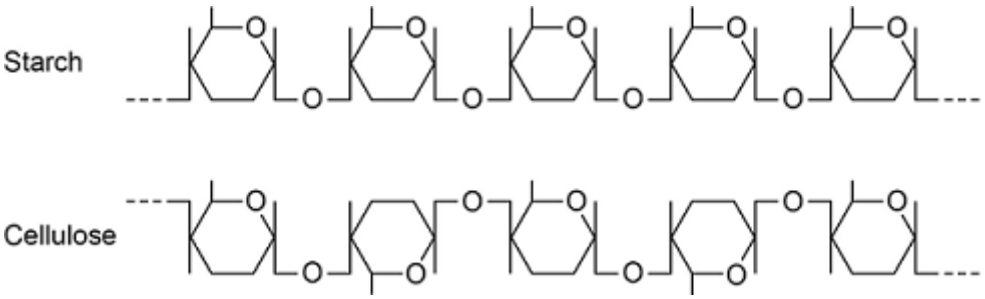
(2)

(Total 6 marks)

Q7.

Starch and cellulose are two important plant polysaccharides.

The following diagram shows part of a starch molecule and part of a cellulose molecule.



(a) Explain the difference in the structure of the starch molecule and the cellulose molecule shown in the diagram above.

_____

_____

_____

_____

(2)

(b) Starch molecules and cellulose molecules have different functions in plant cells. Each molecule is adapted for its function.

Explain **one** way in which starch molecules are adapted for their function in plant cells.

_____

_____

_____

_____

(2)

(c) Explain how cellulose molecules are adapted for their function in plant cells.

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)