



CHEMISTRY ONLINE
— **TUITION** —

Phone: +442081445350
www.chemistryonlinetuition.com
Email: asherrana@chemistryonlinetuition.com

BIOLOGY

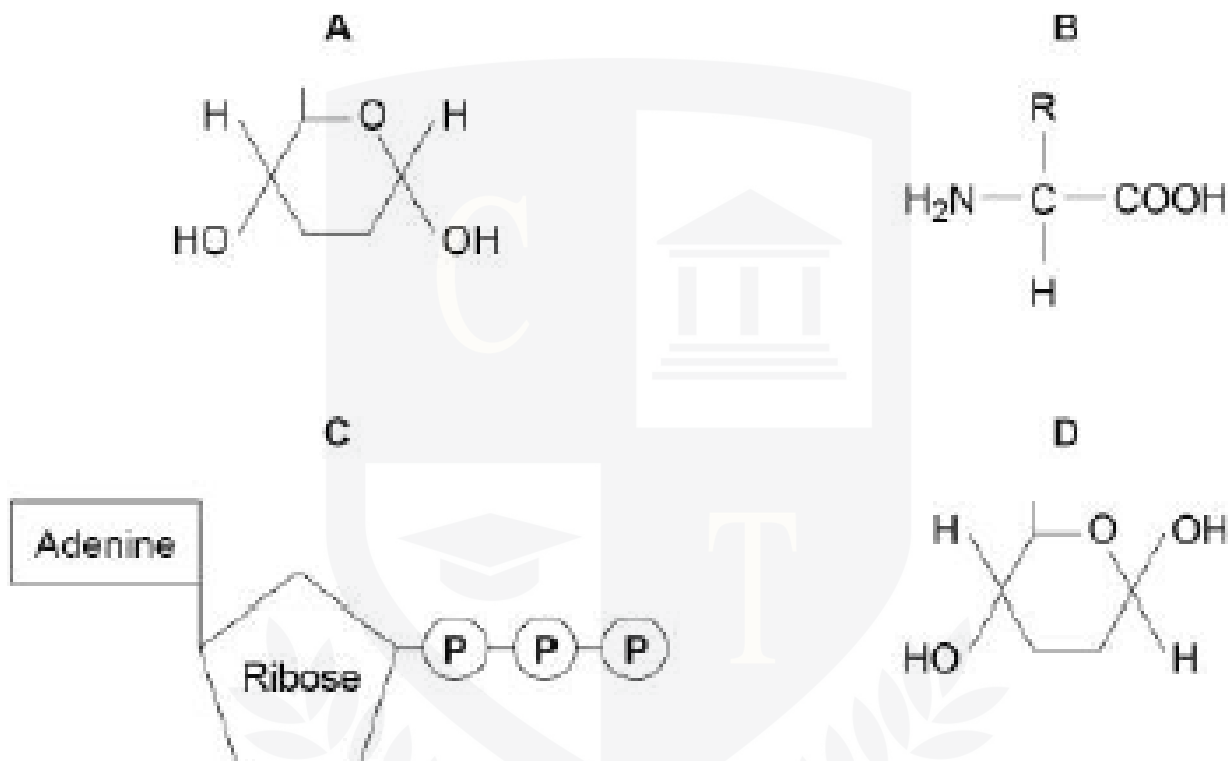
BIOLOGICAL MOLECULES

LEVEL & BOARD:	AQA (A - LEVEL)
TOPIC:	Carbohydrate
PAPER TYPE:	QUESTION PAPER 1
TOTAL QUESTIONS	06
TOTAL MARKS	41

Carbohydrate - 1

1.

The structure of molecules found in organisms is seen in the diagram below.



(a)

Put the appropriate letter, A, B, C, or D, in the box next to each statement to complete the table below. You can use a letter just once, several times, or never at all.

[4 marks]

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
--	---

(b)

Raffinose is a trisaccharide made up of galactose, glucose, and fructose as its three monosaccharides. These monosaccharides have the following chemical formulas:

[1 mark]

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

In a raffinose molecule, how many carbon, hydrogen, and oxygen atoms are there?

Number of carbon atoms

Number of hydrogen atoms

Number of oxygen atoms

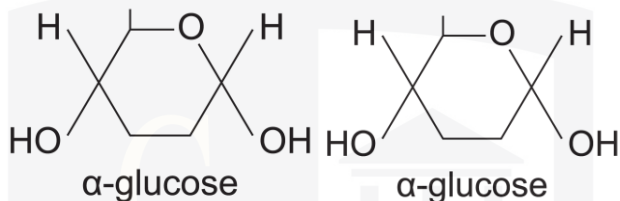
(c)

With refined solution, a biochemical test for decreasing sugar yields a negative result.

[3 marks]

Describe a biochemical test that demonstrates the presence of a non-reducing sugar in raffinose solution.

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



(a)

On the diagram, circle the chemical group that each glucose molecule has that contributes to the formation of a glycosidic bond.

[1 mark]

(b)

When decreasing sugar is detected in a Benedict's test, a precipitate is created.

Solid material suspended in solution is called a precipitate.

The Benedict's test was administered by a student. Give this pupil a different way to quantify the amount of reducing sugar in a solution besides using a colorimeter.

[2 marks]

A student sought to determine the solutions in two beakers, A and B, as part of a study. She was aware that one beaker held a maltose solution, and the other, a glucose solution. The concentration of both solutions was the same.

She examined a sample from each beaker using two different biochemical assays.

In Test 1, Benedict's solution was used to check for sugar reduction.

Test 2 involved adding the enzyme maltase and heating the mixture for 5 minutes at 30 °C.

Use Benedict's solution to check for sugar reduction. Maltose is hydrolyzed by maltase.

The table below displays the student's outcomes.

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

B	red	Dark red
----------	-----	----------

(c)

What did beakers A and B produce that is shown in the table?

[2 marks]

Beaker A

Beaker B

(d)

The student's findings in this experiment would be more reproducible if a colorimeter had been used.

Give one reason. [1 mark]

In Test 1, the student measured 15 cm³ of solution from a beaker using a measuring cylinder. The measuring cylinder provides a volume with a 1 cm³ error. 5.0 cm³ of Benedict's solution was measured by her using a graduated syringe. The graded syringe provides a volume with a 0.5 cm³ error. She combined these liquid volumes to do the biochemical test.

(e)

Calculate the measurement error as a percentage for the 20 cm³ mixture of Benedict's solution and the solution from the beaker. Demonstrate your work.

[2 marks]

Answer =

(a) Describe a monomer.

[1mark]

One molecule of galactose and one molecule of fructose combine to generate the disaccharide known as lactulose.

Give one similarity and one difference outside the fact that they are both disaccharides. **[2 marks]**

Similarity

Difference

3.

(a) Both cellulose and glycogen are sugars.

Identify two distinctions between the cellulose and glycogen molecules' structures.

[2 marks]

1

2

(b)

The carbohydrate starch is frequently stored in plant cells.

Give two examples of how starch has properties that make it a useful storage molecule.

[2 marks]

1.

2.

(c)

Check (✓) the box next to the test that will be used to demonstrate the presence of starch.

[1 mark]

Acid hydrolysis test

Benedict's test

Emulsion test

Iodine/potassium iodide test

4. A developing embryo in mammals exchanges chemicals with its mother through cells in the uterine lining during the early stages of pregnancy. The cells lining the uterus have a lot of glycogen at this point.

(a)

What's the make-up of glycogen?

[2 marks]

(b)

Early in pregnancy, the embryo relies heavily on the glycogen stored in the uterine lining cells as a source of energy.

Describe how glycogen functions as an energy source.

Do not include membrane transport in your response.

[2 marks]

5.

(a) List the monomers that go into creating a maltose molecule. **[1 mark]**

(b)

What kind of chemical connection unites the two monomers to form maltose?

[1 mark]

To plot a calibration curve, a student needed to create a series of dilutions of a maltose solution. He had distilled water and a stock solution of maltose with a concentration of 0.6 mol dm^3 . He performed several dilutions, ranging from 0.1 to 0.6 mol dm^3 .

(c)

Fill in all headings, units, and the concentration of the produced maltose

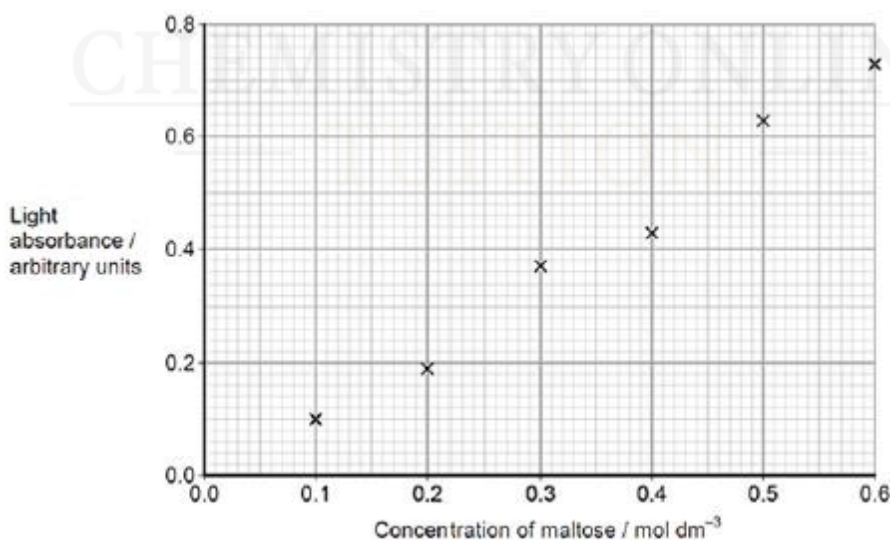
solution in the table below.

[2 marks]

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

The student tested six maltose solutions ranging in concentration from 0.1 mol dm^{-3} to 0.6 mol dm^{-3} using Benedict's method. He used a colorimeter to measure the light absorption of a sample of each solution.

The graph below shows his results.



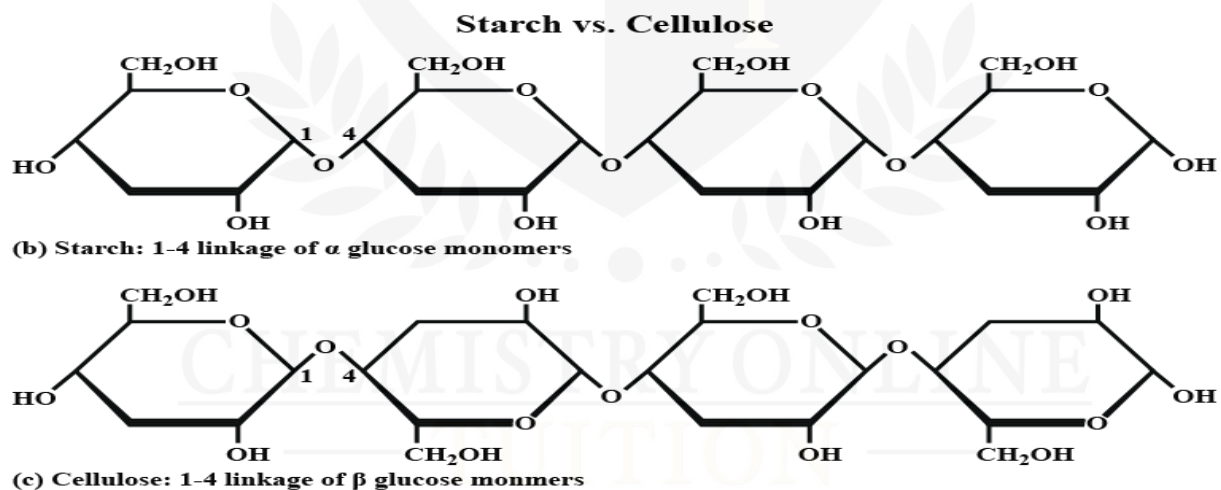
(d)

Describe how you would use the graph to calculate the maltose concentration using a 0.45 arbitrary unit light absorption. [2marks]

6.

The two most significant plant polysaccharides are starch and cellulose.

A portion of a starch molecule and a portion of a cellulose molecule are depicted in the following diagram.



(a)

Explain the difference in the structure of the starch molecule and the cellulose molecule shown in the diagram above. **[2 marks]**

Explain one manner in which starch molecules are modified for their purpose in plant cells.

Starch molecules and cellulose molecules each have specific functions in plant cells. **[2 marks]**

(b)

Describe how the cellulose molecules were modified for their use in plants. **[3 marks]**



DR. ASHAR RANA
M.B.B.S / MS. CHEMISTRY



- Founder & CEO of Chemistry Online Tuition Ltd.
- Completed Medicine (M.B.B.S) in 2007
- 15 years of teaching experience in London
- CIE & EDEXCEL Examiner since 2015
- Chemistry, Physics, Math's and Biology Tutor

CONTACT INFORMATION FOR **CHEMISTRY ONLINE TUITION**

- UK Contact: 02081445350
- International Phone/WhatsApp: 00442081445350
- Website: www.chemistryonlinetuition.com
- Email: asherrana@chemistryonlinetuition.com
- Address: 210-Old Brompton Road, London SW5 OBS, UK

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