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BIOLOGY

BIOLOGICAL MOLECULES

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

Carbohydrate - 1

1.

(a)

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

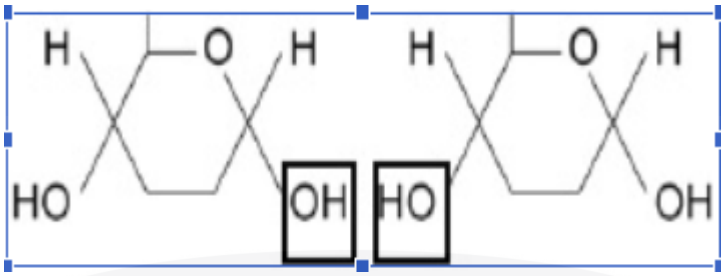
(b) C = 18, H = 32, O = 16

(c) If Benedict's test has been carried out on a solution and it shows that **no reducing sugars** are present then a **modified** version of the test can be carried out to test for the presence of non-reducing sugars

To test for non-reducing sugars:

- The sample is heated in a water bath that has been brought to a boil by adding diluted hydrochloric acid.
- **Neutralise** the solution with sodium hydrogencarbonate
- When the solution has been neutralized, check with a suitable indicator (such red litmus paper), and then add a little more sodium hydrogencarbonate because the Benedict's test requires a mild alkaline environment.
- Perform Benedict's test as usual after that; add Benedict's reagent to the sample and heat in a boiling water bath; if an orange-red precipitate forms, a non-reducing sugar is present.

2. (a)



(b) Filter and dry the ppt. and find the mass by weighing it on a mass scale.

(c) A = glucose and B = maltose

Because solution contain high concentration of sugar and form precipitate after hydrolysis

(d) The colorimeter shines a beam of light through the sample. The more copper sulphate that has been used in the Benedict's test, the less light will be blocked out in the sample, and more transmitted/less absorbed. Therefore, the reading gives a measure of the amount reducing sugar based on the Benedict's reaction.

(e)

$= (1/15 + 0.5/5) \times 100$

$= (0.0667 + 0.1) \times 100$

$= 0.1667 \times 100$

$= 16.67\%$

3.

(a) A **monomer** is a simple, small unit that can be repeated in order to build a larger unit, referred to as a polymer.

Monomer is defined as a simple molecule with two or more binding sites through which it forms covalent linkages with other monomer molecules to form the macromolecule.
Monomers are thus building blocks of polymers.

(b) Similarity

Both contain galactose / a glycosidic bond

Difference

Lactulose contains fructose, whereas lactose contains glucose

4.

(a)

Cellulose	**Glycogen**
Cellulose is made up of β-glucose	Glycogen is made up of α-glucose
Cellulose molecule has straight chain	glycogen is branched
Cellulose molecule has straight chain	glycogen is coiled
glycogen has 1,4- and 1,6- glycosidic bonds	cellulose has only 1,4- glycosidic bonds

(b) Starch is an ideal storage molecule because:

- it is insoluble and therefore doesn't affect the water potential of the cell
- it is large and therefore cannot diffuse from the cell
- it is compact and therefore much can be stored in a small space
- it is branched and has many ends and therefore can be hydrolysed rapidly by many enzymes at the same time
- it releases alpha-glucose when hydrolysed - this is easily transported and can be directly respired

(c) Iodine/potassium iodide

5.

(a) Glycogen is an alpha glucose polymer where most of the alpha glucose molecules are joined by 1,4 glycosidic bonds. Glycogen contains branches.

(b) When the body needs a quick boost of energy or when the body isn't getting glucose from food, glycogen is broken down to release glucose into the bloodstream to be used as fuel for the cells

6.

(a) Maltose is a disaccharide made up of two glucose molecules

(b) Maltose is composed of two molecules of glucose joined by an α-1,4-glycosidic linkage.

(c)

Concentration of maltose solution mol dm^{-3}	Volume of 0.6 mol dm^{-3} maltose solution / cm^3	volume of water / cm3
0.2	5	10

(d)

- draw a lob f
- read off the graph from 0.45 au to determine unknown maltose concentration

7.

(a)

(1) Starch formed from α-glucose but cellulose formed from β-glucose;

(2) Position of hydrogen and hydroxyl groups on carbon atom 1 inverted.

(b) Starch is an ideal storage molecule because it is insoluble and therefore doesn't affect the water potential of the cell

It is large and therefore cannot diffuse from the cell

It is compact and therefore much can be stored in a small space

It is branched and has many ends and therefore can be hydrolysed rapidly by many enzymes at the same time

(c)

- Cellulose molecule has long and straight chains
- It became linked together by many hydrogen bonds to form fibrils;
- It provides strength (to cell wall).

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