SI GOB - Full Discipline Demo

GOB-Macromolecules of Life - Monosaccharides and

FinaPREPORCHARISMEr Guide

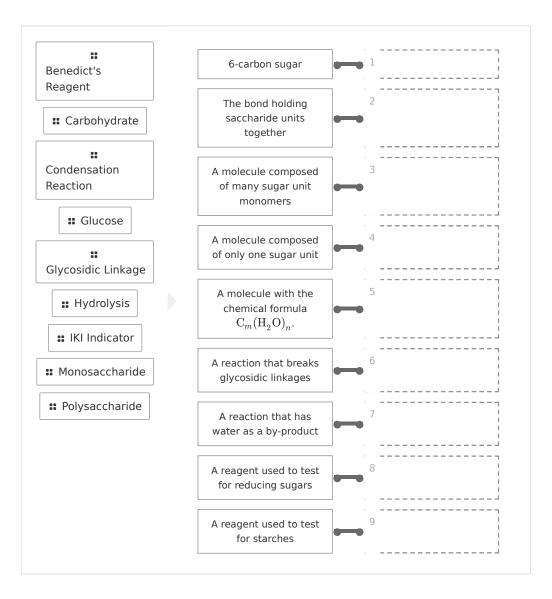
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Test Your Knowledge



Match each term with the best definition.



Correct answers:

- 1 Glucose 2 Glycosidic Linkage 3 Polysaccharide
- 4 Monosaccharide 5 Carbohydrate 6 Hydrolysis
- 7 Condensation Reaction 8 Benedict's Reagent 9 IKI Indicator

Identify the statements about sugars and starches as true or false.

Correct answers:

1

Artificial sweeteners are often so intensely sweet that they are diluted with true sugars

Glucose and fructose are monosaccharides.

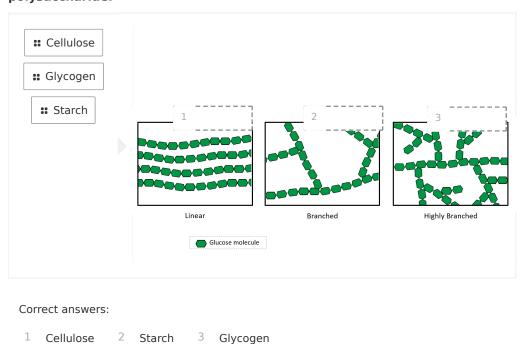
The reducing ability of sugars is defined by the presence of an aldehyde (CHO) or ketone (CO) functional group.

2 Sucrose is a polysaccharide.

Zero-calorie sweeteners contain artificial sweeteners that are synthesized by the modification of proteins.



Cellulose, glycogen, and starch are polysaccharides composed of glucose monomers. Polysaccharides can appear linear, branched, or highly branched, as shown in the image below. Label each image with the correct polysaccharide.



Exploration

- 0 2
- **4**
- **5**
- 0 6

A disaccharide is formed from ____ monosaccharides.

- two
- three
- ofour
- 0 1000

Fructose is an example of a monosaccharide.	
│ ○ True	~
○ False	
Sucralose, an artificial sweetener, is considered a sugar because it has a similar chemical formula.	
 True 	
○ False	~
Benedict's reagent turns in the presence of	
dark red; reducing sugars	~
black; starch	
black; reducing sugars	
 None of the above. 	
The IKI-indicator will turn in the presence of	
blue-black; starch	~
blue-black; monosaccharides	
ored; reducing sugars	
brown; starch	
The structure of alveogen is	
The structure of glycogen is	
linear	
<pre>branched</pre>	
highly branched	~
None of the above	



	Cellulose has a ridged structure because of the beta-1,4 glycosidic linkage.			
	│ ○ True	✓		
	O False			
Exerc	cise 1			
	e table sugar solution test positive or negative for reducing sugars? Explain e behind your results.	n the		
in the	lict's reagent changes colors in the presence of reducing sugars and it did not changes colors. Table sugar is the disaccharide sucrose, a non-reducing			
Sucros	se does not have an aldehyde or ketone group.			
ingredi sweete	enda $^{\circ}$ and Sweet'N Low $^{\circ}$ test positive or negative for reducing sugars? Listents found in each of these products. Underline the ingredient that is the ener (Hint: There is only one artificial sweetener in each of the products. Recound as needed).	artificial		
	of the zero calorie sweeteners test positive for reducing sugars. Splenda: Dextroso dextrin, Sucralose Sweet'NLow: Dextrose, Saccharin, Cream of Tartar, Calcium Sili			
	s the relationship of glucose and dextrose? How does this relationship influsults for Splenda $^{ ext{@}}$ and Sweet'N Low $^{ ext{@}}$?	uence the		
known glucos	erm "dextrose" is predominantly used in food manufacturing. Dextrose is a type of as D-glucose. Therefore, zero-calorie sweeteners that contain dextrose actually see and test positive for reducing sugars. The dextrose is added to reduce the swe tificial sweeteners.	contain		



aspartame ($C_{14}H_{18}N_2O_5$). Would a sample of pure aspartame test positive or negative for reducing sugars? The pure sample does not contain other ingredients, such as dextrose, maltodextrin, or calcium silicate.	•
Pure aspartame would test negative for reducing sugars with Benedict's reagent. Aspartame cannot function as a reducing agent; it does not contain the groups normally associated with a positive result (aldehydes and some keytones).	
Unlike other sweeteners, Splenda [®] may be used in cooking because it does not break down at higher temperatures. Many recipes exist that call for Splenda [®] instead of table sugar. cake baked with Splenda [®] actually sugar-free? How might this affect a person concerned with blood sugar levels?	ls a
Baking a cake with Splenda does add sugar to baking. This may be of concern to people who	

Data Table 1: Sugar Tests with Benedict's Reagent (SAMPLE ANSWER BELOW)

Test Tube Number	Substance	Prediction	Final Color	Test Results for Reducing Sugar
1	Distilled Water	Student answers will vary	Blue	Negative
2	Glucose Solution		Orange	Positive
3	Starch Solution		Blue	Negative
4	Table Sugar		Blue	Negative
5	Splenda [®]		Red- Orange	Positive
6	Sweet'N Low®		Red-brown	Positive
7	Milk		Green	Positive
8	Juice		Orange	Positive
9	Potato		Blue	Negative

Exercise 2

Which sugar substitu a starch derived from				sugar substitute contains he starch.
Splenda, maltodextrir	1			
List three examples orientations of each.	of polysaccharides in	ı living organ	isms. Describ	e the structural
	n green plants and are			chains; starch molecules olecules act as energy
which can be convert However, monosacch	ed to glycogen, a po arides are broken do	olysaccharide own into sma	e in animals, fo ller compound	n into monosaccharides, or storage in the cells. ds, and in the process the starch into glycogen
must be broken down The simple sugars are stored instead of simp	into simple sugars via then condensed and ole sugars to reduce o When the cell needs er	a hydrolysis, s stored as gly smotic pressu nergy to do wo	so that they ma cogen in the ce ire in the cell, v ork, polysaccha	ning during digestion. They y be absorbed by the body. Ils. Polysaccharides are which would cause a loss of rides are hydrolyzed and
Data Table 2: Si (SAMPLE ANSWER BELOW)	tarch Tests with IKI Inc	licator		
Test Tube Number	Substance	Prediction	Final Color	Test Results for Starch



1

Amber

Negative

Distilled Water

2	Glucose Solution	Amber	Negative
3	Starch Solution	Blue-Black	Positive
4	Table Sugar	Amber	Negative
5	Splenda [®]	Blue-Black	Positive
6	Sweet'N Low®	Amber	Negative
7	Milk	Amber	Negative
8	Juice	Amber	Negative
9	Potato	Blue-Black	Positive

Exercise 3

What type of reaction is the conversion of starch to maltose? Describe what occurs during the reaction.
Starch breaks down via a hydrolysis reaction, whereby water is a reactant and the glycosidic linkages holding together the sugars are broken. This hydrolysis reaction occurs in the presence of the enzyme catalyst α -amylase. Maltose is produced.
Is maltose a reducing sugar or a non-reducing sugar? Support your answer with information in Data Table 3.
Maltose is a reducing sugar. A color change was observed when Benedict's solution was added.

Data Table 3: Conversion of Starch to the Sugar Maltose (SAMPLE ANSWER BELOW)

(SAMPLE ANSW	ER BELOW)			
Test Tube Number	Substance	Final Color	Test Results for Reducing Sugar	Test Results for Starch
1	Distilled Water	Light blue	Negative	
2	Distilled Water	Green-brown		Negative
3	Starch Solution	Amber	Positive	



4	Green-brown (slightly darker than distilled water)	 Negative

C

comp	ompetency Review				
	If a carbohydrate has 12 hydrogen atoms, how many oxygen atoms are present in the carbohydrate?				
	○ 3				
	© 6	~			
	O 9				
	O 12				
	Carbohydrates are the most abundant macromolecule in nature.				
	○ True	~			
	○ False				
	The bond that holds two monosaccharide molecules together is a(n)	<u>.</u>			
	glycosidic linkage	✓			
	ionic bond				
	ovan der Waals force				
	 hydrogen bond 				
	Lactose (milk sugar) may be broken down via				
	a dehydration reactionhydrolysis	✓			
	o pepsin	*			
	bile				



Ine	e tongue perceives to be hundreds of times sweeter than	
	sucrose; sucralose (an artificial sweetener)	
	sucralose (an artificial sweetener); sucrose	~
	glucose; fructose	
	starch; sucrose	
	cralose, an artificial sweetener, is actually broken down into a protein tused by the body during human digestion.	to
	True	
	False	~
	nedict's reagent changes color when reacts with a sugar molecule d the ion is reduced.	
	iodine	
	sodium	
	copper	~
	chlorine	
	order to test for reducing sugars with Benedict's reagent, the contents ould be placed in cold temperatures, such as an ice bath.	.
	True	
	False	✓
	indicator changes to a dark blue only when a solution contains reducingars.	ng
	True	
	False	~



١	TrueFalse	•
	What type of reaction is the conversion of starch to maltose? hydrolysis reaction dehydration reaction	•
	A-Amylase is a digestive enzyme that breaks down starch into simple sugars. True False	~

All artificial sweeteners test negative for reducing sugars.

Extension Questions

Benedict's reagent can be used to test the urine of diabetics. What is it testing for and how is that useful for diabetics? (SAMPLE ANSWER BELOW)

Benedict's reagent tests for reducing sugars such as glucose. A diabetic does not properly metabolize the glucose in their body and the excess glucose spills over into the urine. If the urine tests positive with the Benedict's reagent, it means the diabetes is not under control.