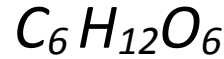


CARBOHYDRATES

GENERAL CHARACTERISTICS:

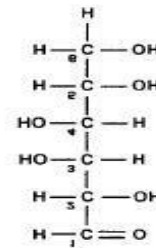
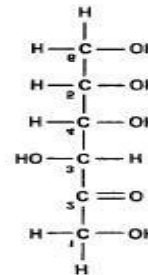
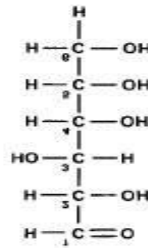
- Polymers of simple sugars
- Classified according to number of simple sugars
- Sugars
 - 3 to 7 carbons
 - -OH attached to each carbon except one
 - Aldehydes or ketones



Aldehyde

Ketone

Aldehyde



Glucose

Fructose

Galactose

MONOSACCHARIDES:

- Simple sugars
- Monomers of di- and polysaccharides
- Store energy in chemical bonds

Trioses

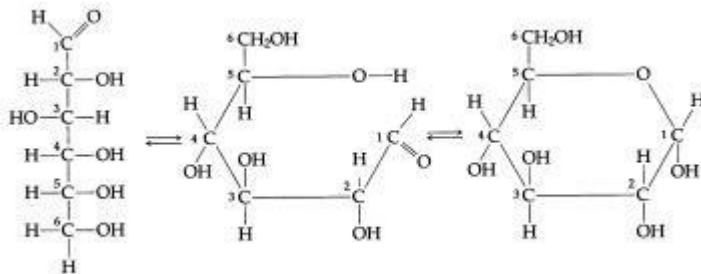
3 carbon sugar
 glyceraldehyde

Pentose

5 carbon sugar
 Ribose
 Deoxyribose

Hexose

6 carbon sugar
 Glucose



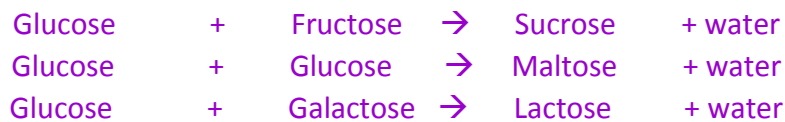
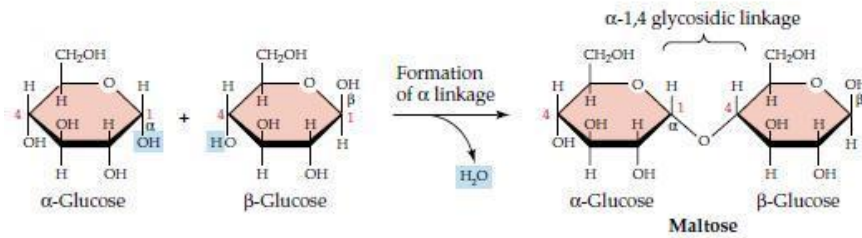
Glucose
 open form (dry)

Glucose
 Ring form (in sol'n)

DISACCHARIDES: Double Sugars

Condensation Synthesis: Removal of water molecule to form bond between monomers

Structure of maltose



POLYSACCHARIDES:

Many monosaccharides covalently bonded together

FUNCTIONS:

Storage

Starch: storage carb. in plants

Glycogen: storage carb. in animals

Structural

Cellulose: plant cell wall component

Chitin: polymer of amino sugar

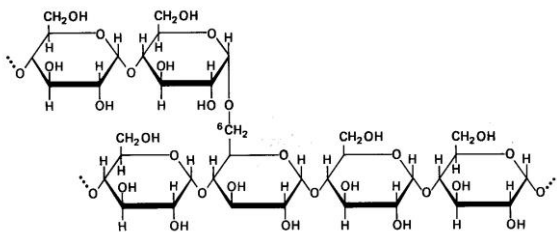
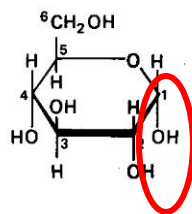
Building block of exoskeletons

STARCH VS CELLULOSE

Starch

Polymer of α -glucose

Branched α 1-4 linkages

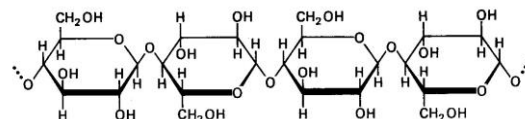
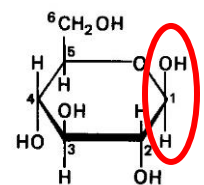


Cellulose

Polymer of β -glucose

Linear Unbranched β 1-4 Linkages

Most animals lack enzyme to break β 1-4 Linkages



QUESTIONS:

5.1

1. The large molecules of all living things fall into just four main classes. Name them.

2. Define Macromolecule

3. Define the following:

Polymer	
Monomer	

4. Match the definition with the correct term.

- A. Condensation Synthesis D. Polymer
B. Hydrolysis E. Polymerization
C. Monomer

_____ Large molecule that consists of many subunits called monomers

_____ Identical or similar subunits of a polymer

_____ Process of linking monomers to form a polymer

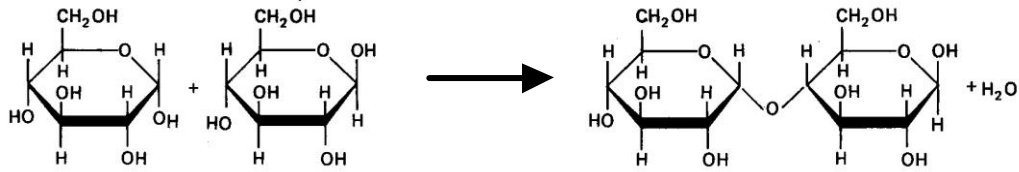
_____ Loss of a water molecule between two monomers to form a covalent bond between the monomers

_____ Breaking the covalent bond between monomers by adding a water molecule

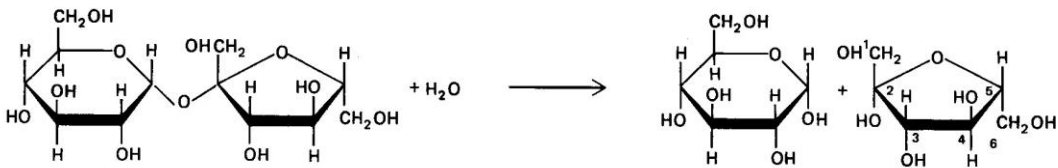
_____ AKA dehydration synthesis

5. Indicate if each of the following is an example of condensation synthesis or hydrolysis.

Reaction #1: _____



Reaction #2: _____



Reaction #3: _____

Protein, carbohydrate, or lipid synthesis

Reaction #4: _____

Digestion of proteins, carbohydrate, or lipids

6. How can you tell if a chemical equation represents :

a. condensation synthesis? _____

b. hydrolysis? _____

5.2

7. How are carbohydrates classified? _____

8. Let's look at carbohydrates, which include sugars and starches. First, what are the monomers of all carbohydrates?

9. Match the description with the correct term.

- | | |
|------------------|--------------------|
| A. Disaccharides | D. Monosaccharides |
| B. Lactose | E. Polysaccharides |
| C. Maltose | F. Sucrose |

_____ General term used to describe a molecule that consists of 2 simple sugars covalently bonded

_____ General term used to describe a molecule that consists of 100s or 1000s of simple sugars covalently bonded

_____ Molecule that consists of 2 glucose molecules covalently bonded

_____ Molecule that consists of a glucose and a galactose covalently bonded

_____ Molecule that consists of a glucose and a fructose covalently bonded

10. Identify each of the following as a **Monosaccharide**, a **Disaccharide**, or a **Polysaccharide**.

_____ Sucrose

_____ Maltose

_____ Glucose

_____ Galactose

_____ Ribose

_____ Lactose

_____ Chitin

_____ Deoxyribose

_____ Starch

_____ Glyceraldehyde

_____ Glycogen

_____ Amylose

_____ Cellulose

_____ Amylopectin

_____ Fructose

11. Listed below are characteristics of four biologically important polysaccharides. Use the key below to indicate the polysaccharide described in each characteristic

- | | |
|--------------|-------------|
| A. Cellulose | C. Glycogen |
| B. Chitin | D. Starch |

_____ Polymer of an amino sugar

_____ Storage Polysaccharide in plants

_____ Linear and unbranched

_____ Component of plant cell walls

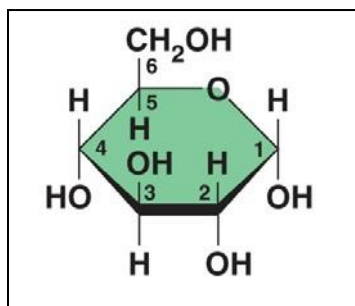
_____ Branched

_____ Forms the exoskeleton in arthropods;
Building material of cell walls of some fungi

_____ Storage polysaccharide in animals

12. So, as a quick review, all of these sugars have the same chemical formula: $C_6H_{12}O_6$. What term did you learn in Chapter 3 for compounds that have the same molecular formulas but different structural formulas?

13. Here is the abbreviated ring structure of glucose. Where are all the carbons? (Use arrows to show)



14. Consider this reaction: $C_6H_{12}O_6 + C_6H_{12}O_6 \rightarrow C_{12}H_{22}O_{11} + H_2O$

Notice that two monomers are joined to make a polymer. Since the monomers are monosaccharides, the polymer is a *disaccharide*. Three disaccharides are important to us with the formula $C_{12}H_{22}O_{11}$. Name them below and fill out the chart.

Disaccharide	Formed from which two monosaccharides?	Found where?

15. Have you noticed that all the sugars end in *-ose*? This root word means _____.

16. There are two categories of *polysaccharides*. Name them and give examples.

Type of Polysaccharide	Examples

17. Draw a glycosidic linkage between two glucose molecules.

18. Why can't the human digestive system break down cellulose?

19. Let's review some key points about the carbohydrates. Each prompt below describes a unique carbohydrate. Name the correct carbohydrate for each.

- a. Has _____ linkages
- b. Is a _____ polysaccharide produced by vertebrates; stored in your liver
- c. Two monomers of _____ form maltose
- d. Glucose + _____ form sucrose
- e. Monosaccharide commonly called "fruit sugar" _____
- f. "Milk sugar" _____
- g. Structural polysaccharide that gives cockroaches their crunch

- h. Malt sugar; used to brew beer _____
- i. Structural polysaccharide that comprises plant cell walls

End of Chapter Synthesis and Evaluation Problems

Do problems 1- 2, 6. Check and correct your answers 1-2 and 6 in back of the text.

1. _____
2. _____
6. _____

Study Guide/ISN (20 points)

In your study guide, review pages 38-39 Carbohydrates. In your ISN, do the following: Title the page **Chapter 5 Carbohydrates Must know!** In one color, copy down the first three must knows listed on page 38. **NOTE:** Must know 2 and 3 should focus on carbohydrates only!!! In another color in the space underneath include a brief description, diagram, model or mnemonic devise that will help you study for the unit test and more importantly the AP Test in May.

Bozeman/Podcasts/AP Biology/ISN (See syllabus for format) (20 points each)

1. Bozeman Biological Molecules (big idea 4 systems)
2. Bozeman Carbohydrates (big idea 4 systems)