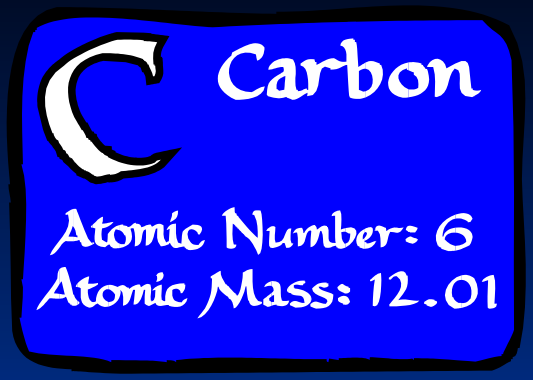
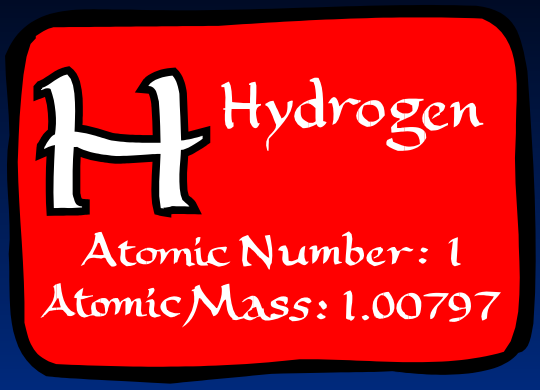
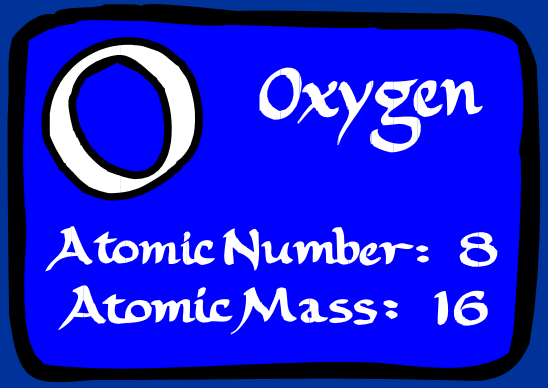
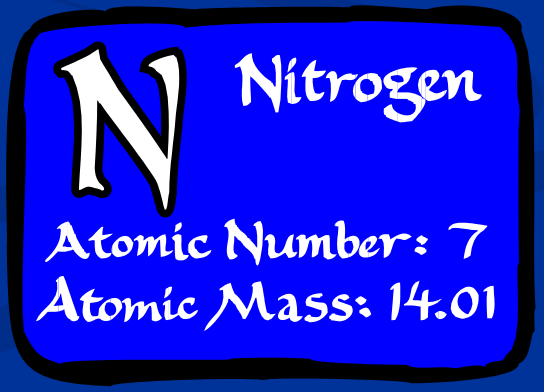




The Molecules of Life

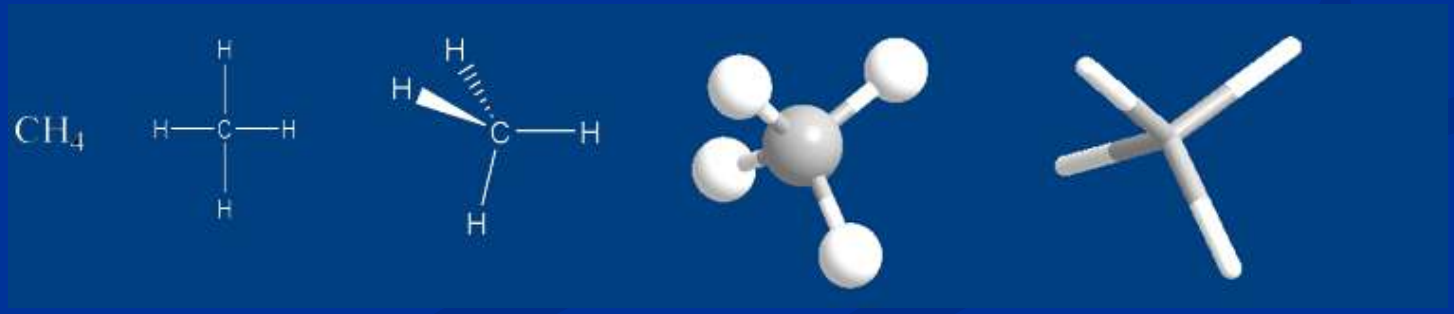
- Mrs. Kerstetter
- Biology





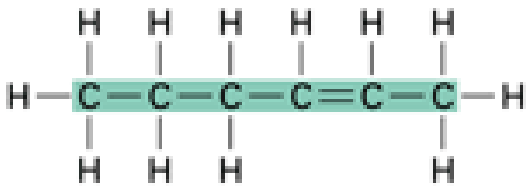
5.1 Carbon

- Other than water, most cell components are carbon-based
- They are called BIOMOLECULES
  - Made of a carbon backbone
  - Carbon can form 4 bonds
    - Important for attaching other atoms

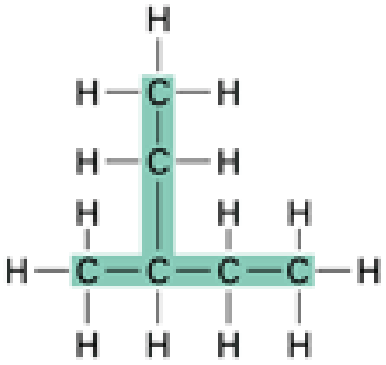


Carbon backbones

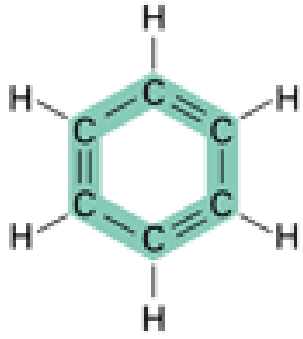
3 types of bonding:



Straight chain



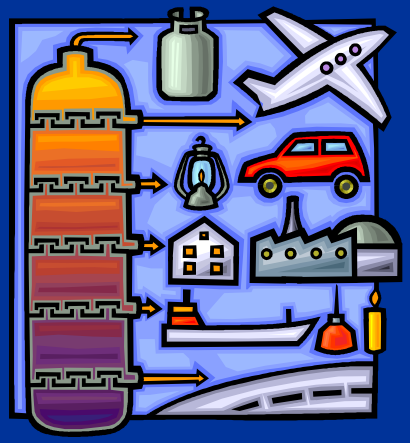
Branched chain



Ring

Organic vs. Inorganic

- Organic
  - Contain CARBON
  - One exception is CO, or carbon monoxide



- Inorganic
  - Do NOT contain carbon
  - What are some inorganic molecules?

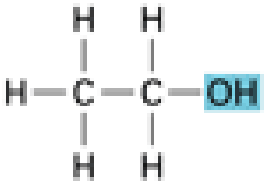
Hydrocarbons

- =contain only carbon and hydrogen
  - Many are important fuels
    - Methane
    - Butane
    - Propane
    - Energy-storing fat molecules

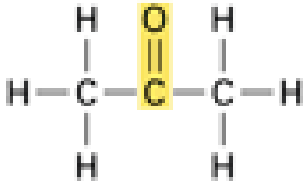
Two other atoms frequently found in organic molecules are _____ and _____.

Functional Groups

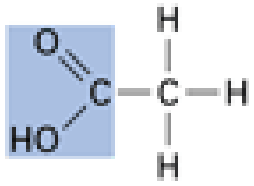
- =a group of atoms with in a molecule that interacts in predictable ways with other molecules



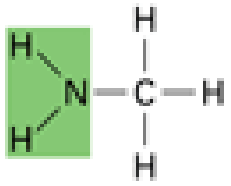
Hydroxyl group



Carbonyl group



Carboxyl group



Amino group

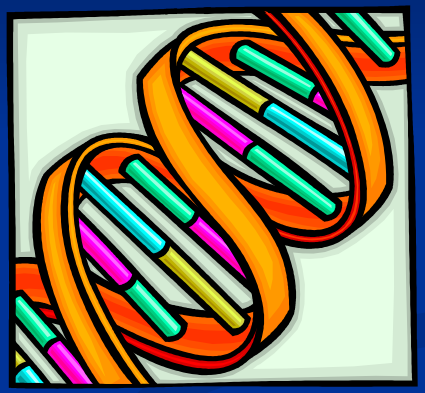
- -OH groups are hydrophilic
  - What does that mean?

Monomers and Polymers

- Monomers
  - Small, similar molecular units
- Polymers
  - Long chains of monomers
  - Can be a straight chain or branched
- Every cell has thousands of different polymers
  - Vary from cell to cell within an organism

Life's Large Molecules

- Carbohydrates
- Lipids
- Proteins
- Nucleic acids

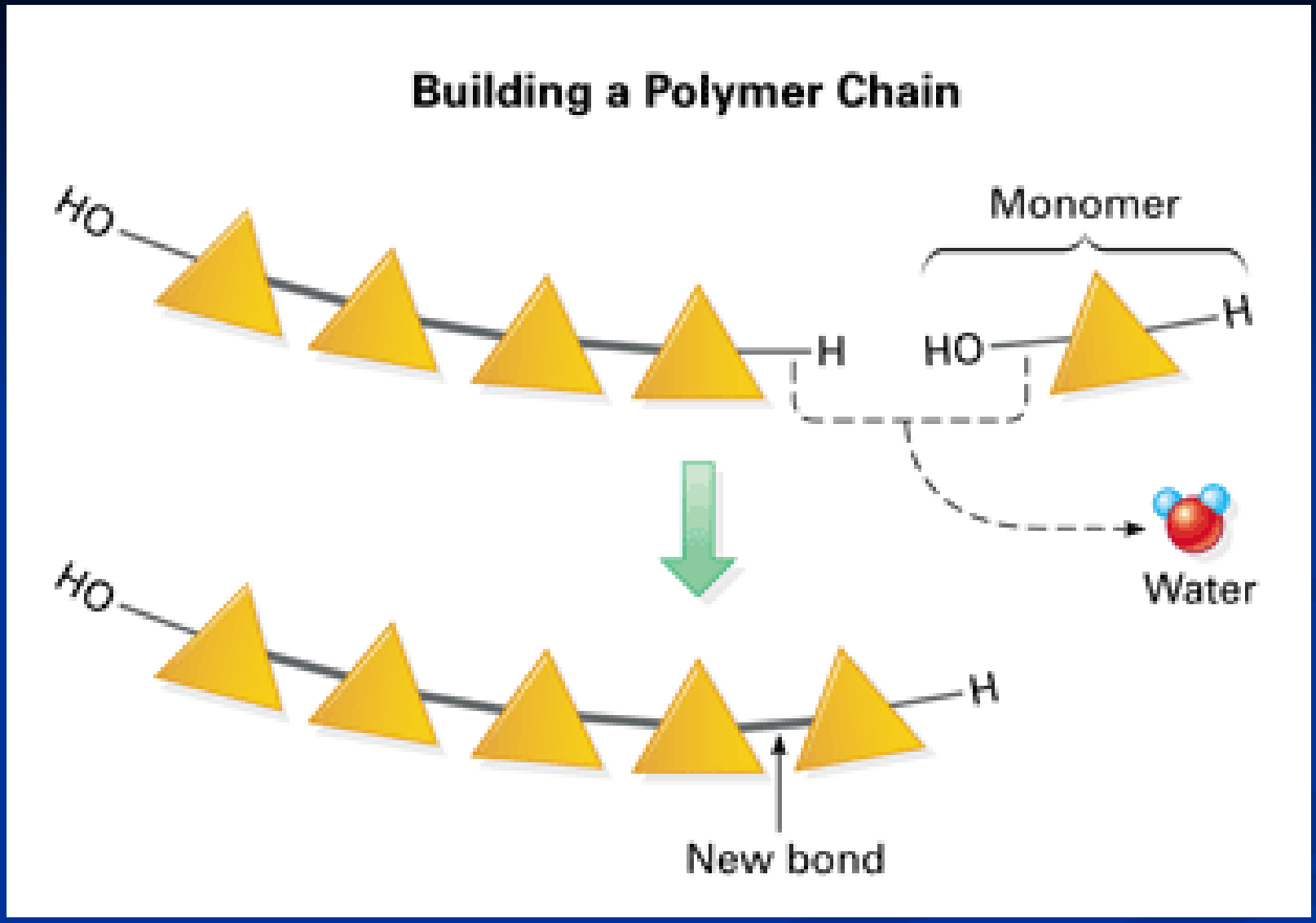


Building Polymers

- Every time a monomer is added to a chain, a WATER molecule is release
  - This is called a _____ reaction

Building Polymers

- Every time a monomer is added to a chain, a WATER molecule is release
  - This is called a DEHYDRATION reaction


Building a Polymer Chain
HO
H
Monomer
HO
H
Water
HO
H
New bond

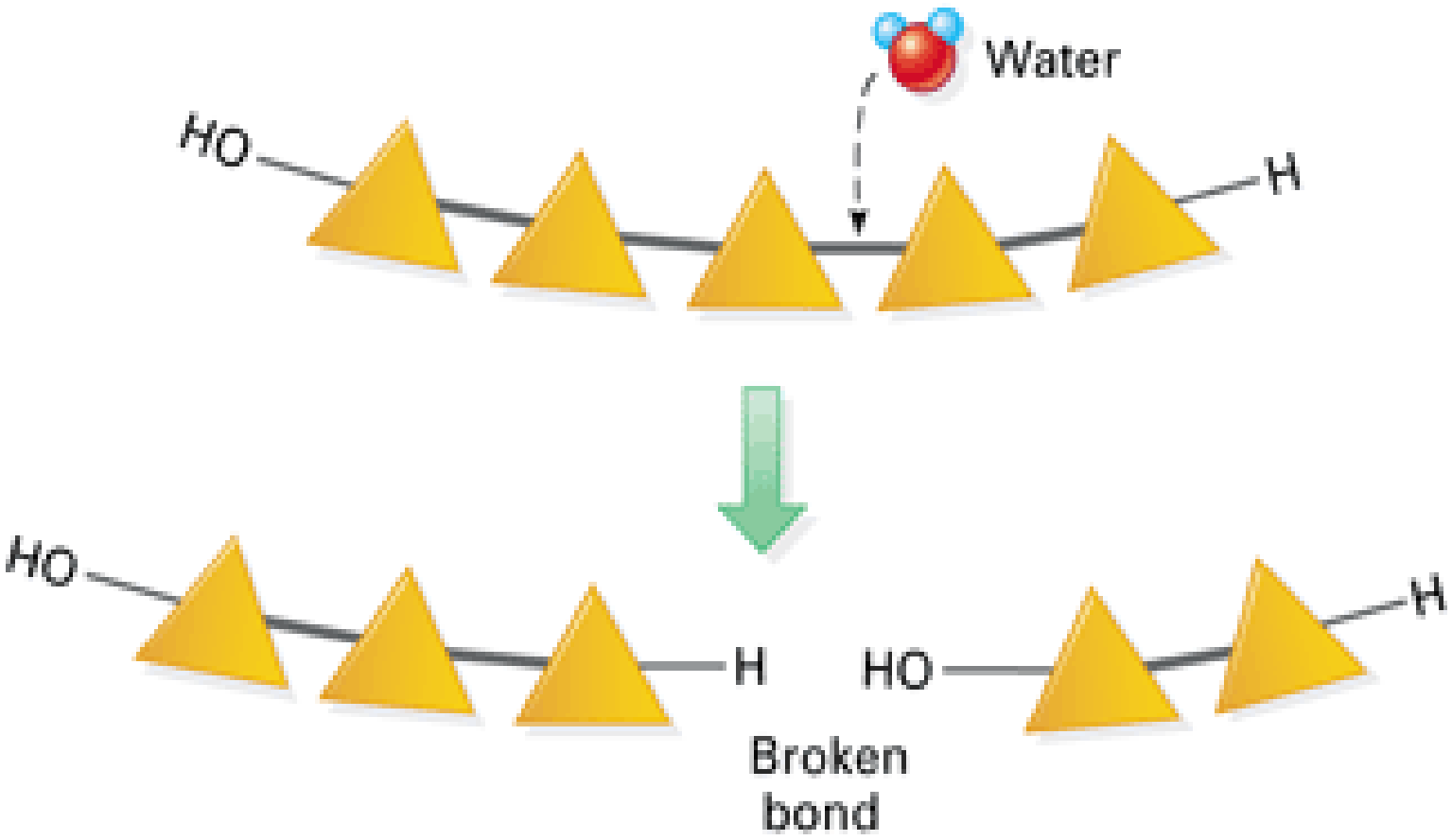
Breaking Polymers

- We also have to break down long chains in order to make the monomers available to the cells
- This is done by adding water to break the bonds
  - This is called a _____ reaction

Breaking Polymers

- We also have to break down long chains in order to make the monomers available to the cells
- This is done by adding water to break the bonds
  - This is called a HYDROLYSIS reaction

Breaking a Polymer Chain



What you should be able do after instruction on Section 5.1:

- Identify carbon skeletons and functional groups on organic molecules
- Relate monomers and polymers
- Describe the process of building and breaking polymers

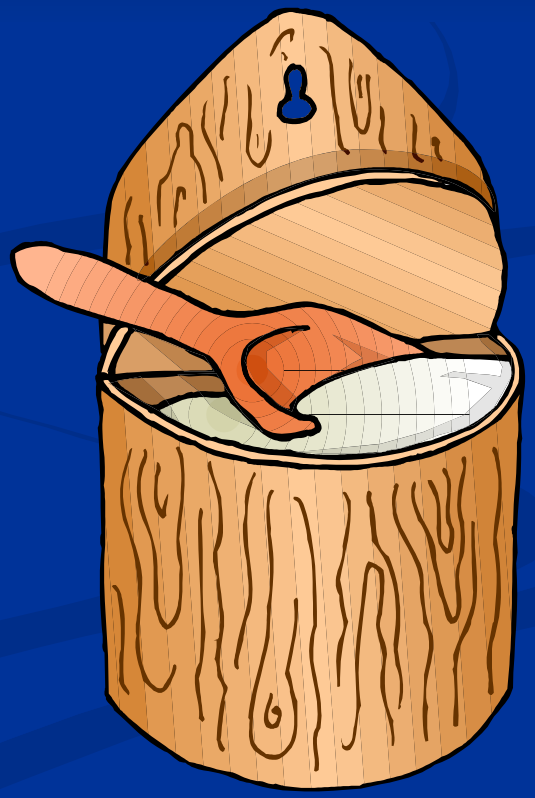
Use this information when studying for your test!

5.2 Carbohydrates

- =an organic cpd made up of sugar molecules
- Used as an energy source
  - Can be stored for later use
  - Can be used within minutes

Sugars

- Contain C, H, and O in a specific ratio
- Ratio 1C:2H:1O
- Formula $(CH_2O)_n$
- Most sugar molecules in nature have a ring shape



Monosaccharides

- =simple sugars containing just one sugar unit
- Examples
  - Glucose
  - Fructose
  - Galactose

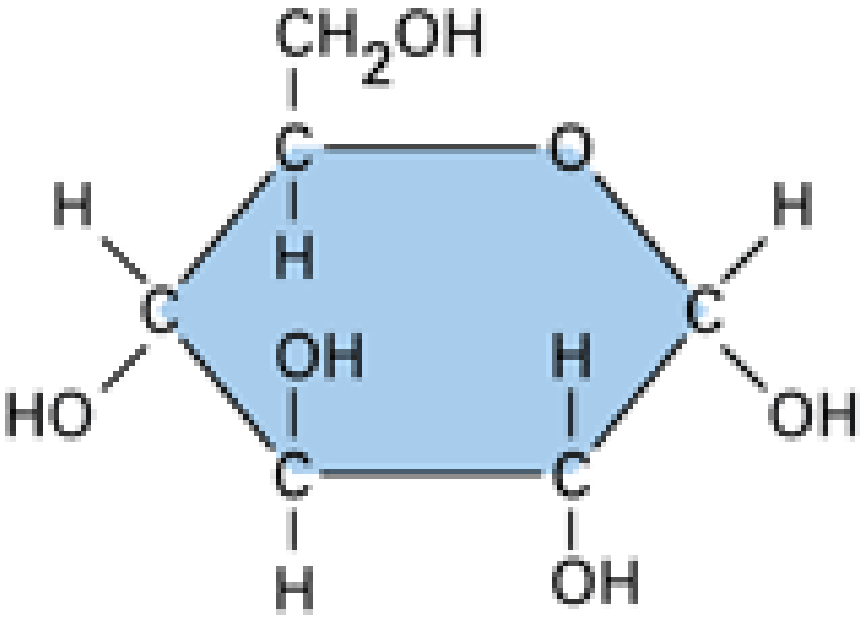
  - Names of sugars end in _____

Monosaccharides

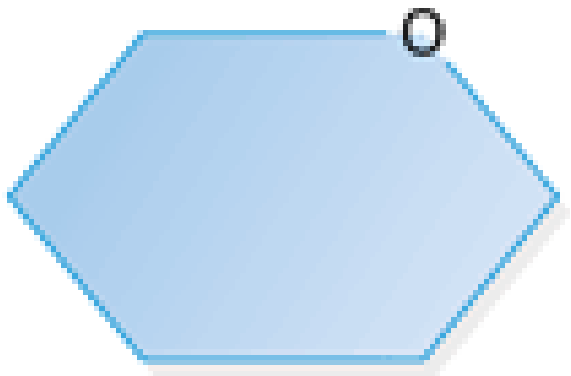
- =simple sugars containing just one sugar unit
- Examples
  - Glucose
  - Fructose
  - Galactose

  - Names of sugars end in ***-ose***

Glucose



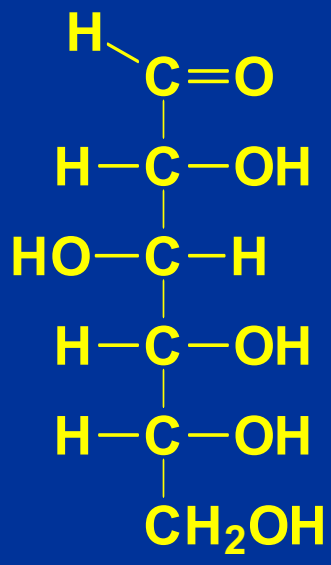
Molecular structure



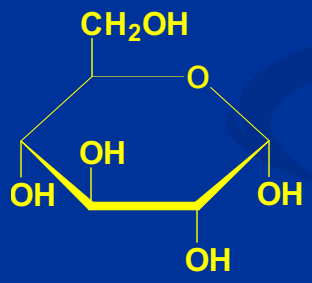
Simplified representation

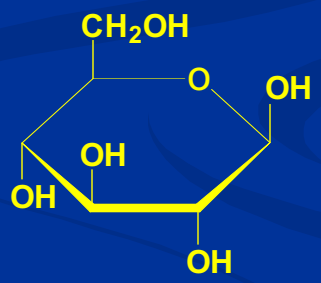
Glucose

- Exists in both straight-chain and ring-shaped structures



D-Glucose





Sugar Molecules

- Are the main fuel supply for cellular work
  - esp glucose!
  - Cells break down sugar molecules and extract the stored E
  - Cells use the carbon skeletons of monosaccharides as raw materials for other organic molecules

What if sugars aren't used right away?

- Incorporated into larger carbohydrates

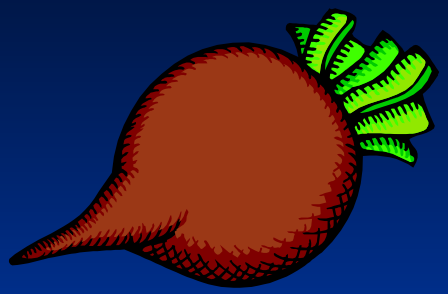
OR

- Used to make fat molecules

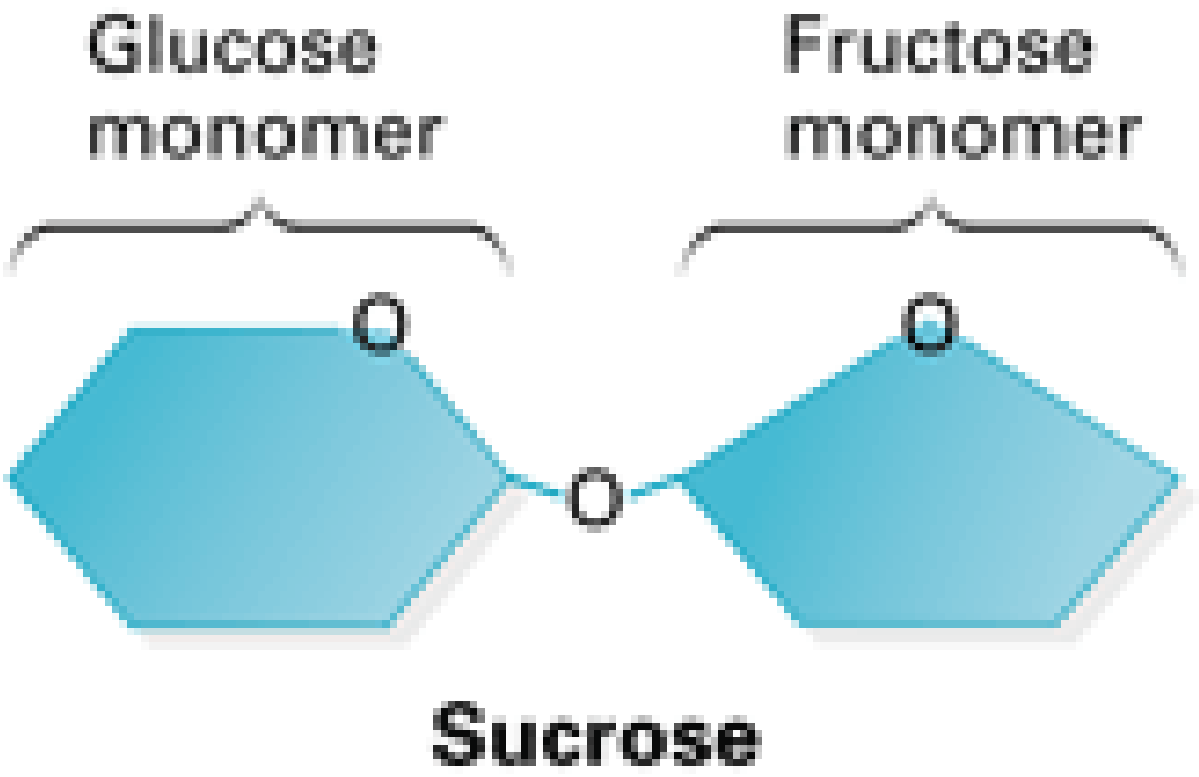
Disaccharides

- Using a dehydration reaction, cells put together 2 monosaccharides to make one disaccharide
- Most common is sucrose
- Other examples:
  - Lactose
  - maltose

Sucrose



- Glucose + Fructose
- Major carb in plant sap, so…
  - Nourishes plant
- Table sugar is extracted from stems of sugar cane or roots of sugar beets
- Can be broken down and used as soon as consumed
  - Or can store glucose



Sucrose

Polysaccharides

- =long polymer chains made up of simple sugar monomers
- Examples:
  - Starch
  - Glycogen
  - Cellulose

Starch

- Found in plant cells
- Composed of glucose monomers
  - Branch
- Humans can break down starch unto useful energy
- Examples of foods rich in starch:
  - Potatoes
  - Rice
  - corn

Glycogen

- In animal cells
- More highly branched than starch
- In humans
  - Stored as granules in liver and muscle cells
  - When body needs E, it breaks down glycogen, releasing glucose

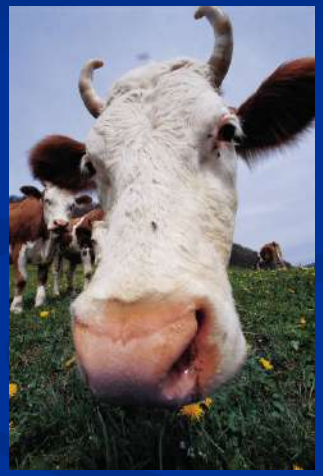
Cellulose

- Functions:
  - A building material in plants
  - Protect cells
  - Stiffen plant so it doesn't fall over

- Made of glucose monomers
- Multiple cellulose chains form H bonds
  - Makes a cable-like fiber in the cell walls

Cellulose

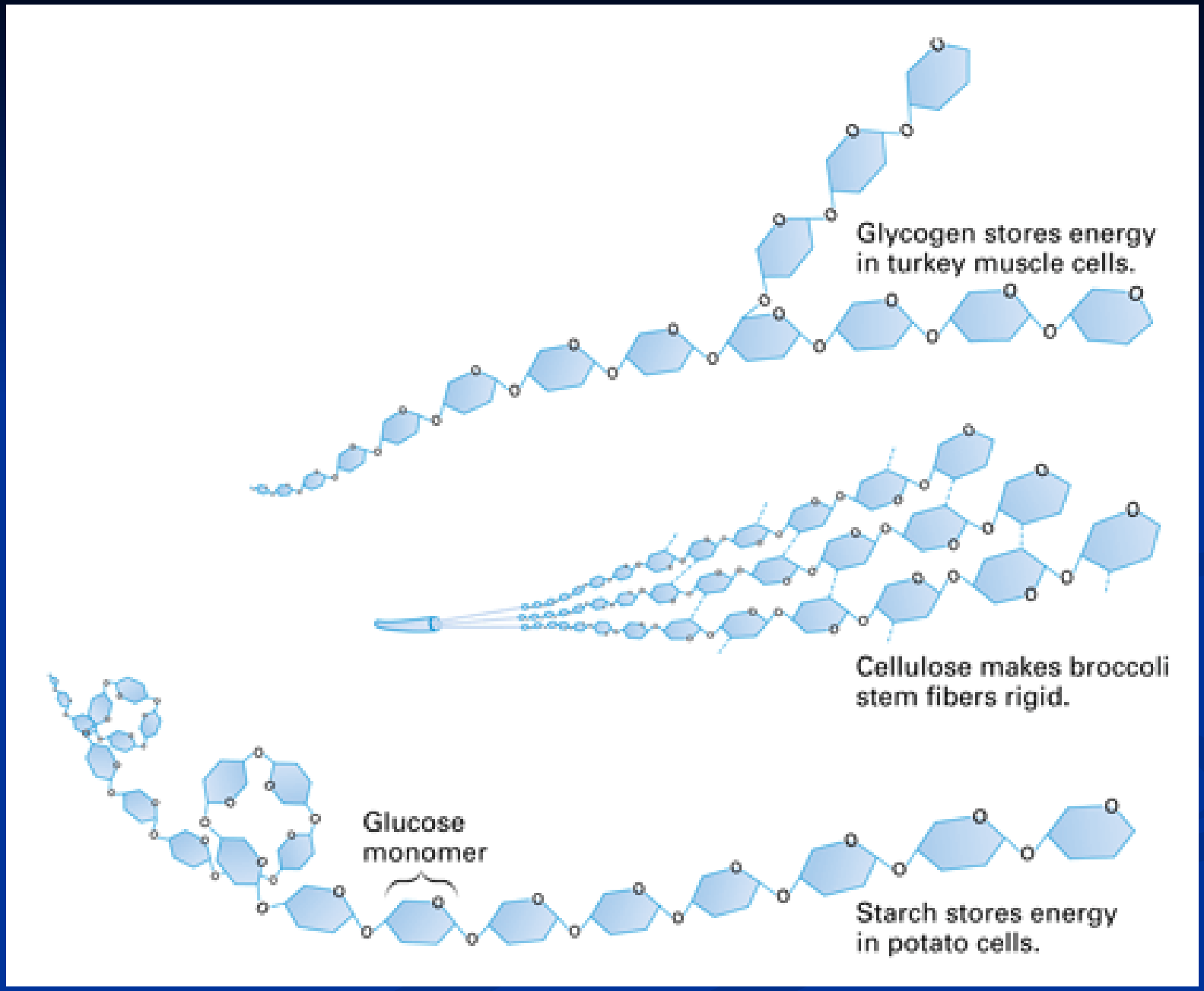
- Most animals cannot digest cellulose
  - Why?
- So…
  - Passes through body unchanged
- It is NOT a nutrient



- Cows and termites can digest cellulose…
  - How?

Properties

- ALMOST all carbs are hydrophilic because of –OH groups
- Mono- and disaccharides dissolve easily in water
  - Cellulose and some starches do not dissolve in water (even though they are hydrophilic)
    - Why?
    - Why is this good for the textile industry?


Glycogen stores energy in turkey muscle cells.
Cellulose makes broccoli stem fibers rigid.
Glucose monomer
Starch stores energy in potato cells.