

More About Digestion

Biochemistry is known as the chemistry of life. It is the chemistry of the living world. Plants and animals use the same basic chemical compounds to live their lives. All living things need energy to survive. To get this energy we must eat and digest food. The food we eat contains nutrients that our body needs to grow and function. The major nutrients we get from food are called carbohydrates (a fancy name for sugar and starch), proteins (from meat) and lipids (a fancy name for fats). During digestion our body breaks down the nutrients into smaller substances that we can use in our cells.

These substances are called molecules. There are several types of molecules but we need the molecules from organic compounds for nutrition. An organic compound is one that contains the element carbon and usually contains hydrogen, nitrogen and oxygen.

These are elements that have abbreviations of C, H, N and O. Scientists write the abbreviations for elements to save them from having to write the names of elements over and over.

1. Which of the following compounds are organic?

$C_6H_{12}O_6$ H_2O O_2 C_3H_4O
 $C_{10}H_{11}ClN_4$ KI $CaCl_2$ $C_8H_9NO_2$

2. Why did you choose the ones you did? _____

Testing for an Organic Compound

As we learned one type of nutrient is called starch. Starch is one kind of carbohydrate. We can use iodine stain to test for the presence of starch in food. If the food has starch in it, the iodine will turn from red/brown to a purple/black color.

Materials: Iodine stain, cookie, milk, slice of ham,, bread, portion cups, paper towel.

What To Do:

1. Lay out all the food items on a paper towel.
2. Place 2 drops of iodine on each food item.
3. Observe the color of the iodine stain.

Food Item	Color of Iodine stain before	Color of Iodine stain after	Starch Yes or No
Cookie			
Milk			
Bread			
Ham			

Questions:

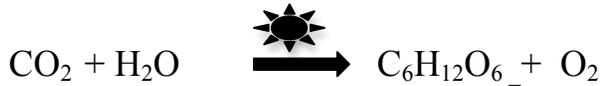
1. Which food items contained starch? _____
2. How do you know? _____
3. You have probably heard that you are supposed to eat a balanced diet. This means you should eat some of each type of nutrient. If you only eat these types of items would you be getting a balanced diet?

4. What would you have to do to have a balanced diet?

Energy Transformation in Digestion

You may remember learning about energy transformations last year. One of the energy transformations you learned about was the sun's radiant energy turning into chemical energy in plants. This happens in the process of photosynthesis.

This is the chemical reaction that occurs during photosynthesis:

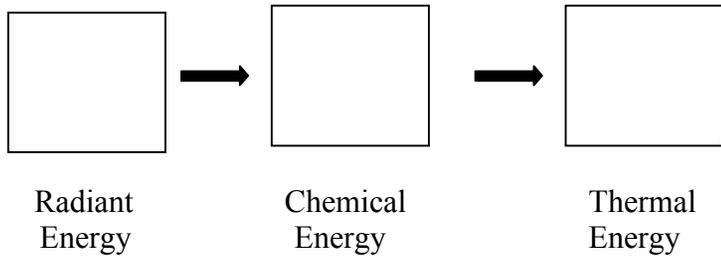


This is read: Carbon Dioxide plus Water (in the presence of energy from the sun) yields sugar plus oxygen. Notice all the carbon molecules in the formulas.

The sugar that plants make during photosynthesis is used by living things for food. During digestion the chemical energy in sugar is broken down and gives off thermal (heat) energy, which gives us energy to live. That chemical reaction looks like this:



1. In the space below draw some pictures that represent the energy transformations indicated.

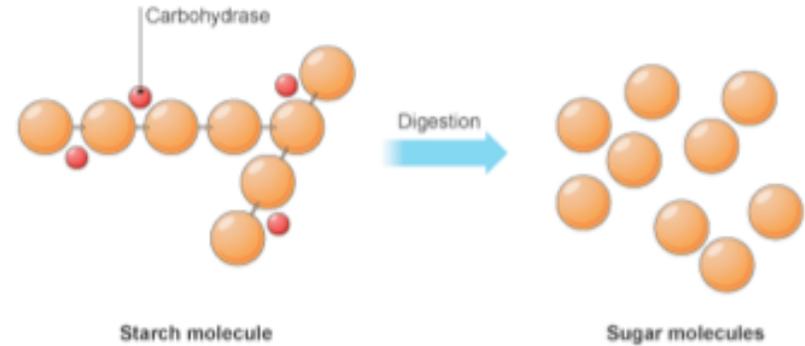


Breaking down large molecules in digestion

As you remember our teeth break food down into small pieces when we chew. This is one physical change that happens during digestion. The chemical changes start in the mouth, too. Some of the chemicals that break down food are called enzymes. Enzymes are special proteins that can break large molecules into small molecules. Different types of enzymes break down different nutrients.

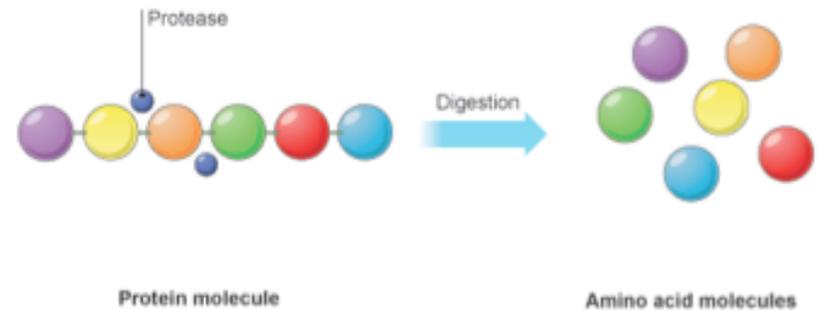
Carbohydrates, such as starch, are digested in the mouth, stomach and small intestine. Carbohydrase enzymes break down starch into sugars.

Color the starch and sugar molecules orange and the carbohydrase red.



Proteins are digested in the stomach and small intestine. Protease enzymes break down proteins into amino acids. Digestion of proteins is helped by stomach acid, which is strong hydrochloric acid.

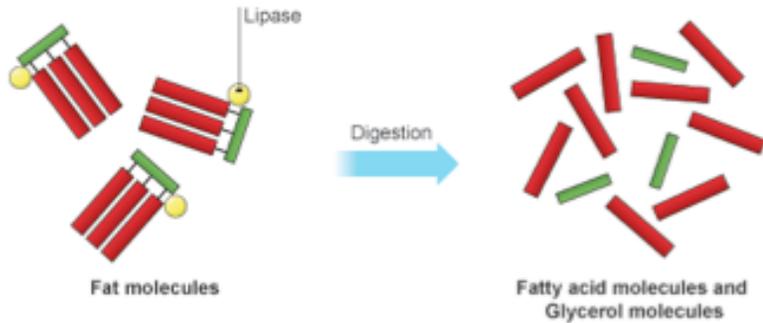
Color each of the parts of the protein molecule a different color then color the amino acid molecules the same colors. Color the protease blue.





Lipase enzymes break down fats into fatty acids and glycerol. Digestion of fat in the small intestine is helped by bile, which is made in the liver. Bile breaks the fat into small droplets that are easier for the lipase enzymes to work on.

Color the fat molecules red and green and the lipase enzyme yellow.



Place the name of each large molecule, the enzyme that breaks it down and the small molecule it is broken into in the table below.

Large Molecule	Enzyme	Small Molecule

In the foldable on the next page cut out around the large rectangle and then glue the anchor tab to a page in your lab notebook.

Under each flap write what you know about each enzyme listed.

Enzymes for Digestion	CARBOHYDRASE
	PROTEASE
	LIPASE

Name _____ period _____

EXIT TICKET

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1. What do enzymes do in the digestive system?
 - A. color the food brown
 - B. cause small molecules to join
 - C. cause large molecules to break down
2. What energy transformation occurs during photosynthesis?
 - A. Radiant to Chemical
 - B. Chemical to Thermal
 - C. Thermal to Chemical
3. What are the elements that are found in organic compounds?
 - A. CHOMPS
 - B. CHONPS
 - C. CHONFS
4. Which of the following is NOT a nutrient found in food?
 - A. Carbohydrate
 - B. Protein
 - C. Hydrochloric Acid
5. What smaller molecule does carbohydrase enzyme break starch into?
 - A. Sugar
 - B. Fatty Acids
 - C. Amino Acids

Name _____ period _____

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