AGENDA for 12/06/13

- AGENDA:
  1. 2.2.3: The Biochemistry of Food
     1. Building Macromolecules
     2. Understanding the Chemistry of Food
- OBJECTIVES:
  1. Complete a series of molecular puzzles to build macromolecules
  2. Explore the biochemistry of food

- HOMEWORK:
  - Due **Mon, 12-09**
    1. 2.2.3. Activity Packet
  - 2.2 Key Terms Quiz **Mon, 12-09**
  - 2.2.3 Quiz on Chemistry on **Tues, 12-10**

Essential Questions for 2.2.3

7. What are the main structural components of carbohydrates, proteins and lipids?
8. What is dehydration synthesis and hydrolysis?
9. How do dehydration synthesis and hydrolysis relate to harnessing energy from food?

2.2 Key Terms

Adenosine tri-phosphate (ATP)	A compound composed of adenosine and three phosphate groups that supplies energy for many biochemical cellular processes by undergoing enzymatic hydrolysis.
Amino Acid	An organic monomer which serves as a building block of proteins.
Calorie	The amount of heat energy required to raise the temperature of 1 g of water by 1°C; also the amount of heat energy that 1 g of water releases when it cools by 1°C. The Calorie (with a capital C), usually used to indicate the energy content of food, is a kilocalorie.
Carbohydrate	A sugar in the form of a monosaccharide, disaccharide or polysaccharide.
Chemical Bond	An attractive force that holds together the atoms, ions, or groups of atoms in a molecule or compound.
Chemical Indicator	A substance (as a dye) used to show visually usually by its capacity for color change, the condition of a solution with respect to the presence of free acid or alkali or some other substance.
Chemical Reaction	Chemical transformation or change; the interaction of chemical entities.
Compound	A substance consisting of two or more elements in a fixed ratio.
Covalent bond	A type of strong chemical bond in which two atoms share one or more pairs of valence electrons.
Dehydration Synthesis	A chemical reaction in which two molecules are bonded together with the removal of a water molecule.
Disaccharide	A double sugar molecule made of two monosaccharides bonded together through dehydration synthesis.
Element	The smallest particle of a substance that retains all the properties of the substance and is composed of one or more atoms.
Glucose	A monomer of carbohydrate, simple sugar.
Homeostasis	The maintenance of relatively stable internal physiological conditions (as body temperature or the pH of blood) in higher animals under fluctuating environmental conditions.
Hydrolysis	A chemical process that splits a molecule by adding water.
Ionic bond	A chemical bond resulting from the attraction between oppositely charged ions.
Lipid	One of a family of compounds including fats, phospholipids, and steroids that is insoluble in water.
Macromolecule	A type of giant molecule formed by joining smaller molecules which includes proteins, polysaccharides, lipids, and nucleic acids.
Molecule	Two or more atoms held together by covalent bonds.
Monomer	The subunit that serves as the building block of a polymer.
Monosaccharide	A single sugar molecule such as glucose or fructose, the simplest type of sugar.
Nutrient	A substance that is needed by the body to maintain life and health.
Polymer	A large molecule consisting of many repeating chemical units or molecules linked together.
Polysaccharide	A polymer of thousands of simple sugars formed by dehydration synthesis.
Protein	A three dimensional polymer made of monomers of amino acids.

Activity Objectives – 2.2.3.

1. Complete a series of molecular puzzles to build macromolecules
2. Explore the biochemistry of food

2.2.3. Conclusion Question

1. Explain the relationship between chemical bonds and energy in the body.
2. Explain what has to happen to join two monosaccharide units into a disaccharide.
3. A person eats a large pasta meal at lunch and then goes for a run before dinner. Explain how the body taps energy from this starchy meal.
4. Explain how it is possible to have thousands of different proteins when there are only 20 different amino acids.
5. How do saturated triglycerides compare to unsaturated triglycerides in how tightly they pack together? Based on this information, which of these triglycerides is likely to be a solid at room temperature? Explain your reasoning.
6. Why aren't lipids considered polymers?
7. Based on what you have now learned about biochemistry, predict which one of the three types of carbohydrates (monosaccharide, disaccharide, or polysaccharide) would have more energy stored in its structure. Explain your answer.
8. Some people might argue that an orange is a high energy food. Others would disagree and consider a cup of pasta to be a high energy food. How is it possible for both groups of people to argue their position and be correct? Based on the actual biochemistry of the molecules involved, which food has a higher energy content? Explain your answers.
9. Even though lipids and carbohydrates are made from the same elements (carbon, hydrogen, and oxygen), why is it easy to tell them apart when viewing a model of each?

Due Mon, 12-09

2.2.3 Activity Checklist

1. 2.2.3. Completion of *Part 1: Chemistry Basics Interactive* Presentation STAMP — 1
2. 2.2.3. Chemistry Basics Notes (NB) STAMP — 2
3. 2.2.3. Building Molecules (see separate checklist) STAMP — 4
4. 2.2.3. Molecule Drawings (NB) — 5
5. 2.2.3. Completed Student Response Sheet (handout) — 4
6. 2.2.3. Conclusion Questions — 3
7. Clean-Up and Kit Return STAMP — 1

Total = 20

2.2.3: Building Molecules Checklist

BUILD MODEL	CURRICULUM STEPS	GROUPS NEEDED	✓ COMPLETED
1) WATER	4-5	1	
2) MONOSACCHARIDE	14-15	1	
3) DISACCHARIDE	18-20	2	
4) POLYSACCHARIDE	25	4	
5) STARCH	28	WHOLE CLASS	
6) AMINO ACID	31-33	1	
7) DIPEPTIDE	35-37	2	
8) POLYPEPTIDE	40-41	4	
9) GLYCEROL	46-47	1	
10) SATURATED FATTY ACID	49-50	1	
11) TRIGLYCERIDE (SATURATED)	51-53	2	
12) TRIGLYCERIDE (UNSATURATED)	56-57	2	
13) MULTIPLE TRIGLYCERIDES	58-59	WHOLE CLASS	

2.2.3. Activity Directions

2.2.3. Completion of *Part 1: Chemistry Basics Interactive* Presentation and Notes

1. Refer to curriculum file for more detailed instructions
2. Open the *Chemistry of Life* presentation file
3. Follow directions and complete *Part I: Chemistry Basics*
4. Takes notes in your NB
5. Make sure to define the following terms in your notes:
   - Dehydration synthesis (see step 21 in curriculum)
   - Hydrolysis (see step 23 in curriculum)

2.2.3. Building Molecules

1. Refer to curriculum file for more detailed instructions.
2. Go to Part 2: *Macromolecules* section of the interactive presentation to help you complete this part of the activity
3. You will need to show Mr. Hwang each build and at completion of all models (see separate checklist), you will received a stamp
4. Rules for building molecules:
   - Oxygen and Hydrogen atoms can bond with anything they fit with. Remember that each snap represents a covalent bond.
   - A molecule is stable (complete) only if it has no available pegs or slots (Note: proteins are an exception).
   - Macromolecules are assembled by connecting puzzle pieces of the SAME color and oxygen and hydrogen atoms.
   - The lettering on the puzzle pieces must be visible and all in the same general direction when assembling the puzzle pieces.

2.2.3. Molecule Drawings (NB)

1. Refer to curriculum file for more detailed instructions
2. Draw each of the molecules that you are asked to build
3. Be sure to *name* each of the molecules
4. Be sure to *label* each *element or atom type* in the molecule
5. Color each of your drawings
6. See steps 6, 10, 16, 20, 26, 28, 34, 38, 48, 54

2.2.3. Completed Student Response Sheet (handout)

1. Refer to curriculum file for more detailed instructions.
2. Fill out the student response sheet as you are completing the *Part II: Macromolecules* portion of the presentation file and while you are building your molecules
3. Complete each Puzzle Set in the interactive presentation file

Clean-Up and Kit Return

1. Clean-Up and return kit materials to the correct containers
2. Make sure all pieces are returned and are accounted for
3. Receive a stamp once pieces are counted and returned