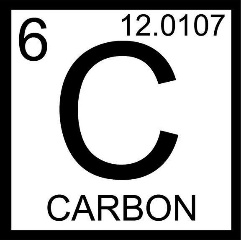
Chapter 2 Mader Study Guide Part 1 Name: Colin Quinn  
Bio 241

Directions: put things into your own words as best you are able. Be as concise as you can while still being accurate. If you are having trouble answering a question, first look at Mader, then google. If you are still having trouble, don’t stress. 70% of completion is considered an A on this activity but try to answer to the best of your ability as your pre-work on this will help us have better discussions in class.

2.1 From Atoms to Molecules

1. What is the term that describes a basic building block of matter that cannot be chemically broken down further? Atom
2. Label this neutral atom with atomic number, atomic mass, and element. For this element, describe how many electrons, protons, and neutrons it has. Defend your answer. Atomic Number: 6. Atomic Mass: 12.0107. This is Carbon, with 6 electrons, 6 protons, and 6 neutrons.



1. What is the smallest unit of an element? Hydrogen
2. What charges do protons, neutrons, and electrons have? Electrons are negative, protons are positive, and neutrons are neutral.
3. What is an ion? What charges can ions take on? An ion is an element that has lost or gained electrons, giving it a positive or negative charge.
4. Look at the periodic table of the elements. A. Where are metals located? B. Where are nonmetals located? C. What are transition elements? D. What is the difference between a period and a group in the periodic table? Nonmetals are on the right, transition metals are in the middle, and metals are elsewhere.
5. Atoms bind with other atoms to form \_\_\_molecules\_\_\_.
6. Some atoms come together and form covalent bonds with other atoms. Other atoms come together and form ionic bonds. Why do atoms bond in the first place/what is the underlying reason for bond formation? Atoms bond in order to balance their outer shells so they can be more stable.
7. Describe the nature of ionic and covalent bonds. Why do some atoms have a tendency of forming ionic bonds? Covalent bonds? Ionic bonds are when an electron is donated to the other atom (between metal and nonmetal) and covalent bonds are when the atoms share an electron (between 2 nonmetals).
8. Use google to find the structural formula for water. Draw it here.
9. Use google to find the molecular formula for water. Write it here.

2.2 Water and Life

1. Water makes up what percentage of body weight? 60%

2. What does it mean that water molecules exhibit polarity in their bonds? Oxygen is more negative than hydrogen is positive, so the electrons are pulled towards each other.

3. What is a hydrogen bond? In a glass of water, where are the hydrogen bonds seen? A much weaker bond between hydrogen and another atom.

4. Define cohesion and adhesion from a chemical perspective. Cohesion is water being attracted to other water molecules due to its polarity. Adhesion is when water is attracted to other molecules with positive or negative charges.

How does having hydrogen bonding abilities contribute to water’s cohesive and adhesive forces? The different strengths of hydrogen bonds allow for things like surface tension to exist.

When are the cohesive and adhesive forces of water advantageous in the body? In things like our tear ducts and allowing the water to move upwards without much effort.

5. What is heat capacity? Water has a high heat capacity—why is this advantageous in the body? Heat capacity is the amount of energy it takes to heat 1g of something 1 degree Celsius. Water has a relatively high heat capacity, meaning bodies with lots of water can remain at a homeostasis with ease.

6. What is heat of evaporation? Why is water’s having a high heat vaporization advantageous in the body? Similar to listed above, it is the amount of energy to evaporate a liquid. It means that we can have a wide variety of climates and survive quite well.

7. Water is known as the universal solvent; it dissolves more things than other solvents.   
A. What are the chemical properties of things that can be dissolved by water? Sugar, salt, proteins  
B. What are the chemical properties of things that are not so easily dissolved? Oils, fats, organic solvents.

8. Consider that blood is composed of 92% water. Since water is the solvent of things in the blood, how does this impact drug design? What does this mean for digestion? Things that are dissolvable in water are usually favorable since it happens naturally.

9.Use google to check out the blood: brain barrier. What chemical properties must be true of substances that are used to treat neurological disorders or conditions, to be able to cross the blood: brain barrier?

10. Notice that when we define acid and base, we assign these terms relative to substances’ abilities to dissociate in water.

11. What is the chemical definition of an acid? What bodily fluids are acidic? A chemical that donates protons or accepts electrons. Stomach acid

12. What is the chemical definition of a base? What bodily fluids are basic? A chemical that donates electrons, accepts protons, or releases hydroxide. DNA,

13. The pH scale is a log based scale describing the acidity or alkalinity of a solution; a pH of 7 is considered neutral, with a relatively equal amount of Hydrogen ions as hydroxide ions released when the substance is released in water.   
If a substance is released in water and more hydroxide ions than hydrogen ions are released, it is considered a \_\_base\_\_.

If a substance is released in water and more hydrogen ions than hydroxide ions are released, it is considered a \_\_acid\_\_.

14. What is the role of a buffer? To resist change in a solutions pH.

2.3 Molecules of Life

1. What are the 4 categories of organic macromolecules found in cells? Carbohydrates, lipids, proteins, nucleic acids.

2. What does it mean for a substance to be organic, from a chemist’s perspective? Contains C, H, O, N, P, and S.

3. What reaction is used to build a macromolecule from monomers? Dehydration synthesis

4. What reaction is used to break down a macromolecule into its monomers? Hydrolysis

5. Consider what you ate for one of your meals yesterday. Assign each of the components to its macromolecule category.