Biology 1113
Sections 3.1,3.2,4.2,4.3

Each topic is the focus of each section from the book. The questions answered are from the concept questions at the end of the chapter. Please not that not all questions are answered, the vast majority are, and I don't claim that my answer are the only right answer or they are always right. The guide follows a numerical order in which the chapter were taught. This guide utilizes concept and concept questions from Campbell Biology, "Biology" by Reece, Urry, Cain, Wasserman, Minorsky, and Jackson. It also involves information learned from Professor Ball's lectures. Any of their work shown here is copyrighted and belongs to them respectively. I do not own any of this information. All images were acquired from Google images and they are also copyrighted and belong to them. I do not own any of these images.

Biology 1113

3.1, 3.2, 4.2, 4.3 Reading Notes

The Molecule that Supports All of Life:

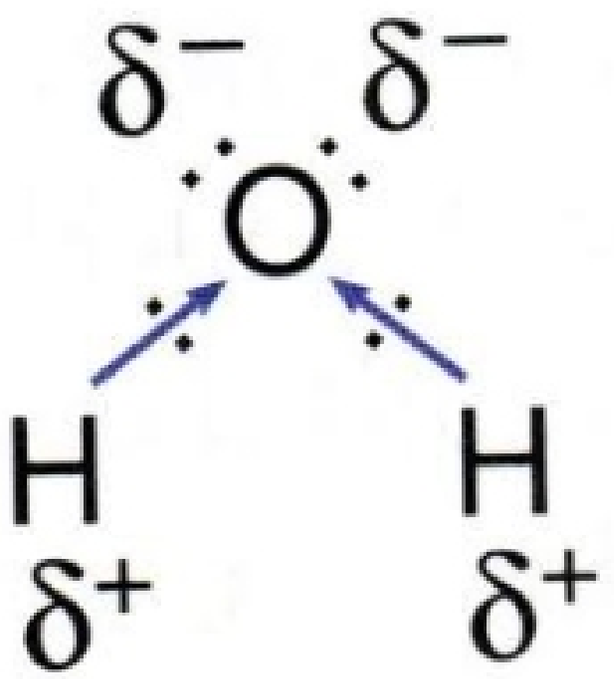
Water makes all life on earth possible.

- A biological medium.

3.1: Polar Covalent Bonds in water molecules result in hydrogen bonding

Oxygen is more electronegative than hydrogen so the electrons of the covalent bonds spend more time closer to oxygen than to the hydrogen.

- This results in polar covalent bonds
  - This means it is a polar molecule: the overall charge is unevenly distributed.
  - The oxygen has a partial negative charge while the hydrogen has a partial positive charge.



The water internal bonds are polar; however, water bonded to water is a hydrogen bond.

- These bonds are very weak, 1/20 the strength of a covalent bond, they break and reform with great frequency.

3.1 Concept Check questions

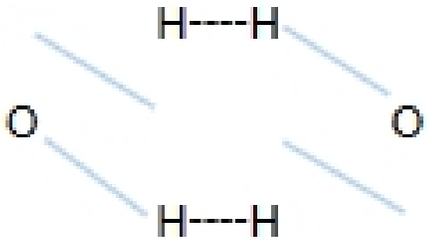
1. What is electronegativity and how does it affect interactions between water molecules? (Reference pg. 39 & figure 2.13)

Answer: Due to the fact that the oxygen is more electronegative it pulls more electrons towards itself causing it to become more negative than the hydrogen resulting in uneven distribution of electrons. This is what causes the polar bonding.

→ Electronegativity is the attraction of a particular atom for the electrons of a covalent bond. The **MORE** electronegative an atom is the stronger it pulls shared electrons toward itself.

→ Covalent bonds share the electrons evenly.

2. Why is it unlikely that two neighboring water molecules would be arranged like this?



Answer: This is unlikely to occur because the hydrogens are both positive. In bonding the opposites attract and similarities repel. Therefore, the hydrogens should be depicted bonding to the oxygen.

3. What would be the effect on the properties of the water molecule if oxygen and hydrogen had equal electronegativity?

Answer: The bonds would become covalent because the definition of a covalent bond is evenly shard electrons. This would also depolarize the molecule.

3.2: Four emergent properties of water contribute to Earth's suitability for life

Cohesion of water molecules:

- Water molecules stay close together as a result of hydrogen bonding.
- Cohesion: Being bound together through bonding, in the case of water hydrogen bonds.
- Adhesion: The clinging of one substance to another.
- Surface tension: A measure of how difficult it is to stretch or break the surface of a liquid.

Moderation of temperature by water:

Water moderates air temperature by absorbing heat from air that is warmer and releasing the stored heat to air that is cooler.

- Kinetic energy: The energy of motion
    - The faster the movement of a molecule the greater the kinetic energy.