

Chapter 3 – Water and the Fitness of the Environment

The Properties of Water

1. With the use of a diagram or diagrams, explain why water molecules are:
 - a. polar
 - b. capable of hydrogen bonding with four neighboring water molecules
2. List four characteristics of water that are emergent properties resulting from hydrogen bonding.
3. Define **cohesion** and **adhesion**. Explain how water's cohesion and adhesion contribute to the movement of water from the roots to the leaves of a tree.
4. Distinguish between heat and temperature, using examples to clarify your definitions.
5. Explain the following observations by referring to the properties of water:
 - a. Coastal areas have milder climates than adjacent inland areas.
 - b. Ocean temperatures fluctuate much less than air temperatures on land.
 - c. Insects like water striders can walk on the surface of a pond without breaking the surface.
 - d. If you slightly overfill a water glass, the water will form a convex surface above the top of the glass.
 - e. If you place a paper towel so that it touches spilled water, the towel will draw in the water.
 - f. Ice floats on water.
 - g. Humans sweat and dogs pant to cool themselves on hot days.
6. Distinguish among a solute, a solvent, and a solution.
7. Distinguish between hydrophobic and hydrophilic substances.
8. Explain how you would make up a one molar (1M) solution of ethyl alcohol.

The Dissociation of Water Molecules

9. Name the products of the dissociation of water and give their concentration in pure water.
10. Define **acid**, **base**, and **pH**.
11. Explain how acids and bases may directly or indirectly alter the hydrogen ion concentration of a solution.
12. Using the bicarbonate buffer system as an example, explain how buffers work.
13. Briefly explain the causes and effects of acid precipitation.