**Aqueous Chemistry**

**Explain water’s properties in term of its ability to form hydrogen bonds.**

* Describe the electronic structure of a water molecule.
* Identify hydrogen bond donor and acceptor groups.
* List the other types of weak noncovalent forces that affect biological molecules.
* Describe how water interacts with polar and charged solutes.

**Relate the solubility of substances to the hydrophobic effect.**

* + Explain the hydrophobic effect in terms of water’s entropy.
  + Predict the water solubility of hydrophobic and hydrophilic substances.
  + Describe how amphipathic substances behave in water.
  + Explain why a lipid bilayer is a barrier to diffusion.

Q: How does the entropy of water change when a non-polar material is added to the solution?

Q: Is there a change in the free energy of the system described above? Increase or decrease?

Q: How do amphipathic molecules orient themselves in aqueous solution?

Q: What molecules can freely pass through the cell membrane (lipid bilayer)?

**Determine the effects of acids and bases on a solution’s pH.**

***K*W = [H+][OH-] = 1 x 10-14**

**pH = -log [H+]**

**pH = pK + log ([A-]/[HA])**

* Recognize the relationship between the concentrations of H+ and OH-.
* Predict how the pH changes when acid or base is added to water. (calc. 2.1)
* Perform calculations using the Henderson-Hasselbalch equation. (calc. 2.2, 2.3)
* Predict the ionization states of acid-base groups at a given pH. (calc. 2.4)

**Describe how buffer solutions resist changes in pH.**

* Recognize the acidic and basic species in a buffer solution.
* Use the Henderson-Hasselbalch equation to devise a recipe for a buffer solution. (calc. 2.5)
* Determine the useful pH range of a buffer solution.

**Explain how the human body maintains a constant pH.**

* Write the equations that describe operation of the bicarbonate buffer system in the human body.

