**AP Biology U3/U4 Study Guide**

**Ch. 2-3 Basic Chemistry and Water:**

1. Understand the difference between:
   1. Covalent bonds
   2. Ionic bonds
   3. Hydrogen bonds
2. Understand the difference between:
   1. Hydrophilic vs Hydrophobic
   2. Polar - attracted to water
   3. vs Nonpolar – repelled by water
   4. vs amphipathic (phospholipids)
   5. Dehydration Synthesis (condensation) – forms bonds; monomer 🡪 polymer, loses water
   6. vs Hydrolysis (digestion) – breaks bonds; polymer 🡪 monomer; add water
   7. Monomers vs Polymers (and examples)
3. Understand properties of water:
   1. Polarity
   2. Formed by internal covalent bonds
   3. Attracted to other water molecules via hydrogen bonding – causes cohesion
   4. Capillary action: cohesion + adhesion
   5. High heat capacity – resists temp. change
   6. High heat of vaporization - cooling properties
   7. High surface tension – disrupted by soap
   8. Lower density as a solid (ice)

**Ch. 4-5: Organic Molecules**

1. Characteristics of each monomer/polymer pair (4 macromolecules)
2. Functions/purposes of the “big 4”
3. Elements (atoms) of each of the “big 4”
4. Recognize types of bonds between:
   1. Amino acids – *peptide bonds*
   2. Lipids (glycerol + fatty acid) – *ester linkage*
   3. Nucleic acids (DNA/RNA)
      1. sugar + phosphate – *phosphodiester bond*
      2. nitrogen bases (A/T and G/C) – *hydrogen bonds*
   4. Carbohydrates – *glycosidic bond*

**Ch.6 : Cells and Organelles**

1. Prokaryotic vs. Eukaryotic cells
   1. Structural similarities and differences
   2. Pictures
2. Animal vs. Plant cells – similarities and differences
3. All the organelles and their functions!!!!
4. 3 Types of cytoskeleton – structure, functions
5. Pathway a molecule would take as it enters a cell; sequence of cell structures that would be encountered
   1. And how this is different in pant vs animal cells
6. Pathway (sequence of cell structures) that follow protein production from DNA 🡪 exocytosis
   1. Recognize in words and pictures
   2. Know functional steps at each cell location
7. Difference between sequence of events and cell structures involved in making proteins for excretion vs cytoplasmic proteins
8. Parts of the cell that make up the endomembrane system
9. Know what apoptosis is and which organelles direct this event

**Ch. 7: Cell Membrane and Transport**

1. Significance of cells having a high surface area: volume ratio
2. How to calculate surface area and volume and write as a ratio
3. Structure of the phospholipid bilayer
4. Importance of cholesterol in the membrane
5. Role of unsaturated fatty acids in the membrane
6. Integral vs. Peripheral proteins in cell membrane – properties (hydrophobic vs hydrophilic regions), roles
7. Know how to interpret a “u-tube”
   1. Identify hyper, hypo, isotonic
   2. Predict movement of water or solutes across the semi-permeable membrane
8. Terminology:
   1. Hypertonic
   2. Hypotonic
   3. Isotonic
   4. Plasmolysis (plasmolyzed)
   5. Turgid
   6. Flaccid
9. Impact of cell wall on plant cell tonicity
10. Be able to predict effect of changing solute concentration on cells likelihood to shrink, swell, or stay the same; swell vs burst
11. Passive vs. Active Transport (direction of molecule movement with/against a gradient, use of energy, use of proteins for channels/carriers or pumps, types of molecules moved)
12. How to calculate water potential

**Other Bio stuff:**

* Scientific Method
* Independent vs. Dependent Variables
* Mutualism (+/+)
* Central Dogma: DNA🡪mRNA🡪protein (transcription 🡪 translation)
* Aqueous = water