Ch. 6: Bioenergetics I

- Fundamentals of chemical reactions:
  - Exergonic Reaction: a chemical reaction where there is less free energy than when the reaction started
  - Endergonic Reaction: a chemical reaction where there is more free energy than when the reaction started
    - cells are constantly breaking bonds & add bonds & making bonds in these reactions to provide fuel to synthesis new molecules
    - growing bonds/adding molecules adds energy (as molecules get more & more complex they store energy)
- Intro to catalysis: catalysis may be the most fundamental of protein functions
  - catalysis: to help a reaction go forward (shaping chemical reactions)
  - enzymes (catalysts) have two functions
    - bring substrates together in precise orientation so that the elections involved in the reaction can interact
    - decrease the amount of kinetic energy (activation energy) reactants must have for the reaction to proceed
  - enzyme catalyst shrinks activation energy needed
- Intro to ATP:
  - ATP consist of the 3 phosphate groups (hence triphosphate) as well as ribose & adenine
  - energy is released when ATP is hydrolyzed
    - when a phosphate bond is broken ATP becomes ADP (diphosphate) & energy is released that was stored in that covalent bond
    - hydrolysis: ATP reacts w/ water to lose a phosphate group (water breaks the bond) & becomes a part of the product
- ATP hydrolysis & protein phosphorylation:
  - Phosphorylation: the attachment of a phosphate group to a molecule
  - in order for phosphorylation to occur energy is released (enzyme become phosphorylated)
  - energetic coupling: where an exergonic phosphorylation reaction of a protein is paired w/ an endergonic reaction
  - in cells endergonic reactions become exergonic when the substrates or enzymes involved are phosphorylated
  - enzymes borrow energy from ATP & stick it into the system where it's needed
  - ATP donates energy into system by forming bond that's in transition state (breaking bond re-releases energy so reaction can go forward)
- Enzymes:
  - enzymes are simply proteins w/ a specific shape
  - initiation: reactants bind to the active site of an enzyme in a specific orientation, forming an enzyme-substrate complex