

Ch. 7: Cellular Respiration

- In cells the endergonic reactions needed for life are paired w/ exergonic reactions requiring ATP
 - Cellular respiration produces ATP from molecules w/ high potential energy (usually glucose)
 - ATP: adenosine triphosphate
 - In cells electrons are the most important source of chemical potential energy
 - amount of PE in an e⁻ is based on its position relative to positive & negative charges
 - e⁻ closer to negative charges (from other e⁻) & farther from positive charges (in nuclei of nearby atoms), have higher PE
 - A molecule's PE is a function of its e⁻ configuration & position
 - Redox Reaction
 - Reduction-oxidation reactions (redox reactions): are chemical reactions that involve e⁻ transfer
 - when atom/molecule gains an e⁻ it is reduced
 - when atom/molecule loses an e⁻ it is oxidized
 - e⁻ donors are always paired w/ e⁻ acceptor
 - each e⁻ transferred from one molecule to another during redox reaction is usually accompanied by a free proton (H⁺: usually a hydrogen ion)
- reduced molecule gains a proton (& an e⁻) & has higher PE
oxidized molecule loses a proton (& an e⁻) & has lower PE
- Nicotinamide adenine dinucleotide (NAD) is reduced (gains an e⁻) to form NADH
- the H at the end of NADH is b/c it gained a free proton as well (H⁺)
NADH readily donates e⁻ to other molecules & is called an e⁻ carrier & has a "reducing power" (ability to donate e⁻ to other molecules)
- Oxidization of Glucose:
 - Glucose contains high PE bonds b/c they contain e⁻ that can move easily
 - Through cellular respiration glucose is broken down, & oxidized (loses e⁻) & passed on to other molecules
 - Carbon atoms of glucose are reduced to form Carbon Dioxide, & the oxygen atoms in oxygen are reduced to form water
 - we're getting the energy out of glucose to fuel production of ATP
 - Cellular Respiration:
 - glucose is used to make ATP through cellular respiration
 - cellular respiration has 4 steps

Glycolysis: glucose is broken down to pyruvate

Pyruvate processing: pyruvate is oxidized to form acetyl CoA

Citric acid cycle: acetyl CoA is oxidized to Carbon Dioxide

Electron transport & chemiosmosis: compounds that were reduced in steps 1-3 are oxidized in reaction leading to ATP production