

Last Time:

1. Metabolism covers the biochemical mechanisms for energy production, waste processing, and synthesis of biomolecules.
2. Cells convert chemical (sugars, fats, protein) and physical (sunlight) energy to chemical forms (ATP). They use chemical energy and simple molecules (CO₂, H₂O, NH₃, etc.) to synthesize basic biomolecules and their derivatives.
3. Living organisms mediate the cycling of carbon, nitrogen, oxygen and hydrogen, and other elements, between organic and inorganic forms. Solar radiation is the engine that turns this global cycle.
4. Systems are collections of matter (molecules) in a defined region of space. The surroundings represent everything outside of a defined region. The system and its surroundings constitute the universe. A chemical reaction, organelle, cell or organism may all serve as a system.
5. Molecules possess energy, primarily in their chemical bonds (intramolecular and intermolecular). Chemical reactions frequently proceed with energy changes. Three primary thermodynamic quantities (G, H, and S), describe these changes.
6. G (Gibb's free energy) expresses the amount of energy capable of doing work in a system. H (enthalpy) is an expression of the heat content (bond energies) in a system, and S (entropy) is an expression of the randomness of a system. The three expressions are related by the expression $\Delta G = \Delta H - T\Delta S$, which says that the free energy change for a system depends on the change in the enthalpy and entropy. Positive ΔG values indicate a net absorption of free energy from the surroundings. Postive ΔH values indicate a net absorption of (heat) energy from the surroundings while positive ΔS values indicate the system increases in disorder.

Terms to know: Catabolism/Catabolic, Anabolism/Anabolic, thermodynamics, kinetics, Gibbs free energy (G), Enthalpy (H), Entropy (S), exergonic, endergonic, exothermic, endothermic.

Today's objectives

1. Chemical equilibrium and equilibrium constants (K_{eq})
2. Differences between ΔG , ΔG° , and $\Delta G'^\circ$
3. Relationship between equilibrium constant (K_{eq}) and the free energy change (ΔG , ΔG° , $\Delta G'^\circ$)
4. Combining free energy changes and equilibrium constants for linked reactions
5. ATP as an energy source
6. High energy molecules: phosphorylated compounds and thioesters
7. Biological Oxidation-reduction reactions