CONCEPT: ACTIVATED CARRIERS

● Energetically favorable and unfavorable reactions can **couple** because free energy is _____

□ Reaction **coupling** is defined as using energy from one reaction to fuel another less energetically favorable one

- Usually combining a negative ΔG reaction and a positive ΔG reaction

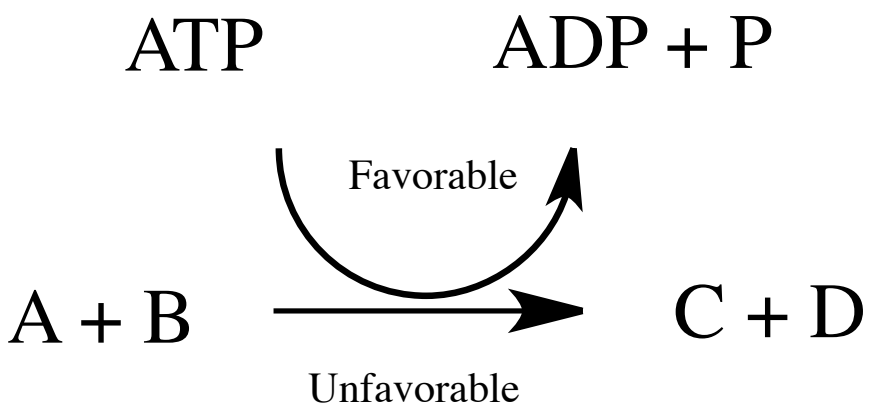
□ **Activated carriers** are small molecules responsible for energy storage and electron transfer

- Contain energy rich covalent bonds

- Bonds in activated carriers are broken and the energy is coupled to energetically unfavorable reactions

□ Energetic coupling is the foundation for cellular _____ (sum of cellular chemical reactions)

EXAMPLE: The activated carrier ATP couples with an energetically unfavorable reaction



● **ATP** and **NADPH** are the two most commonly used _____ in cell biology

□ **ATP** stands for adenosine tri phosphate, and it contains three high energy phosphate bonds

- ATP is generated in *photosynthesis* and *cellular respiration* to provide an energy source for cells

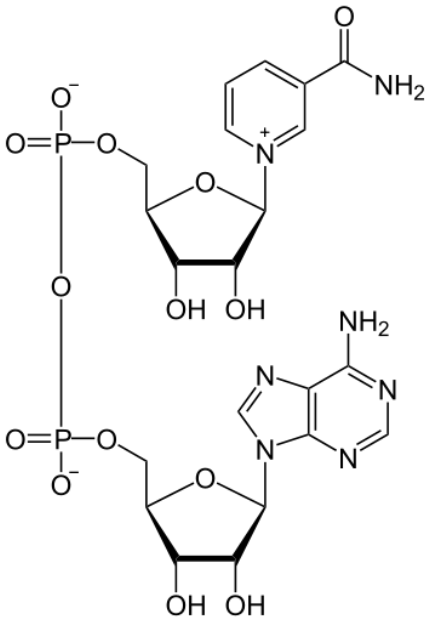
- ATP is broken through *hydrolysis* to release its energy

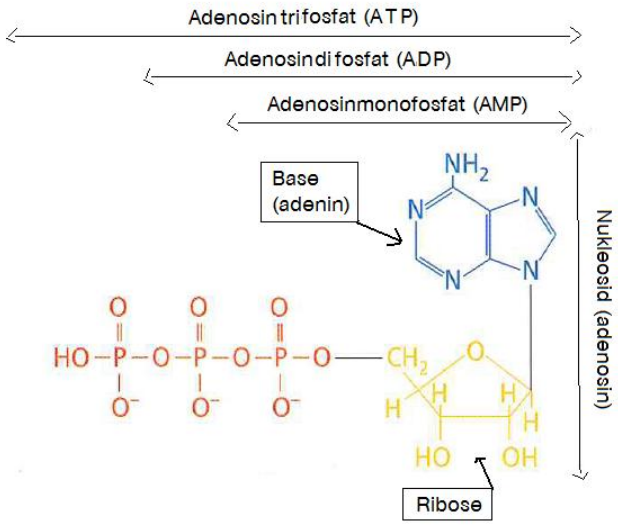
□ **NAD^+** is used to store high-energy electrons and hydrogen atoms

- *oxidation:* loss of electrons and *reduction* is the gain of electrons

- NAD^+ is reduced to NADH in cellular respiration and *NADPH* in photosynthesis

EXAMPLE: Structure of NAD^+ and ATP





PRACTICE:

1. Which of the following is false about activated carriers?
    a. ATP and NADH/NADPH are common activated carriers
    b. Activated carriers are responsible for energy storage
    c. Activated carriers contain strong noncovalent bonds that are broken to release energy
    d. Activated carriers can store high energy electrons

2. NAD^+ becomes NADH through which of the following processes?
    a. Hydrolysis
    b. Oxidation
    c. Reduction
    d. Condensation

3. Enzymes bind to the transition state of the reactant because they have what?
    a. The lowest kinetic energy
    b. The highest kinetic energy
    c. The lowest free energy
    d. The highest free energy

4. Which term describes enzyme regulation controlled through binding of a second molecule to a different site on the enzyme?
    a. Feedback Inhibition
    b. Allosteric Regulation
    c. Phosphorylation