

## Chemical Bonds in Biology

### Bond Energy Comparison

50-200  
Covalent

5-10  
Ionic

1-5  
H-bond

<1  
Van der Waals

#### Covalent Bonds

- Strong electron sharing
- Single, double, triple bonds
- Form backbone of biomolecules
- Energy: 50-200 kcal/mol

#### Ionic Interactions

- Electrostatic attractions
- Important in protein folding
- Salt bridges stabilize structures
- Energy: 5-10 kcal/mol

#### Hydrogen Bonds

- Weak but numerous
- Critical for DNA base pairing
- Protein secondary structure
- Energy: 1-5 kcal/mol

#### Van der Waals Forces

- Weakest interactions
- Important in close packing
- Hydrophobic effect
- Energy: <1 kcal/mol