Periodic Table: 6 Abundant Elements (Pink) and Inorganic Elements (5 Essential – Purple - and Trace - Blue)
**Organic compounds**

- Alcohol: \( R \text{-} OH \)
- Aldehyde: \( R \text{-} C \text{-} H \)
- Ketone: \( R \text{-} C \text{-} R_1 \)
- Carboxylic acid: \( R \text{-} C \text{-} OH \)

Thiol (Sulfhydryl): \( R \text{-} SH \)

Primary amine: \( R \text{-} NH_2 \)
Secondary amine: \( R \text{-} NH \)
Tertiary amine: \( R \text{-} N \text{-} R_2 \)

**Amines**

1. Under most biological conditions, carboxylic acids exist as carboxylate anions:

   \[ R \text{-} C \text{-} O^- \]

2. Under most biological conditions, amines exist as ammonium ions:

   \[ R_1 \text{-} \text{NH}_3, \quad R_2 \text{-} \text{NH}_2, \quad \text{and} \quad R_1 \text{-} \text{NH} \text{-} R_2 \]

---

**Organic Chemistry**

**Functional groups**

- Hydroxyl: \(-\text{OH}\)
- Acyl: \(-\text{C} \text{-} R\)
- Carbonyl: \(-\text{C}\)
- Carboxylate: \(-\text{C} \text{-} \text{O}^-\)

- Sulfhydryl (Thiol): \(-\text{SH}\)
- Amino: \(-\text{NH}_2\) or \(-\text{NH}_3\)
- Phosphate: \(-\text{P} \text{-} \text{O}^-\)
- Phosphoryl: \(-\text{P} \text{-} \text{O}^-\)
**Amino Acids and Peptides**

![Amino Acid Structure](image-url)

**Linkages in biochemical compounds**

![Linkage Structures](image-url)

*Figure 1-2r: Principles of Biochemistry, 4/e © 2006 Pearson Prentice Hall, Inc.*
Chapter 4: 3D Structure and Function (Ligand Binding and Enzyme Kinetics)

(a) Lysozyme

(b) Lysozyme bound with Substrate (Inhibitors)

Chapter 5: Enzyme Kinetics

\[
\text{velocity} = \frac{[S]}{[S] + K}\m
\]

E + ES $\rightleftharpoons$ ES $\rightarrow$ E + P

E + ES $\rightleftharpoons$ ES $\rightarrow$ E + P

velocity = [S]/([S] + Km)
Chapter 6: Enzyme Mechanisms

Chapter 7: Coenzymes

Metals/Ions
Chapter 8: Structures of Monosaccharides

(a) Fischer projection (open-chain form)  (b) Fischer projection (ring form)  (c) Haworth projection  (d) Envelope conformation

Chapter 8: Structures and Properties Of Polysaccharides (Cellulose)
Chapter 8 (and 10)
Structures and Properties of Nucleotides
(ATP) or Dinucleotides

Building Block for RNA and DNA;
Chemical Energy

Structure-Function of RNA and DNA (CH 462)
Chapter 9:
Structure-Function Lipids
(TG & Polar Lipids)

Chapter 9:
Membrane Structure
And Function
(Transport & Signaling)
Chapter 10: Introduction To Metabolism: Catabolism & Anabolism

Kinetics and Thermodynamics

\[ A + B \not\leftrightarrow C + D \]

Kinetics:
- Forward Rate = \( k_{\text{forward}} [A][B] \)
- Reverse Rate = \( k_{\text{reverse}} [C][D] \)

Equilibrium:
- \( K_{eq} = \frac{[C_{eq}][D_{eq}]}{[A_{eq}][B_{eq}]} = \frac{k_{\text{forward}}}{k_{\text{reverse}}} \)

Thermodynamics:
- \( \Delta G^\circ = -RT \ln K_{eq} \)
- \( \Delta G = \Delta G^\circ + RT \ln \frac{[C][D]}{[A][B]} \)
- \( \Delta G < 0 \) for Spontaneous Reactions
- \( \Delta G = \Delta H - T \Delta S \) (enthalpy or entropy driven)