

## Amino Acids Structure

### General Structure

- Central  $\alpha$ -carbon
- Amino group ( $-\text{NH}_2$ )
- Carboxyl group ( $-\text{COOH}$ )
- Variable R group (side chain)

### Classification

- Nonpolar/hydrophobic
- Polar uncharged
- Positively charged (basic)
- Negatively charged (acidic)

### Chirality

- All are L-amino acids in proteins
- D-amino acids rare in nature
- Asymmetric  $\alpha$ -carbon
- Mirror image isomers

### Ionization States

- pKa values determine charge
- Zwitterion at physiological pH
- Affects protein interactions
- Important for enzyme catalysis