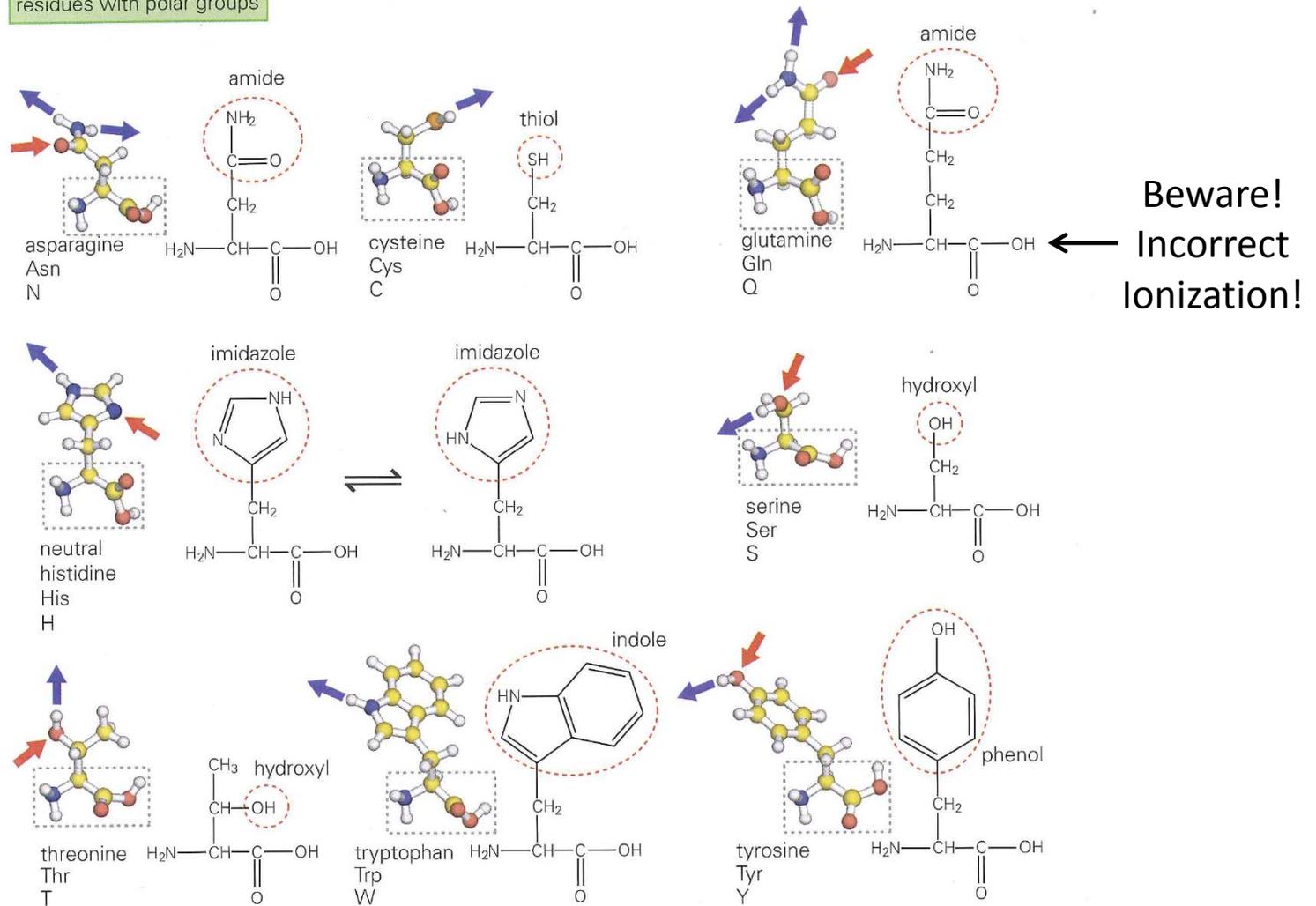


Polar Amino Acids

(side chain is uncharged at neutral pH, can donate or accept hydrogen bonds)

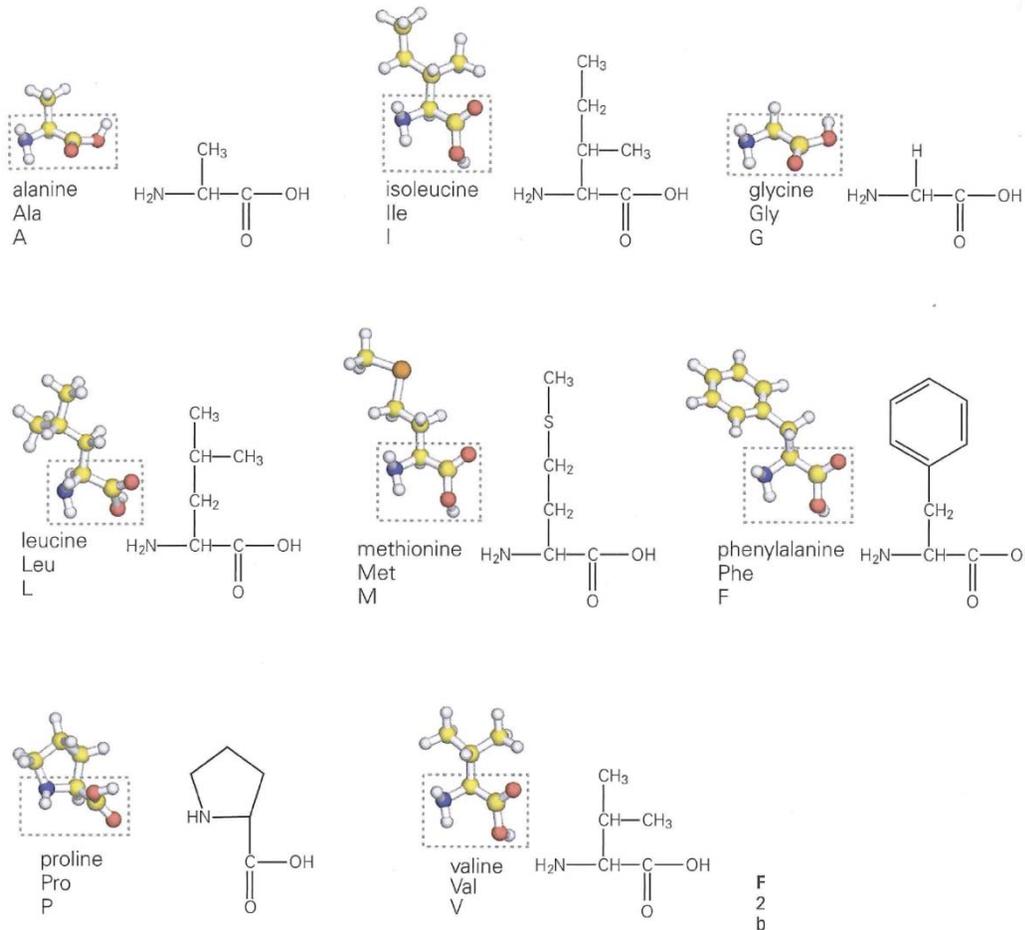
residues with polar groups



Nonpolar Amino Acids

(side chain is uncharged at neutral pH, cannot participate in hydrogen bonding)

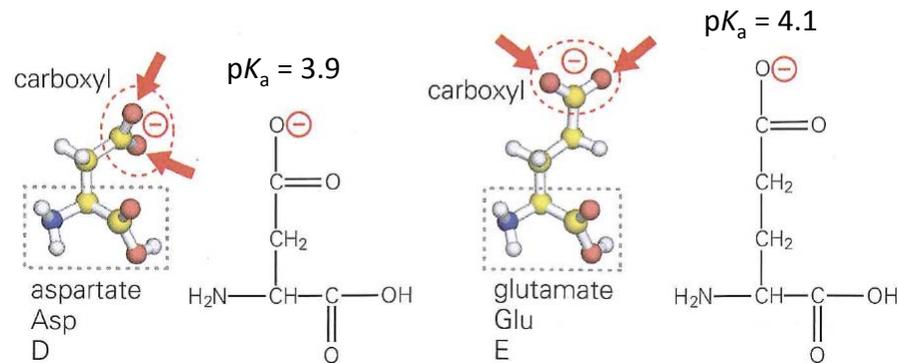
nonpolar, hydrophobic residues



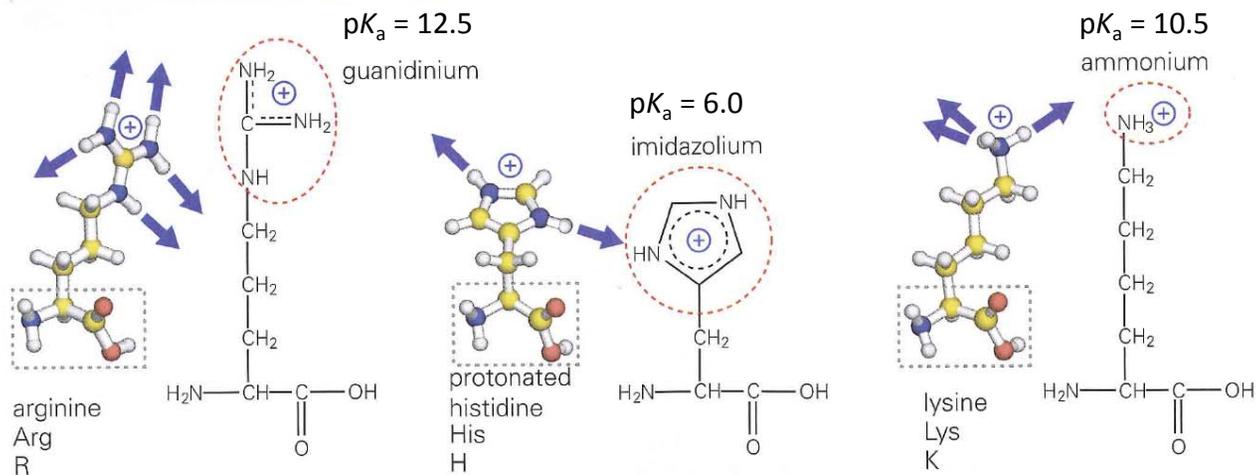
Ionizable Amino Acids

(with typical side-chain pK_a values, charged at neutral pH)

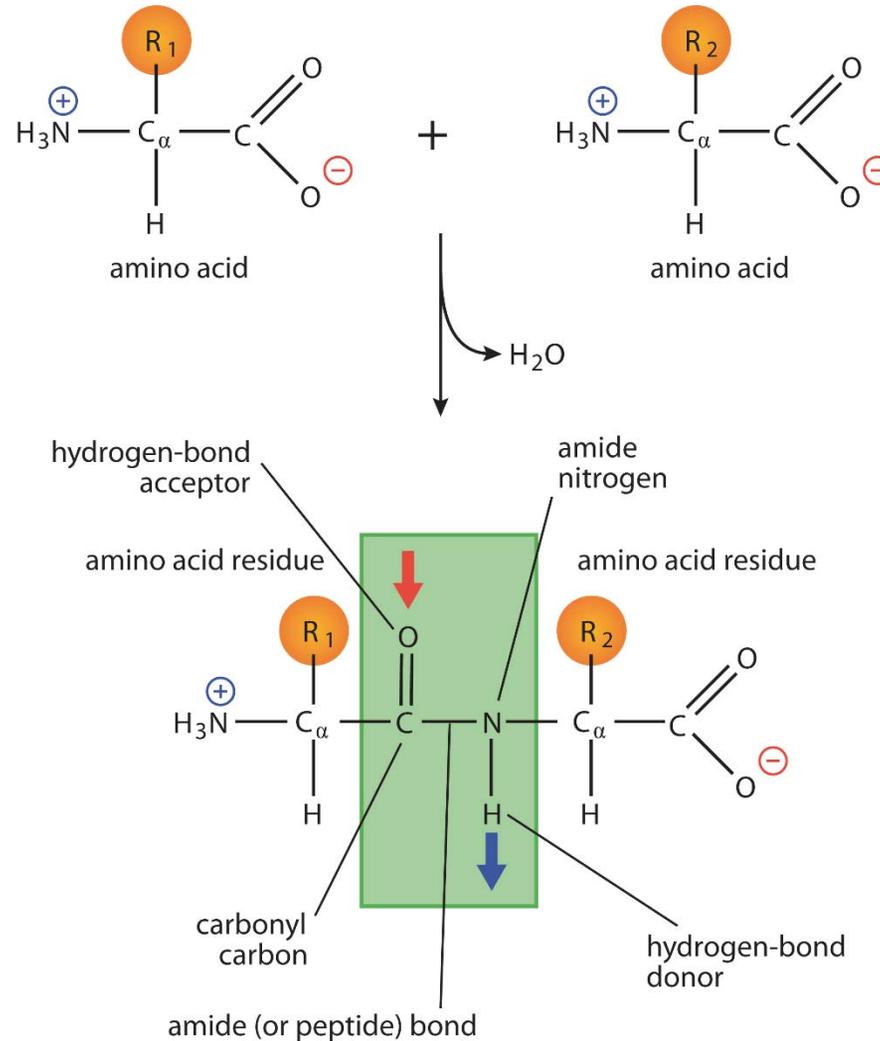
negatively charged, hydrophilic residues



positively charged, hydrophilic residues



Making Peptide Bonds: Condensation



Expectations: Amino Acids

- Structures memorized
- Three- and one-letter codes memorized
- pK_a values do *not* need to be memorized
- Structure of protein backbone memorized

Example: Draw the structure of GDEF at neutral pH.