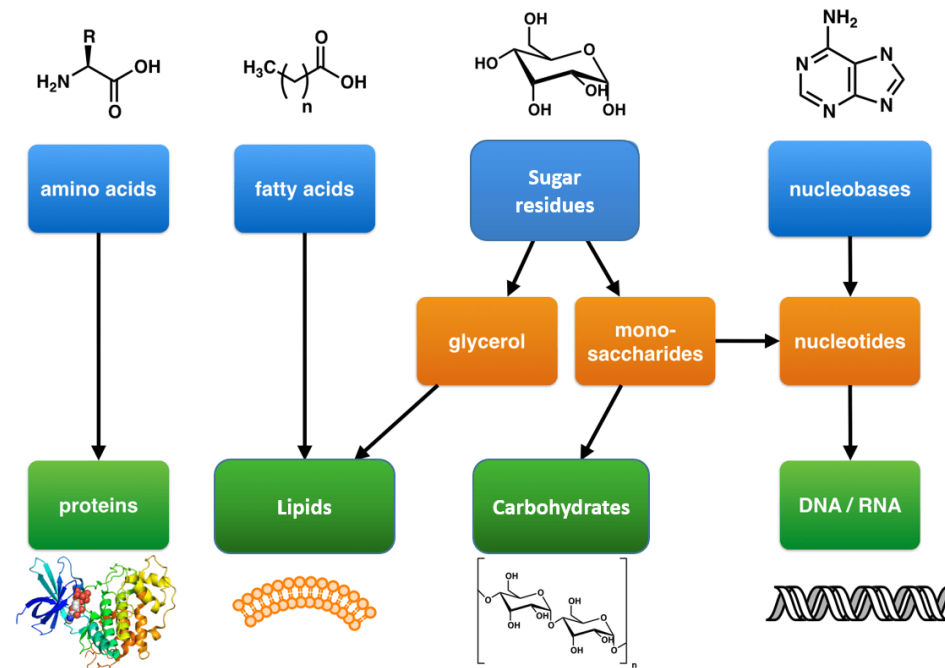


Lesson 1

Recognizing Macromolecules

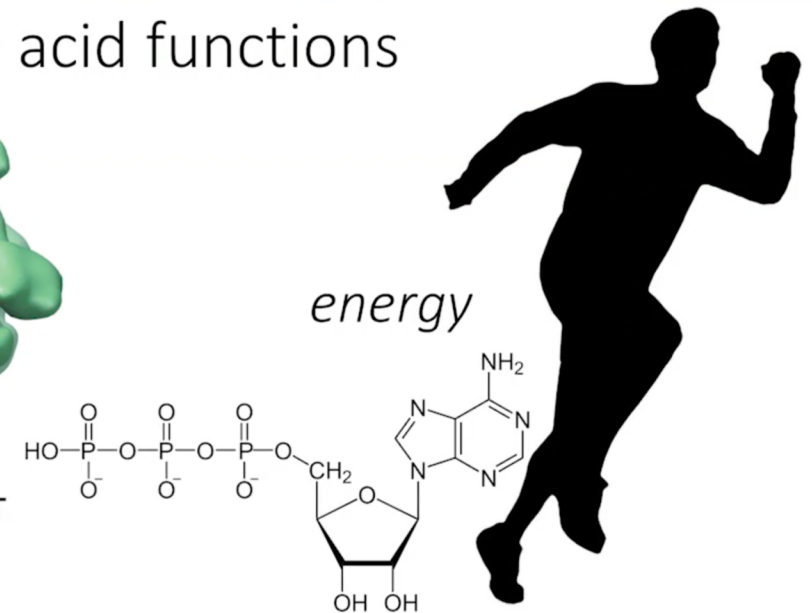
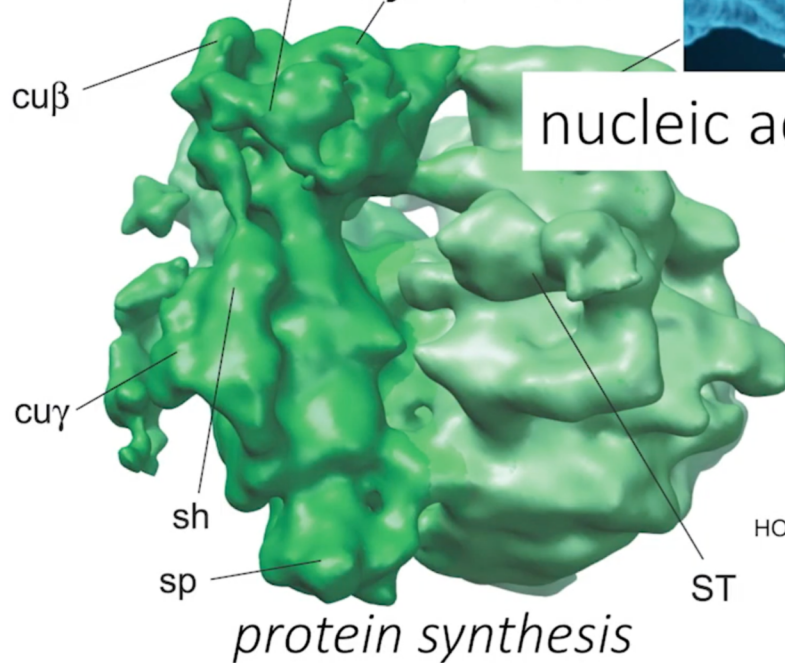
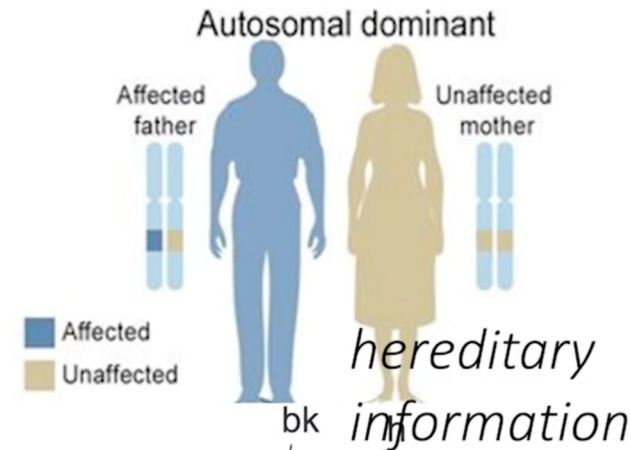


Nucleic acids

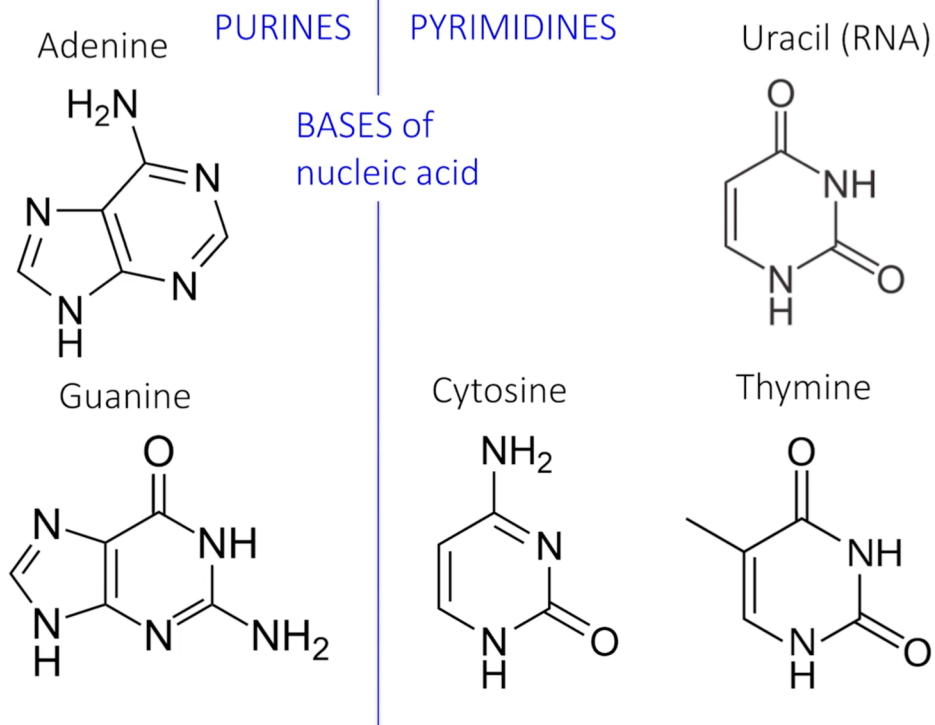
- Hereditary information (genes), energy
- Monomer M = nucleotides
- Polymers = DNA or RNA
- The nucleotide structure is stereotypical:

Phosphate-sugar-base (P-S-B)

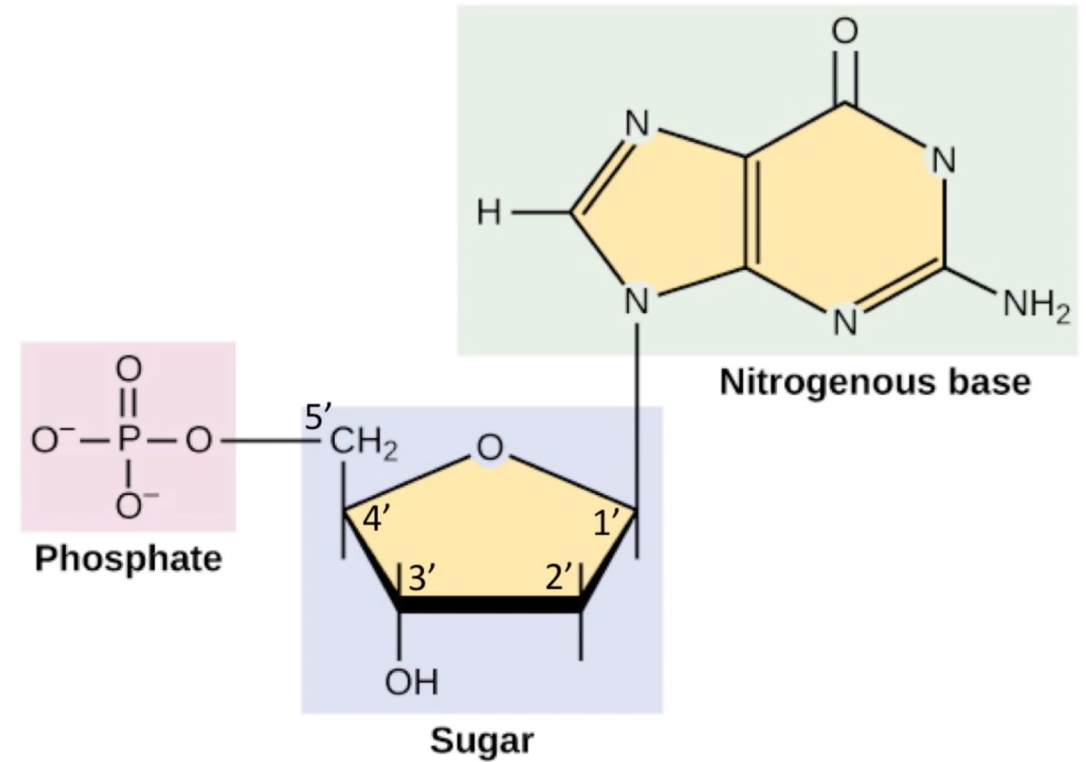
- Sugar = (5C) ribose (RNA) or deoxyribose (DNA)
- 5 bases:
 - Adenine (A), Guanine (G) = PURINES
 - Cytosine (C), Thymine (T), Uracil (U) = PYRIMIDINES
- A,G,C,T = DNA
- A,G,C,U = RNA



Nucleic acids



Nucleotide

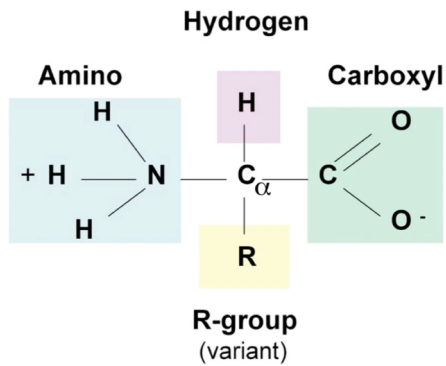


Note that the carbon atoms of the sugar are called C1', C2' etc
C1' is where the base attaches
C2' can have attached a H (as here, for DNA) or a OH group (for RNA)
C3' is very important and where the next nucleotide will join
C5' is where the phosphate group attaches

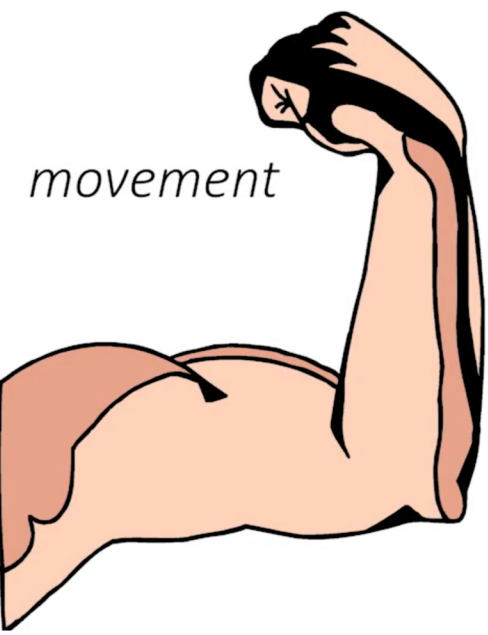
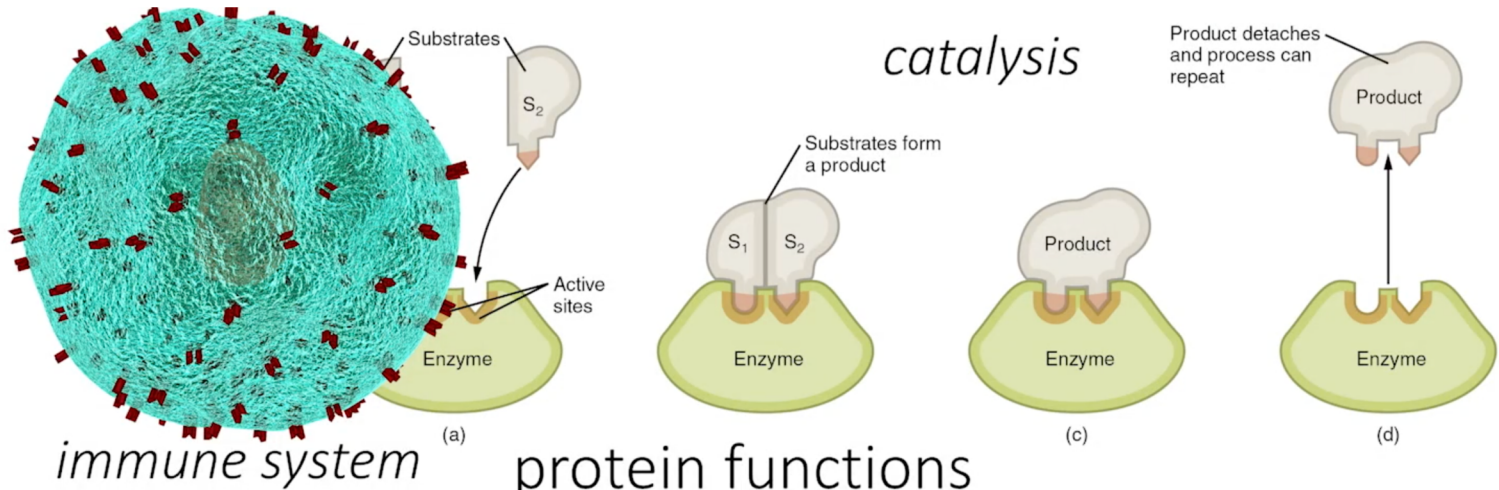
Proteins

- Everything except genes
- Monomer M = amino acids
- 20 natural common amino acids
- Polymer = protein
- Amino acid structure:

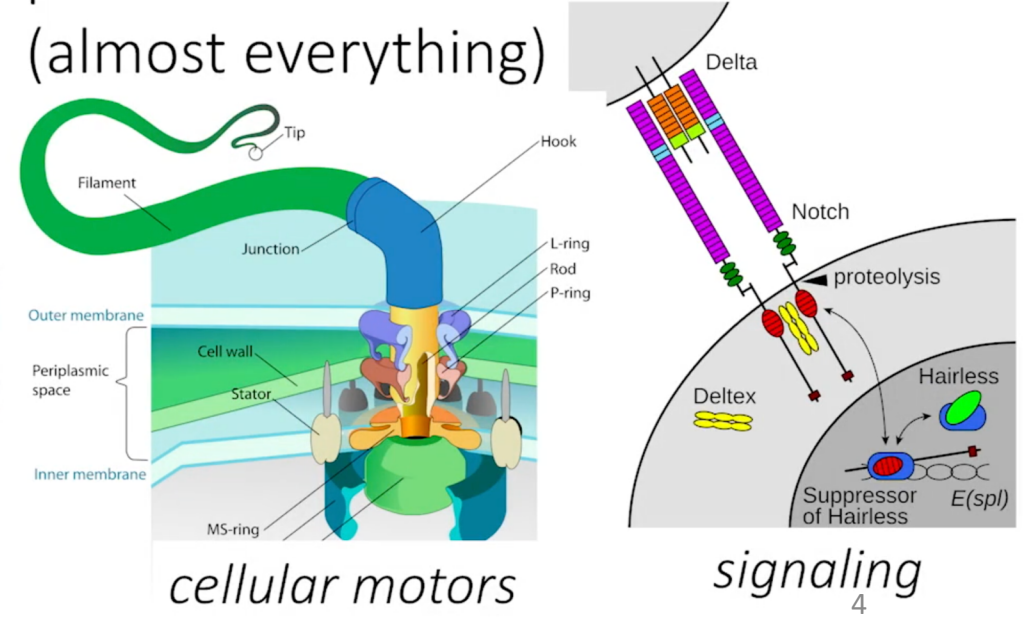
Alpha C + NH₂ + COOH + R (side group)



- R can be polar, non-polar, charged, uncharged
- Three or one letter code:
 - Valine = VAL
 - Valine = V



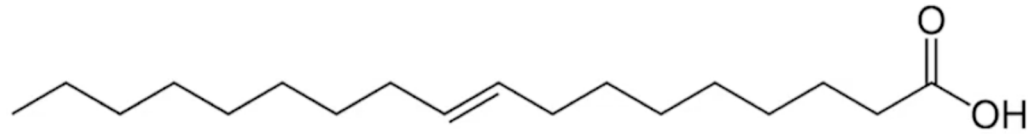
protein functions (almost everything)



Proteins

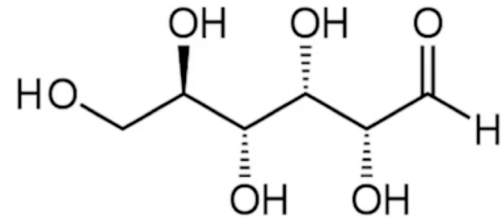
AMINO ACID					
Nonpolar, aliphatic R groups	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{H} \end{array}$ <p>Glycine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_3 \end{array}$ <p>Alanine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH} \\ / \quad \backslash \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$ <p>Valine</p>		
	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{CH} \\ / \quad \backslash \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$ <p>Leucine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{S} \\ \\ \text{CH}_3 \end{array}$ <p>Methionine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{H} - \text{C} - \text{CH}_3 \\ \\ \text{CH}_2 \\ \\ \text{CH}_3 \end{array}$ <p>Isoleucine</p>		
	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2\text{OH} \end{array}$ <p>Serine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{H} - \text{C} - \text{OH} \\ \\ \text{CH}_3 \end{array}$ <p>Threonine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{SH} \end{array}$ <p>Cysteine</p>		
	$\begin{array}{c} \text{COO}^- \\ \\ \text{C} \\ / \quad \backslash \\ \text{H}_2\text{N}^+ \quad \text{CH}_2 \\ \quad \quad \\ \text{H}_2\text{C} \quad \text{CH}_2 \end{array}$ <p>Proline</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{C} \\ / \quad \backslash \\ \text{H}_2\text{N} \quad \text{O} \end{array}$ <p>Asparagine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{C} \\ / \quad \backslash \\ \text{H}_2\text{N} \quad \text{O} \end{array}$ <p>Glutamine</p>		
	Positively charged R groups	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{NH}_3^+ \end{array}$ <p>Lysine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{NH} \\ \\ \text{C} = \text{NH}_2^+ \\ \\ \text{NH}_2 \end{array}$ <p>Arginine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{C} - \text{NH}^+ \\ / \quad \backslash \\ \quad \quad \text{CH} \\ \quad \quad \quad \backslash \\ \quad \quad \quad \text{C} - \text{NH}^+ \\ \quad \quad \quad / \\ \quad \quad \quad \text{H} \end{array}$ <p>Histidine</p>	
		$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{COO}^- \end{array}$ <p>Aspartate</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{COO}^- \end{array}$ <p>Glutamate</p>		
$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{C}_6\text{H}_5 \end{array}$ <p>Phenylalanine</p>		$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{C}_6\text{H}_4 \\ \\ \text{OH} \end{array}$ <p>Tyrosine</p>	$\begin{array}{c} \text{COO}^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2 \\ \\ \text{C}_5\text{H}_4\text{NH} \end{array}$ <p>Tryptophan</p>		
<p>Nonpolar, uncharged R groups</p>					

Recognizing macromolecules - review



trans-oleic acid

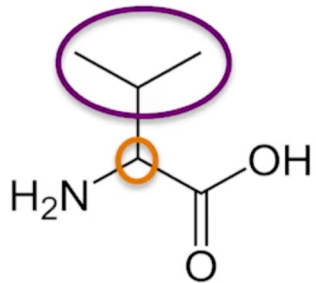
Lipids: **nonpolar**/hydrophobic



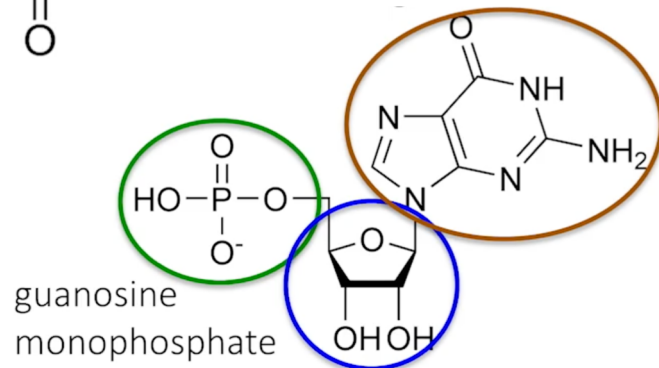
glucose

Carbohydrates: **CH₂O** formula/**polar**

valine



Proteins: M = **amino acid** = **α C bonded to NH₂, COOH and R**, R = polar/nonpolar



guanosine monophosphate

Nucleic acids: M = **nucleotide** = **phosphate + sugar + base, polar**

Recognizing macromolecules

- Take assignment 1: **Recognizing Macromolecules**