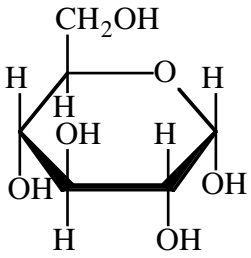
MIT Department of Biology
7.014 Introductory Biology, Spring 2005

7.014 Handout

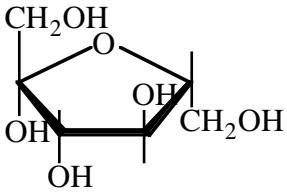
Biochemistry I-III

Carbohydrates

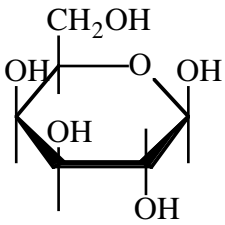
Monosaccharides:



α-Glucose

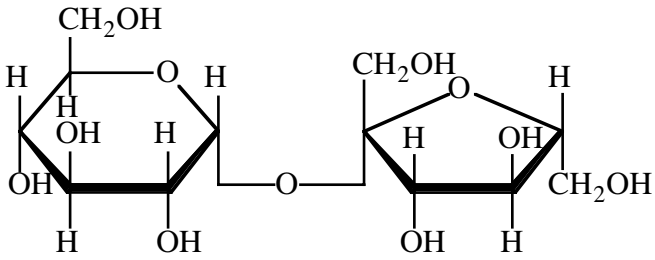


Fructose

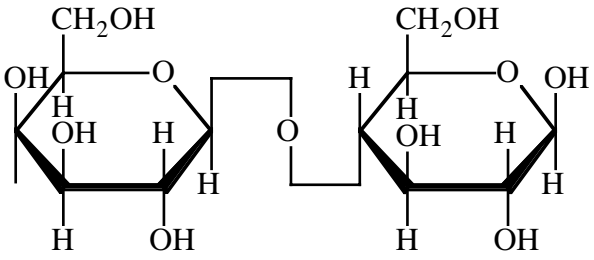


β-Galactose

Disaccharides:

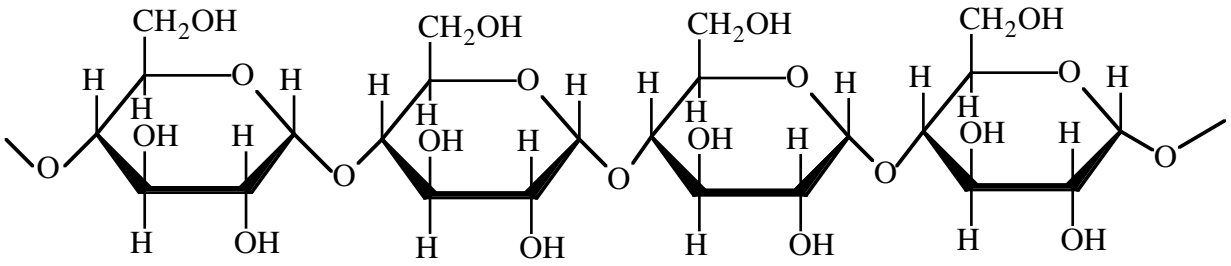


Sucrose
(Glucose(α1→2)Fructose)



Lactose (β-form)
(Galactose(β1→4)Glucose)

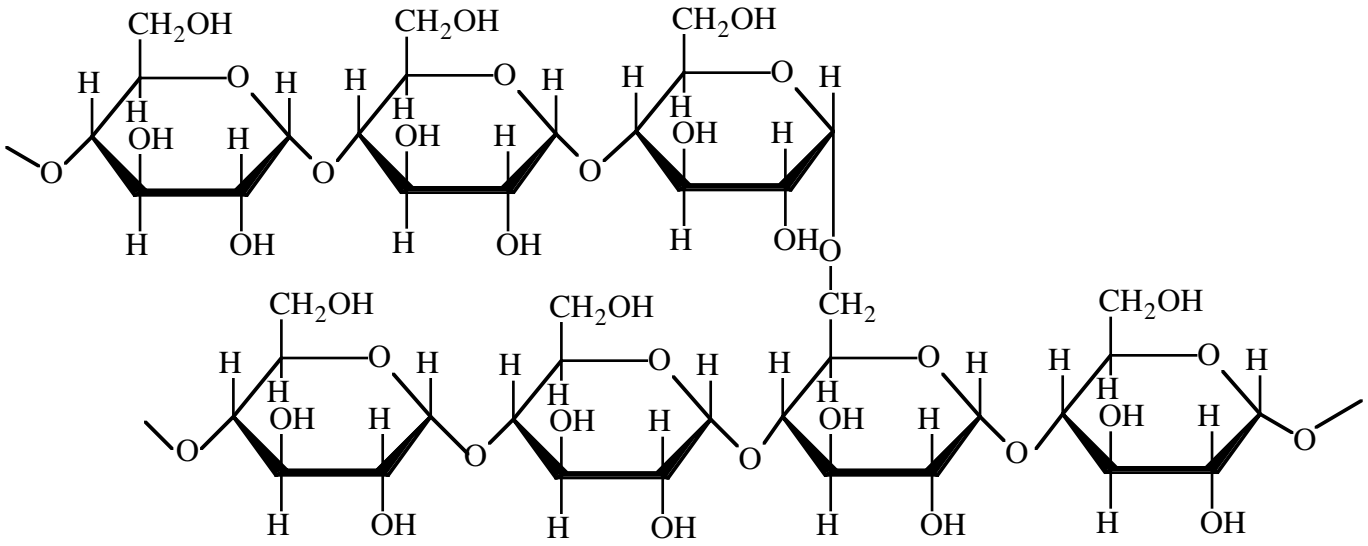
Polysaccharides:



Starch

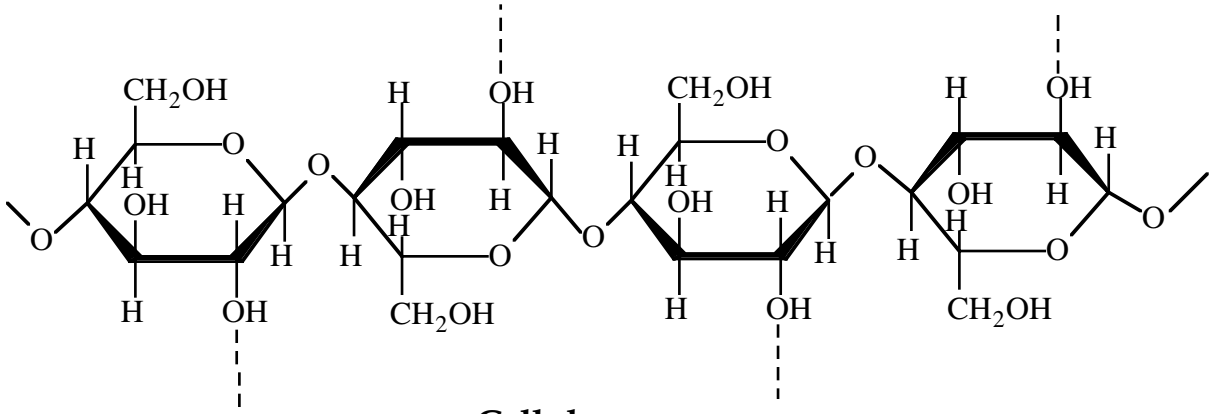
(Unbranched polymer of Glucose (α1➔4) linkage)

(Amylose is an example of a branched starch molecule)



Glycogen

(Branched polymer of Glucose in (α1 ➔4) linkage with (α1➔ 6) branch points)



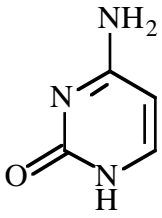
Cellulose

(Unbranched polymer of Glucose in (β1➔ 4) linkage)

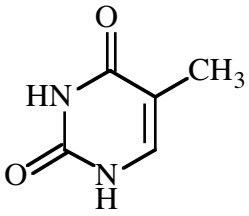
Nucleic Acids

Nitrogenous Bases found in Nucleic Acids:

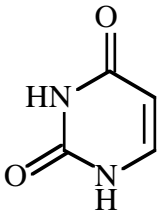
Pyrimidines



Cytosine

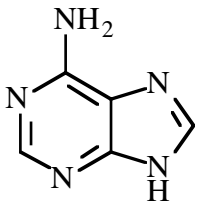


Thymine
(in DNA)

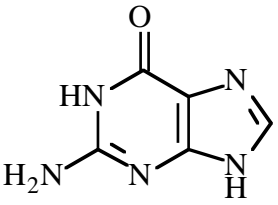


Uracil
(in RNA)

Purines

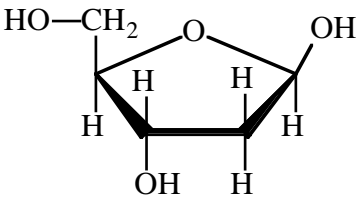


Adenine

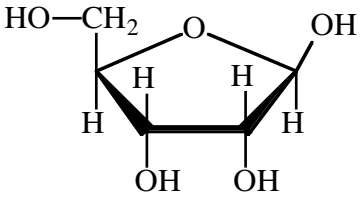


Guanine

Sugars found in Nucleic Acids:

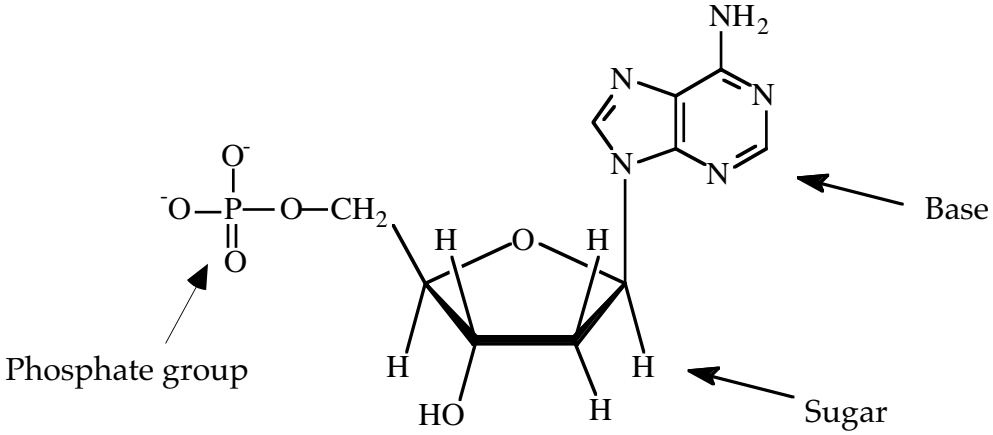


Deoxyribose
(in DNA)



Ribose
(in RNA)

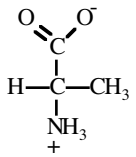
A Nitrogenous Base plus a Sugar plus Phosphate forms a Nucleotide:



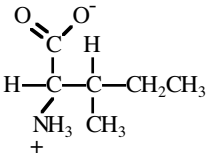
Deoxyribonucleoside monophosphate = Deoxyribonucleotide
(found in DNA)

Structures of Amino Acids at pH 7.0

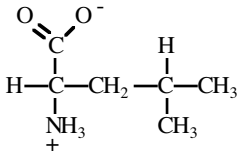
Non-Polar



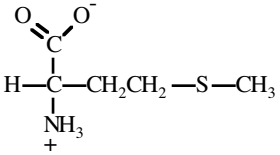
ALANINE
(ala)



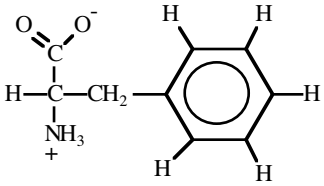
ISOLEUCINE
(ile)



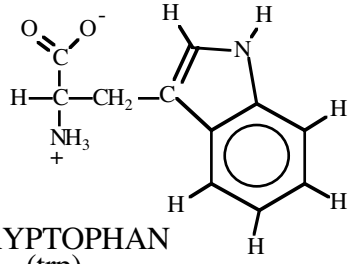
LEUCINE
(leu)



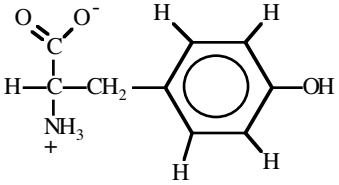
METHIONINE
(met)



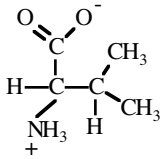
PHENYLALANINE
(phe)



TRYPTOPHAN
(trp)

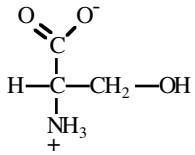


TYROSINE
(tyr)

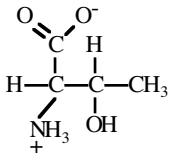


VALINE
(val)

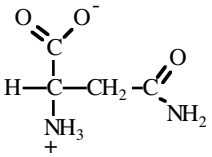
Polar



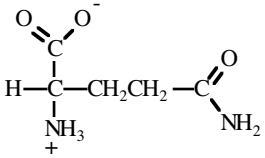
SERINE
(ser)



THREONINE
(thr)

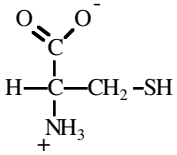


ASPARAGINE
(asn)

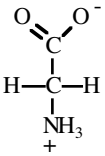


GLUTAMINE
(gln)

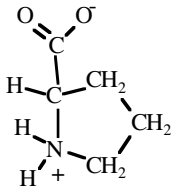
Special Cases:



CYSTEINE
(cys)



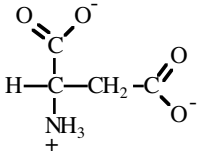
GLYCINE
(gly)



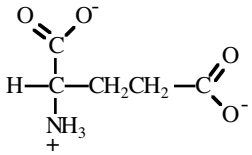
PROLINE
(pro)

Charged

Acidic

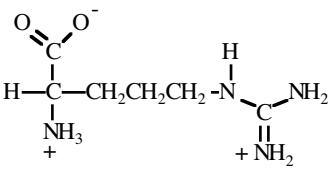


ASPARTIC ACID
(asp)

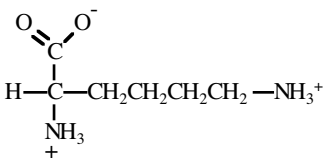


GLUTAMIC ACID
(glu)

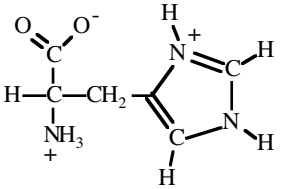
Basic



ARGININE
(arg)



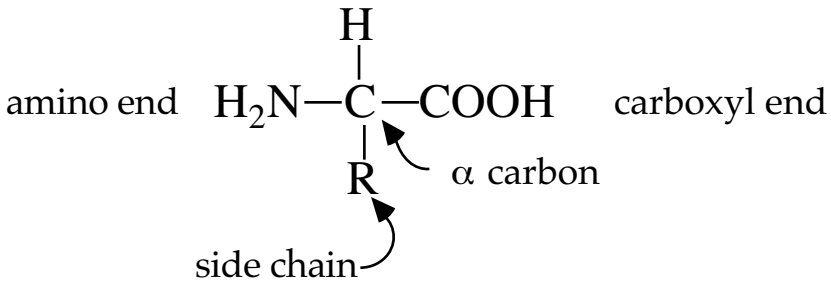
LYSINE
(lys)



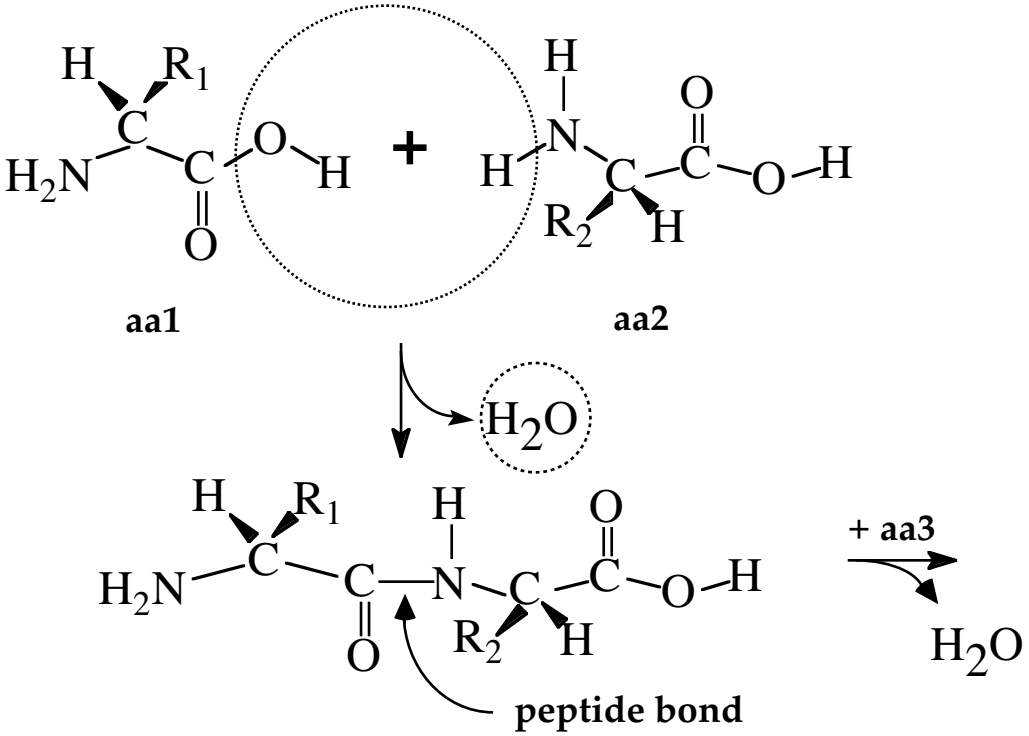
HISTIDINE
(his)

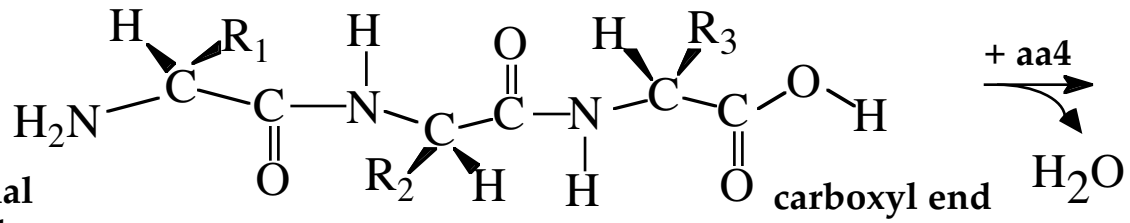
Proteins

General formula for amino acids (the building blocks of proteins):



Polymerization of amino acids to form polypeptides with amide (peptide) linkag

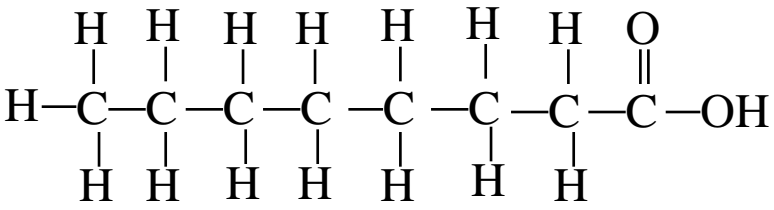




Polypeptide

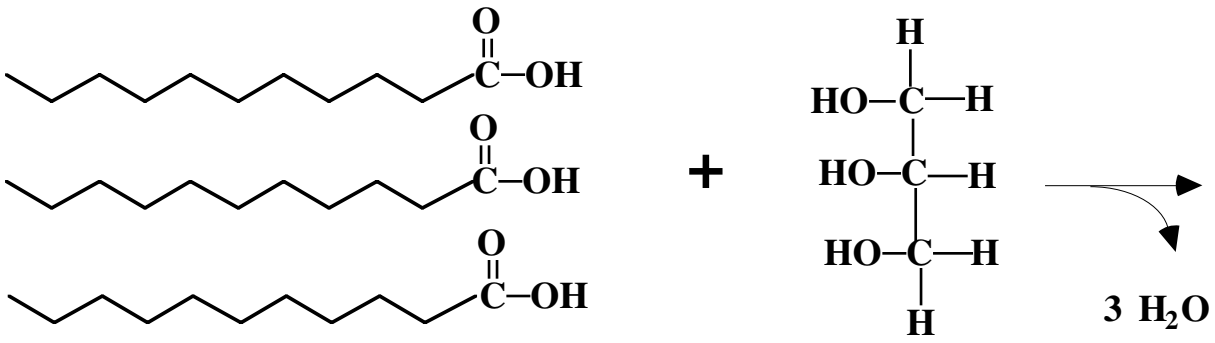
(Proteins are long polypeptides)

Lipids

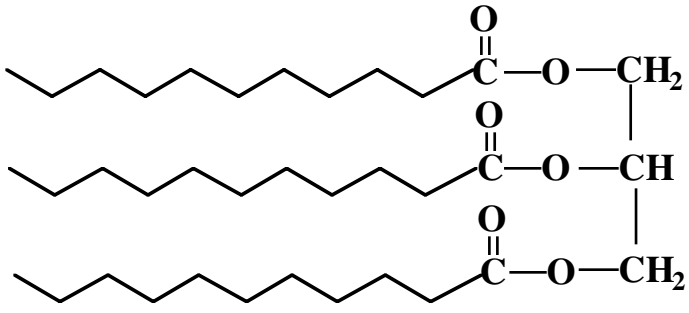


A Fatty Acid

To make a Triacylglycerol (triglyceride):



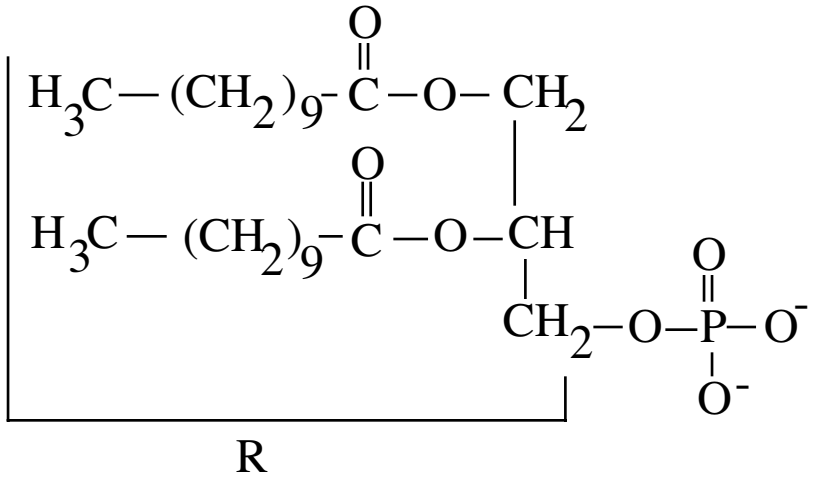
3 Fatty acids **1 glycerol**



Triacylglycerol (triglyceride)

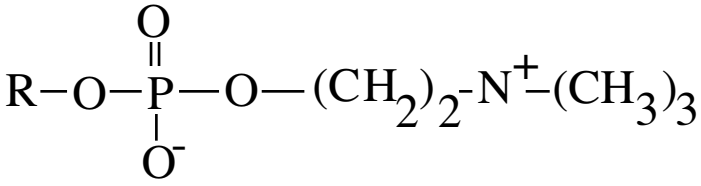
Phospholipids

General structure of a phospholipid:

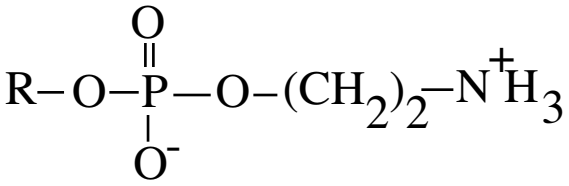


Common phospholipids:

Phosphatidyl choline:



Phosphatidyl ethanolamine:



Phosphatidyl inositol: