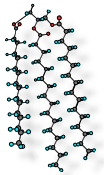
Lipids-types and roles

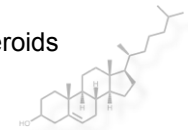
1. Fats and oils
   - Storage of energy
   - Insulation and protection



2. Phospholipids

- **structural role in cell membranes**

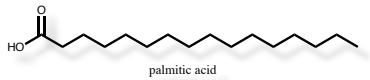
3. Steroids



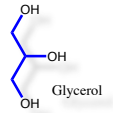
Phospholipids

Phospholipids *are composed of* ***three*** *molecule parts*

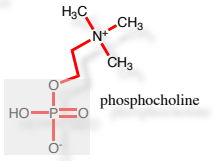
1. Fatty acids



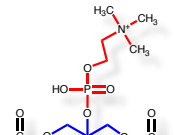
2. Glycerol



3. Polar group



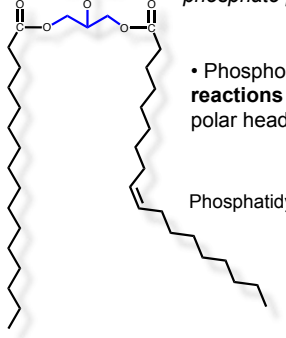
Phospholipids



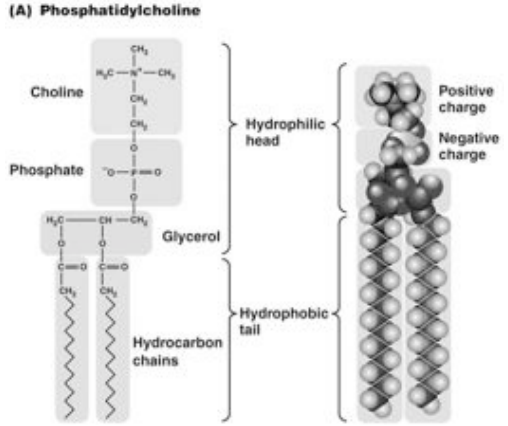
Phospholipids *differ from triglycerides by their phosphate polar head group*

- Phospholipids also undergo **condensation reactions** to join fatty acids, glycerol and polar head group

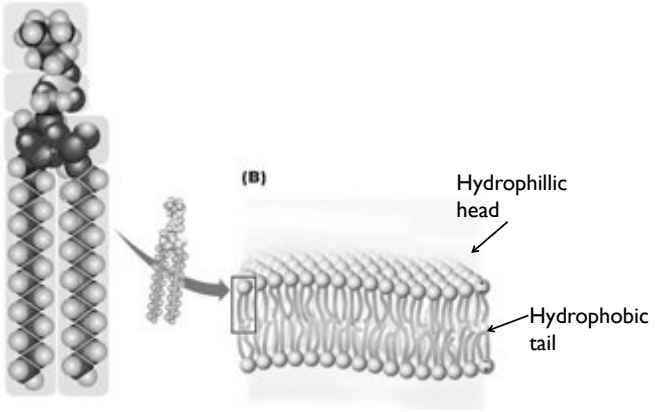
Phosphatidylcholine



Phospholipid bilayer



Phospholipid bilayer

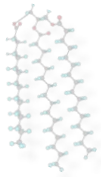


Phospholipids

Phospholipids *differ from triglycerides by their polar head group and usually have at least one* ***unsaturated*** *carbon*

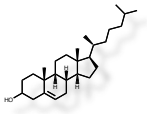
Phospholipids are **amphiphillic** molecules

Lipids



1. Fats
   - Storage of energy
   - Insulation and protection

2. Phospholipids
   - Major component of cell membranes

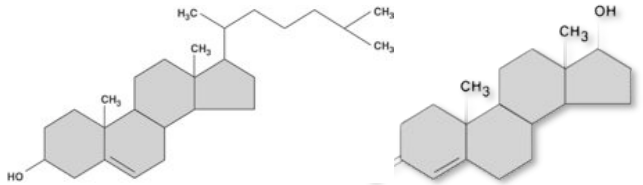


3. Steroids
   - Component of cell membranes
   - "Fat soluble" hormones (*examples*: sex hormones)

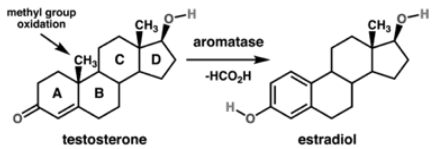
Steroids

Steroids are characterized as carbon skeletons with four fused rings

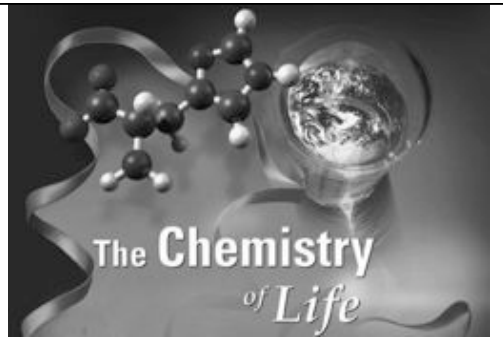
- **Cholesterol** is the most common steroid in humans
  - Gives structure to cell membranes, keeps them "fluid"
  - Precursor to steroid hormones, such as the reproductive hormones
  - Mostly insoluble in water



Steroids



Sex hormone families:
Androgen
Estrogen
Progesterone



Living tissues: 70% water + 30% macromolecules
Carbohydrates
Lipids
Nucleic Acids
Proteins

Two Types of Nucleic Acids

DNA

DNA is the most important component of **chromosomes**, our genetic material

RNA?

DNA is the *template* of your genetic material.
RNA *carries* the information for a single gene for the synthesis of a protein

Crime Scene Investigation- DNA evidence

Nucleic Acids

Nucleic Acids- polymers that contain the genetic information

2 types of nucleic acids:

DNA-deoxyribonucleic acid
contains the hereditary information

RNA-ribonucleic acid
Delivers the information encoded by DNA to the cell's protein manufacturing sites (ribosomes)

Nucleic acids composed of 3 different monomers:
base
sugar
phosphate

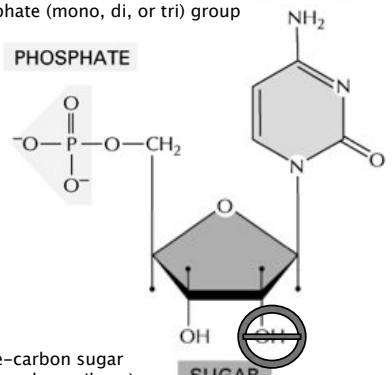
Nucleotides

1. Nitrogenous Base

BASE

3. Phosphate (mono, di, or tri) group

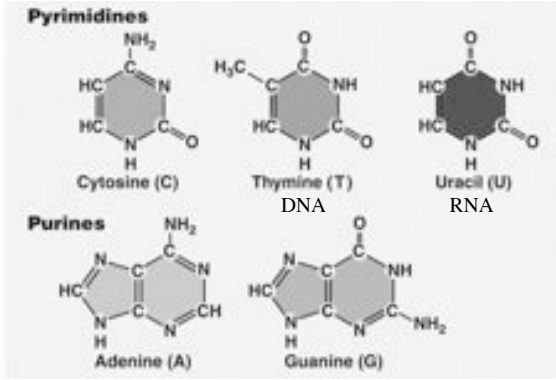
PHOSPHATE



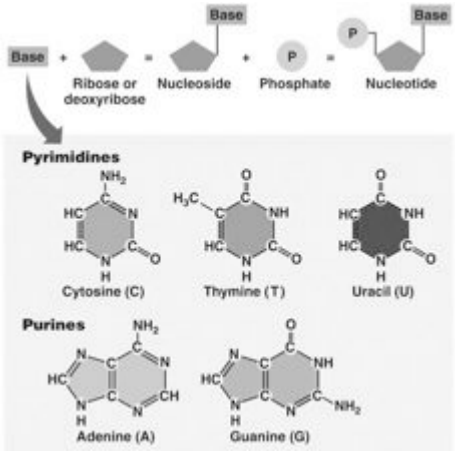
2. A five-carbon sugar (ribose or deoxyribose)

SUGAR

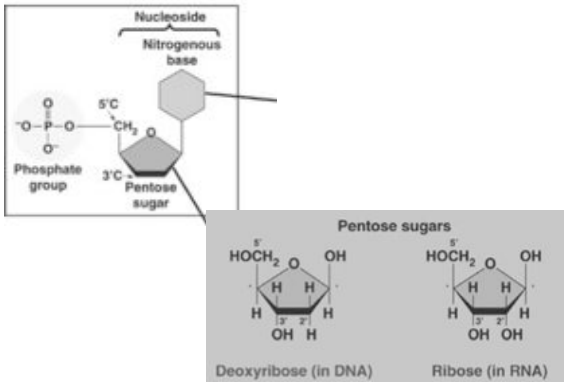
1. Nitrogenous Bases



1. Nitrogenous Bases



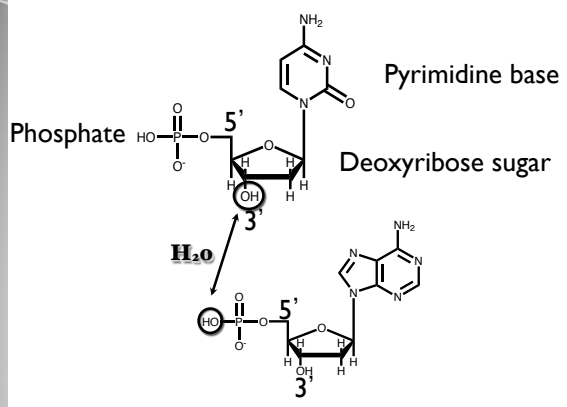
Sugars



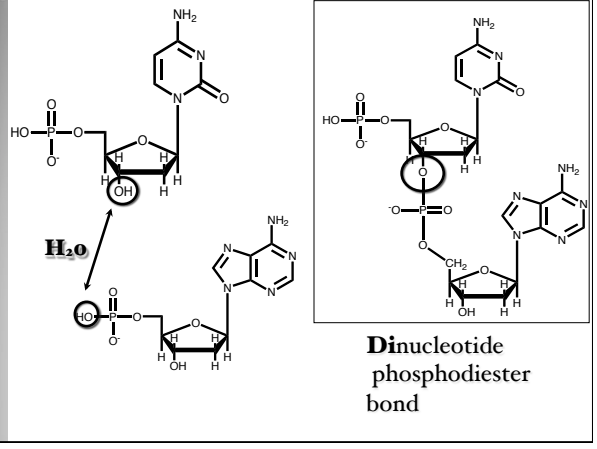
Contrasting RNA and DNA

NUCLEIC ACID	SUGAR	BASES	STRANDS
RNA	Ribose	Adenine	Single
		Cytosine	
		Guanine	
		Uracil	
DNA	Deoxyribose	Adenine	Double
		Cytosine	
		Guanine	
		Thymine	

DNA synthesis occurs 5'-3'

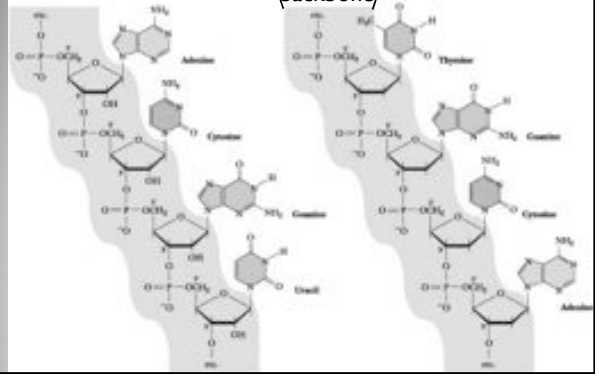


Polynucleotide formation

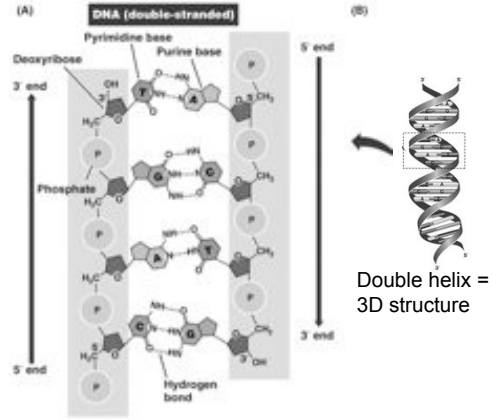


Dinucleotide phosphodiester bond

Polynucleotide formation

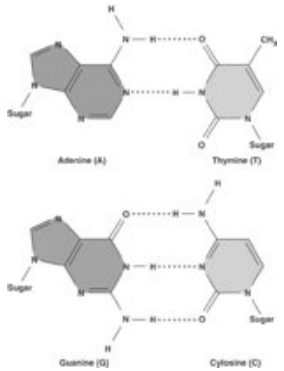


DNA is double-stranded

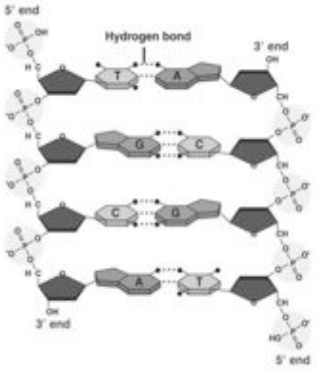


Double helix = 3D structure

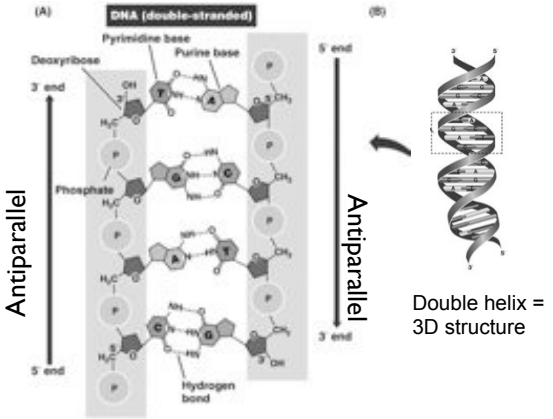
Complementary base pairing



Complementary base pairing

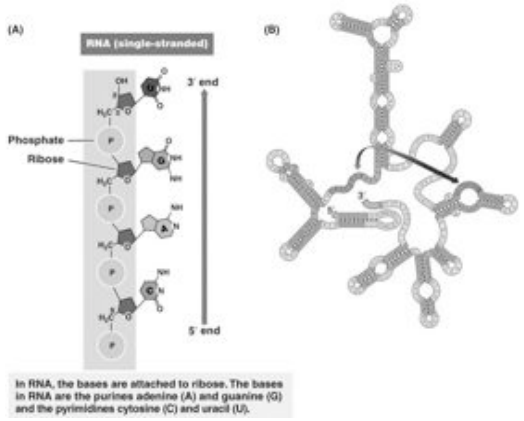


DNA is double-stranded



Double helix = 3D structure

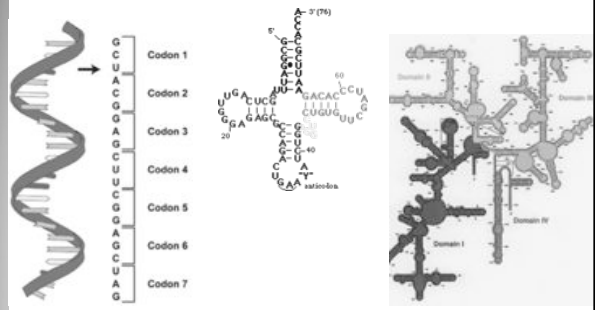
RNA is usually single-stranded



In RNA, the bases are attached to ribose. The bases in RNA are the purines adenine (A) and guanine (G) and the pyrimidines cytosine (C) and uracil (U).

3 types of RNA

tRNA, Transfer RNA
Brings amino acid to the mRNA



mRNA, Messenger RNA
Intermediate for protein synthesis

rRNA, ribosomal RNA
Site of protein synthesis

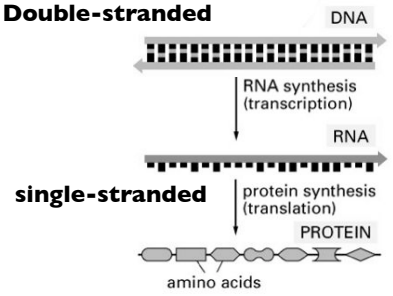
Contrasting RNA and DNA

NUCLEIC ACID	SUGAR	BASES	STRANDS
RNA	Ribose	Adenine	Single
		Cytosine	
		Guanine	
		Uracil	
DNA	Deoxyribose	Adenine	Double
		Cytosine	
		Guanine	
		Thymine	

Transcription/Translation

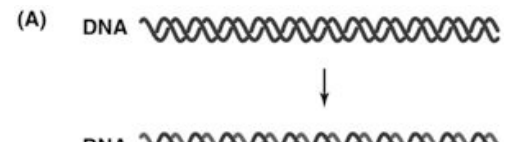
DNA is the *template* of your genetic material.
RNA *carries* the information for the synthesis of a protein

Flow of information in the cell

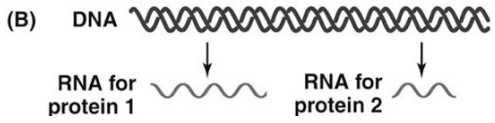


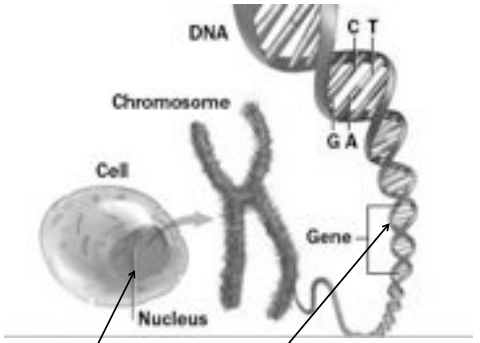
Transcription vs. Replication

•Entire DNA double helix gets replicated



•Only DNA region necessary to make a protein is transcribed



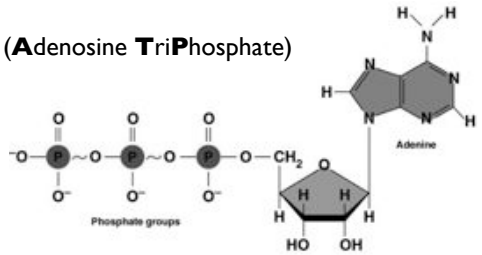


Gene = DNA sequence that encodes a specific protein

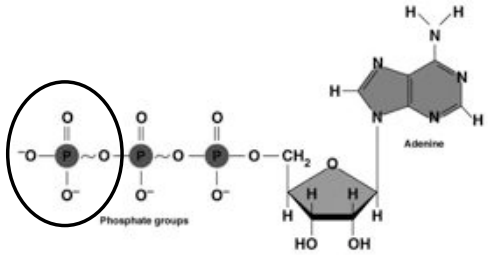
Genome = complete set of DNA in a living organism

ATP- Multifunctional Nucleotide

ATP (**A**denosine **T**ri**P**hosphate)

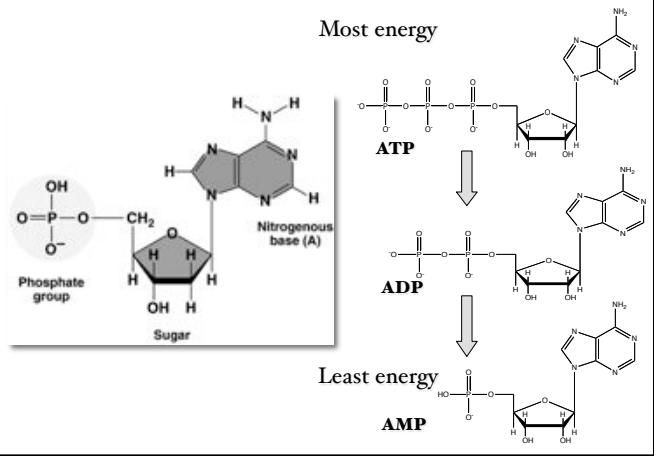


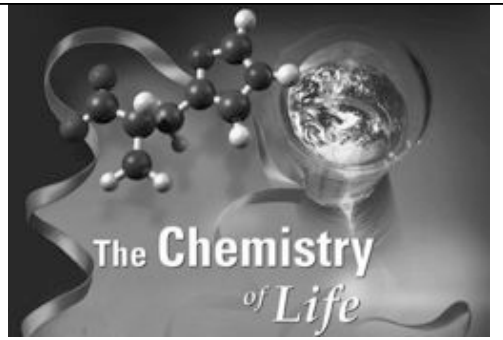
Nucleotide Hydrolysis



Hydrolysis of a phosphate releases **energy**

The Energy is in the Phosphates



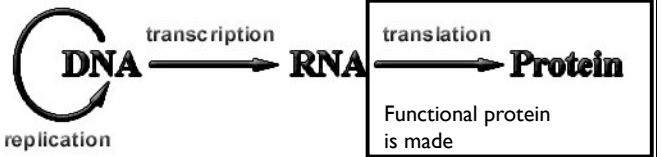


Living tissues: 70% water + <u>30% macromolecules</u>

- Carbohydrates
- Lipids
- Nucleic Acids
- **Proteins**

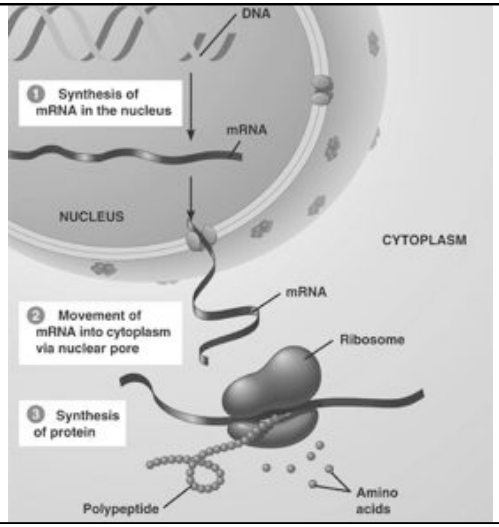
Central Dogma of Molecular Biology

Information to produce a single gene is copied



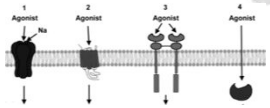
Functional protein is made

Entire DNA double helix is duplicated

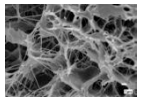


Protein functions:

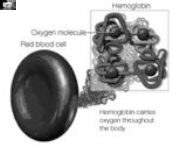
Catalyze reactions- enzymes
Defense- antibodies



Regulatory- insulin
Receptors-EGF

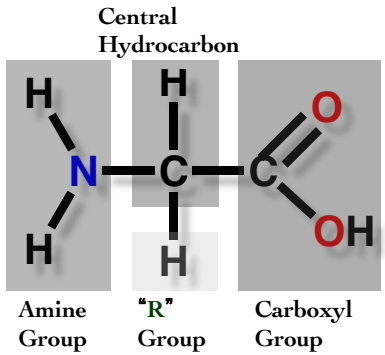


Storage- of amino acids
Structural- collagen



Transport- hemoglobin
Regulate gene expression

Proteins are composed of monomers called **amino acids**



- ALL amino acids have the exact same structure *except* for the "R" Group