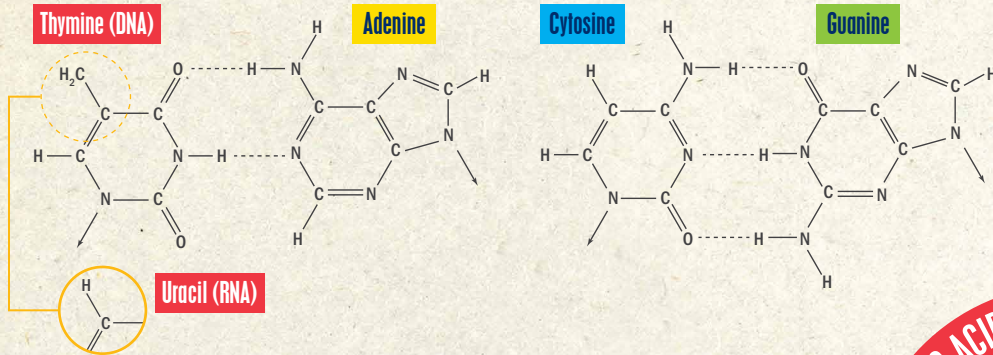


## NUCLEIC ACIDS

Nucleotides are the building blocks of nucleic acids such as DNA and RNA. Individual nucleotides are each composed of a nucleoside (A, T/U, G, or C), either a deoxyribose (DNA) or ribose (RNA) sugar, and a phosphate group. Nucleotides also serve as energy storage molecules in the cell, primarily in the form of ATP and GTP.



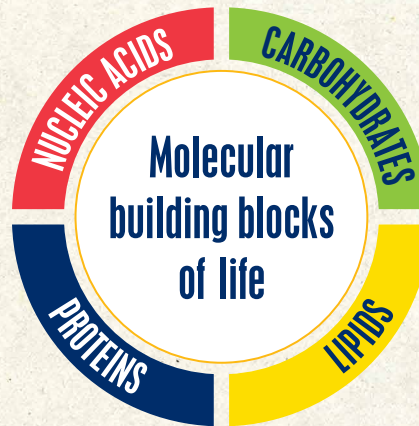
**DNA Polymerase**  
Replication (DNA → DNA)



**RNA Polymerase**  
Transcription (DNA → RNA)



**Ribosome**  
Translation (RNA → Protein)



## PROTEINS

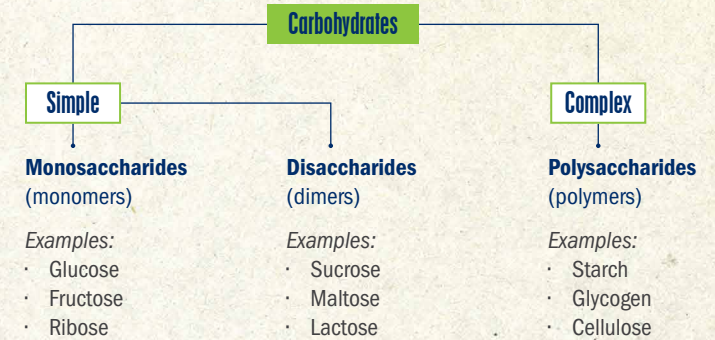
Proteins are built from amino acids and are the most diverse class of molecules in the cell. They play a role in the structure and function of the cell, communication between cells, and transport of other molecules in and out of cells. Proteins perform nearly all the biochemical functions of a cell.

### 20 Common Amino Acids

- |                     |                     |                     |                  |
|---------------------|---------------------|---------------------|------------------|
| Alanine (Ala)       | Glutamine (Gln)     | Leucine (Leu)       | Serine (Ser)     |
| Arginine (Arg)      | Glutamic Acid (Glu) | Lysine (Lys)        | Threonine (Thr)  |
| Aspartic acid (Asp) | Glycine (Gly)       | Methionine (Met)    | Tryptophan (Trp) |
| Asparagine (Asn)    | Histidine (His)     | Phenylalanine (Phe) | Tyrosine (Tyr)   |
| Cysteine (Cys)      | Isoleucine (Ile)    | Proline (Pro)       | Valine (Val)     |

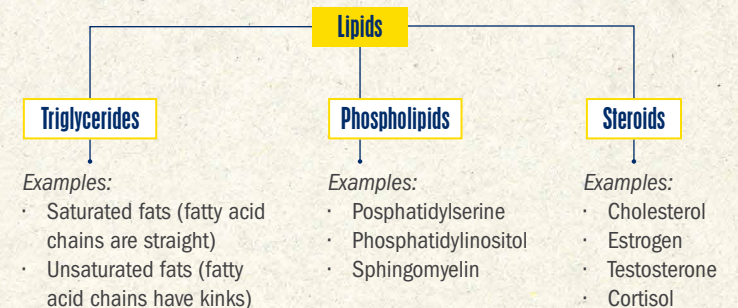
## CARBOHYDRATES

Carbohydrates are important to all organisms structurally and as a source of energy. Carbohydrates can exist as simple sugars or as long polymers of simple sugars. The carbohydrate cellulose is the most abundant naturally-occurring polymer.



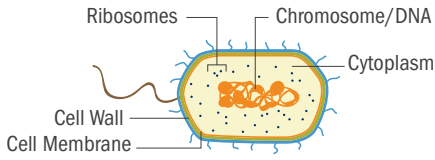
## LIPIDS

Lipids are a structurally diverse class of molecules that share the common feature of being relatively insoluble in water. In cells, lipids serve as an energy source and as a form of stored energy (triglycerides), an essential component of cell membranes (phospholipids and cholesterol), and important signaling molecules within and between cells (steroids).

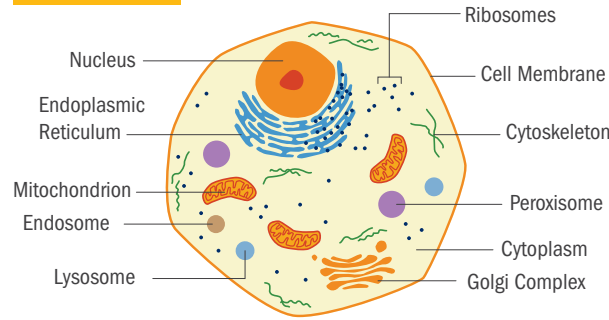


# CELL MODELS

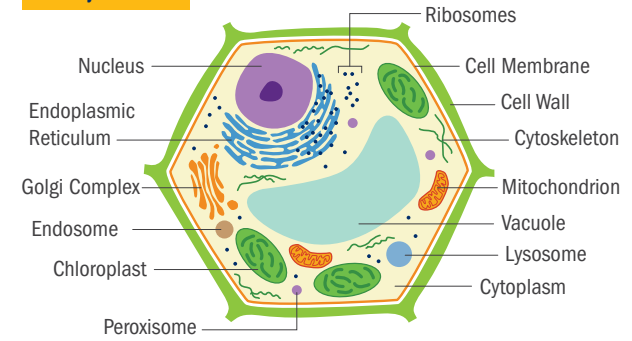
## Prokaryote: Bacterium



## Eukaryote: Animal



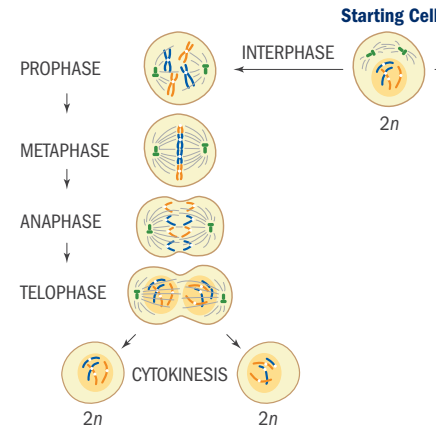
## Eukaryote: Plant



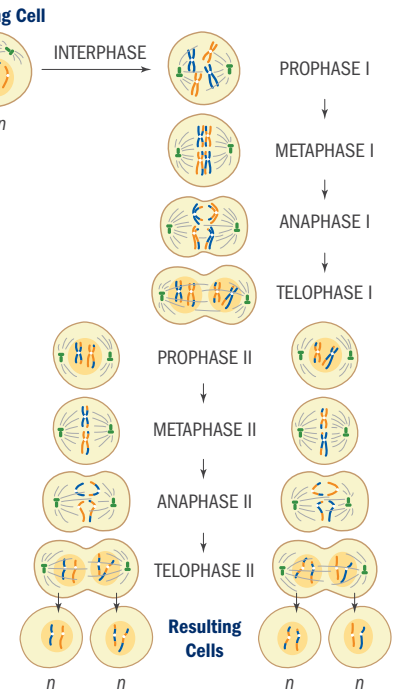
# ORGANELLES

Prokaryotic and Eukaryotic		Cell Membrane	Semipermeable surface for exchange of molecules and substances Lipids > Proteins > Carbohydrates
		Cytoskeleton	Maintaining cell shape, cell movement, and intracellular trafficking Proteins
		Chromosomes (DNA)	Code for everything including building proteins for cell growth and maintenance Nucleic Acids > Proteins
		Ribosome	Build proteins; site of translation Proteins > Nucleic Acids
		Cell Wall*	Structural support for maintaining cell shape Bacteria: peptidoglycan; Plants: Cellulose; Fungi: Chitin <i>*Not in animal cells</i>
Eukaryotic: Membrane-Bound Organelles	Endomembrane System	Nucleus	Houses chromosomes; site of transcription Nucleic Acids > Proteins > Lipids
		Smooth Endoplasmic Reticulum	Builds and breaks down fats and steroids; Breaks down toxins; Regulates calcium ion levels Lipids > Proteins > Carbohydrates
		Rough Endoplasmic Reticulum	Site of protein synthesis, tagging, folding, quality control, and dispatch Proteins > Lipids > Carbohydrates
		Golgi Complex	Final preparation and tagging of proteins for delivery to organelles or membrane Lipids > Proteins > Carbohydrates
		Endosome	Transport vesicle Proteins > Lipids > Carbohydrates
	Unknown	Lysosome	Breakdown of ingested materials or non-functional organelles or macromolecules for recycling Proteins > Lipids > Carbohydrates
		Peroxisome	Catabolism of long chain fatty acids; Reduction of hydrogen peroxide (ROS) by catalase; glyoxylate cycle in plants Proteins > Lipids > Carbohydrates
		Mitochondria	Production of ATP by Citric Acid Cycle and Electron Transport Chain (ETC); An important component of the catabolism of glucose: $C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2 + 38 ATP$
		Chloroplast*	Production of carbohydrates by light reactions and Calvin Cycle (dark reactions). An important component in the anabolism of glucose: $6H_2O + 6CO_2 + \text{light energy} \rightarrow C_6H_{12}O_6 + 6O_2$ <i>*Plants only</i>
		Endosymbiotic Origins	

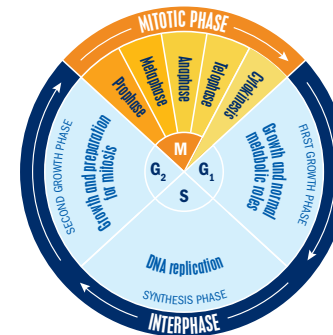
# MITOSIS



# MEIOSIS



## Cell Cycle



### Mnemonics

Pro	Prepare	Telo	End
Meta	Middle	Kinesis	Separate
Ana	Away		