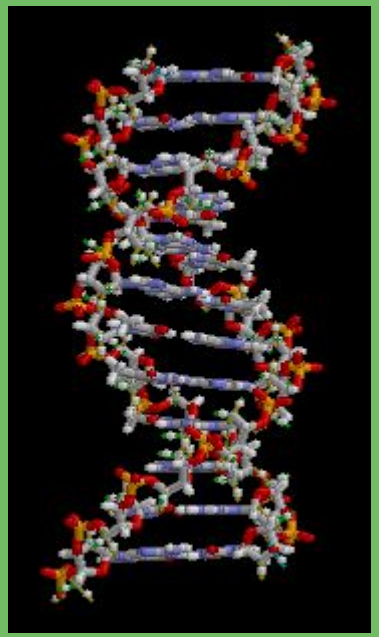
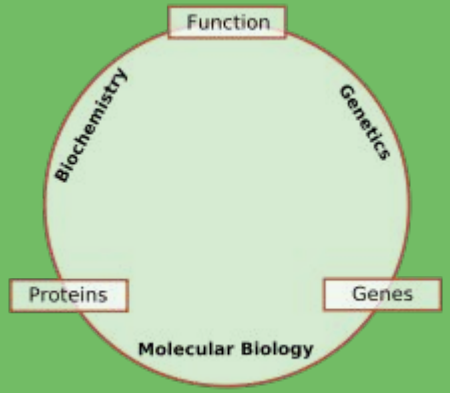
ScienceCraft

Molecular Biology

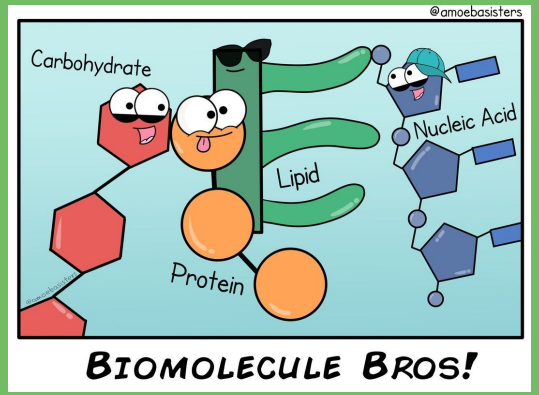
What is Molecular Biology?

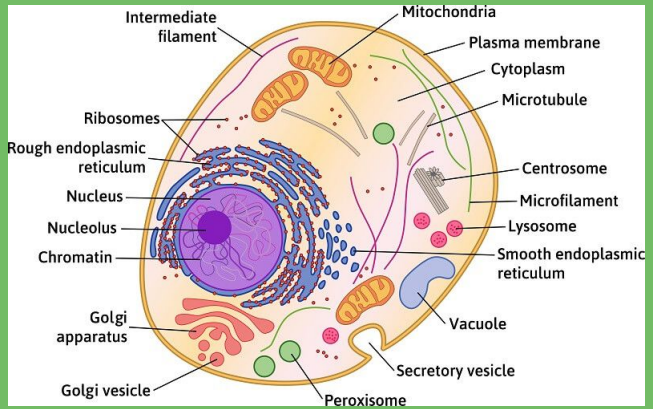




- **Biology** - study of life, **Molecular** - at the molecular level
- The study of life at the **Cellular Level**
  - Interactions **between cells** and **cellular molecules**
- Involves things such as human genetics, viruses and diseases at the cellular level, and DNA
- Similar to **Biochemistry** but biochemistry focuses on chemical reactions within body, while **Molecular Biology** focuses on structure and interactions between molecules

Cellular Molecules

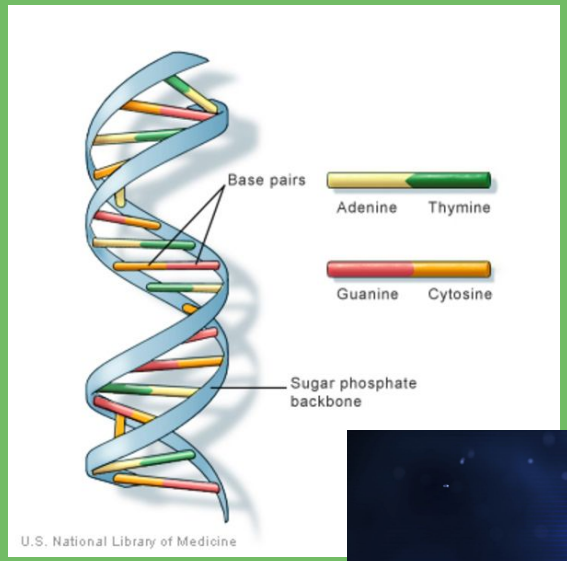




- There are 4 major types of cellular molecules (molecules of life)
- **Proteins** are the building blocks of life, most common, and help with cellular function
  - Made out of **4 Structures** of **Amino Acids**
- **Carbohydrates** are sources of energy
  - Made out of carbon, hydrogen, and oxygen
- **Lipids** are fatty molecules used in cell membranes
  - Made out of **Fatty Acids**
- **Nucleic Acids** are what makes DNA and RNA (found in Nucleus)

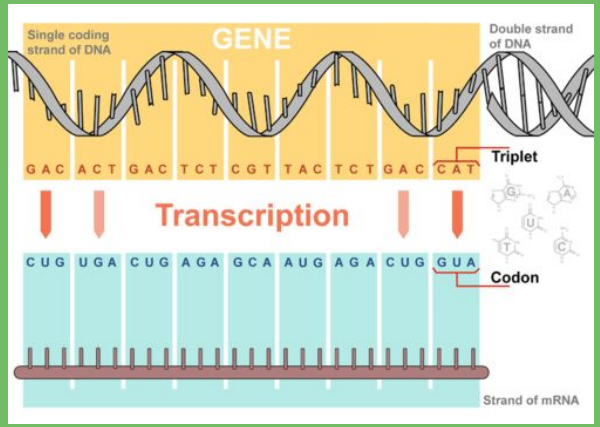
Part One: Mechanisms

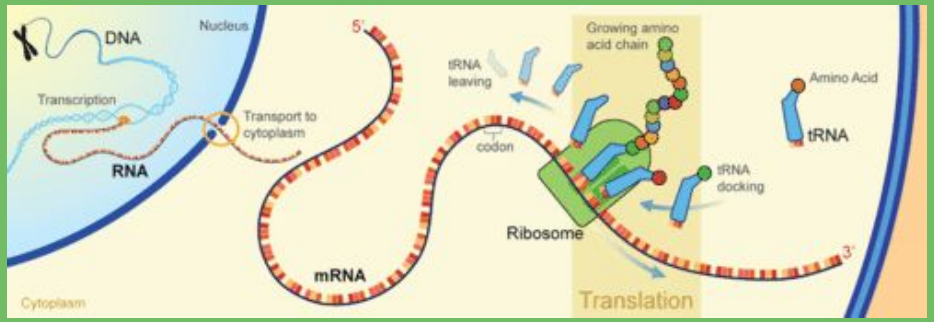
DNA



- **DNA** is the genetic material found in nearly all life that determines everything about life
- DNA's structure is in a **double-helix** with rings in the middle (think of a ladder)
  - Outer helix is a **sugar phosphate backbone**
- Inner rings consist of **A, T, G, and C** which are 4 Amino Acids (A pairs with T, G pairs with C - think "Always together and "Great couple")
- This is called **Base Pairing**
- **Nucleotides** are a base attached to a sugar and phosphate

Protein Synthesis

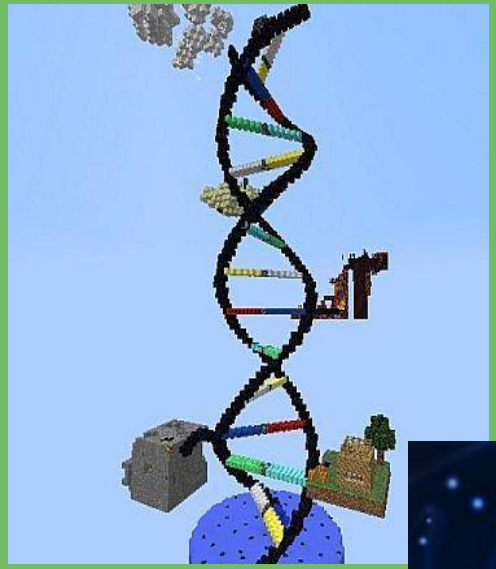




- Protein Synthesis is how proteins are made (proteins do everything in the cell)
- **Dogma** of molecular biology is "DNA → RNA → Proteins"
- Occurs in two stages
- **Transcription** is where DNA is copied to RNA (Nucleus)
  - Instructions for how to make each protein is written as an mRNA
- **Translation** is where RNA is turned into Protein (Ribosome)
  - mRNA moves to ribosome where rRNA and tRNA work together to build a protein

Part Two: Genetics

What are genes?



- **Genes** segments of DNA located on specific chromosomes.
  - **Chromosomes** are long DNA molecules with all genes carried
  - 23 pairs of Chromosomes.
  - **Have instructions for proteins**

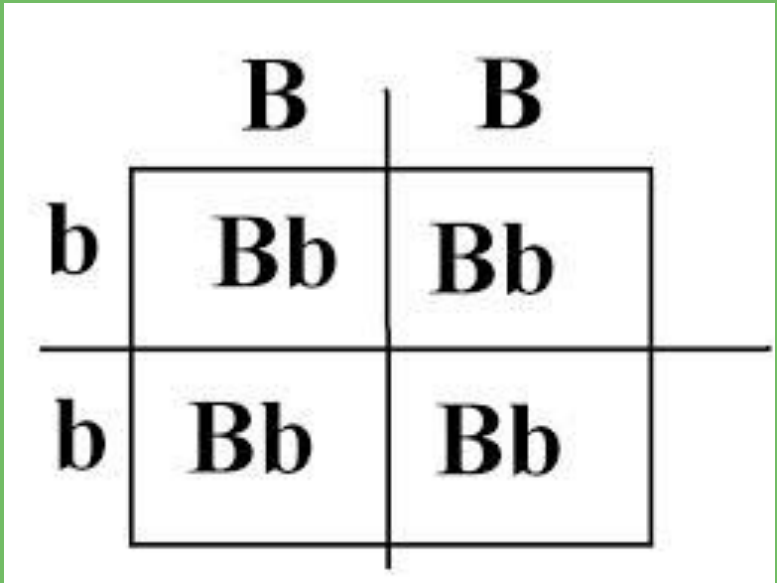
- **Nucleotide bases, phosphate backbone, and a 5 carbon sugar.**
  - Bases are A, T, C, G
  - Double Helix

Mendelian Genetics

- **Gregor Mendel** came up with his theory of inheritance after experimenting with different pea plants.
- Alleles are pairs of a gene that determine what trait you will have AKA **Genotype**
  - **Genotype determines phenotype**
  - Dominant and recessive genes

- **Law of Segregation**
  - One of each gene is passed on and chosen randomly

Punnett Square



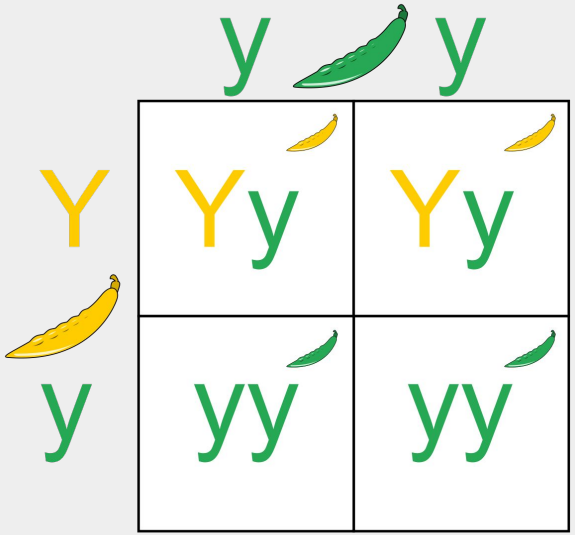
- **Dominant is capital, recessive is lowercase**
  - Dominant always appears over the recessive.
  - **Homozygous** – both recessive or both dominant
  - Homozygous recessive is the only way recessive phenotype shows up.
  - **Heterozygous**: both!
- **Punnett Squares**
  - Parent alleles on the sides, Cross them together.
  - The results are the different genotypes that could appear in the child

Mendelian Genetics Continued

Mendel's Seven F_1 Crosses on Pea Plants

	Seed Shape	Seed Color	Seed Coat	Pod Shape	Pod Color	Flower Position	Plant Height
P	Round X Wrinkled	Yellow X Green	Gray X White	Smooth X Constricted	Green X Yellow	Axial X Terminal	Tall X Short
F_1	Round	Yellow	Gray	Smooth	Green	Axial	Tall

- By looking at the results of Mendel's study in the photo on the left, **which phenotypes do you think are dominant**?



Kahoot Time!