Introduction to DNA & RNA
In our first unit (Biochemistry), we learned that there were 4 major organic compounds.

- Carbohydrates
- Lipids
- Proteins
- Nucleic Acids

Nucleic Acids serve as the blueprint for proteins.

- Gives organisms their unique traits like hair/eye color, blood type, height, skin color, etc.
Types of Nucleic Acids

- There are two types of nucleic acids:
  - DNA – Deoxyribonucleic Acid
  - RNA – Ribonucleic Acid

- Both, DNA and RNA, are composed of small units called nucleotides
Structure of Nucleotides

- Composed of 3 parts:
  1. **Nitrogen Base**
     - Adenine, Thymine, Cytosine, Guanine, or Uracil
  2. **5-carbon Sugar**
     - Either Ribose or Deoxyribose
  3. **Phosphate Group**
Structure of DNA

- DNA nucleotides bond together to **form a double helix**
  - *Helix = twisted / winded*

- Think of a twisted ladder
  - “rungs” are **nitrogen bases**
  - “Sides” are the **sugar-phosphate backbone**
This is known as Chargaff’s Rule
- You won’t need to remember this name!

When DNA nucleotides bond together to form the double helix:
- Adenine always pairs with Thymine $A = T$
- Cytosine always pairs with Guanine $C = G$

Nitrogenous bases that bond together are called complementary base pairs.
Structure of RNA

- RNA is a **single helix**
  - Instead of having 2 strands, like DNA, RNA has only 1 strand
RNA Base Pairing

- When DNA nucleotides bond together to form the double helix:
  - Adenine *always* pairs with Uracil  \( A = U \)
  - Cytosine *always* pairs with Guanine  \( C = G \)
DNA

- Deoxyribose Sugar
- Nitrogen Bases:
  - Adenine = Thymine
  - Cytosine = Guanine
- Double Stranded

RNA

- Ribose Sugar
- Nitrogen Bases:
  - Adenine = Uracil
  - Cytosine = Guanine
- Single Stranded
Try this...

- Write the complementary strand of DNA for the following 2 sequences of DNA:
  - ATGCATGCTTAGTCCCA
  - TACGTACGAATCAGGT
  - GCATGGAAATCACAAGTT
  - CGTACCTTAGTGTCAAA

- Write the complementary strand of RNA for the following 2 sequences of DNA:
  - ATGCATGCTTAGTCCCA
  - UACGUACGAUUCAGGU
  - GCATGGAAATCACAAGTT
  - CGUACCUUAGUGUCAAA
Terminology

- **Chromosome:**
  - Structure in the nucleus consisting of one long, tightly coiled thread of DNA

- **DNA:**
  - Composed of nucleotides, provides the blueprint for protein synthesis by the specific arrangement of nitrogenous bases

- **Gene:**
  - A specific location on a chromosome, consisting of a segment of DNA, that codes for a particular protein. These determine the characteristics of an organism.

  - Each chromosome consists of hundreds of genes determining the many proteins for an individual organism
Function of DNA & RNA

- DNA contains instructions for building proteins and is stored in our genes.
- Estimated that we have 30,000 – 40,000 genes.
- Only 20,000 genes are known to code for certain proteins.
- Function of RNA is to make copies of the DNA and help during protein synthesis.
How does this all fit together?