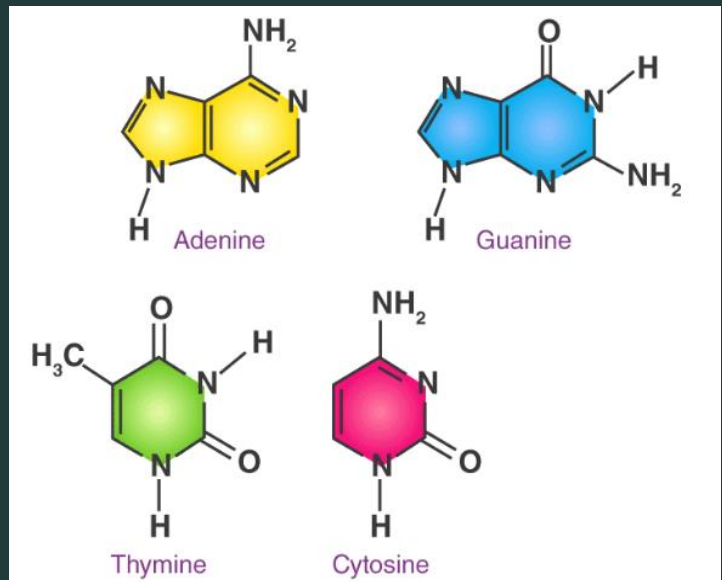
DNA and How it Works

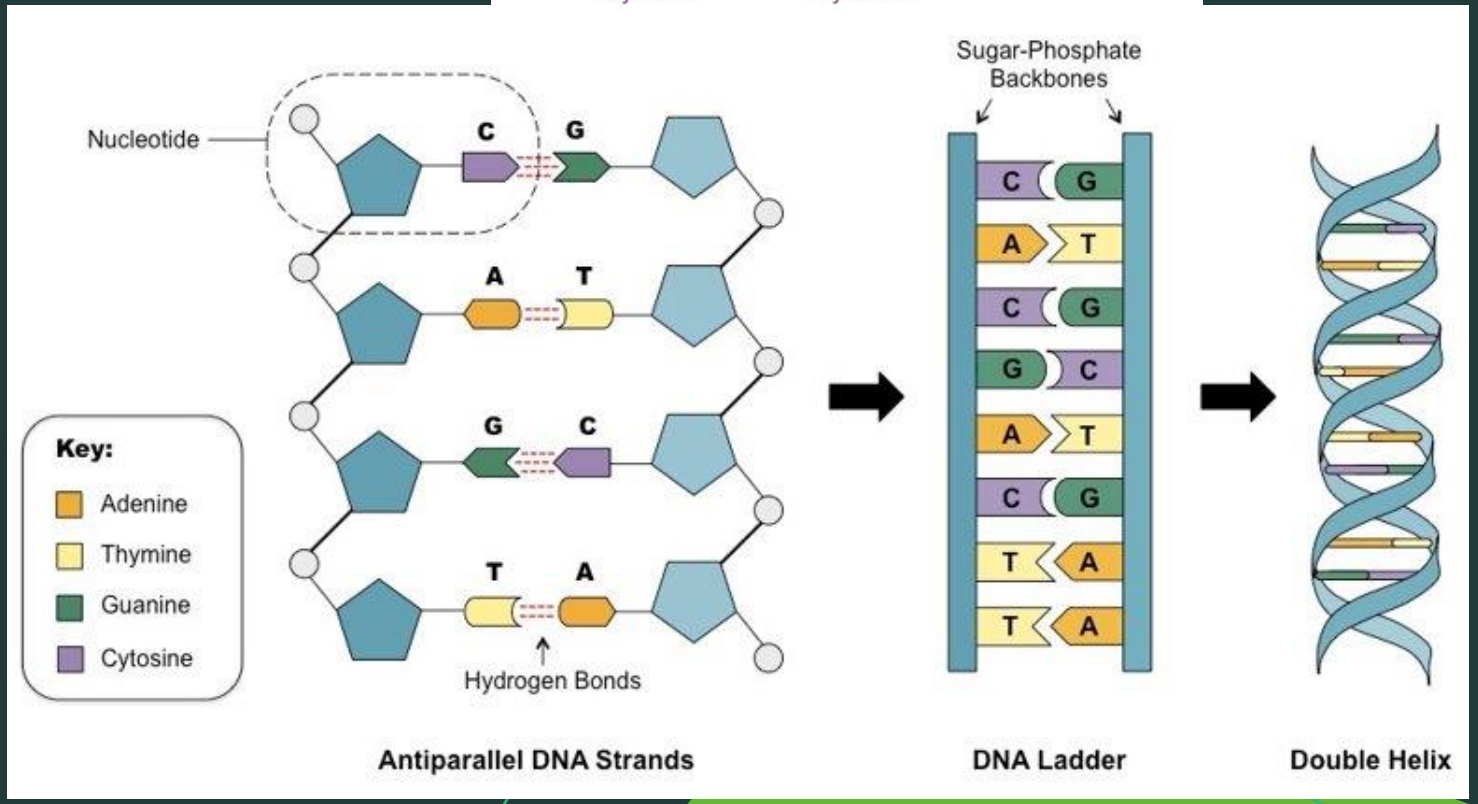
What is Deoxyribo Nucleic Acid?

- DNA is found in the nucleus (control center organelle) of a cell
- It is an information molecule that codes for information on how to make **proteins**.
- **Proteins** are the molecular machines that do everything for the cell.
- DNA has a twisted ladder (double helix) shape

DNA Structure

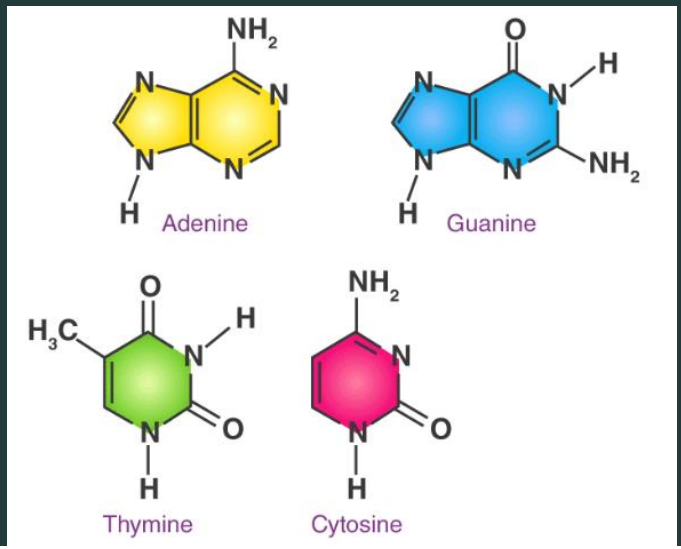
- DNA is made of repeating units called "nucleotides". Each nucleotide is made of:
  - A phosphate (the white circle)
  - A sugar called deoxyribose (the blue pentagon)
  - 1 of 4 nitrogenous bases (chemicals)
    - Adenine
    - Thymine
    - Guanine
    - Cytosine

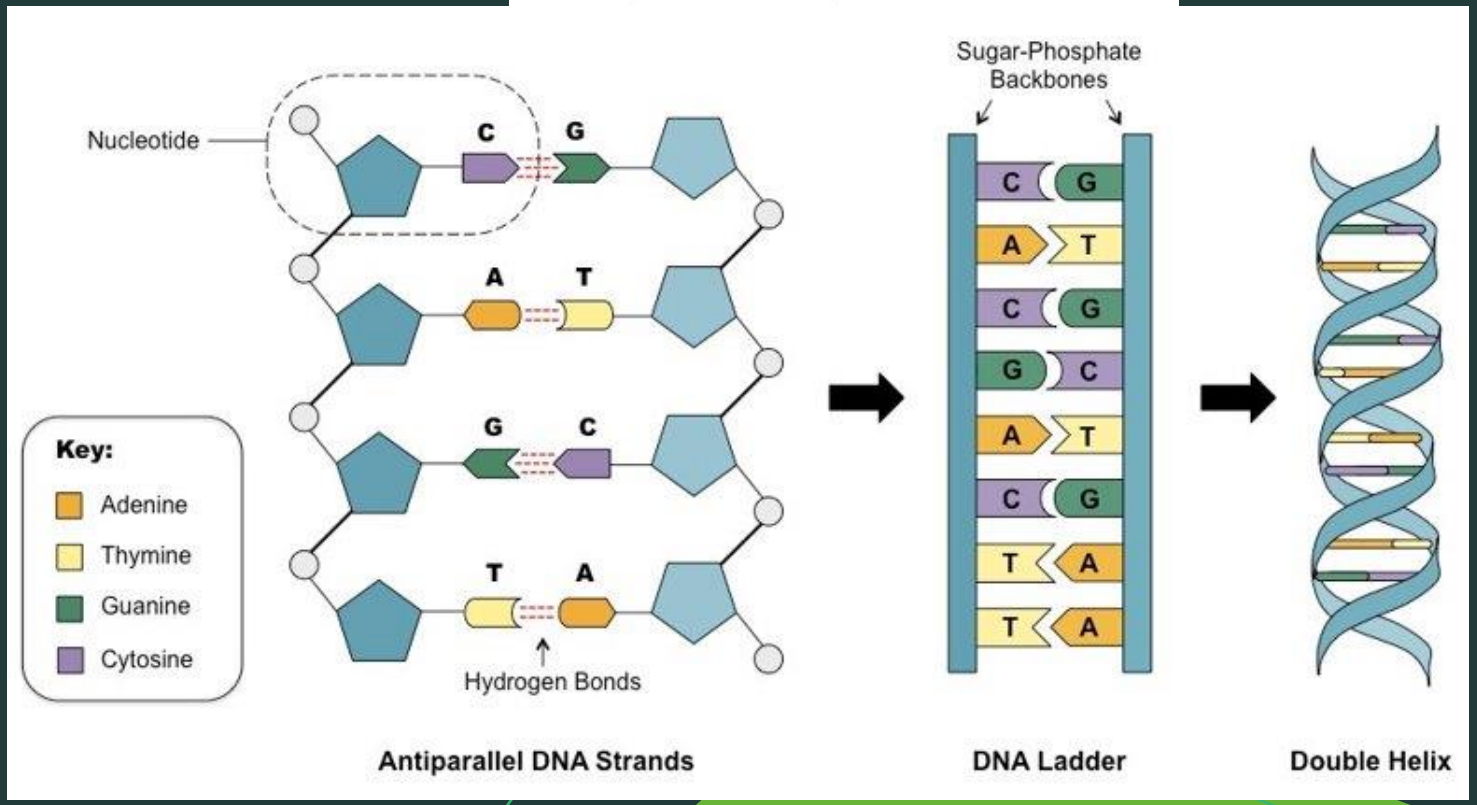




DNA Structure

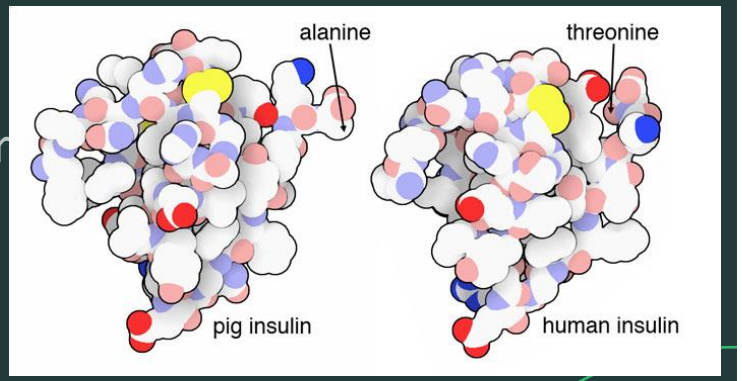
- The sugar and phosphates make of the backbone, while the bases glue the two strands together
- C pairs with G, A pairs with T, no exceptions (at grade 10)
- The bases code the information to create proteins like a computer
  - A computer writes code using 1's and 0's in a certain **order** to remember how to create/do something
  - All life, including humans, store information in a similar way, but we have 4 bases (chemicals) rather than 2 numbers
  - Ex. AAAGTTCTA could code for something like an insulin protein

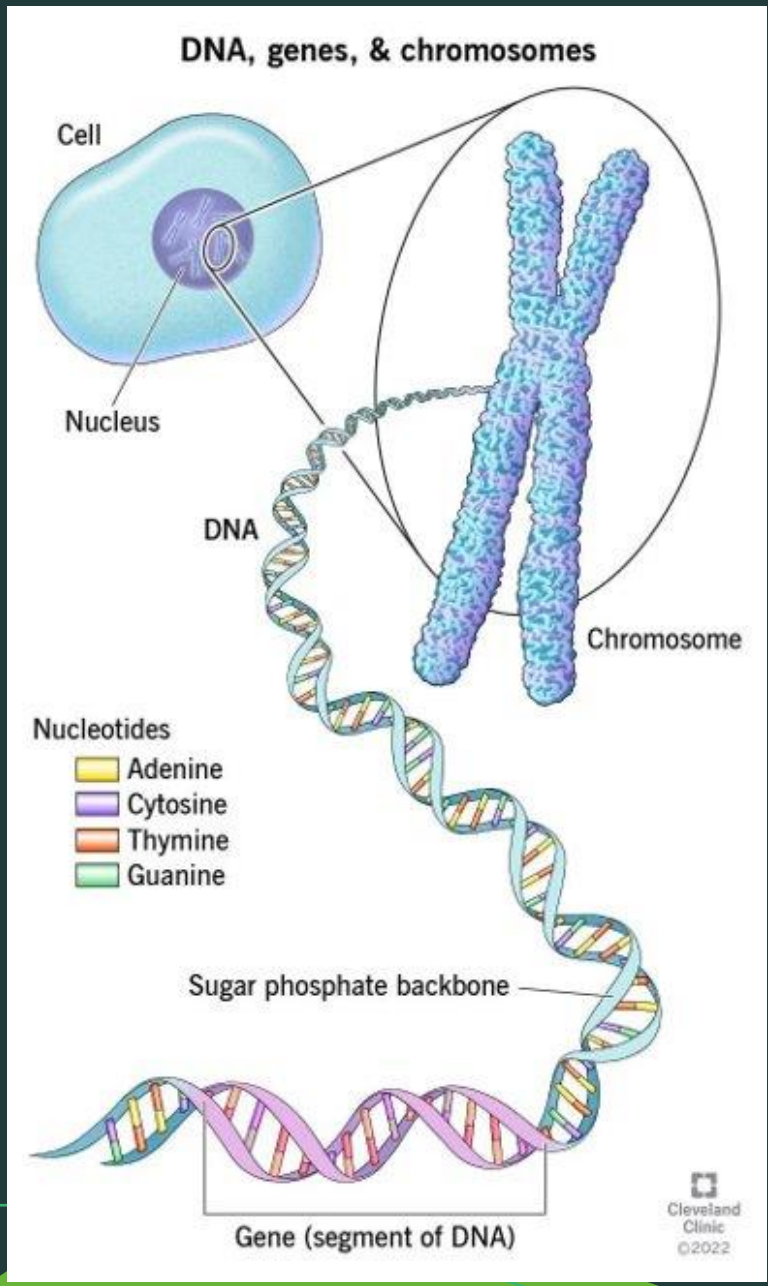




Chromosomes and Genes

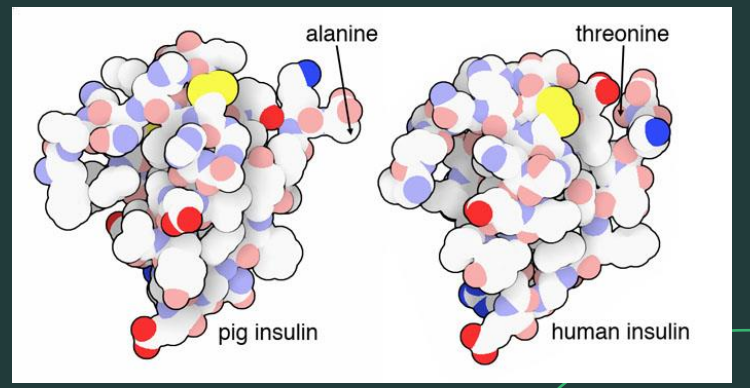
- All DNA has sections called genes. **Genes** are regions of DNA that code for a protein.
- The means that a bunch of DNA does not code for proteins, however the other regions still serve other functions.
- Proteins created by genes cause **traits** or features in the organism such as eye colour, hair colour, or if you ear lobe is attached or not.

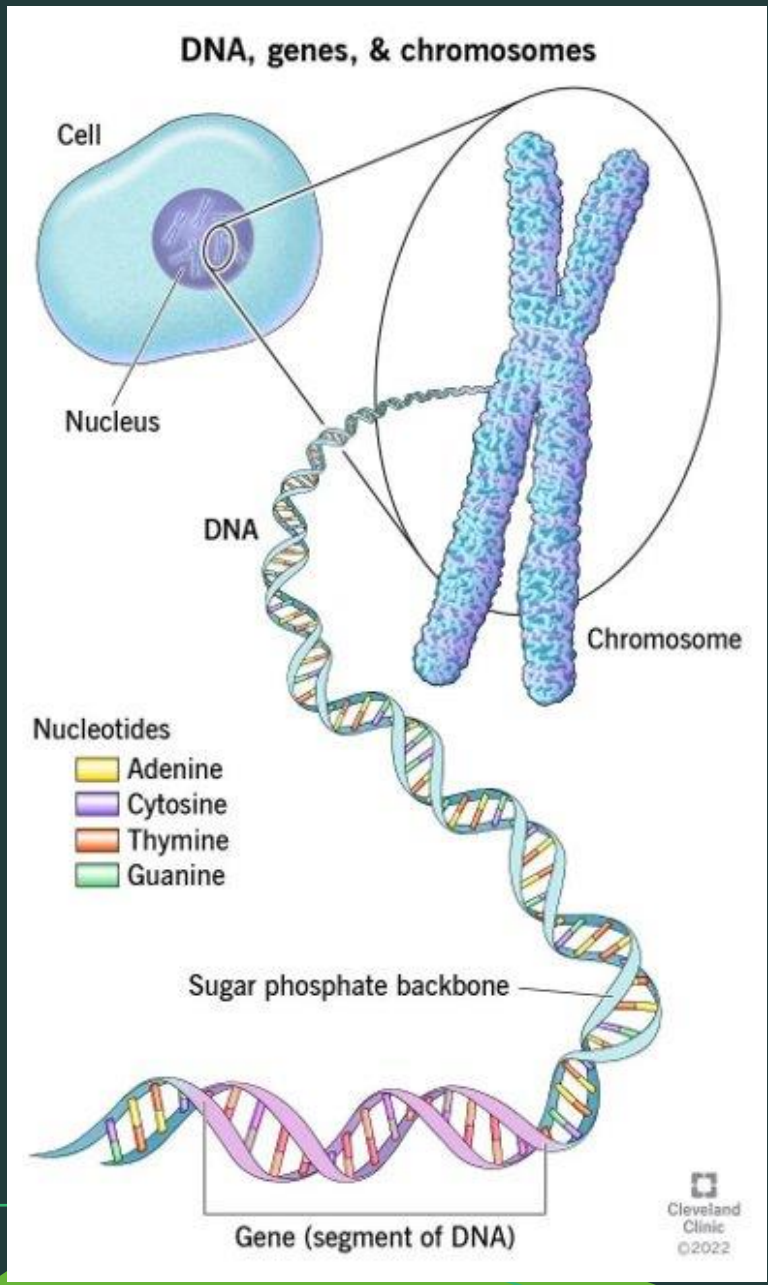




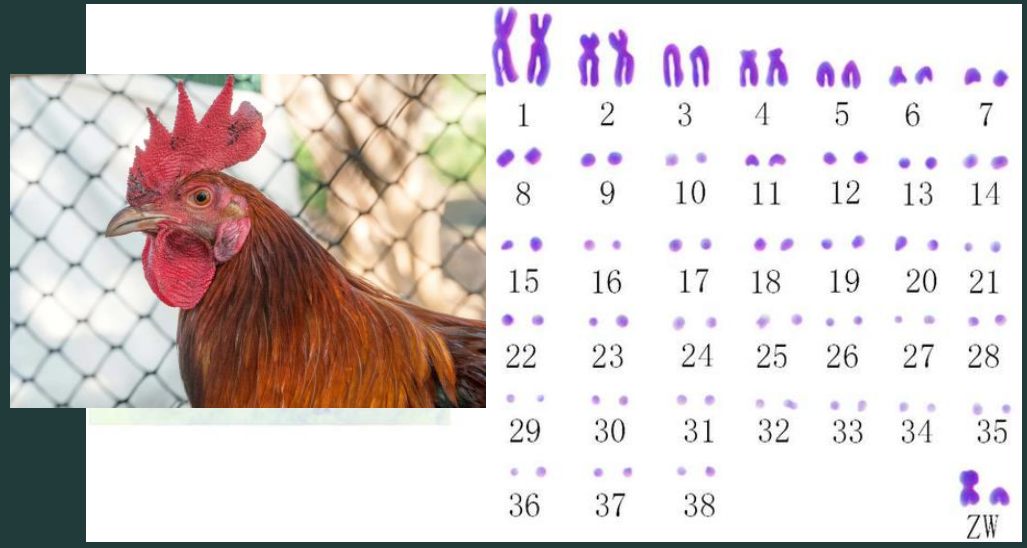
Chromosomes and Genes

- Some simple organisms, like bacteria just have a circle of DNA. Complex organisms, like humans, wind our DNA into X shaped **chromosomes**.
- **Chromosomes** are needed to effectively store complex DNA, since a human's DNA has about 3 billion base pairs (rungs of the ladder) in every cell!
- Cool fact: stretched out, DNA would be 2 meters in length





Chromosomes in Humans



- Humans have 46 chromosomes, 23 from a father and 23 from a mother
- Each matching chromosome (called homologous chromosome pairs) code for similar types of genes
  - Example: both copies of the human chromosome number 1 could code for eye colour
  - You will learn more about how genes interact with each other next year.
- Humans also have a sex-linked chromosome that determines anatomical features
- Other creatures/organisms have other chromosome numbers. The mighty chicken has 78! (But only 1.2 billion base pairs, so smaller chromosomes)