SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Sub: Biology for Engineers

Sub code:19BY701

Topic: Prokaryotic and Eukaryotic Cells

Gene

- Segment of DNA that has the information (the code) for a protein or RNA.
- A single molecule of DNA has thousands of genes on the molecule.
- Remember the mantra: DNA to RNA to Protein

Chromosomes

- DNA and the proteins associated with the DNA.
- Histone proteins help DNA coil up and form its shape.
- Non-histone proteins regulate turning on and turning off genes.
- Found in the nucleus.

- Chromosomes are really just the form DNA becomes in the nucleus when the cell is preparing to divide. (In the form of chromatin at other times.)
- Humans have 46 chromosomes.
- One set of 23 chromosomes from mom.
- One set of 23 chromosomes from dad.
- Human Chromosomes

Chromatid

- Two exact copies of a chromosome that are connected together.
- The point where they are connected near the middle is called the centromere.
- Chromatids are made when new cells are going to be made.

Duplicated chromosomes

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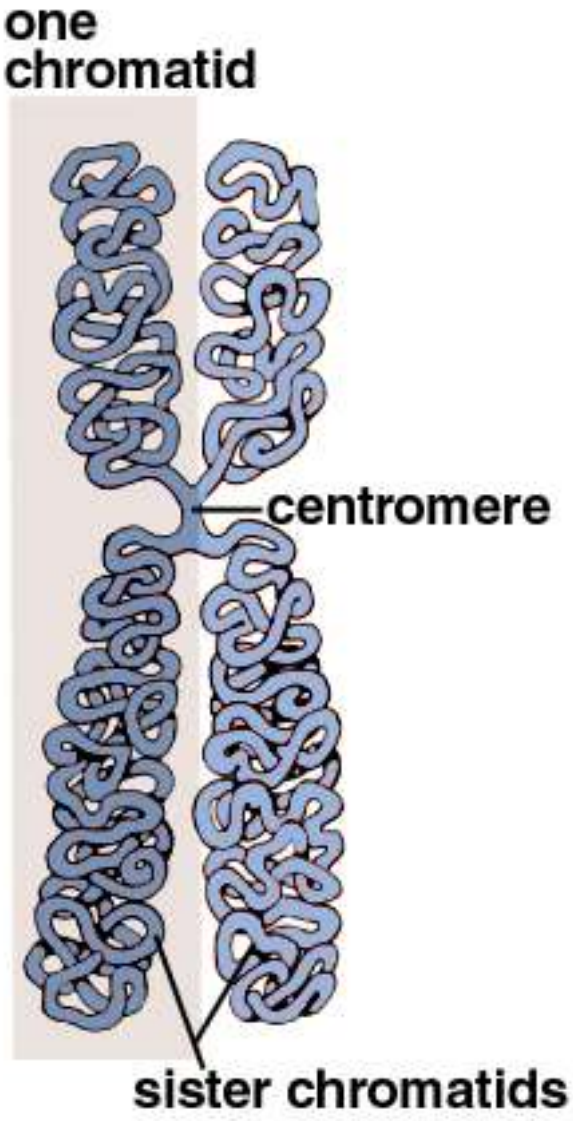
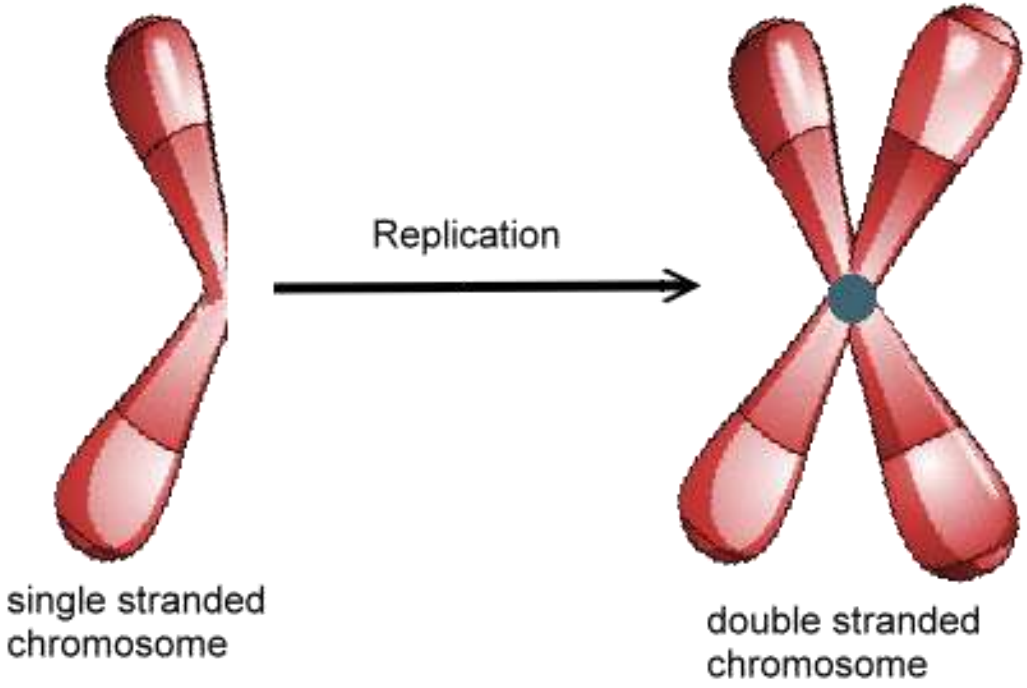
1 μm



Eukaryotic Chromosome Structure



- Chromosomes are only visible when a cell is dividing so we usually see them in their double-stranded form.

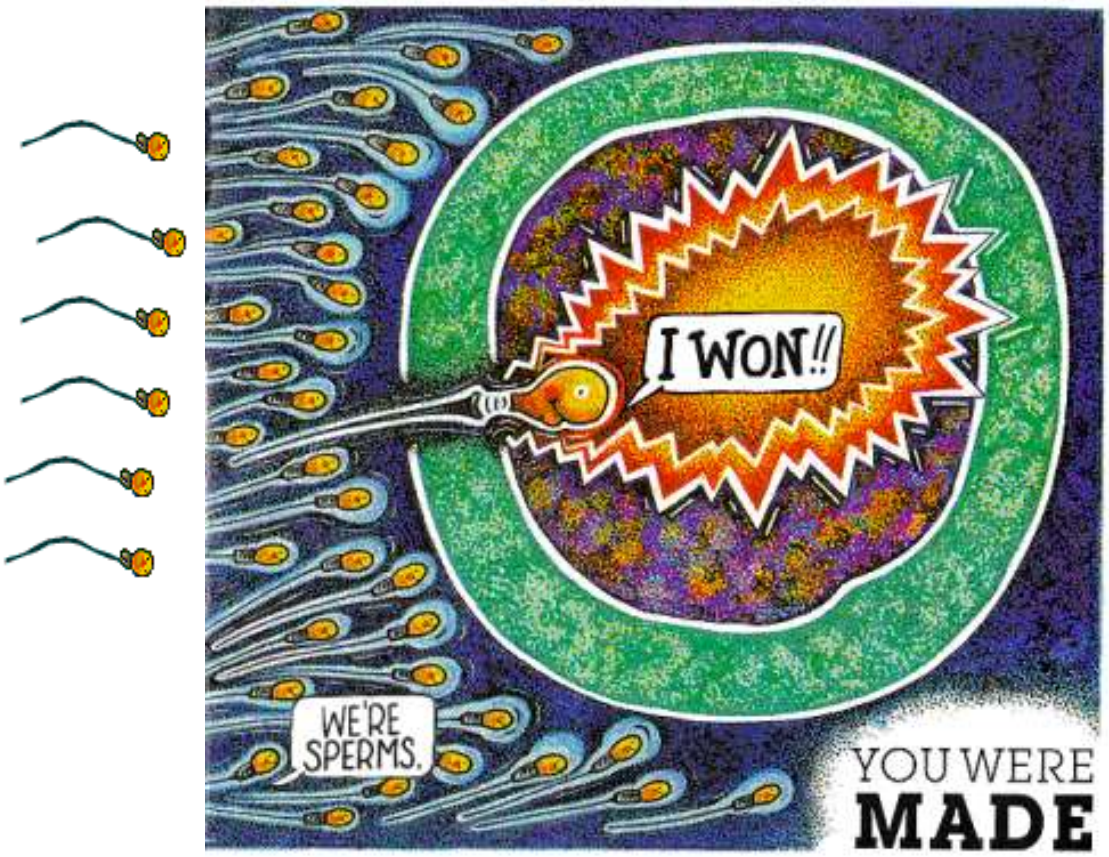
Each species has a characteristic number of chromosomes.

- **Diploid (2n) :** two sets of chromosomes
  - Found in all the non-sex cells or autosomes of an organism's body (with a few exceptions).
  - Examples include humans (46), crayfish (200), etc.

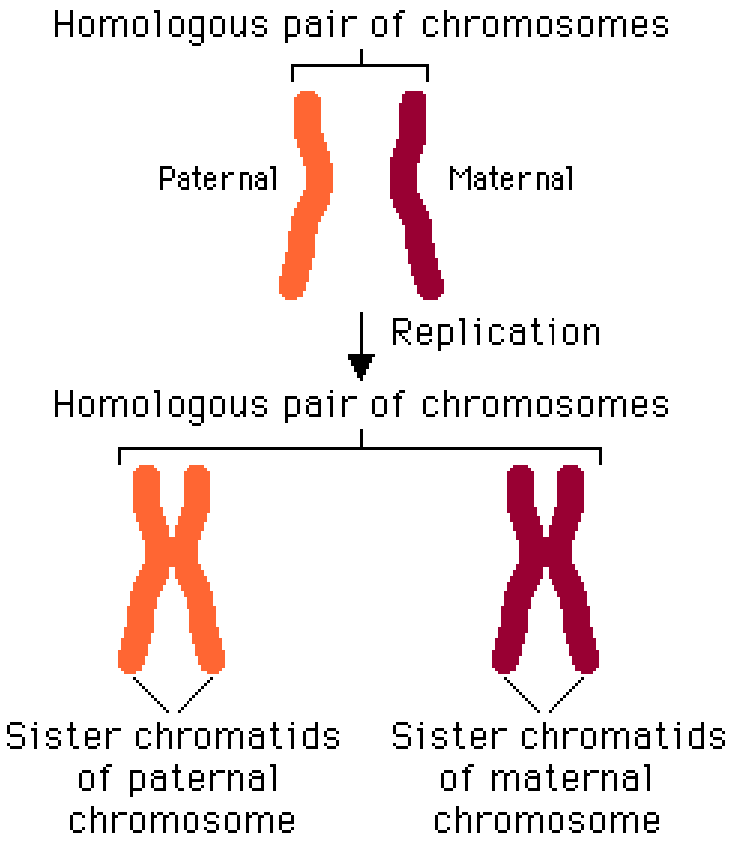
- **Haploid (n)** contains one set of chromosomes.
  - In the life cycle of many animals, only sperm and egg cells(sex cells) have the haploid number.
  - Examples include humans (23), crayfish (100), etc.

Vocabulary

- **<u>Gamete</u>:** sex cells= sperm or egg
- Fusion of gametes forms a **<u>zygote.</u>**
- A **zygote** always has a full or diploid (2n) number of chromosomes
  - A fertilized egg cell. (sperm + egg)

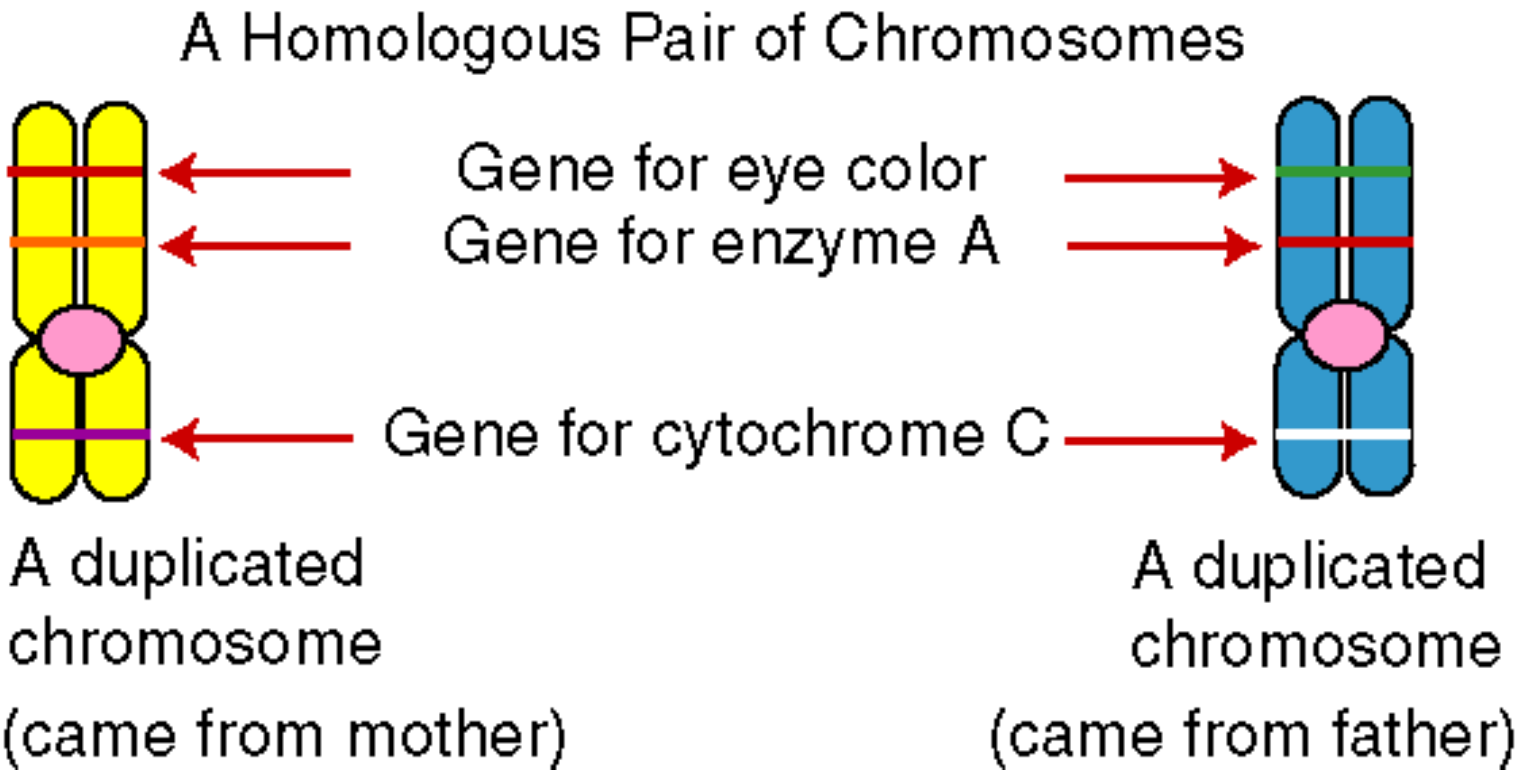


Homologous Chromosomes

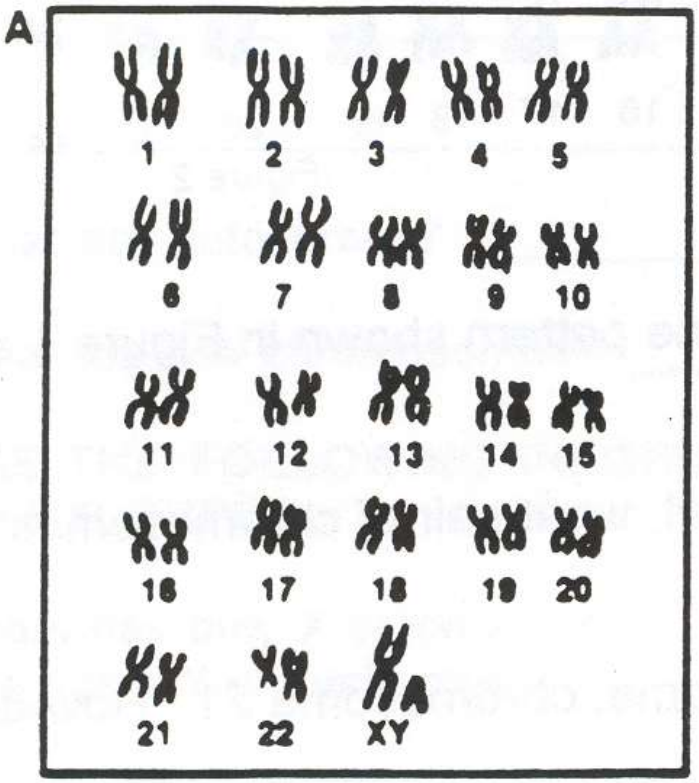


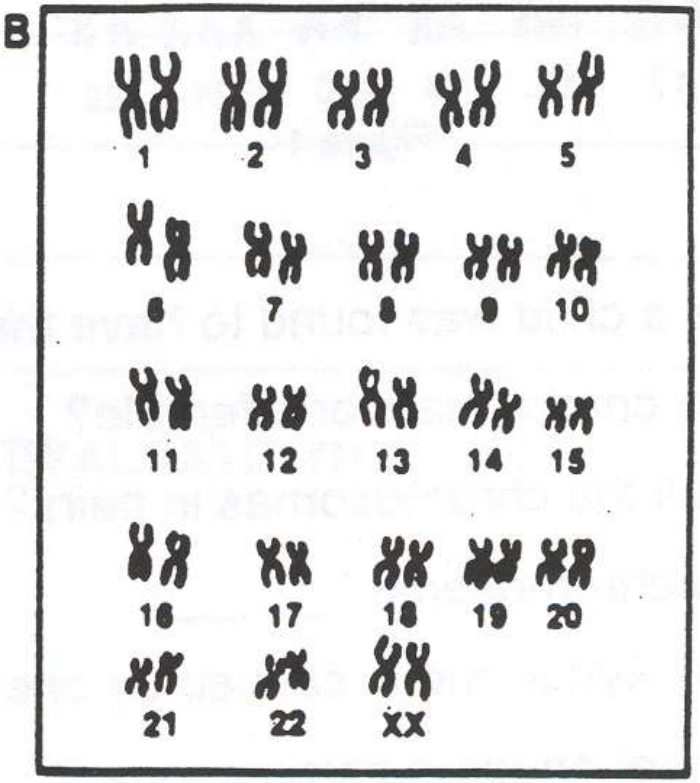
- Chromosomes containing the same type of genetic information
- one comes from male parent, one comes from female parent

Homologous Chromosomes



The chromosomes diagrammed below are arranged in a **karyotype**, the 46 chromosomes have been arranged in homologous pairs.





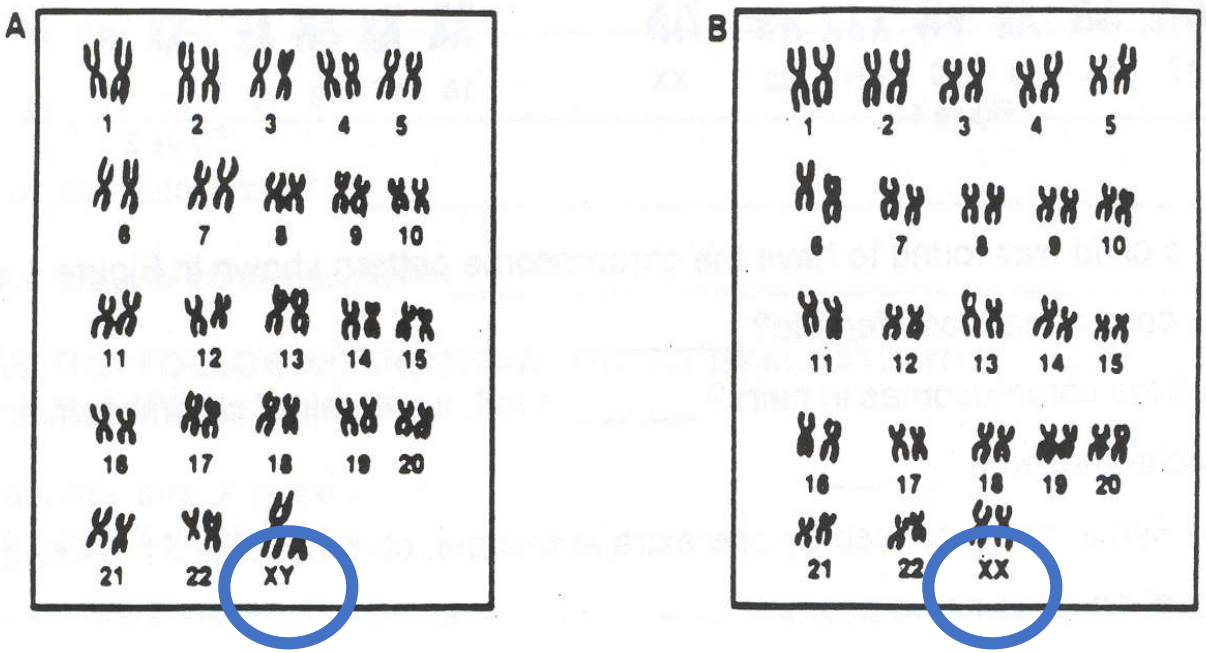
Types of Chromosomes:

- **Autosomes** = Body chromosomes or non sex chromosomes (humans have 44 or 22 pairs)
- **Sex Chromosomes** = XX or XY (23rd pair for humans) determines the sex of the offspring

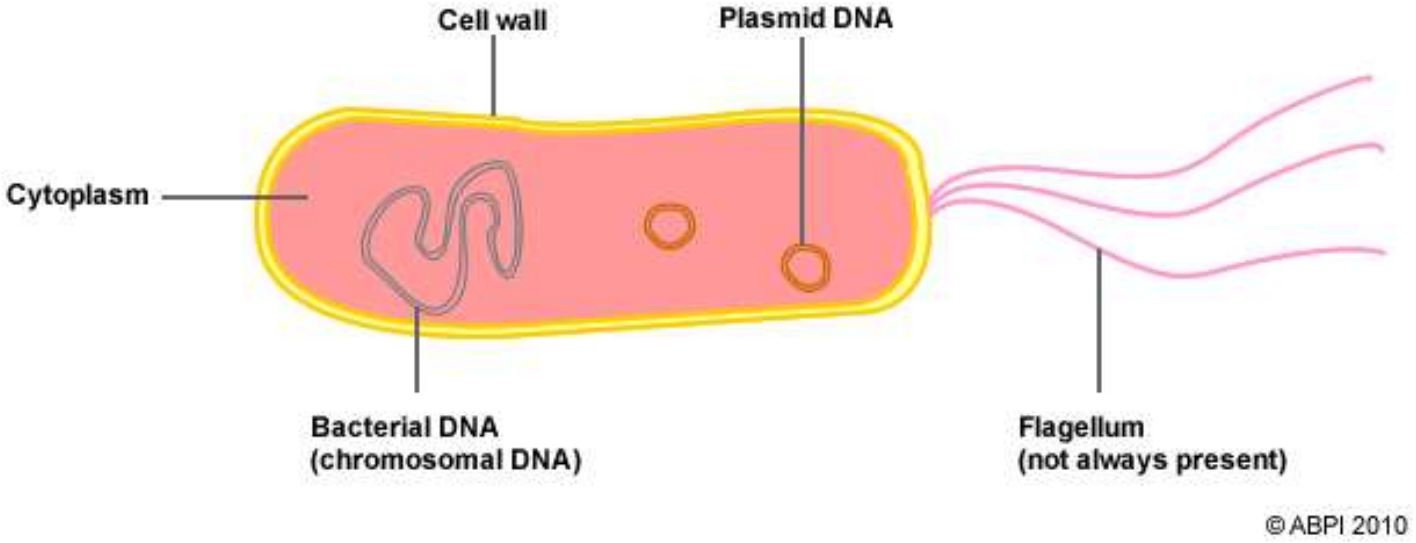
The first 22 pairs of homologous chromosomes are called **autosomes** or autosomal chromosomes.

The 23rd pair of chromosomes determines the sex of the individual and are called **sex chromosomes.**

The sex chromosomes of a female are **XX**.
The sex chromosomes of a male are **XY**.



Prokarvotic Chromosome Structure



- Bacteria have a one single loop of DNA
- Where is the nucleus?
  - THERE IS NO NUCLEUS! IT'S A PROKARYOTIC CELL! ONLY EUKARYOTIC CELLS HAVE A NUCLEUS!

DNA

- A double stranded, helical nucleic acid.
- There are 4 different bases (parts/building blocks) that make up DNA.
- Adenine, Guanine, Thymine, and Cytosine. Often referred to as A's, G's, T's, and C's
- Stores your hereditary information, ***it stores the information for your genes!!***

Cell Cycle and Cancer

- **Loss of Control**

Genes: regulate and control

- Certain genes control the start, control the processes during, and finish cell growth.
- What happens if there is a mutation?

Mutations

- Mutations will cause a gene to produce a protein that will not function properly.
- Bad protein usually leads to cell growth and division not working properly.

What happens?

- 1. Uncontrolled growth. The cells grow and divide too fast. Caused by overproducing growth-promoting molecules.
- 2. Other times proteins are inactivated which normally slow or stop the cell cycle.

RESULT

- Uncontrolled cell cycle can lead to cancer.
- Undifferentiated cells are cells that do not have a specific function. A growth or ball of these cells lead to a tumor.

Causes

- These are some common causes among many.
- 1. Smoking
- 2. UV-radiation
- 3. Environmental influences, chemical exposure, especially known carcinogens. Carcinogen: substances that causes cancer.
- 4. Effects of diet, may lead to increased or decreased risk of cancer.