Keystone Biology Remediation

B1: Cell Growth and Reproduction

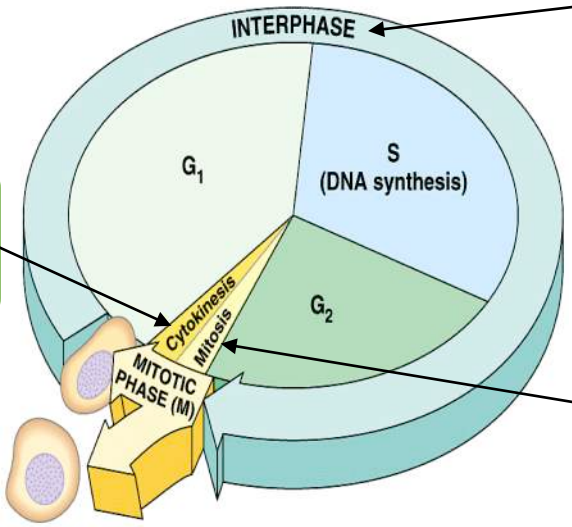
Assessment Anchors:

- to describe the events that occur during the cell cycle: interphase, nuclear division (e.g. mitosis or meiosis), cytokinesis (B.1.1.1)
- to compare the processes and outcomes of mitotic and meiotic nuclear divisions (B.1.1.2)
- to describe how the process of DNA replication results in the transmission and/or conservation of genetic material (B.1.2.1)
- to explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance (B.1.2.2)

Unit Vocabulary:

allele	DNA	interphase
cell cycle	DNA replication	meiosis
chromosomes	gamete	nucleic acid
crossing over	gene	semiconservative replication
cytokinesis	inheritance	template

Assessment Anchor: Describe the events that occur during the cell cycle: interphase, nuclear division (e.g. mitosis or meiosis), cytokinesis. (B.1.1.1)



Interphase

The cell is preparing for division:

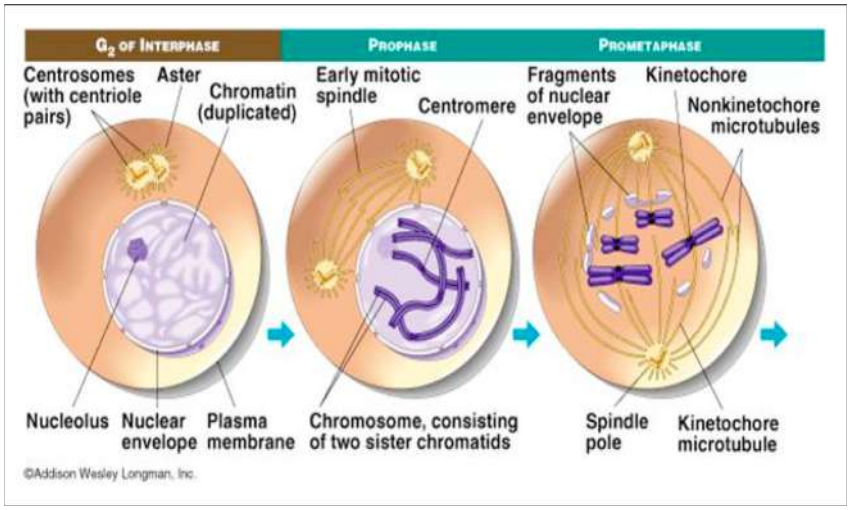
- DNA is replicated
- Additional organelles are produced
- Cell grows
- Cells make proteins necessary for division

Cytokinesis

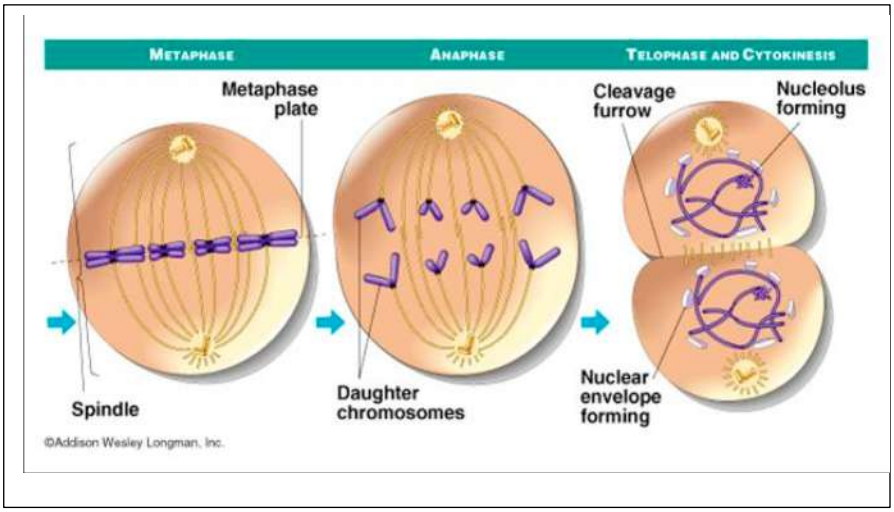
The **cytoplasm** divides.

Mitosis

The **nucleus** divides.



****** Consider prometaphase to be late prophase.**



Stages of Mitosis:

A. Prophase

- chromatin coils becoming shorter and thicker; once they are visible as individual strands, they are called chromosomes
- two copies of each chromosome are held together by a centromere
- centrioles separate and move to opposite poles.
- spindle fibers form attaching centromeres to centrioles
- nucleolus disappears
- nuclear membrane breaks down

B. Metaphase

- chromosomes line up along the equator

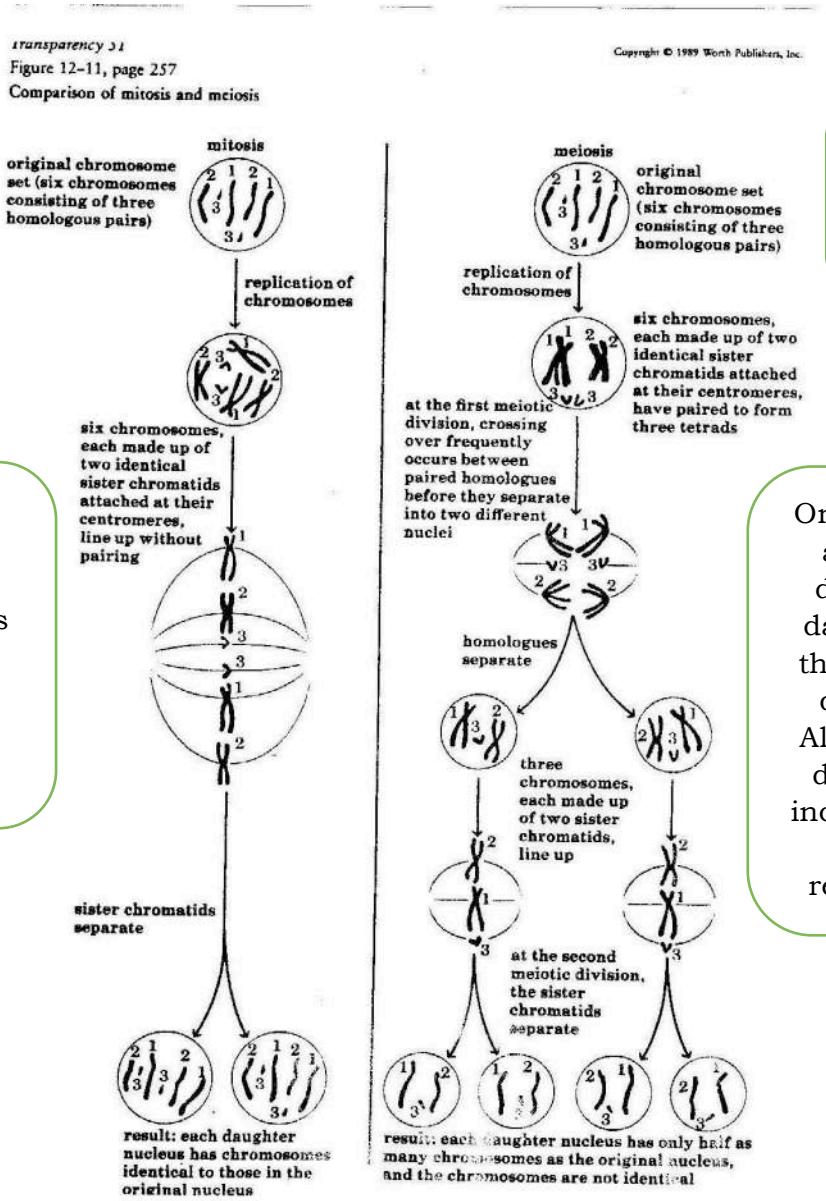
C. Anaphase

- sister chromatids split at the centromere
- now that the chromatids are separated, they are called chromosomes
- chromosomes move to opposite poles

D. Telophase

- chromosomes begin to uncoil into chromatin
- nuclear membrane reforms
- spindle fibers break down
- nucleolus becomes visible

Assessment Anchor: Compare the processes and outcomes of mitotic and meiotic nuclear divisions. (B.1.1.2)



Original cell is **diploid** – notice the pairs of chromosomes.

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One DNA replication and one nuclear division produces daughter cells with the diploid number of chromsomes.

One DNA replication and **two** nuclear divisions produce daughter cells with the haploid number of chromosomes. Also, **crossing over** during prophase I increases the genetic variation in the resulting gametes.

Mitosis: result is 2 diploid daughter cells that are identical to each other and identical to the parent cell.

Meiosis: result is 4 haploid gametes that are genetically different from each other and from the parent cell.

Purpose of mitosis: growth, repair, and replacement (in multicellular organisms); reproduction (binary fission) in unicellular organisms

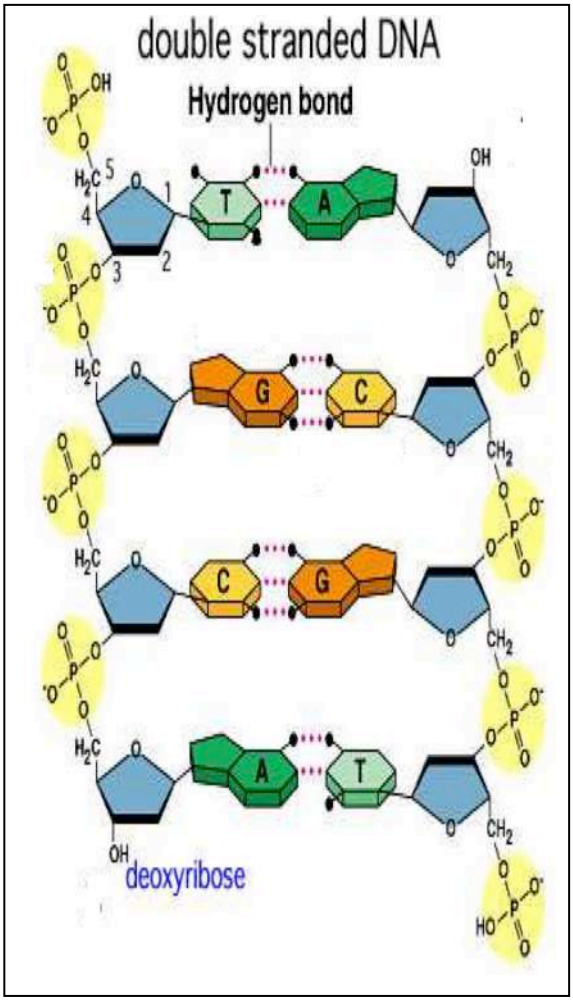
Purpose: production of gametes

Location: all body cells

Location: reproductive organs

Assessment Anchor: Describe how the process of DNA replication results in the transmission and/or conservation of genetic material. (B.1.2.1)

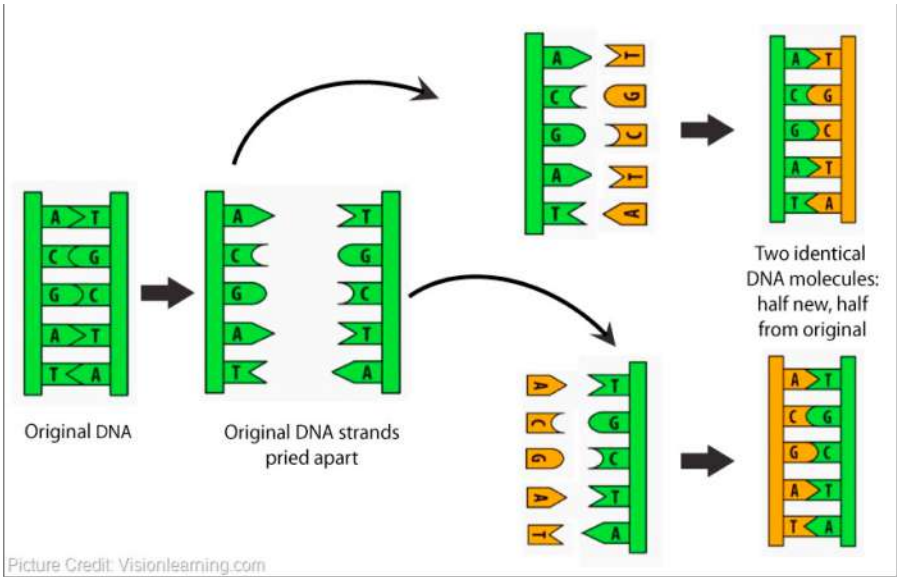
DNA



Facts that you need to know about DNA including important vocabulary:

- DNA is one type of ***nucleic acid*** (that's what the "NA" stands for!)
- DNA is a polymer made of monomers called ***nucleotides***.
- Each nucleotide consists of three parts: a sugar (deoxyribose), a phosphate, and a base.
- Nucleotides are different depending on which base they contain.
- There are four possible bases (and therefore, four possible nucleotides). They are ***cytosine, guanine, adenine and thymine***. (A, T, G, C)
- ***All living things*** have a genetic code based on these four nucleotides. What makes each of us different is the order that the bases are in.
- ***Complementary*** can refer to the two strands of a DNA molecule or bases that pair with each other. (Adenine is complementary to thymine and cytosine is complementary to guanine.)

DNA Replication



Important info and terms:

The process depicted in the graphic is called ***DNA replication.*** This process happens right before a cell divides.

The strand that is used for the pattern to build the new strand is called the ***template strand.***

The ***base pair rule*** is:

- A always binds with T
- C always binds with G

Semiconservative refers to the fact that the resulting DNA strands are half original DNA and half new nucleotides.

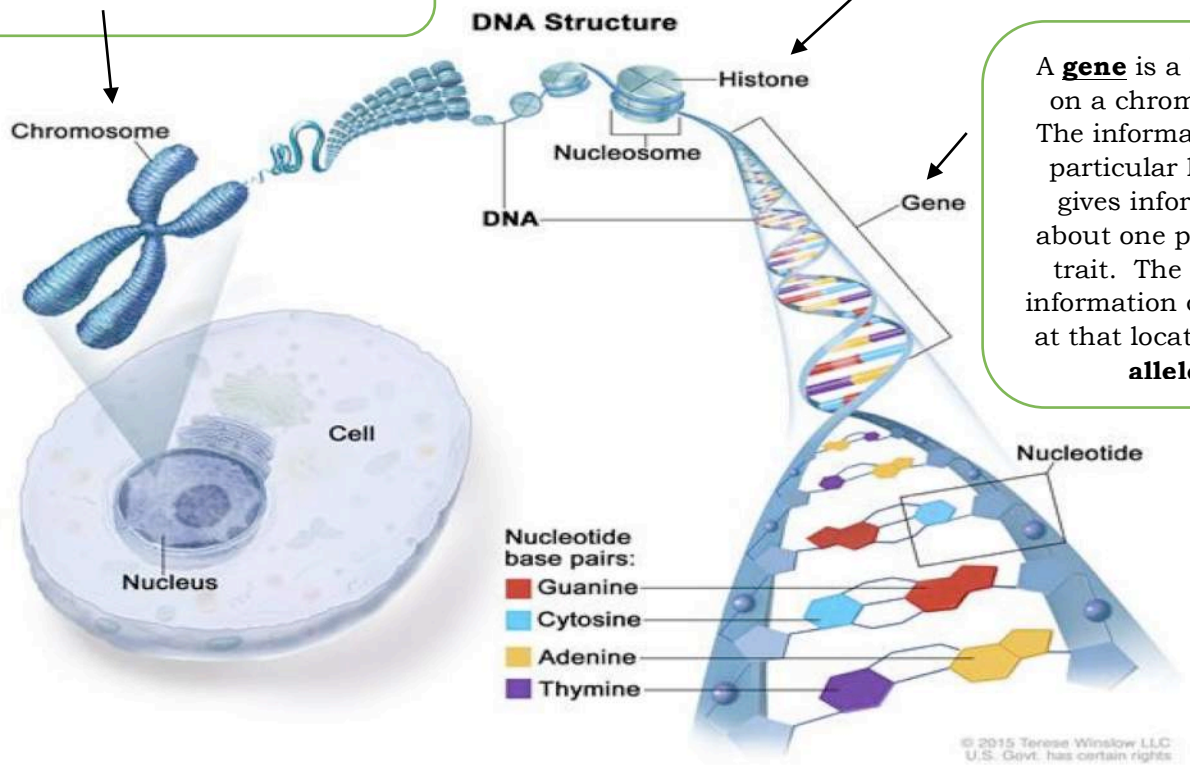
Result: two strands that are identical to each other and identical to the original strand.

Assessment Anchor: Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. (B.1.2.2)

The Relationship between DNA, Chromosomes, and Genes

Chromosomes are structures found in the nucleus of a cell that carry genetic information. They are made of DNA and protein.

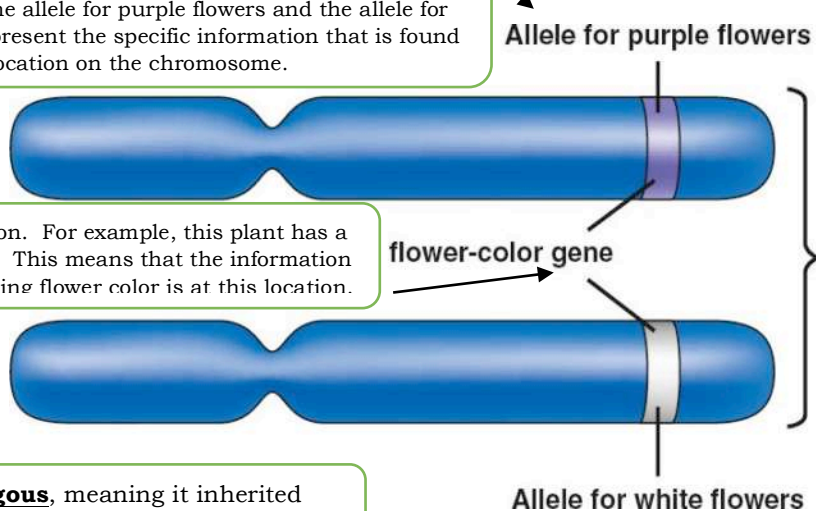
DNA is a chain of repeating subunits called nucleotides. In order to pack about 6 feet of DNA into every cell, the DNA is wrapped around special proteins called histones.



A **gene** is a **location** on a chromosome. The information at a particular location gives information about one particular trait. The specific information contained at that location is an **allele**.

The Relationship between Gene and Allele

Alleles are different forms of a gene. The gene for flower color in this plant has two forms – the allele for purple flowers and the allele for white flowers. Alleles represent the specific information that is found in that location on the chromosome.



homo = same

Homologous chromosomes are the same size, same shape, and carry genes for the same traits.

Remember – a **gene** is a location. For example, this plant has a gene that controls flower color. This means that the information that this plant inherited regarding flower color is at this location.

In a pair of homologous chromosomes, one was inherited from the mother and one was inherited from the father.

This plant is **heterozygous**, meaning it inherited different information for flower color from each parent.