SOL LS.10 MITOSIS & MEIOSIS

a. DNA HAS A ROLE IN MAKING PROTEINS THAT DETERMINE ORGANISM TRAITS;

b. THE ROLE OF MEIOSIS IS TO TRANSFER TRAITS TO THE NEXT GENERATION

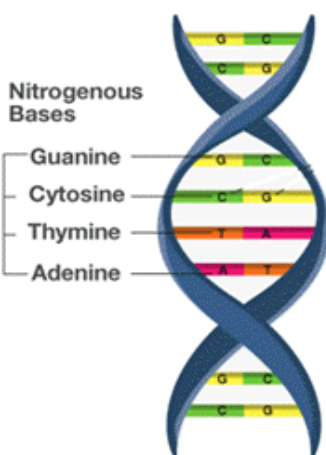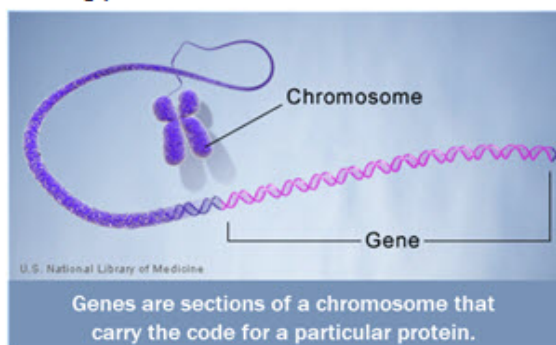c. PUNNETT SQUARES ARE MATHEMATICAL MODELS USED TO PREDICT THE PROBABILITY OF TRAITS IN OFFSPRING

DNA HAS A ROLE IN MAKING PROTEINS THAT DETERMINE ORGANISM TRAITS

DNA double helix

- The **structure** and **function** of **DNA** are intimately **linked.**

- **DNA** is a **double helix** molecule containing a specific sequence of **nitrogenous bases** which create a **code** for making **proteins.**

  - **Proteins** are used to **build cells, tissues, organs,** and to perform life processes.

  - **Chromosomes** are strands of **tightly wound DNA.**

    - **Genes** are **sections of a chromosome** that carry the code for a **particular protein.**

    - Each **gene** controls the production of **specific proteins,** which in turn affects the **traits** of the organism.

Chromosome

Gene

U.S. National Library of Medicine

Genes are sections of a chromosome that carry the code for a particular protein.

Nitrogenous Bases

- Guanine
- Cytosine
- Thymine
- Adenine

- **Proteins** carry out most of the **work of cells** to perform life functions .

- **DNA** provides the **code** that tells the cell exactly which **proteins** to make.

  - The sequence of the **bases A, T, C, and G** along a section of DNA forms a **code** to make each protein .

  - The **sugar** and **phosphate** molecules on the sides of the DNA molecule are always **the same** for all living things, so when scientists write out the DNA code, they write only the sequence of the pairs of **nitrogenous bases** in the center (i.e., on the rungs) of the ladder-like DNA molecule.

- A series of **contributions** and discoveries has led to our current understanding of DNA, genes, chromosomes, and traits.

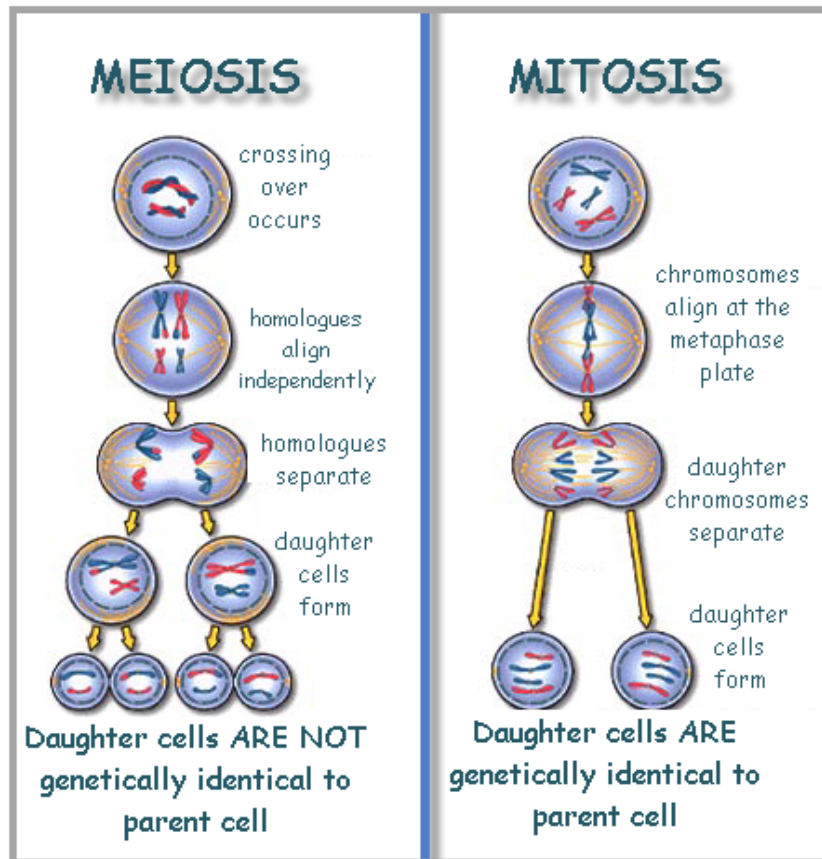 - This process illustrates the **nature of science.**

You should be able to:
- *describe the* **structure** *and* **function** *of DNA*

- *explain the relationship among* **genes, chromosomes,** *and* **alleles**

- *explain that DNA contains* **coded instructions** *that store and* **pass on genetic information** *from one generation to the next*

## MEIOSIS - TO TRANSFER TRAITS TO THE THE NEXT GENERATION

- A complex system functions to pass characteristics (**traits**) from one generation to the next.

- The interaction of heredity mechanisms and the environment creates both **stability** from one generation to the next and drives the changes that produce the **diversity** of life on our planet.

- Living organisms must **reproduce** to continue the existence of their **species.**

- Through **reproduction**, new individuals that **resemble their parents** are formed.
- All the organisms alive today arose **from preexisting organisms.**
- **Reproduction** is a life process (system) by which living things **transfer genetic information** to their offspring.
- **Sexual reproduction** involves the production of **sex cells** through **meiosis.**
- **Sex cells** each carry **half** the parent's **genetic material,** resulting in **variation** between parent and offspring .
- During **meiosis, chromosome pairs** independently become distributed so that **each sex cell** contains **one-half** of the **chromosomes** of the original cell.
- The probability of a sex cell containing either **allele** from the pair is **50 percent.**

MEIOSIS	MITOSIS
crossing over occurs	chromosomes align at the metaphase plate
homologues align independently	
homologues separate	daughter chromosomes separate
daughter cells form	daughter cells form
Daughter cells ARE NOT genetically identical to parent cell	Daughter cells ARE genetically identical to parent cell

PUNNETT SQUARES ARE MATHEMATICAL MODELS USED TO PREDICT THE PROBABILITY OF TRAITS IN OFFSPRING

- The **Punnett square** is one mathematical model that predicts the **probability** of the **genotype** (genetic makeup) and **phenotype** of the offspring of a cross between parents.
  - A Punnett square predicts the probability of the **ratios** of genotypes and phenotypes among **offspring.**
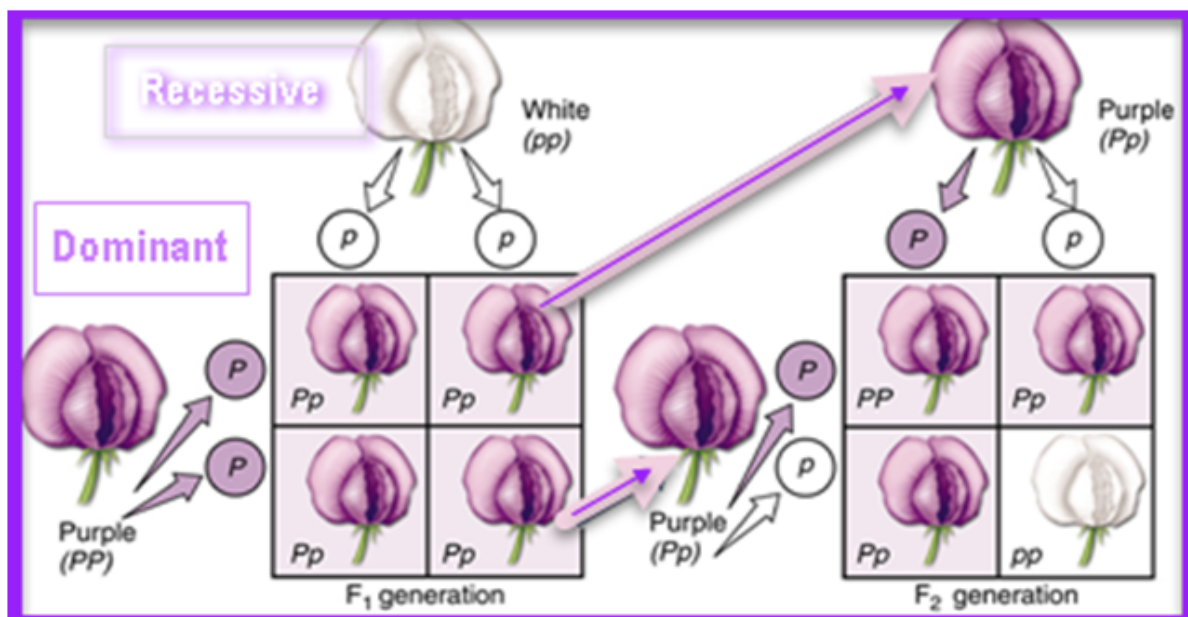
A PUNNETT SQUARE predicts the probability of the genotype (genetic makeup) and phenotype of the offspring

Genotype	Phenotype	
EE Homozygous Dominant	Detached Earlobes	
Ee Heterozygous	Detached Earlobes	
ee Homozygous recessive	Attached Earlobes	

- **Traits** that are expressed through **genes** can be **inherited**.
  - Characteristics that are acquired through **environmental influences**, such as injuries or practiced skills, **cannot be inherited.**
- The basic laws of **Mendelian genetics** explain the transmission of most **traits** that can be **inherited.**
  - **Genotype** refers to the specific **combination** of **genes.**
  - **Phenotype** refers to the physical **expression** of **traits.**
  - **Dominant traits mask** the expression (phenotype) of **recessive traits.**

DOMINANT GENE	RECESSIVE GENE

You should be able to:

- describe why **asexual** reproduction results in offspring with **identical** genetic information and **sexual** reproduction results in offspring with genetic **variation**

- explain the significance of **gametes** contributing **half** of their genetic material through **sexual** reproduction

- know types of characteristics that can be **inherited** and those that **cannot be inherited**

- distinguish between **dominant** and **recessive** traits

- use **Punnett squares** to predict the **possible genetic combinations** and **phenotype expressions** from **single trait crosses** using **dominant** and **recessive** traits