I. BASIC LAWS OF GENETICS

A. **Genetics**: The study of heredity and the variation of inherited characteristics.

Basic Basic Unit of inheritance: Genes

B. **Changes in parents that are heritable:** Characteristics

Process by which genes are passed to the next generation: Meiosis,gamete fertilization

D. **Genotype:** The genetic code they carry in their cells that provides information for a particular trait Mendel pea plants did not have the same genotype

Phenotype: The visible, expressed trait, such as hair color. The phenotype depends upon the genotype but can also be influenced by environmental factors. EX: Mendel tall pea plants had the same phenotype

Examples	DNA, Vulnerable to diseases	Hair color, eye color, weight
Refers to	Information contained on 2 alleles in the cell.	An expressed and observable trait
Depends upon	Hereditary information that's given by their parents.	Genotype and influence of the environment.
Inheritance	Partly inherited by offspring, as 1 of the 2 alleles is passed on during reproduction.	Cannot be inherited.
Contains	All the hereditary information of an individual, even if those genes are not expressed.	Expressed genes only.

E. **Law of Dominance:** If there is a dominant and recessive allele the dominant allele is expressed

Law of Segregation: When gametes are formed, the two factors that govern a trait separate from each other and go into different gametes.

F. **Dominant Gene:** A gene that is fully expressed in the phenotype

Recessive Gene: a gene that is not expressed unless there are 2 of them

Homozygous dominant (pure bred dominant): Has 2 allele copies that exhibit dominant traits

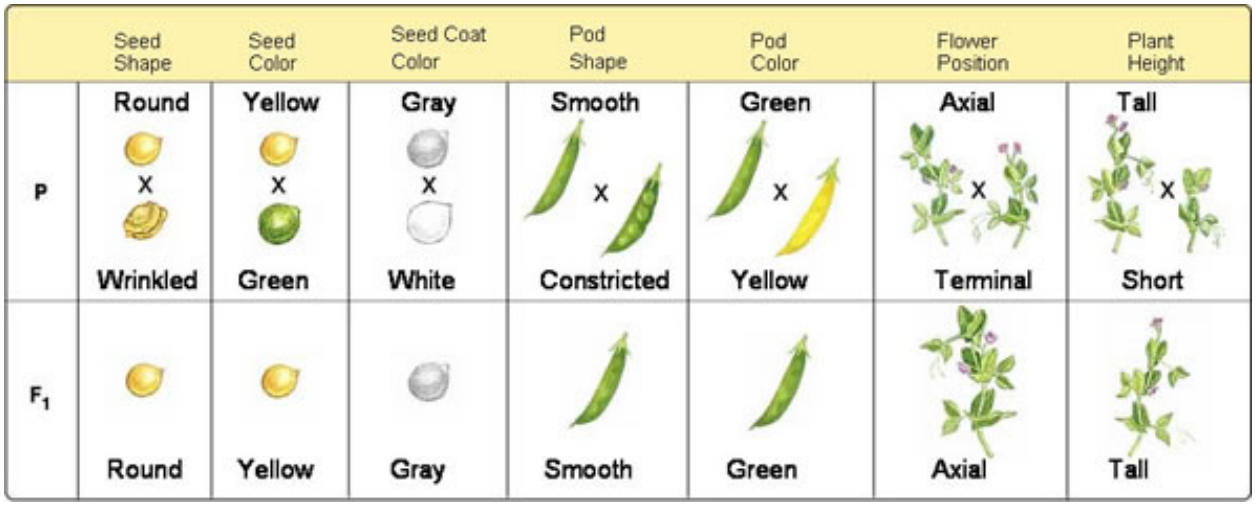
Heterozygous (hybrid): Having different alleles for any one gene

Homozygous recessive (pure bred recessive): Has 2 copies of the recessive trait

G. **Homologous Chromosomes:** The same number of chromosomes from each parent.

H. **Pedigree Chart:** Diagram that shows the occurrence and appearance or phenotype of a particular gene or organism and its ancestors from one generation to the next

J. **Incomplete Dominance:** Case in which one allele is dominant over another. The heterozygous phenotype lies somewhere between the 2 homozygous phenotypes. Some alleles are neither dominant or recessive. Cross products of red and white flowers produce pink flowers, Mirabilis.
Codominance: Similar situation in which the phenotypes produced by both alleles are clearly expressed. EX: In certain varieties of chickens, the allele for black feathers is codominant with the allele for white feathers. Heterozygous chickens have a color speckled with black and white feathers. Many human genes, including 1 for a protein that controls cholesterol levels in the blood, show dominance.
K.People with the heterozygous form of this gene produce 2 different forms of the protein, each with a different effect on cholesterol levels.
Gene Linkage: The tendency of genes that are located proximal to each other on a chromosome to be inherited together during meiosis.
Crossing Over: Genetic materials are transferred between sister chromatids
L. **Sex-Linked Traits:** If a gene is found on the X chromosome (less commonly on the Y chromosome), it is a sex-linked trait. As the gene controlling the trait is located on the sex chromosome, sex linkage is linked to the gender of the individual. Usually genes are found on the X chromosome. The Y chromosome is missing such genes.The result is that females will have 2 copies of the sex-linked gene while males will have 1 copy of this gene. If the gene is recessive, then males need one such recessive gene to have a sex-linked trait rather than the customary two recessive genes for traits that are not sex-linked. This is why males exhibit some traits more frequently than females.
M.**Karyotyping:** Procedure that allows a physician to examine a patient's set of chromosomes.Allows determination of any abnormalities or structural problems. Examines dividing cells to see if any chromosomes are missing. Normal test shows 46 chromosomes 2 of which are sex chromosomes. Females have 2 X chromosomes and males have 1 X and Y chromosomes.
Autosomal Chromosomes: Carry genes about genetic/body characteristics
O. Genes provide a plan for development and the development depends on the environment. The phenotype of an organism is only partly determined by its genotype. Environmental conditions can affect gene expression and influence genetically determined traits. An individual's actual phenotype is determined by its environment and genes.
EX: The western white butterfly, Pontia occidentalis. is found on west North America. Western white hatchlings in the summer had different color patterns on their wings than those on spring. Butterfly hatchlings in the shorter days of spring had greater levels of pigment in their wings, making their markings darker than those in the longer days of summer. Since the spring are cooler in the west, greater pigmentation helps them reach the body temperature needed for flight. In summer, less pigmentation enables the moths to overheating.



During sexual reproduction, male and female reproductive cells join for fertilization to produce a new cell. In peas, this new cell develops into a tiny embryo encased within a seed. Pea flowers are normally self-pollinating, in which sperm cells fertilize egg cells within the same flower.

To learn the different traits of peas, Mendel cross pollinated different peas and he had to prevent self pollination. He did it by cutting away he the pollen-bearing male part and then dusting the pollen from a different plant onto the female part of the flower part. Mendel studied 7 different traits of pea plants. Contrasting characteristic, green or yellow seed color. Offsprings were hybrids.

Ding genetic crosses, the original pair of plants theP, or parental, generation. Their offsprings, F,or first filial generation. **Different forms of a gene are alleles.**

F1 Cross: A dominant allele masked the corresponding recessive allele in the F1 generation. Mendell suggested that the alleles for tallness and shortness in the F1 plants must have segregated from each other during the formation of the sex cells/gametes.

Formation of gametes: During gamete formation, he alleles for each gene segregate from each other, so that each gamete carries only 1 allele for each gene. Each F1 plant produces 2 kind of gametes, those with tall allele and those with short allele.

Mendel's principles of heredity, observed through patterns of inheritance,form the basis of modern genetics.

- Inheritance of biological characteristics is determined by individual units, genes, which are passed from parent to offsprings
- When 2 or more alleles of a gene for a single trait exist, alleles may be dominant or recessive
- In most sexually reproducing organisms,each adult has two copies of each gene. These genes segregate from each other when gametes are formed.
- Alleles for different genes usually segregate independently of each other

Blood Type	Antigen	Antibody	Genotype
A+-	A	B	I^A I^A

B +-	B	A	I^B I^B
AB +-	A,B	None	I^A I^B
O+-	None	A,B Rh of opposite sign	ii

Antibody: Blood protein produced in response to and counteracting a specific antigen.
Antigen: Toxin or other foreign substance that induces an immune response in the body, especially the production of antibody
Melanin: A natural substance that gives pigment to hair, skin, and the color of the eye. Protects the skin against damage by ultraviolet light from the sun. If you have too little melanin in a very sunny environment, you will easily suffer sunburn and skin cancer. If you have a great deal of melanin, and you live in a country where there is little sunshine, it will be harder for you to get enough vitamin D (which needs sunshine for its production in your body). You may then suffer from vitamin D deficiency. People are not born with a genetically fixed amount of melanin. Rather, we have a genetically fixed potential to produce a certain amount, and the amount increases in response to sunlight.
pheomelanin (light)
Eumelanin (dark)
Color blindness: The inability or decreased ability to see color or perceive color differences, under normal lighting conditions. The most usual cause is a fault in the development of 1 or more sets of retinal cones that perceive color in light and transmit that information to the optic nerve. This type of color blindness is usually a sex-linked condition. The genes that produce photopigments are carried on the X chromosome; if some of these genes are missing or damaged, color blindness will be expressed in males with a higher probability than in females because males only have one X chromosome
Hemophilia: Medical condition in which the ability of the blood to clot is severely reduced, causing the sufferer to bleed severely from even a slight injury. The condition is typically caused by a hereditary lack of a factor.It affects mostly males, as it is an X chromosome linked condition.