

B-4.6 Predict inherited traits by using the principles of Mendelian genetics (including segregation, independent assortment, and dominance).

Law (Principle) of Dominance

The *law (principle) of dominance* states that some alleles are dominant whereas others are recessive.

- An organism with a dominant allele for a particular trait will always have that trait expressed (seen) in the organism.
- An organism with a recessive allele for a particular trait will only have that trait expressed when the dominant allele is not present.

Since organisms received one gene for a chromosome pair from each parent, organisms can be heterozygous or homozygous for each trait.

- When an organism has two identical alleles for a particular trait that organism is said to be *homozygous* for that trait.
 - The paternal chromosome and the maternal chromosome have the same form of the gene; they are either both dominant or both recessive.
- When an organism has two different alleles for a particular trait that organism is said to be *heterozygous* for that trait.
 - The paternal chromosome and the maternal chromosome have different forms of the gene; one is dominant and one is recessive.

The *genotype* (genetic makeup) of an organism reveals the type of alleles that an organism has inherited for a particular trait. The genotype for a particular trait is usually represented by a letter, the capital letter representing the dominant gene and the lower-case letter representing the recessive gene.

- TT represents a homozygous dominant genotype.
- tt represents a homozygous recessive genotype.
- Tt represents a heterozygous genotype.

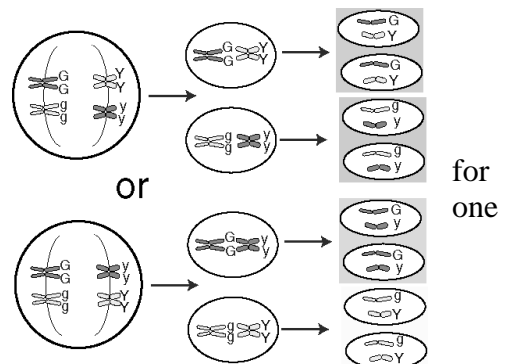
The *phenotype* (physical characteristics) of an organism is a description of the way that a trait is expressed in the organism.

- Organisms with genotypes of TT or Tt would have a phenotype of tall.
- Organisms with a genotype of tt would have a phenotype of short.

Law (Principle) of Segregation

The *law (principle) of segregation* explains how alleles are separated during meiosis.

- Each gamete receives one of the two alleles that the parent carries each trait. Each gamete has the same chance of receiving either of the alleles for each trait.
- During fertilization (when sperm and egg unite), each parent organism donates one copy of each gene to the offspring.



Law (Principle) of Independent Assortment

The *law (principle) of independent assortment* states that the segregation of the alleles of one trait does not affect the segregation of the alleles of another trait.

- Genes on separate chromosomes separate independently during meiosis.
- This law holds true for all genes unless the genes are *linked*. In this case, the genes that do not independently segregate during gamete formation, usually because they are in close proximity on the same chromosome.