Mendel’s Three Laws of Inheritance

Mendel’s research produced three laws of inheritance that are true today.

Summary of the Three Laws

**Law of Dominance (Dominate vs Recessive Alleles)**

In a cross of parents that are pure for contrasting traits, only one form of the trait will appear in the next generation. All offspring will be hybrid for a trait and will have only the dominant trait express the phenotype. The phenotype trait that is NOT expressed in the hybrid is called recessive.

Phenotype for **RR** is Round.
Phenotype for **Rr** is Round.
Phenotype for **rr** is wrinkled.

Because round is the dominant allele over the wrinkled allele, the hybrid, Rr, will express the dominate trait of round.

**Law of Segregation (regarding ALLELES)**

During the formation of gametes (eggs or sperm), the two alleles responsible for a particular trait separate from each other. Alleles for a particular trait are then "recombined" at fertilization, producing the genotype for the traits of the offspring.

**Law of Independent Assortment (regarding TRAITS)**

Alleles for different traits are distributed to sex cells (& offspring) independently of one another. (Example: the trait for height and the trait for color of peas do not depend on each other. These traits are independent of each other and can independently and randomly be distributed into the sperm or egg cells.) (Note: as long as any 2 traits are not on the same chromosomes then they can be distributed randomly and independently from each other into the sex cells.)

**Problem:**

1. An allele is
   A. one of a pair of genes that appear at a particular location on a particular chromosome and control the same characteristic, such as pea plant height or pea pod color.
   B. the study or heredity
   C. always dominant
   D. always recessive

2. The phenotype of an organism
   A. represents its genetic composition.
   B. reflects all the traits that are actually expressed.
   C. occurs only in dominant pure organisms.
   D. cannot be seen.
3. What is the probability that the offspring of a homozygous dominant individual and a homozygous recessive individual will exhibit the dominant phenotype?
   A. 25%  
   B. 66%  
   C. 50%  
   D. 100%

4. Tallness (T) is dominant over shortness (t) in pea plants. Which of the following represents the genotype of a pea plant that is heterozygous for tallness?
   A. T  
   B. Tt  
   C. TT  
   D. tt

5. An individual heterozygous for a trait and an individual homozygous recessive for the trait are crossed and produce many offspring. These offspring are likely to be
   A. all the same genotype.  
   B. of two different phenotypes.  
   C. of three different phenotypes.  
   D. all the same phenotype.

6. If an individual has two recessive alleles for the same trait, the individual is said to be
   A. homozygous for the trait.  
   B. haploid for the trait.  
   C. heterozygous for the trait.  
   D. mutated.

7. Mendel’s finding that the inheritance of one trait had no effect on the inheritance of another became known as the
   A. law of dominance.  
   B. law of universal inheritance.  
   C. law of separate convenience.  
   D. law of independent assortment.

8. To describe how traits can disappear and reappear in a certain pattern from generation to generation, Mendel proposed
   A. the law of independent assortment.  
   B. the law of segregation.  
   C. the law of genotypes.  
   D. that the F2 generation will produce only purple flowers.

9. The law of segregation explains that
   A. alleles of a gene separate from each other during meiosis.  
   B. different alleles of a gene can never be found in the same organism.  
   C. alleles for a particular trait will always travel together during gamete formation.  
   D. alleles do not determine traits.

Match the following terms

10. C  
    A. Law of Dominance
11. B  
    B. Law of Independent Assortment
12. A  
    C. Law of Segregation

13. A  
    A. Homozygous dominant
14. C  
    B. Homozygous recessive
15. B  
    C. Heterozygous