What is Mendelian Inheritance?

Worksheet

Mendelian inheritance states that traits are controlled by pairs of alleles, one dominant and one recessive, that separate during gamete formation (Law of Segregation) and combine independently (Law of Independent Assortment), producing predictable ratios like 3:1 in a monohybrid cross.

Questions

1. In an Aa Aa cross, what is the expected phenotypic ratio?

A) 1:1
B) 3:1
C) 1:2:1
D) 9:3:3:1

2. Mendel's Law of Segregation states that

A) Genes on different chromosomes assort independently
B) Allele pairs separate during gamete formation
C) Traits blend together in offspring
D) All offspring are identical to parents

3. TT tt cross produces F1 offspring that are

A) All TT
B) All tt
C) All Tt
D) 1:1 TT:tt

4. Out of 400 Aa Aa offspring, how many are expected to show the recessive phenotype?

A) 50
B) 100
C) 200
D) 300

5. A pea plant heterozygous for flower color (Aa, purple dominant) is crossed with another Aa plant. Out of 200 offspring, how many are expected to have white flowers?

6. A true-breeding tall plant (TT) is crossed with a true-breeding short plant (tt). What are the genotype and phenotype of the F1 generation?

7. In an F2 generation of 320 pea plants from an Aa Aa cross, how many are expected to be heterozygous (Aa)?

8. Define: What is Mendel's Law of Segregation?

9. Define: What is Mendel's Law of Independent Assortment?

10. Define: What is the phenotypic ratio of a monohybrid cross (Aa Aa)?

Answer Key

1. B) 3:1 - Monohybrid Aa Aa crosses produce a 3 dominant : 1 recessive phenotypic ratio.

2. B) Allele pairs separate during gamete formation - Segregation means the two alleles of a gene separate into different gametes.

3. C) All Tt - Each parent contributes one allele, so all F1 offspring are heterozygous Tt.

4. B) 100 - Recessive phenotype fraction = 1/4, so 400 0.25 = 100.

5. Genotype ratio from Aa Aa = 1 AA : 2 Aa : 1 aa. Phenotype ratio = 3 purple : 1 white. Recessive (white) fraction = 1/4 = 25%. Expected white offspring = 200 0.25 = 50.

6. Cross TT tt all offspring get one T and one t. F1 genotype = Tt (heterozygous) for all offspring. Since tall (T) is dominant, F1 phenotype = 100% tall.

7. Genotype ratio = 1 AA : 2 Aa : 1 aa (total 4 parts). Heterozygous fraction = 2/4 = 50%. Expected Aa plants = 320 0.5 = 160.

8. Each organism carries two alleles for a trait, and these separate (segregate) during gamete formation so each gamete carries only one allele.

9. Alleles of different genes segregate independently of one another during gamete formation (for genes on different chromosomes).

10. 3 dominant : 1 recessive.