What is Mendel's Law of Segregation?

Worksheet

The Law of Segregation states that the two alleles for a gene separate during meiosis, so each gamete (sperm or egg) receives exactly one allele, chosen randomly.

Questions

1. According to the Law of Segregation, how many alleles does each gamete receive for a given gene?

A) Zero
B) One
C) Two
D) Four

2. In an Aa Aa cross, what is the expected phenotype ratio if A is completely dominant?

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

3. During which stage does allele segregation physically occur?

A) Mitosis
B) Meiosis I
C) Meiosis II
D) Fertilization

4. A pea plant is Aa. What gametes can it produce?

A) Only A
B) Only a
C) A and a in equal numbers
D) AA and aa

5. A pea plant with genotype Aa (purple flower) self-pollinates. What genotype and phenotype ratios are expected in the offspring?

6. In a cross of Aa aa, what fraction of offspring is expected to be heterozygous (Aa)?

7. Out of 200 offspring from an Aa Aa cross, how many are expected to show the recessive phenotype?

8. Define: What does the Law of Segregation state?

9. Define: When does segregation occur?

10. Define: What ratio results from an Aa Aa cross?

Answer Key

1. B) One - Alleles separate during meiosis so each gamete gets exactly one.

2. C) 3:1 - Genotypes 1AA:2Aa:1aa give phenotypes 3 dominant : 1 recessive.

3. B) Meiosis I - Homologous chromosomes - and their alleles - separate in meiosis I.

4. C) A and a in equal numbers - Segregation gives equal numbers of A and a gametes.

5. Each parent produces gametes A and a in equal numbers (segregation) Punnett square: AA, Aa, Aa, aa Genotype ratio = 1 AA : 2 Aa : 1 aa Phenotype ratio = 3 purple : 1 white (A is dominant)

6. Aa parent gives gametes A or a (50/50) aa parent gives only gametes a Offspring: Aa, Aa, aa, aa Heterozygous (Aa) fraction = 2/4 = 50%

7. Expected recessive fraction = 1/4 (aa) 200 1/4 = 50 So about 50 offspring show the recessive trait

8. The two alleles for a gene separate during meiosis so each gamete carries only one allele.

9. During meiosis I, when homologous chromosomes separate.

10. Genotype 1:2:1 (AA:Aa:aa); phenotype 3:1 if complete dominance.