

Module 09: Inheritance — Study Questions

Basic Genetics Terminology

1. What is the difference between a gene and an allele?
2. Define genotype and phenotype. Give an example of each.
3. What does it mean for an allele to be dominant? Recessive?
4. What is the difference between homozygous and heterozygous?
5. Who was Gregor Mendel, and why is he called the "father of genetics"?

Mendel's Laws

1. What is the law of segregation?
2. Why did Mendel use pea plants for his experiments?
3. In Mendel's experiments, a cross between two purple-flowered plants sometimes produced white-flowered offspring. How is this possible?
4. What is a monohybrid cross?
5. If you cross two heterozygous tall plants ($Tt \times Tt$), what are the expected genotypic and phenotypic ratios of the offspring?

Punnett Squares

1. How do you set up a Punnett square for a monohybrid cross?
2. In a cross between a homozygous dominant (BB) and homozygous recessive (bb) individual, what will be the genotype and phenotype of all offspring?

3. If two heterozygous individuals ($Aa \times Aa$) are crossed, what fraction of offspring would you expect to show the recessive phenotype?
4. How do you set up a Punnett square for a dihybrid cross?
5. What is the expected phenotypic ratio of a dihybrid cross between two individuals heterozygous for both traits?

Extensions to Mendelian Genetics

1. What is incomplete dominance? Give an example.
2. How is codominance different from incomplete dominance?
3. Explain the inheritance of ABO blood types. What type of inheritance pattern does it demonstrate?
4. What is polygenic inheritance? How does it differ from single-gene traits?
5. What does it mean when a gene is pleiotropic?

Sex-Linked Inheritance

1. How is sex determined in humans?
2. What are sex-linked traits? Why are they more common in males?
3. If a woman who is a carrier for color blindness (X^cX) has children with a man who has normal vision (XY), what is the probability that their sons will be color blind?
4. Can a color-blind female be born? What would her parents' genotypes have to be?

Pedigree Analysis

1. What is a pedigree, and how is it used in genetics?
2. How can you tell from a pedigree if a trait is dominant or recessive?

3. How can you identify carriers of a recessive trait in a pedigree?
4. Looking at a pedigree, how can you determine if a trait might be sex-linked?