

Module 10: Inheritance — Study Questions

1. What is the difference between a gene and an allele?
2. Define genotype and phenotype, and give an example of each.
3. What does it mean for an allele to be dominant compared to recessive?
4. What is the fundamental difference between an individual who is homozygous versus heterozygous for a trait?
5. Who was Gregor Mendel, and why is he called the "father of genetics"?
6. Explain Mendel's law of segregation in your own words.
7. In Mendel's experiments, a cross between two purple-flowered plants sometimes produced white-flowered offspring. How is this genetically possible?
8. If you cross two heterozygous tall plants ($Tt \times Tt$), what are the expected genotypic and phenotypic ratios?
9. How do you set up the axes of a Punnett square for a monohybrid cross?
10. In a cross between a homozygous dominant (BB) and homozygous recessive (bb) individual, what will be the genotype and phenotype of all offspring?
11. What is a test cross, and why is it useful?
12. What is the law of independent assortment?
13. What is the expected phenotypic ratio of a standard dihybrid cross between two individuals heterozygous for both traits?
14. What is incomplete dominance? Provide a real-world biological example.
15. How does codominance differ from incomplete dominance?

16. Explain the inheritance of human ABO blood types, and describe what type of inheritance pattern (or patterns) it demonstrates.
17. What is polygenic inheritance, and how does it explain traits with continuous variation, like human height or skin color?
18. How is biological sex genetically determined in humans?
19. What are sex-linked traits, and why are X-linked recessive disorders more common in males than in females?
20. If a carrier woman ($X^C X^c$) has children with a man with normal vision ($X^C Y$), what is the probability that their sons will be color blind?
21. What is a pedigree chart, and how do geneticists use it to trace traits through a family?
22. **Challenge Question:** Looking at a pedigree, how can you definitively tell if a particular trait is dominant or recessive, just by looking at the parents and offspring?