

Mendel and the Gene Idea

Chapter 14

1. Explain Mendel's laws of segregation and independent assortment in terms of genes and chromosomes.
2. Define allele, dominant, recessive, homozygous, heterozygous, phenotype, and genotype.
3. Explain, at the molecular level, how one allele can be dominant over another.
4. Describe how a testcross can be used to determine the genotype of an individual with a dominant phenotype.
5. Pea plants heterozygous for flower position and stem length (AaTt) are allowed to cross-pollinate, and 400 of the resulting seeds are planted. Draw a Punnett square for this cross. How many offspring would be predicted to have terminal flowers and be dwarf?
6. Pattypan squash is either white or yellow. In growing the plants, you notice that if you want to get white fruit at least one of the parents must be white. Which color is dominant?
7. For any gene with a dominant allele A and recessive allele a, what proportion of the offspring from an AA x Aa cross are expected to be homozygous dominant, homozygous recessive, and heterozygous?
8. Two individuals, with genotypes BbDD and BBDD, are mated. Assuming independent assortment of both genes, indicate the genotype of all possible offspring and use the rules of probability to calculate the chance of each genotype occurring.
9. Three traits (flower color, seed color, and pod shape) are considered in a cross between two pea plants: PpYyIi x ppYyii. What fraction of offspring is predicted to be homozygous recessive for at least two of the three traits?
10. Determine the probability of obtaining the indicated offspring in the following crosses:

Cross	Offspring	Probability
AAbb x AaBb	AAbb	
AaBB x AaBb	aaBB	
AABbcc x aabbCC	AaBbCc	
AaBbCc x AaBbcc	aabbcc	

11. a) Distinguish between incomplete dominance and codominance.
b) Distinguish between incomplete dominance and epistasis.
12. Use human skin color to explain polygenic inheritance.
13. If a man has blood type AB has a child with a woman with blood type O. Identify the possible blood types of the child and give the probability of each.
14. A rooster and hen, both with grey feathers, produce 15 grey, 6 black, and 8 white chicks. Propose a simple explanation for the inheritance of feather color in these chickens. What phenotypes would you expect in the offspring of a cross between a grey rooster and a black hen?
15. Why are most genetic disorders related to enzyme or protein function recessive disorders?
16. The presence of a recessive allele is not apparent in a carrier because they show the dominant phenotype. How can a pedigree be used to identify carriers of a recessive allele?
17. Use examples to help you distinguish between recessively and dominantly inherited disorders.
18. Fetal testing and newborn screening are tools that can be used to detect genetic disorders. Describe each of them.