

Chapter 9: Patterns of Inheritance

Life Science GSEs Covered in this Unit:

Students demonstrate an understanding of Natural Selection/ evolution by...

7aa distinguishing the stages of mitosis and meiosis and how each contributes to the production of offspring with varying traits (***extension***)

7b investigating how the sorting and recombination of genes in sexual reproduction results in a great variety of possible gene combinations in the offspring of any two parents. (e.g. manipulate models to represent and predict genotypes and phenotypes, Punnett Squares, probability activities).

Students demonstrate an understanding of how humans are affected by environmental factors and/or heredity by ...

9a researching scientific information to explain how such things as radiation, chemicals, and other factors can cause gene mutations or disease.

Objectives: At the end of this chapter, you need to be able to:

Mendel's Laws

1. Explain why Mendel's decision to work with peas was a good choice. Define and distinguish among true-breeding organisms, hybrids, the P generation, the F₁ generation, and the F₂ generation.
2. Define and distinguish between the following pairs of terms: genotype versus phenotype, dominant allele versus recessive allele, and heterozygous versus homozygous. Also define a monohybrid cross and a Punnett square.
3. Explain how Mendel's law of segregation describes the inheritance of a single characteristic.
4. Describe the genetic relationship between homologous chromosomes.
5. Explain how Mendel's law of independent assortment applies to a dihybrid cross. Illustrate this law with examples from Labrador retrievers and Mendel's work with peas.
6. Explain how a testcross is performed to determine the genotype of an organism.
7. Explain how and when the rule of multiplication and the rule of addition should be used to determine the probability of an event. Explain why Mendel was wise to use large sample sizes in his studies.
8. Explain how family pedigrees can help determine the inheritance of many human traits.
9. Explain how recessive and dominant disorders are inherited. Provide examples of each.
10. Compare the health risks, advantages, and disadvantages of the following forms of fetal testing: amniocentesis, chorionic villus sampling, and ultrasound imaging. Describe the ethical dilemmas created by advances in biotechnology.

Variation in Mendel's Laws

11. Describe the inheritance patterns of incomplete dominance, multiple alleles, and polygenic inheritance.
12. Explain why human skin coloration is not sufficiently explained by polygenic inheritance.
13. Describe the limits, benefits, and ethical challenges of genetic testing.

The Chromosomal Basis of Inheritance

14. Define the chromosome theory of inheritance. Explain the chromosomal basis of the laws of segregation and independent assortment.
15. Explain how linked genes are inherited differently from nonlinked genes.

Sex Chromosomes & Sex-Linked Genes

16. Explain how sex is genetically determined in humans. Compare the sex determination system in humans to those in fruit flies, grasshoppers, birds, and bees.
17. Describe the patterns of sex-linked inheritance, noting examples in fruit flies and humans

Key Terms:

alleles	genotype	pleiotropy
carriers	hybrids	P generation
chromosome	hemophilia	Punnett square
chromosome theory of inheritance	heterozygous	recessive
codominant (<i>also called incomplete dominance</i>)	homozygous	recombination frequency
cross	independent assortment	self-fertilize
cross-fertilize	law of segregation	sex chromosomes
dihybrid cross	linked genes	sex-influenced traits
dominant	monohybrid	sex-linked trait
F1 generation	phenotype	testcross
F2 generation	polygenic inheritance	true-breeding