Module 11: Mendelian Genetics

Keys to Success & Study Guide

Learning Objectives

By the end of this module, you should be able to:

1. **Predict** the outcomes of monohybrid and dihybrid crosses using Punnett Squares.
2. **Differentiate** between dominant, recessive, incomplete dominance, and codominance.
3. **Analyze** pedigrees to determine inheritance patterns (autosomal vs. sex-linked).
4. **Explain** how multiple alleles and polygenic inheritance produce phenotypic variation.

Key Terminology Checklist

Define these terms in your own words to ensure mastery.

- [ ] **Locus**: The specific position of a gene on a chromosome.
- [ ] **True-Breeding**: An organism homozygous for a trait that always produces offspring with the same phenotype.
- [ ] **F_1 Generation**: The first filial generation (offspring of P_0 cross).
- [ ] **Carrier**: A heterozygous individual who possesses a recessive allele but does not express the trait.
- [ ] **Pleiotropy**: A single gene affecting multiple phenotypic traits.

Concept Check

1. Monohybrid Ratios

- **Question**: What phenotypic ratio results from a monohybrid cross between two heterozygotes?
- **Key Answer**: 3:1 (3 dominant phenotype : 1 recessive phenotype). Genotypic ratio is 1:2:1 (1 AA : 2 Aa : 1 aa).

2. Dihybrid Ratios

- **Question**: What phenotypic ratio results from a dihybrid cross (AaBb × AaBb)?
- **Key Answer**: 9:3:3:1 (9 A_B_ : 3 A_bb : 3 aaB_ : 1 aabb).

3. Sex-Linked Inheritance

- **Question**: Why are males more frequently affected by sex-linked recessive disorders?
- **Key Answer**: Males are hemizygous (XY)—they have only one X chromosome. A single recessive allele on the X will be expressed. Females (XX) require two copies for expression.