Module 10: Meiosis and Sexual Reproduction

Keys to Success & Study Guide

Learning Objectives

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

1. **Contrast** the outcomes of asexual and sexual reproduction.
2. **Distinguish** between homologous chromosomes and sister chromatids.
3. **Diagram** the phases of Meiosis I and Meiosis II.
4. **Explain** the three sources of genetic variation: crossing over, independent assortment, and random fertilization.

Key Terminology Checklist

Define these terms in your own words to ensure mastery.

- [ ] **Allele**: An alternative form of a gene at a specific locus.
- [ ] **Karyotype**: A display of an individual's chromosomes arranged by size and banding pattern.
- [ ] **Synapsis**: The pairing of homologous chromosomes during Prophase I.
- [ ] **Tetrad (Bivalent)**: The structure formed by two synapsed homologous chromosomes (four chromatids).
- [ ] **Euploidy**: Having the correct number of chromosomes.
- [ ] **Aneuploidy**: An abnormal chromosome number (e.g., trisomy, monosomy).

Concept Check

1. Meiosis I vs. Meiosis II

- **Question**: What separates in Meiosis I? In Meiosis II?
- **Key Answer**:
    - **Meiosis I**: Homologous chromosomes separate (reductional division: 2n → n).

    - **Meiosis II**: Sister chromatids separate (equational division: n → n).

2. Genetic Variation

- **Question**: Why is genetic variation important?
- **Key Answer**: Variation provides raw material for natural selection. Genetically diverse populations are more resilient to environmental change and disease.

3. Human Chromosomes

- **Question**: How many chromosomes do humans have?
- **Key Answer**: 46 total (23 pairs): 22 pairs of autosomes + 1 pair of sex chromosomes (XX or XY). Gametes contain 23 chromosomes.

4. Nondisjunction

- **Question**: What is nondisjunction?
- **Key Answer**: The failure of chromosomes or chromatids to separate properly during cell division, resulting in aneuploid gametes.