Module 10: Meiosis and Sexual Reproduction

Comprehension & Critical Thinking Questions

Part 1: Understanding Core Concepts

1. **Sexual Reproduction Basics**
    - Define **Gametes** and **Zygotes**.
    - Why must gametes be **Haploid** (n) while body cells are **Diploid** (2n)? What would happen to the chromosome number in the offspring if gametes were diploid?
2. **Meiosis Phases**
    - Meiosis involves two rounds of division (Meiosis I and II). What is being separated in **Anaphase I**? (Homologous Pairs).
    - What is being separated in **Anaphase II**? (Sister Chromatids).
3. **Key Events**
    - Describe **Crossing Over (Synapsis)**. When does it happen? Why is it crucial for evolution?
    - Describe **Independent Assortment**. How does the random alignment of chromosomes create unique gametes?

Part 2: Applying Biological Principles

1. **Mitosis vs. Meiosis**
    - Create a comparison table:
        - **End Product**: (2 Identical cells vs 4 Unique cells).
        - **Purpose**: (Growth/Repair vs Reproduction).
        - **Divisions**: (1 vs 2).

2. **Human Genetics**

    - Humans have 46 chromosomes.
        - How many pairs are **Autosomes**?
        - How many pairs are **Sex Chromosomes**?
    - What determines biological maleness in humans? (The Y chromosome).

Part 3: Analyzing & Evaluating

1. **When Things Go Wrong**

    - Define **Nondisjunction**.
    - **Analyze**: If a Nondisjunction event happens in Meiosis I, how many gametes will be abnormal? What if it happens in Meiosis II?
    - Explain the genetic cause of **Down Syndrome** (Trisomy 21).

2. **The Cost of Sex**

    - Asexual reproduction is fast and efficient. Sexual reproduction is slow and costly (finding a mate). **Evaluate**: Why is sexual reproduction so common? What is the biological payoff? (Answer: Genetic Diversity).