Module 9: Cell Division and Mitosis

Keys to Success & Study Guide

Learning Objectives

By the end of this module, you should be able to: 1. **Sequence** the phases of the eukaryotic cell cycle and mitosis. 2. **Differentiate** between chromatin, chromosomes, and sister chromatids. 3. **Compare** cytokinesis in plant and animal cells. 4. **Explain** the genetic basis of cancer (oncogenes vs. tumor suppressors).

Key Terminology Checklist

Define these terms in your own words to ensure mastery. - [ ] **Somatic Cell**: Body cells (Diploid). - [ ] **Gamete**: Sex cells (Haploid). - [ ] **Sister Chromatids**: Identical copies of a chromosome rejoined at the centromere. - [ ] **Centromere**: The waist where chromatids are attached. - [ ] **Metastasis**: The spread of cancer cells to different parts of the body. - [ ] **Genome**: The total genetic information of an organism.

Concept Check

1. Timing is Everything

- **Question**: Which phase takes up the bulk of the cell cycle?
- **Deep Dive**: Interphase takes up ~90% of the time. Mitosis is very short. Why? (Think about preparations vs. the actual act of splitting).

2. The Guardian of the Genome

- **Question**: What is the role of p53?
- **Deep Dive**: p53 is a Tumor Suppressor. If DNA is damaged, p53 halts division to repair it. If it can't be repaired, p53 triggers Apoptosis. If p53 is mutated/broken, what happens? (Cancer often follows).

3. Bad Brakes and Stuck Gas

- **Question**: What kinds of genes are involved in cancer?
- **Deep Dive**:
    - **Proto-oncogenes**: Enhance division (Gas pedal). Mutate to become Oncogenes (Gas stuck down).
    - **Tumor Suppressors**: Stop division (Brake pedal). Mutate to break (Brakes cut).

4. Prokaryote Comparison

- **Question**: Through what process do prokaryotes replicate?
- **Deep Dive**: **Binary Fission**. They have a single circular chromosome. They replicate it and pull apart. Simplistic compared to the dance of 46 chromosomes in humans.

Study Tips

- **Hand Signals**: Use your hands to model mitosis phases.
    - **P**rophase: Fingers spread (chromosomes condense).
    - **M**etaphase: Hands together (align middle).
    - **A**naphase: Hands pull apart.
    - **T**elophase: Two fists (two nuclei).
- **Chromosome Math**: Confused by "46 chromosomes vs 92 chromatids"?
    - Count the **Centromeres**. If there is one waist, it is ONE chromosome (even if it has two legs/chromatids).