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**: Any body cell (diploid, 2n).
- [ ] **Gamete**: A reproductive cell (haploid, n).
- [ ] **Sister Chromatids**: Identical copies of a replicated chromosome, joined at the centromere.
- [ ] **Centromere**: The region where sister chromatids are attached.
- [ ] **Metastasis**: The spread of cancer cells from the primary tumor to other body sites.
- [ ] **Genome**: The complete set of genetic information in an organism.

Concept Check

1. The Cell Cycle

- **Question**: Which phase occupies the majority of the cell cycle?
- **Key Answer**: Interphase (G_1, S, G_2) comprises approximately 90% of the cycle. Mitosis and cytokinesis are relatively brief.

2. Tumor Suppressors

- **Question**: What is the role of p53?
- **Key Answer**: p53 is a tumor suppressor that monitors DNA integrity. If DNA damage is detected, p53 halts the cell cycle for repair or triggers apoptosis. Mutations in p53 are found in over 50% of human cancers.

3. Oncogenes

- **Question**: What types of genes are implicated in cancer?
- **Key Answer**:
  - **Proto-oncogenes**: Normal genes that promote cell division. Mutations convert them to oncogenes (constitutively active).
  - **Tumor Suppressors**: Genes that inhibit division. Loss-of-function mutations lead to uncontrolled proliferation.

4. Prokaryotic Division

- **Question**: How do prokaryotes replicate?
- **Key Answer**: Binary fission—the circular chromosome replicates, and the cell divides into two identical daughter cells. This is simpler and faster than mitotic division.