CHAPTER 12
THE CELL CYCLE

Learning objectives

The Key Roles of Cell Division

1. Explain how cell division functions in reproduction, growth, and repair.
2. Describe the structural organization of a prokaryotic and eukaryotic genome.
3. Describe the major events of eukaryotic cell division that enable the genome of one cell to be passed on to two daughter cells.
4. Describe how the chromosome number changes throughout the human life cycle.

The Mitotic Cell Cycle

5. List the phases of the cell cycle and describe the sequence of events that occurs during each phase.
6. List the phases of mitosis and describe the events characteristic of each phase.
7. Recognize the phases of mitosis from diagrams and micrographs.
8. Draw or describe the mitotic spindle, including centrosomes, kinetochore microtubules, nonkinetochore microtubules, asters, and centrioles (in animal cells).
9. Describe the changes in the mitotic spindle during each phase of mitosis.
10. Describe two mechanisms that explain how motor proteins associated with the kinetochore microtubules bring about the poleward movement of chromosomes.
11. Explain how nonkinetochore microtubules lengthen the cell during anaphase.
12. Compare cytokinesis in animals and plants.
13. Describe the process of binary fission in bacteria and explain how eukaryotic mitosis may have evolved from binary fission.

Regulation of the Cell Cycle

14. Describe the roles of checkpoints, cyclin, Cdks, and MPF in the cell cycle control system.
15. Describe the internal and external factors that influence the cell cycle control system.
16. Explain how the abnormal cell division of cancerous cells escapes normal cell cycle controls.
17. Distinguish between benign, malignant, and metastatic tumors.