

Unit 5 - Cell Growth & Division

Standards:

- Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis.
- Compare the processes and outcomes of mitotic and meiotic divisions.
- Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.

The cell cycle is a series of events that take place in a **EUKARYOTIC** cell leading to its division and duplication. During this cycle the cell:

- Grows
- Reproduces/Divides
- Performs normal functions (protein synthesis, respiration, transport of materials)

Mitosis = required for growth and repair of eukaryotic cells

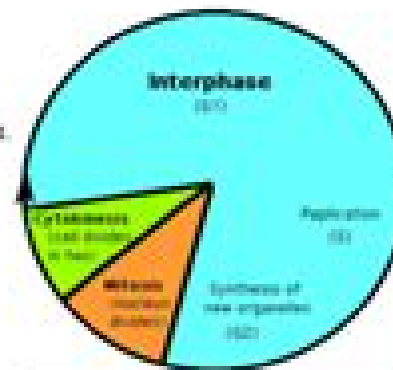
Meiosis = required for sexual reproduction of many multi-cellular organisms.

Nuclear Division Characteristic	Mitosis	Meiosis
Chromosome number stays the same	X	
Chromosome number is cut in half		X
One cell division	X	
Two cell divisions		X
Produces four cells		X
Produces two cells	X	
Associated with sexual reproduction		X
Associated with asexual reproduction, growth and repair	X	
Forms gametes (sex cells)		X
Forms somatic (body) cells	X	
Involves pairing and separation of homologous chromosomes		X
Daughter cells are identical to parent	X	
Daughter cells are NOT identical to parent		X
Crossing over occurs		X

1. Uncontrolled cell division results in **tumors**. Tumors can be malignant OR benign. Malignant tumors are **cancerous** and can metastasize (break off and travel within an organism).

2. Cancer cells do NOT carry out necessary functions. Cancer cells come from normal cells with damage to the genes that are involved in cell cycle regulation.

3. **Carcinogens** are substances that cause these gene mutations.



- Cell division only occurs if the cell is large enough and the DNA is undamaged!
- The surface area of a cell must be large enough for the transport of materials into and out of the cell.
- Cells that are large tend to have different shapes to help them function properly.
- The rate of cell division varies depending upon the location and function/type of the cell.
- Some cells are unlikely to divide, such as neurons (nerve cells). These cells stay in a phase known as (G0).

The cell cycle consists of three distinct stages:

1. **Interphase** - the longest phase of the cell cycle in which a cell performs the majority of its functions, such as preparing for nuclear division and cytokinesis.

> Interphase consists of 3 phases:

- G₁ (G1)** - Cell growth, normal functions, organelles duplicate
- Synthesis (S)** - DNA replication (Synthesis of DNA = New DNA is made by copying pre-existing DNA)
- G₂ (G2)** - Additional growth

2. **Nuclear division** - division of the nucleus

> There are two types of nuclear division:

- Mitosis** - a nuclear division that results in 2 somatic (body) cells with identical DNA.
- Meiosis** - a two-phase nuclear division that results in the production of 4 gametes (sex cells) with half the normal number of chromosomes. Gametes are genetically different.

3. **Cytokinesis** - final phase of the cell cycle resulting in the division of the cytoplasm

DNA replication - The process in which DNA makes a duplicate copy of itself.

- DNA = **D**eoxyribonucleic **A**cid (genetic material)
- DNA is made of nucleotides = A, T, C, G.
- A single strand of DNA serves as a template for a new strand.
- Replication occurs following the base-pair rules (A = T and C = G).
- DNA is replicated during **Interphase (S - Synthesis)** of the cell cycle.
- DNA Replication is semi-conservative which means that the DNA molecule uncoils and separates into two strands. Each original strand becomes a template on which a new strand is constructed, resulting in two DNA molecules identical to the original DNA molecule.
- Each somatic cell (body cell) gets a complete set of identical DNA.

Cell Growth And Division Study Guide

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Table of Contents Cell Growth And Division Study Guide

1. Understanding the eBook Cell Growth And Division Study Guide
 - The Rise of Digital Reading Cell Growth And Division Study Guide
 - Advantages of eBooks Over Traditional Books
2. Identifying Cell Growth And Division Study Guide
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Cell Growth And Division Study Guide
 - User-Friendly Interface
4. Exploring eBook Recommendations from Cell Growth And Division Study Guide
 - Personalized Recommendations
 - Cell Growth And Division Study Guide User Reviews and Ratings
 - Cell Growth And Division Study Guide and Bestseller Lists
5. Accessing Cell Growth And Division Study Guide Free and Paid eBooks
 - Cell Growth And Division Study Guide Public Domain eBooks

- Cell Growth And Division Study Guide eBook Subscription Services
- Cell Growth And Division Study Guide Budget-Friendly Options
- 6. Navigating Cell Growth And Division Study Guide eBook Formats
 - ePub, PDF, MOBI, and More
 - Cell Growth And Division Study Guide Compatibility with Devices
 - Cell Growth And Division Study Guide Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Cell Growth And Division Study Guide
 - Highlighting and Note-Taking Cell Growth And Division Study Guide
 - Interactive Elements Cell Growth And Division Study Guide
- 8. Staying Engaged with Cell Growth And Division Study Guide
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Cell Growth And Division Study Guide
- 9. Balancing eBooks and Physical Books Cell Growth And Division Study Guide
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Cell Growth And Division Study Guide
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Cell Growth And Division Study Guide
 - Setting Reading Goals Cell Growth And Division Study Guide
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Cell Growth And Division Study Guide
 - Fact-Checking eBook Content of Cell Growth And Division Study Guide
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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