

# 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:

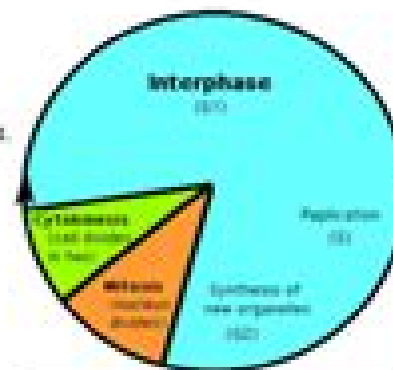
- Grows
- Reproduces/Divides
- Performs normal functions (protein synthesis, respiration, transport of materials)

**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

- 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).
- 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.
- 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:

- G<sub>1</sub> (G1)** - Cell growth, normal functions, organelles duplicate
- Synthesis (S)** - DNA replication (Synthesis of DNA = New DNA is made by copying pre-existing DNA)
- G<sub>2</sub> (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 Answers

**Martha R. Taylor**



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