

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.

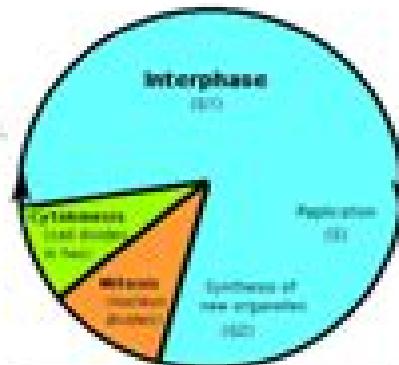
The cell cycle is a series of events that take place in a EUKARYOTIC cell leading to its division and duplication. During this cycle the cell:

- 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
Crossover occurs		X



- Cell division only occurs if the cell is large enough and the DNA is unchanged!
- 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:

- 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:
 - G0, 1 (G1) - Cell growth, normal functions, organelles duplicate
 - Synthesis (S) - DNA replication (Synthesis of DNA) - New DNA is made by copying pre-existing DNA
 - G0, 2 (G2) - Additional growth
- 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.
- 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 = Deoxyribonucleic Acid (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.

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