Cell cycle

The cell cycle is the sequence of growth and division of a cell.

As a cell proceeds through its cycle, it goes through two general periods: a period of growth and a period of division.

Interphase: During interphase, a cell grows in size and carries on metabolism. Also, during this period, chromosomes are duplicated in preparation for the period of division.

The interphase is divided into three further phases:

l- G1 phase (Gap 1): G1 phase corresponds to the interval between mitosis and initiation of DNA replication. During G1 phase the cell is metabolically active and continuously grows but does not replicate its DNA.

2- S phase (Synthesis): S or synthesis phase marks the period during which DNA synthesis or replication takes place. During this time the amount of DNA per cell doubles.

3- G2 phase (Gap 2): During the G2 phase, proteins are synthesized in preparation for mitosis while cell growth continues.

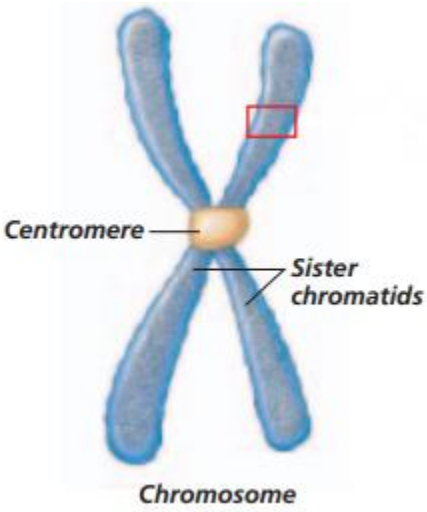
Cells differ in the length of time it takes them to complete the cell cycle. The difference seems to depend on how long they spend in G1. There are even some human cells such as nerve cells and skeletal muscle cells that become permanently arrested in G1, and these cells are said to have entered a G0 stage.

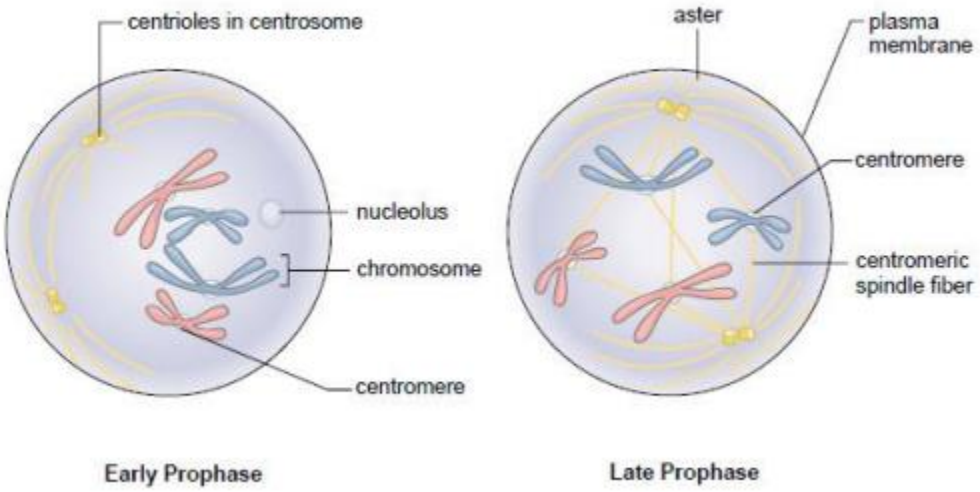
Mitosis: is the process by which two daughter cells are formed, each containing a complete set of chromosomes. Mitosis has been divided into four stages of nuclear division (karyokinesis). The completion of prophase can thus be marked by the following characteristic events:

l- Prophase:

Early Prophase: Chromosomal material condenses to form compact mitotic chromosomes. Chromosomes are seen to be composed of two chromatids attached together at the centromere.

Late Prophase: Centrosome which had undergone duplication during interphase, begins to move towards opposite poles of the cell. Each centrosome radiates out microtubules called asters. The two asters together with spindle fibers forms mitotic apparatus.



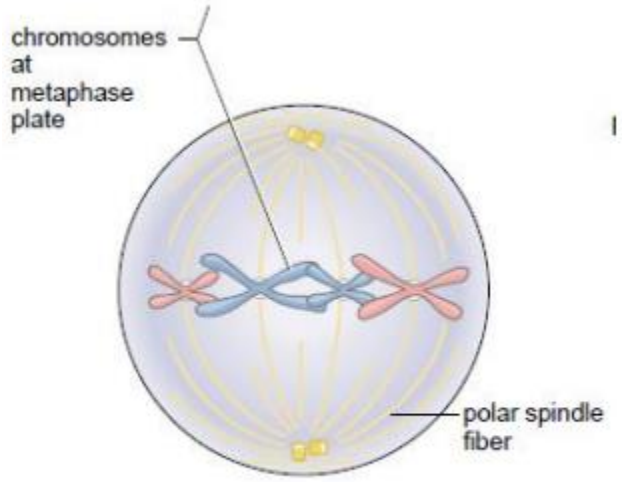


2- Metaphase: the metaphase is characterized by all the chromosomes coming to lie at the equator with one chromatid of each chromosome connected by its kinetochore to spindle fibers from one pole and its sister chromatid connected by its kinetochore to spindle fibers from the opposite pole. The plane of alignment of the chromosomes

at metaphase is referred to as the metaphase plate. The key features of metaphase are:

l- Spindle fibers attach to kinetochores of chromosomes.

2- Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibers to both poles.



Metaphase

3- Anaphase: each chromosome arranged at the metaphase plate is split simultaneously and the two daughter chromatids, now referred to as daughter chromosomes of the future daughter nuclei, begin their migration towards the two opposite poles. Thus, anaphase stage is characterized by the following key events:

l- Centromeres split and chromatids separate.

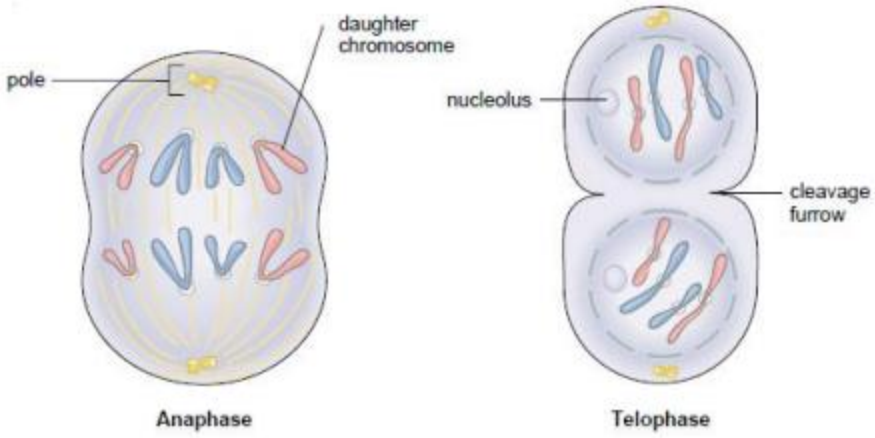
2- Chromatids move to opposite poles.

4-Telophase: This is the stage which shows the following key events:

l- Chromosomes cluster at opposite spindle poles and their identity is lost as discrete elements.

2- Nuclear envelope develops around the chromosome clusters at each pole forming two daughter nuclei.

3- Nucleolus, golgi complex and ER reform.



Cytokinesis: the cytoplasm divides, separating the two daughter cells.