

Section 4.1: The Cell Cycle

SBI3U

MS. FRANKLIN

Genetics

The study of how heredity information is passed from one generation to the next.



Depending on the organism or the type of cell, each may undergo sexual or asexual reproduction to pass on hereditary information to their offspring.

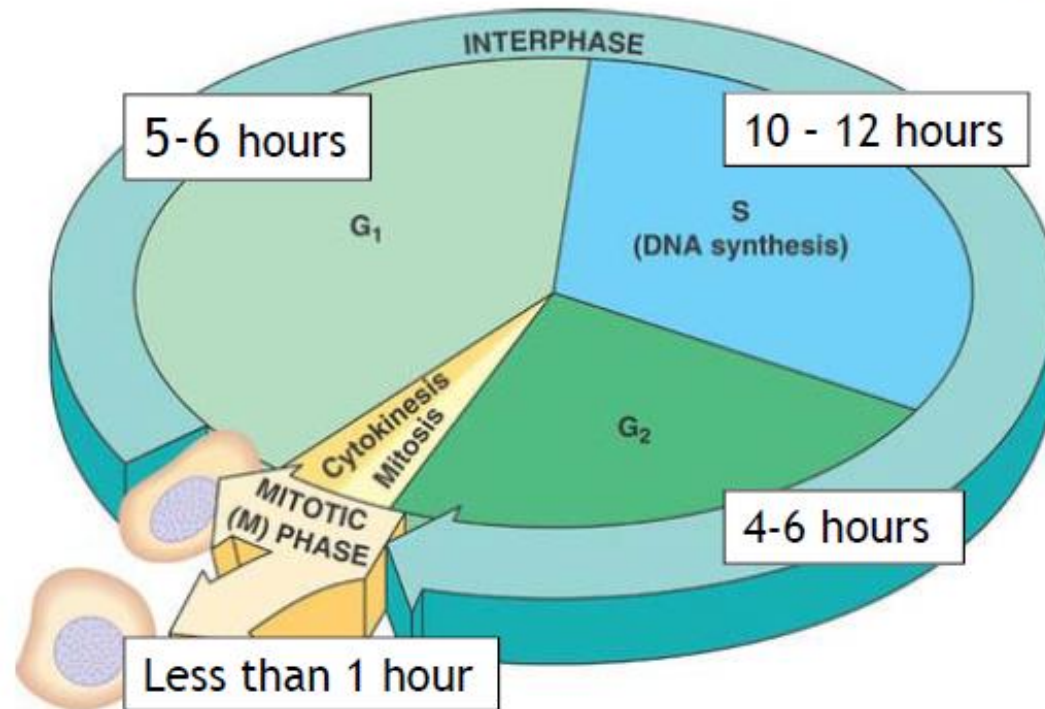
Cell Theory

- 1) All living things are composed of one or more cells
- 2) Cells are the smallest units of living organisms
- 3) New cells come only from pre-existing cells by cell division



Cell Cycle

All somatic cells in the human body undergo a cell cycles in order to produce identical daughter cells that contain the same genetic information.



Main functions of the cell cycle:

- 1) Growth of organism
- 2) Repair of tissues
- 3) Replace damaged cells

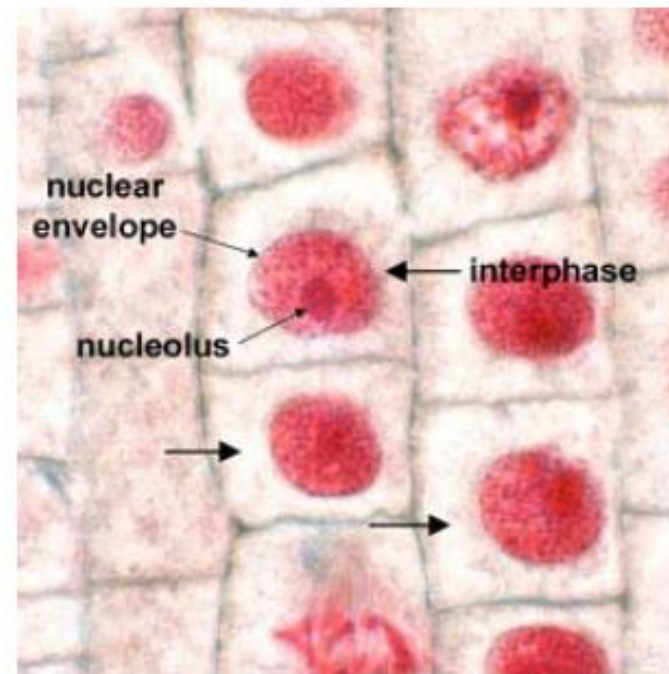
Interphase

Interphase is the stage where the cell grows and makes copies of genetic information. It prepares the cell for cell division.

G1 (Growth 1) :

S (Synthesis) :

G2 (Growth 2):

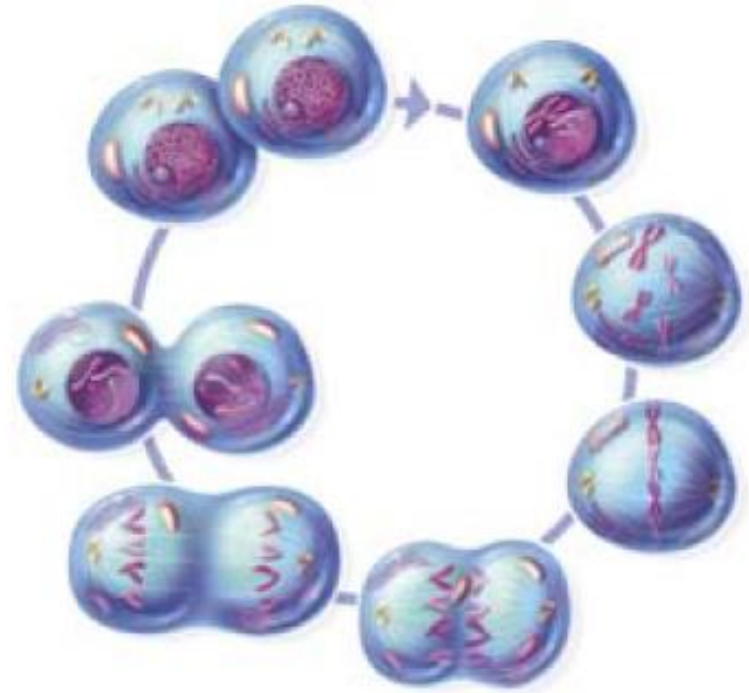


Mitosis

During mitosis, a single nucleus gives rise to two daughter nuclei that each contain the same number of chromosomes as the parent nucleus.

Mitosis is subdivided into 4 main stages:

- Prophase
- Metaphase
- Anaphase
- Telophase

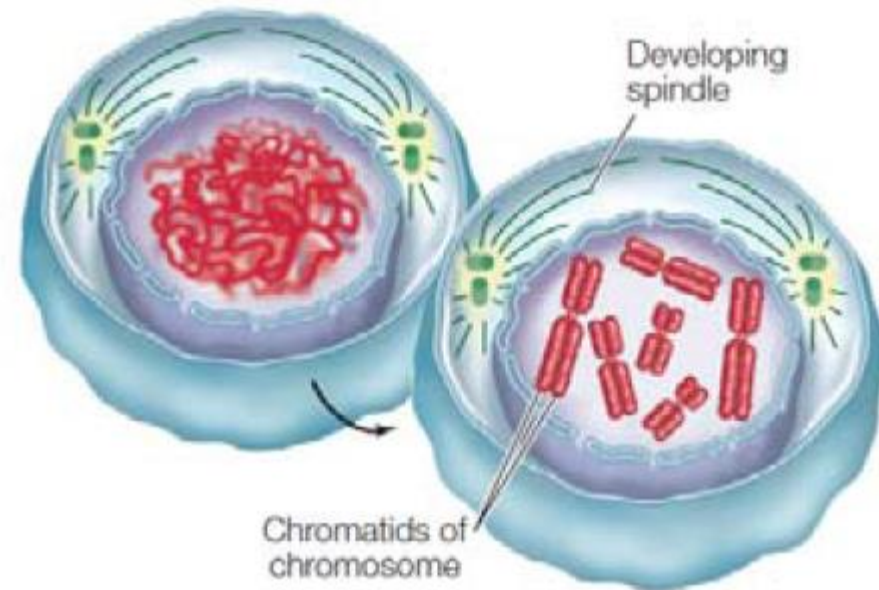


Step 1: Prophase

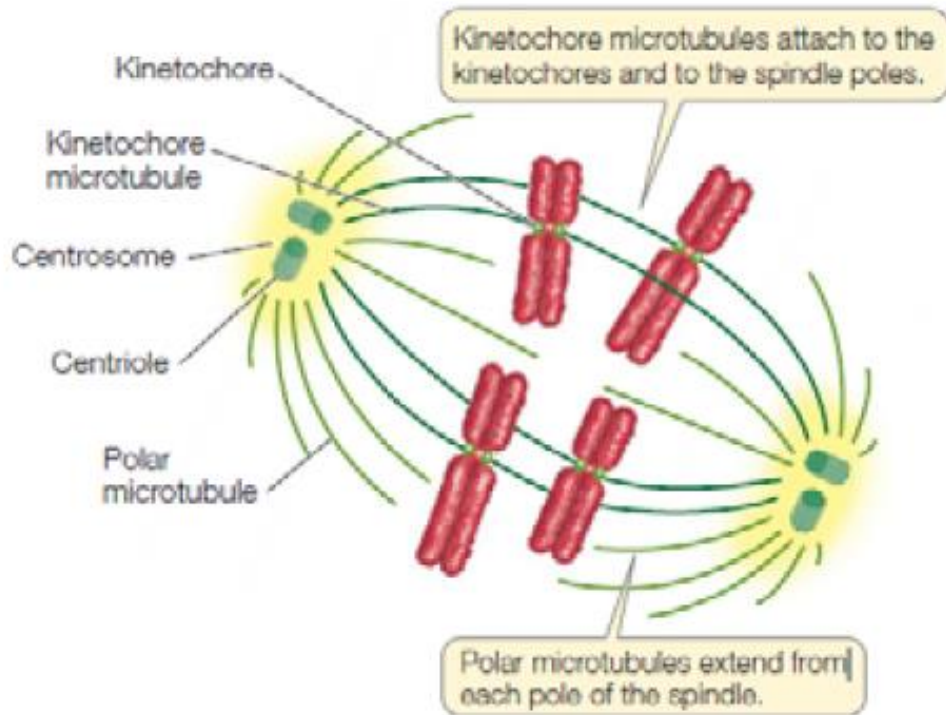
Chromatin condenses into **chromosomes** and are visible under the microscope.

Sister chromatids are joined by the **centromere**.

Centrosomes release **spindle fibers**.

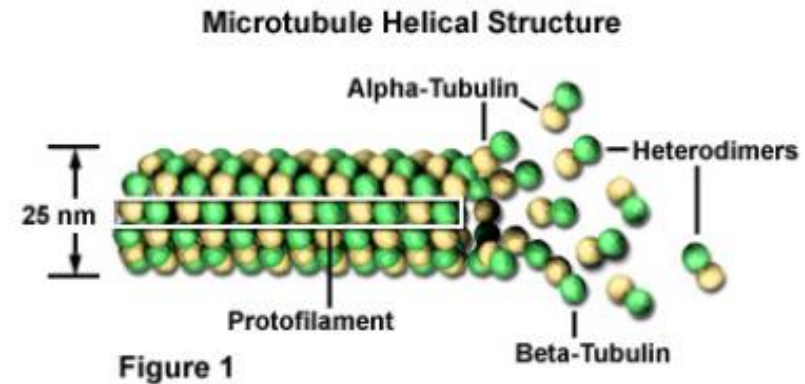


Step 1: Prophase



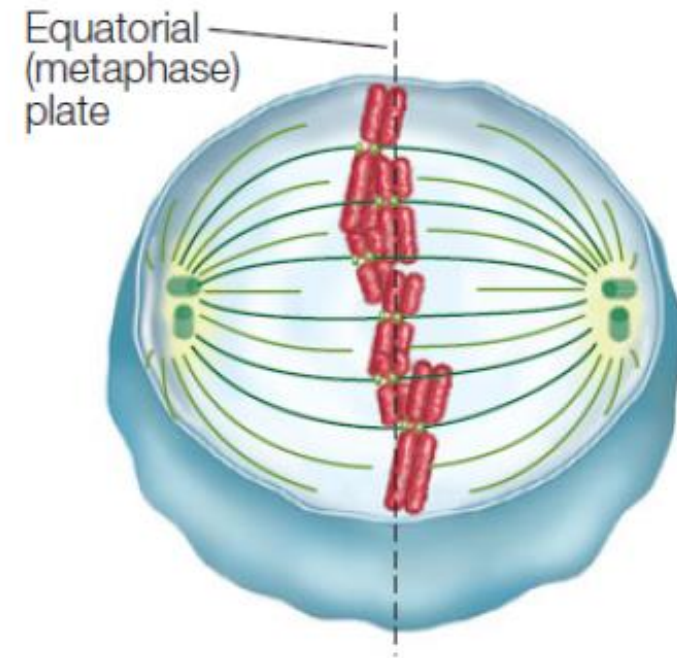
The centrosomes release spindle fibers so that they can attach to the centromeres and allow movement of the chromosomes.

The spindle fibers are made up of microtubules.



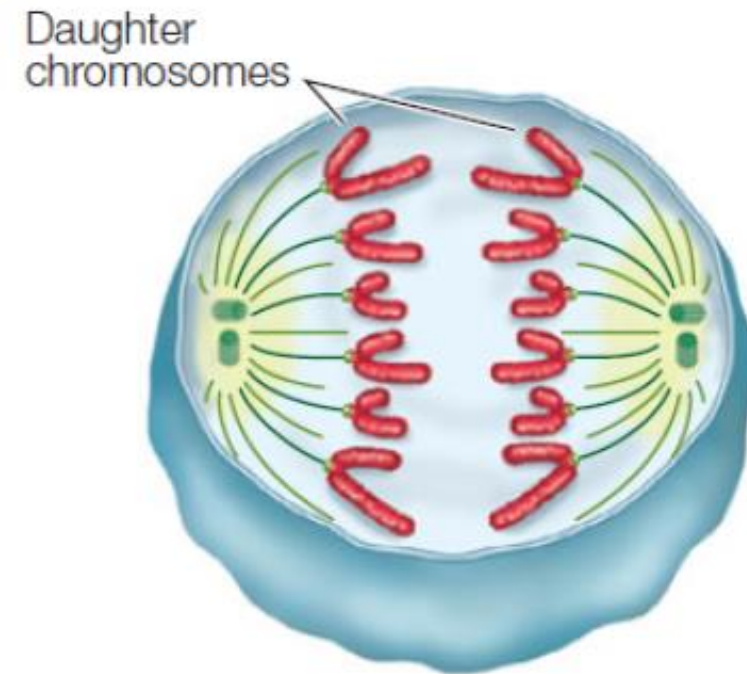
Step 2: Metaphase

The chromosomes lined up on the metaphase plate, which is located on the equator of the cell.



Step 3: Anaphase

The microtubules begin to contract and they shorten which causes the sister chromatids to separate and move to opposite ends of the cell.

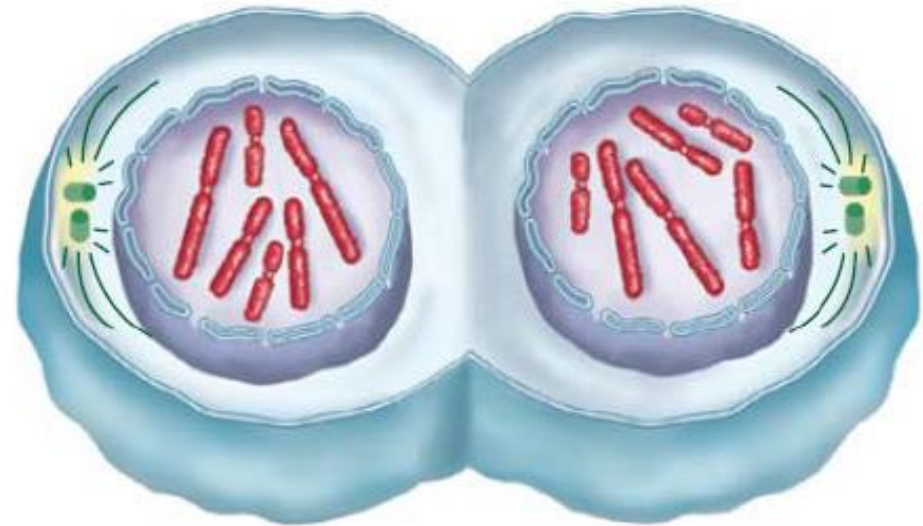


Step 4: Telophase

The nuclear envelope reforms around the chromosomes.

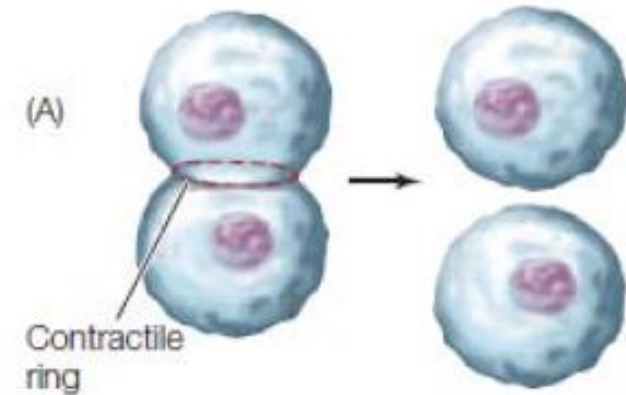
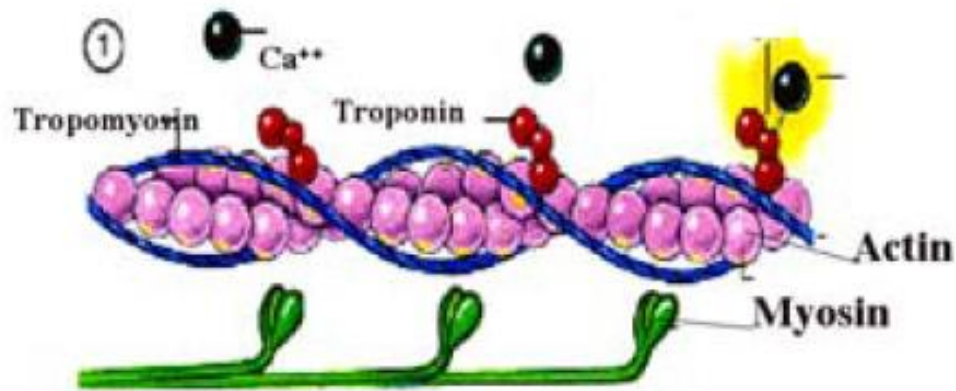
The nuclei reappears and the chromosomes become less compact and become chromatin.

The spindle fibers disappear and a cleavage furrow forms.



Cytokinesis – Animal Cells

In animal cells a cleavage furrow begins to form. A contractile ring composed of microfilaments begins to contract so that the membrane can be pinched into two cells.



50 μm

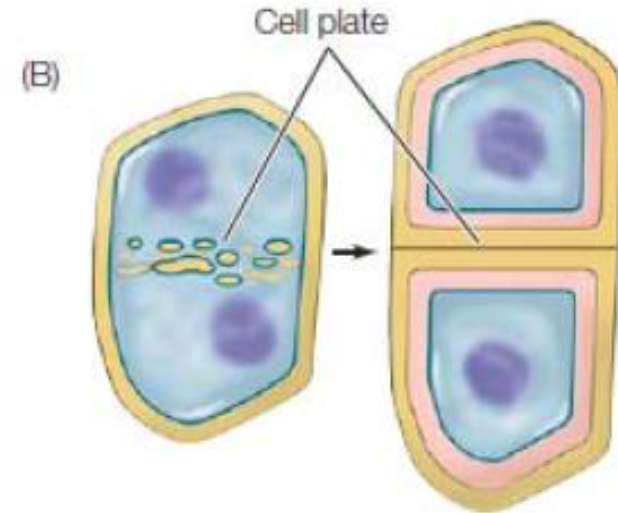
The contractile ring has completely separated the cytoplasm of these two daughter cells, although their

Cytokinesis – Plant Cell

Once the spindle fibers have broken down, the golgi apparatus sends out vesicles to the plane of cell division.

Once at the center of the cell, the vesicles fuse with one another to form a new plasma membrane.

The contents of the vesicle help to form the new cell wall of the daughter plant cells.



Checking for Understanding

1. The cancer drug vinblastine interferes with the synthesis of microtubules. In mitosis, this would interfere with which of the following?

- A) spindle formation
- B) DNA replication
- C) Carbohydrate synthesis
- D) disappearance of nuclear membrane
- E) cytokinesis

Homework

Textbook: p.168 # 2, 3, 5, 9, 10 and 11