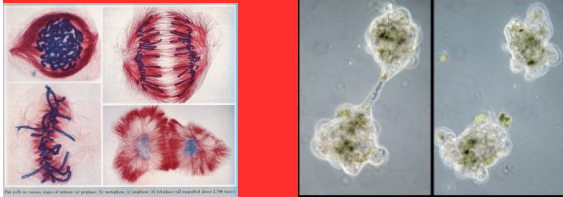




## 4.6 Cell Cycle



## ENDURING UNDERSTANDING

**IST-1 Heritable information provides for continuity of life.**

### IST-1.B Describe the events that occur in the cell cycle.

In eukaryotes, cells divide and transmit genetic information via two highly regulated processes.

### IST-1.B Describe the events that occur in the cell cycle.

The cell cycle is a highly regulated series of events for the growth and reproduction of cells

### IST-1.B Describe the events that occur in the cell cycle.

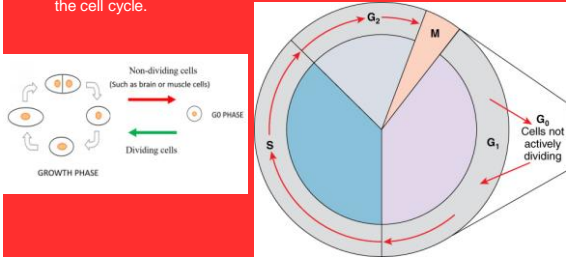
– The cell cycle consists of sequential stages of interphase (G1, S, G2), mitosis, and cytokinesis.

### IST-1.B Describe the events that occur in the cell cycle.

- Interphase consists of three phases: growth, synthesis of DNA, preparation for mitosis.
  - G1- just prior to DNA replication, when cell grows in size and organelles increase in number.
  - S- DNA replication occurs; proteins associated with DNA are also synthesized.
  - G2- just prior to cell division; preparation for mitotic cell division (grows).

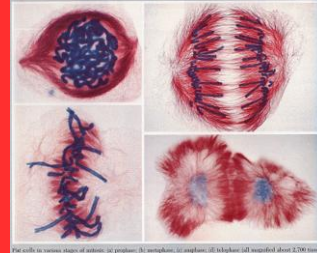
### IST-1.B Describe the events that occur in the cell cycle.

- A cell can enter a stage (G<sub>0</sub>) where it no longer divides, but it can reenter the cell cycle in response to appropriate cues.
- Nondividing cells may exit the cell cycle or be held at a particular stage in the cell cycle.



### IST-1.C Explain how mitosis results in the transmission of chromosomes from one generation to the next.

- Mitosis is a process that ensures the transfer of a complete genome from a parent cell to two genetically identical daughter cells



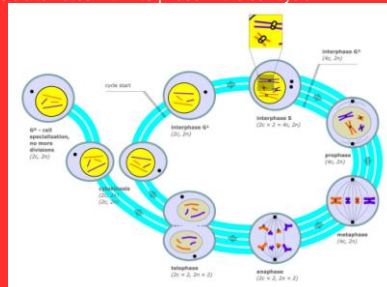
### IST-1.C Explain how mitosis results in the transmission of chromosomes from one generation to the next.

- Mitosis plays a role in growth, tissue repair, and asexual reproduction.



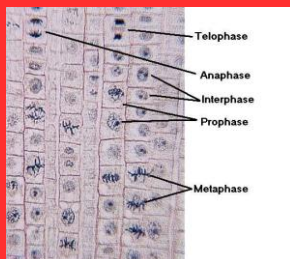
### IST-1.C Explain how mitosis results in the transmission of chromosomes from one generation to the next.

- Mitosis alternates with interphase in the cell cycle.



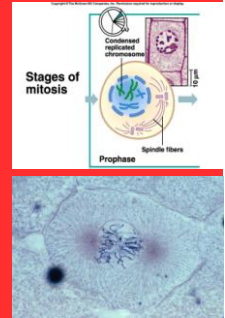
### IST-1.C Explain how mitosis results in the transmission of chromosomes from one generation to the next.

- Mitosis occurs in a sequential series of steps (prophase, metaphase, anaphase, telophase).



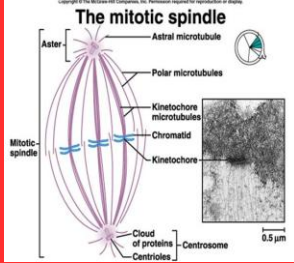
### Mitosis

- **Prophase**
  - Chromatin condenses forming visible **chromosomes** (held together by a **centromere**).
  - The nucleolus disappears.
  - Chromosomes have no particular orientation.
  - **Spindle** begins to assemble as pairs of **centrosomes** migrate away from each other.
  - Short microtubules radiate out from the pair of centrosomes; form starlike **asters**.



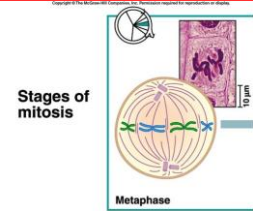
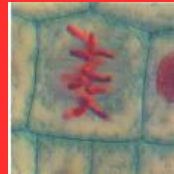
## Mitosis

- Chromosomes attach to the spindle (kinetochore fibers).
- Nuclear envelope fragments
- Polar fibers (nonkinetochore fibers) span from centrosome to centrosome.



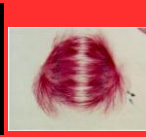
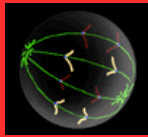
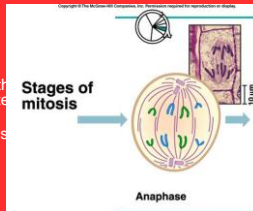
## Mitosis

- Metaphase**
  - Chromosomes, attached to kinetochore fibers, are aligned at the metaphase plate.
  - Nonattached spindle fibers (polar, nonkinetochore) fibers, overlap.



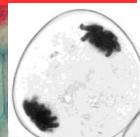
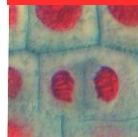
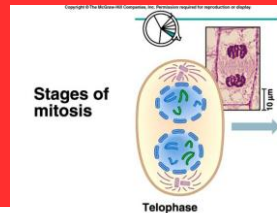
## Mitosis

- Anaphase**
  - Sister chromatids separate at centromere.
  - Daughter chromatids, each with a centromere, move to opposite poles.
  - Polar spindle fibers lengthen as they slide past each other.
  - Kinetochore spindle fibers disassemble at the kinetochores; this pulls daughter chromatids to poles.



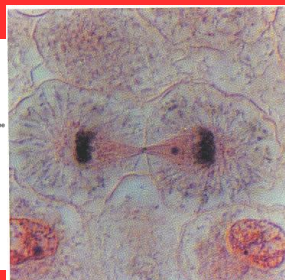
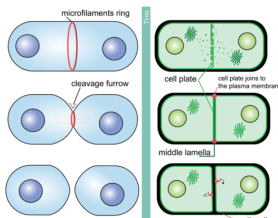
## Mitosis

- Telophase**
  - Spindle disappears.
  - Chromatids decondense and return to chromatin.
  - Nuclear envelope reforms.
  - Nucleoli reappear



## Cytokinesis

- In Animal Cells**
  - Cleavage furrow forms between the two daughter nuclei.
  - Cleavage furrow deepens as band of actin filaments slowly constricts between the two daughter cells.



## Cytokinesis

- In Plant Cells**
  - Golgi apparatus produces vesicles that move to the midpoint
  - Vesicles fuse, forming a cell plate.
  - Vesicles also release molecules that signal the formation of plant cell walls.
  - Later, walls are strengthened by the addition of cellulose fibrils.

