CONCEPT: MITOSIS

● **Mitosis** is a type of cell division that produces _____ daughter cells

□ **Interphase** is the initial stage of the cell cycle, and is the period between divisions

- **G1**, which is a growth phase before DNA replication

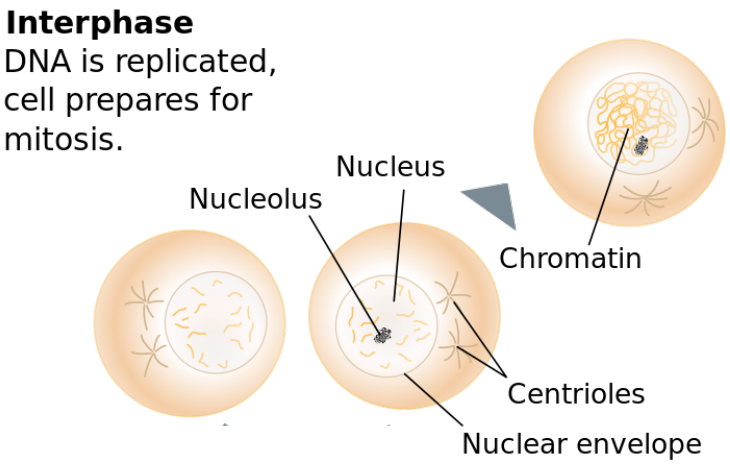
- **G0** is a non-proliferative phase that the cell enters if it's not ready to replicate the DNA

- **S**, is the phase with DNA replication

- **Sister chromatids** are the two copies of the same chromosome

- **G2**, which is a growth phase after DNA replication

EXAMPLE:



□ **Prophase** is the first stage of cell division

- **Centrioles** move to opposite ends of the cells

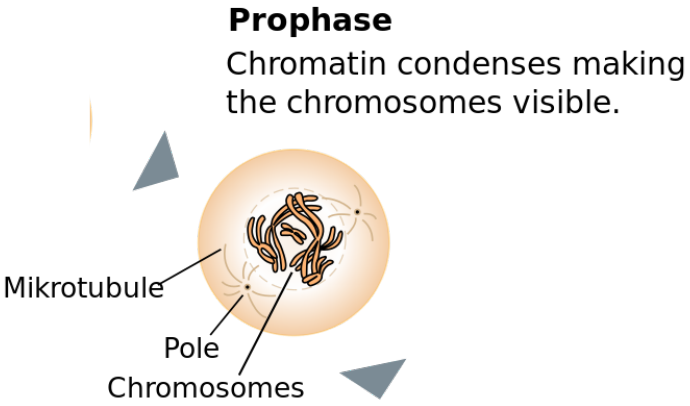
- **Spindle fibers** are microtubules that extend out from the centrioles

- Nuclear envelop breaks down

- **Chromatin (**DNA + pt) begins to condense

- **Cohesion** is a protein that holds two sister chromatids

EXAMPLE:



□ **Prometaphase** is the period of chromosome movement to the middle of the cell

□ **Metaphase** is when the chromosomes are lined up in the middle of the cell

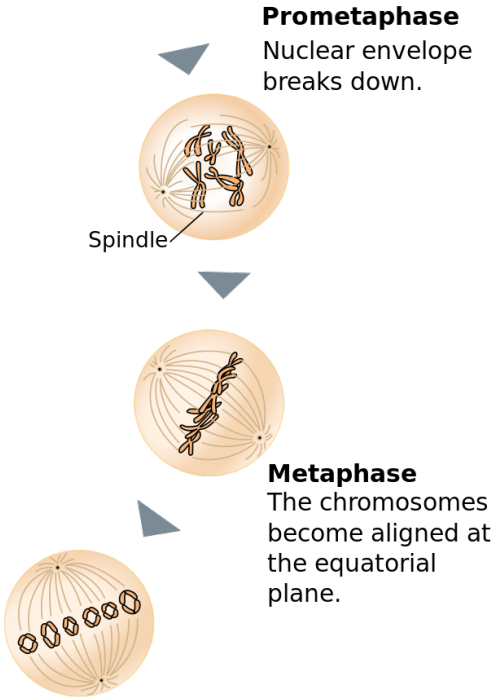
- **Metaphase plate** is the midline region of the cell

- **Kinetochore** is a protein complex that attaches to the chromosome centromere

  - The kinetochore attaches the chromosome to the spindle fibers

- Cohesion is beginning to be degraded

EXAMPLE:



□ **Anaphase** is when the chromosomes begin to segregate into daughter cells

- Cohesion is completely degraded

- **Disjunction** is the process of separating homologous chromosomes

□ **Telophase** is the final stage of mitosis

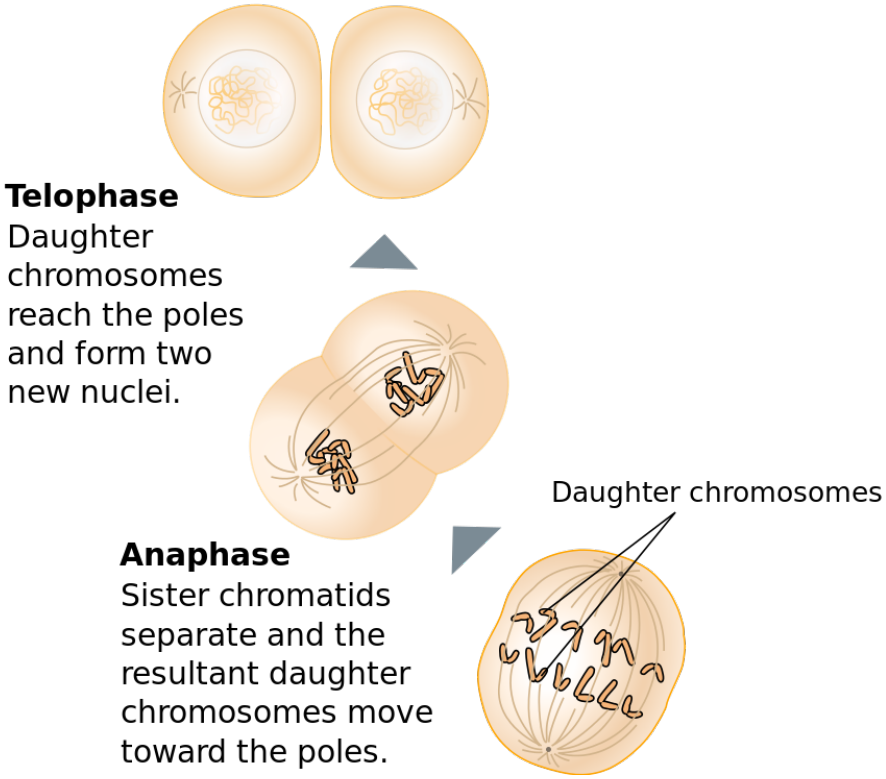
- A complete set of chromosomes are present at each cell pole

□ **Cytokinesis** is the process of dividing the cytoplasm into two cells

- **Cell plate** is formed by plant cells, which helps form the plant cell wall

- **Cleavage furrow** is the invagination of the cell membrane, which forms two cells

EXAMPLE:



Cell-Cycle Regulation

- The cell cycle must be intricately _____

  □ **Checkpoints** have been set up by the cell to ensure the cell is replicating and dividing properly

    - **G1/S Checkpoint** ensures the cell size is appropriate for division

    - **G2/M Checkpoint** ensures that DNA has been replicated correctly

    - **M Checkpoint** ensures the spindle fibers have formed correctly

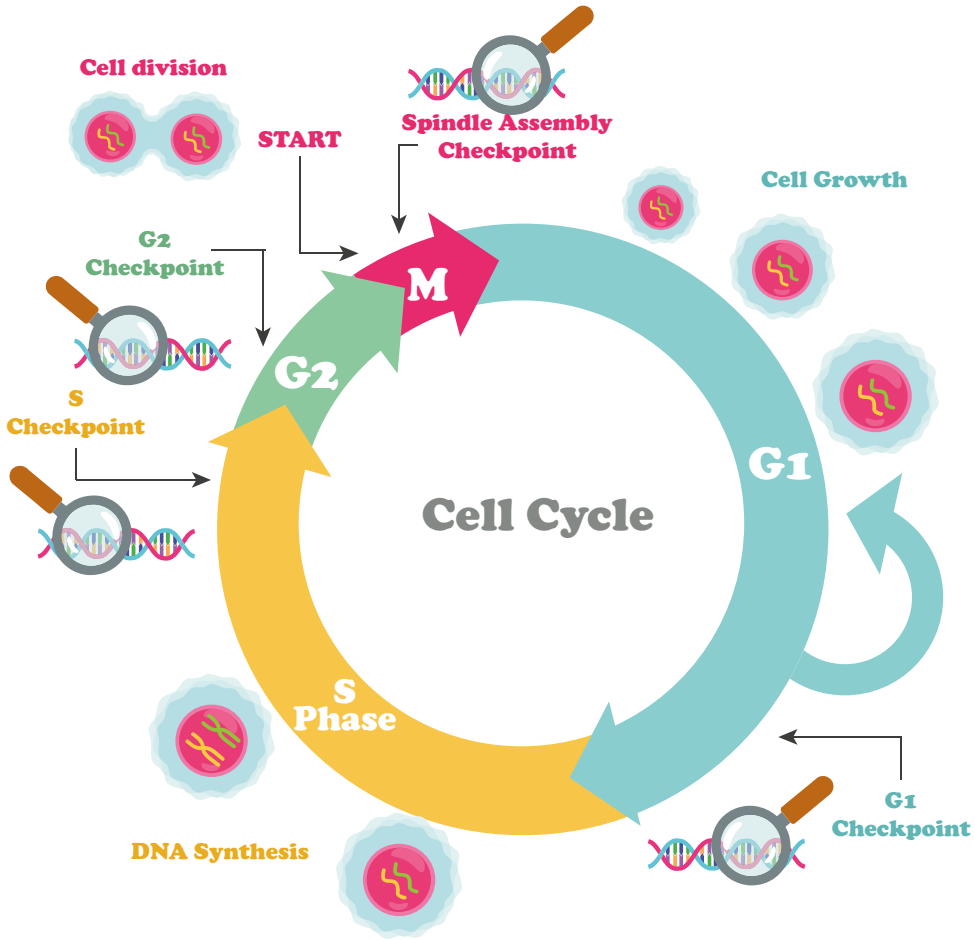
  □ Certain proteins are responsible for these checkpoints

    - **Cyclin dependent kinases** are enzymes that add phosphates to molecules

      - Phosphates can activate or deactivate cell cycle proteins

    - **Cyclins** are master control proteins that ensure proper regulation

EXAMPLE:



PRACTICE:

1. Which of the following is the correct order of mitosis steps?
    a. Interphase - metaphase - prophase - anaphase - telophase – cytokinesis
    b. Interphase – prophase – metaphase – anaphase – telophase – cytokinesis
    c. Interphase – prophase – metaphase – telophase – anaphase – cytokinesis
    d. Cytokinesis – prophase – metaphase – anaphase – telophase – interphase

2. In which step do the chromosomes begin to separate into daughter cells?
    a. Interphase
    b. Prophase
    c. Prometaphase
    d. Metaphase
    e. Anaphase
    f. Telophase
    g. Cytokinesis

3. In which step does the cleavage furrow form
    a. Interphase
    b. Prophase
    c. Prometaphase
    d. Metaphase
    e. Anaphase
    f. Telophase
    g. Cytokinesis

4. In which step is the DNA replicated?
    a. Interphase
    b. Prophase
    c. Prometaphase
    d. Metaphase
    e. Anaphase
    f. Telophase
    g. Cytokinesis

5. In which step does the chromatin begin to condense
    a. Interphase
    b. Prophase
    c. Prometaphase
    d. Metaphase
    e. Anaphase
    f. Telophase
    g. Cytokinesis

6. Which checkpoint is responsible for ensuring the DNA was replicated properly?
    a. G1/S
    b. G2/M
    c. M
    d. C

7. Cohesion is a protein responsible for what?
    a. Forming the spindle fibers
    b. Holding non-sister chromatids together
    c. Connecting the spindle fibers to the centromere
    d. Holding sister chromatids together