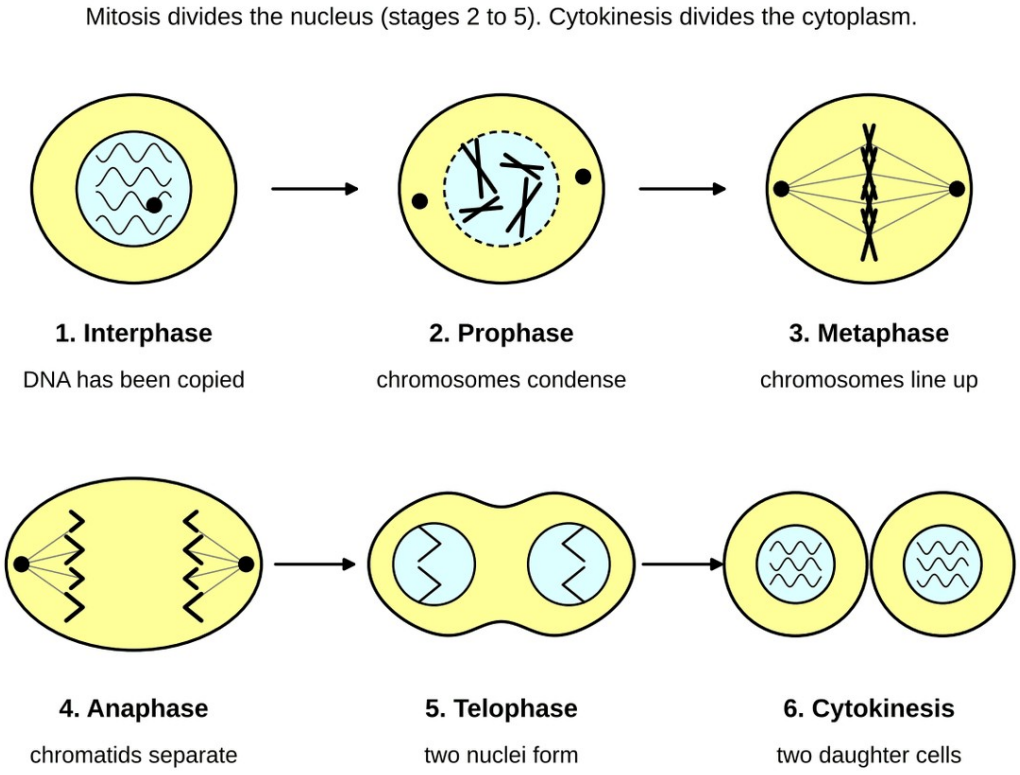
Mitosis

Essential Question

How does one cell become two identical cells?

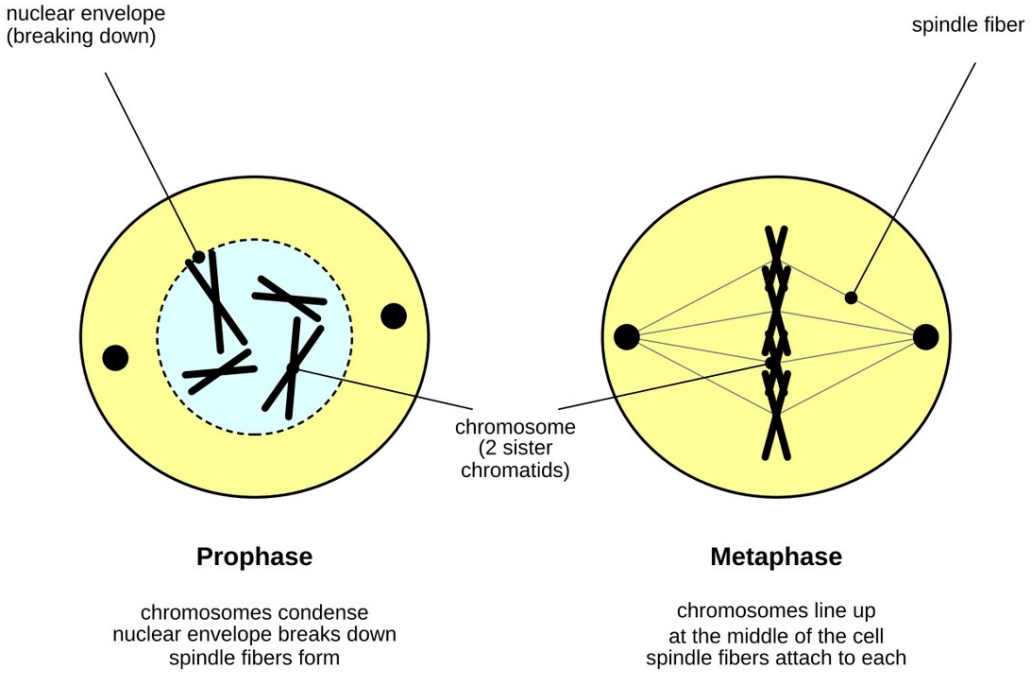
Mitosis Makes Two Identical Cells

- Mitosis divides the nucleus
- Cytokinesis divides the cytoplasm
- Stages: prophase, metaphase, anaphase, telophase
- Two daughter cells with the same DNA as the parent



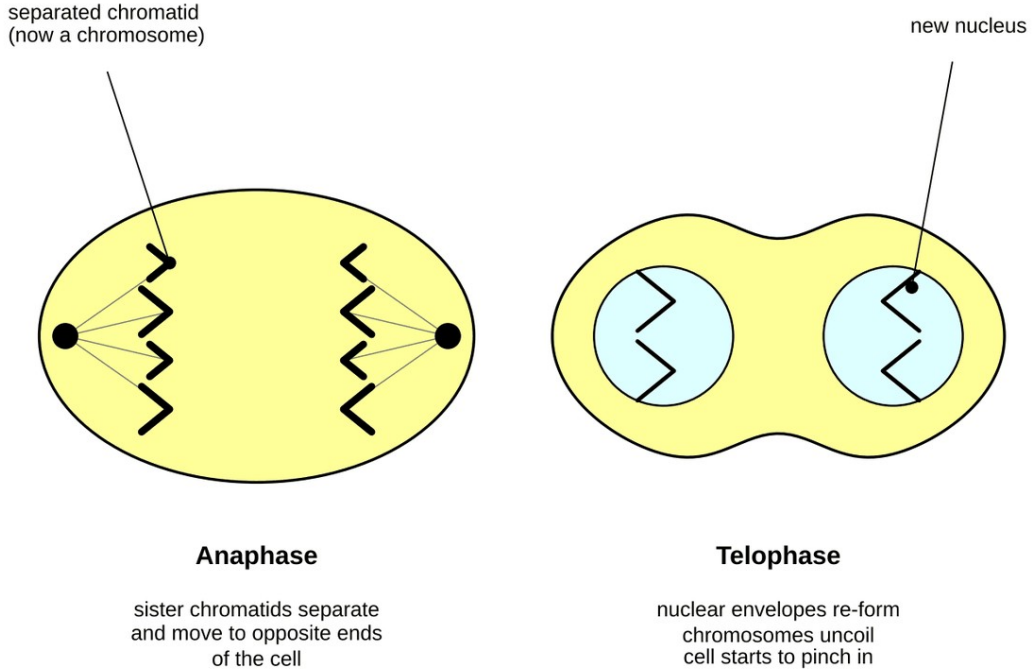
Prophase and Metaphase

- Prophase: chromosomes condense and become visible
- Prophase: the nuclear envelope breaks down and spindle fibers form
- Metaphase: chromosomes line up across the middle
- Metaphase: spindle fibers attach to each centromere



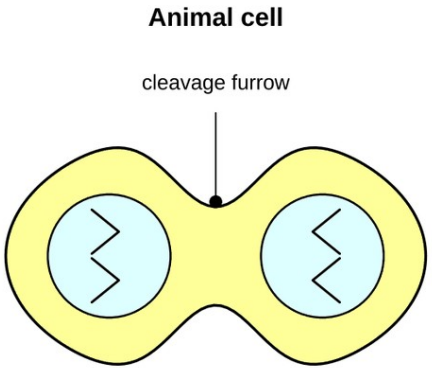
Anaphase and Telophase

- Anaphase: sister chromatids separate
- Anaphase: each chromatid is pulled to an opposite end
- Telophase: nuclear envelopes re-form
- Telophase: chromosomes uncoil and the cell pinches in

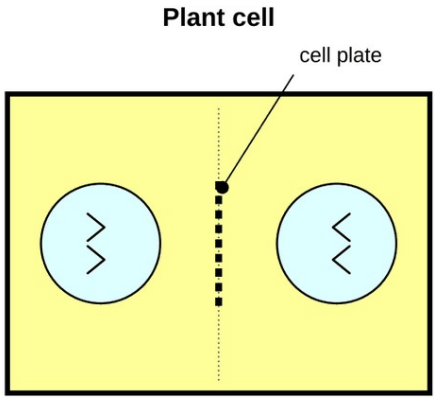


Cytokinesis Splits the Cytoplasm

- Animal cells: the membrane pinches in (cleavage furrow)
- Plant cells: a cell plate grows across the middle
- The cell plate becomes a new cell wall
- Each daughter cell gets a nucleus and cytoplasm



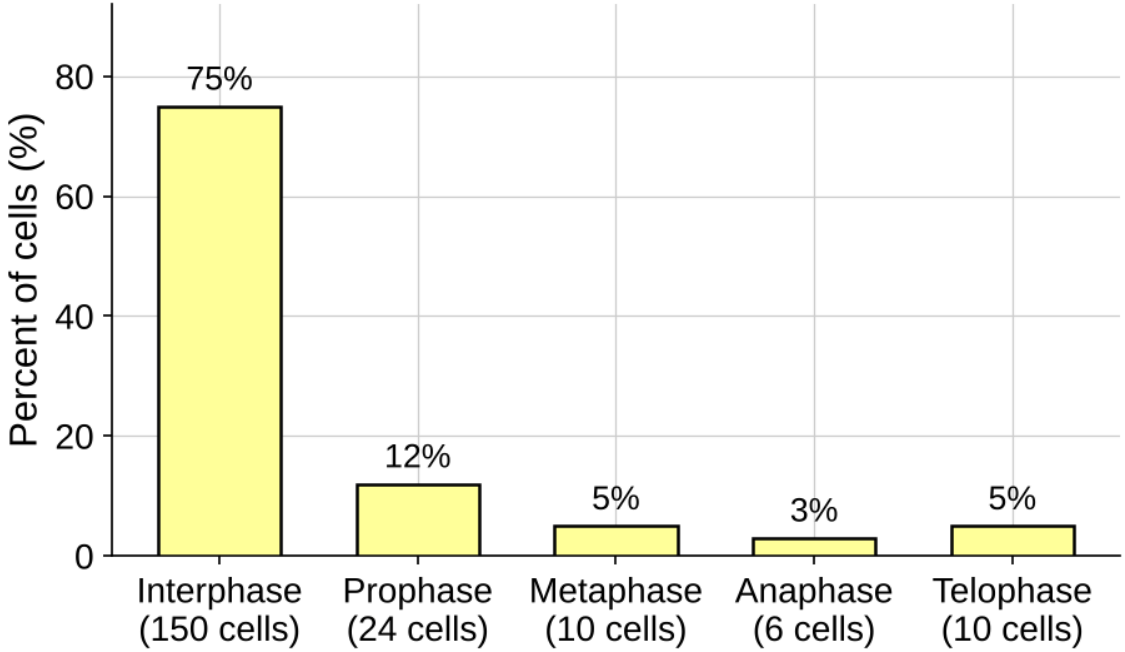
The cell membrane pinches in (cleavage furrow) until the cell splits in two.



A cell plate grows outward across the middle and becomes a new cell wall.

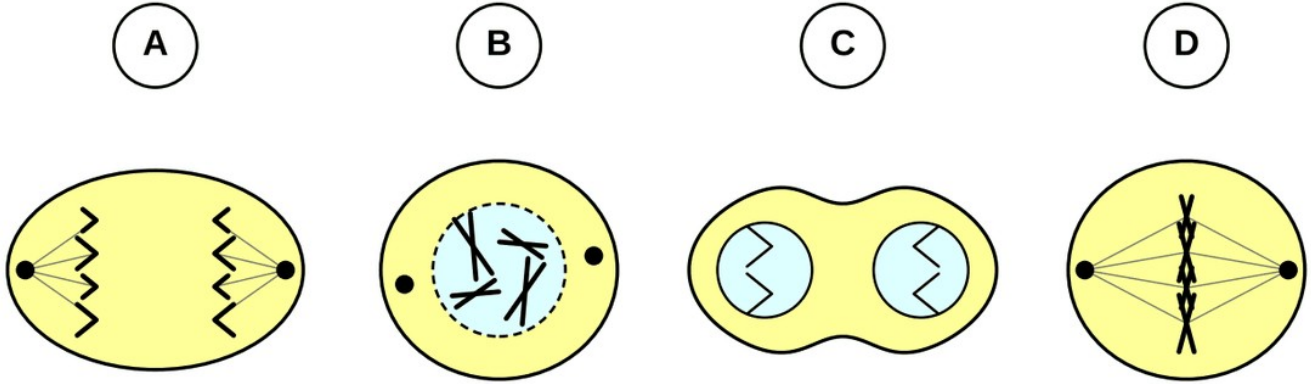
Counting Cells to Find Time

- Root tip cells divide quickly
- Count the cells in each stage under a microscope
- Cells in a stage ÷ total cells = fraction of cells
- More cells in a stage means more time spent in it



Example: Put the Stages in Order

The four cells below are from the same root tip, but they are shown out of order. Put them in the correct order and name the stage of each cell. Explain how you decided.



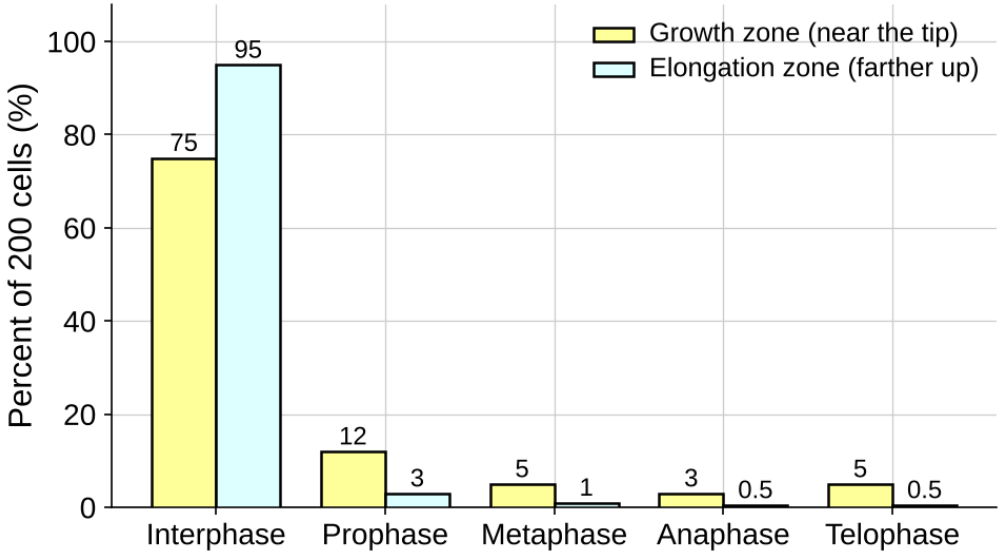
Example: How Long Does Each Stage Last?

In a sample count of 200 onion root tip cells, 150 were in interphase, 24 in prophase, 10 in metaphase, 6 in anaphase, and 10 in telophase (count cells in cytokinesis as telophase). Assume the whole cell cycle takes 24 hours. Find the percent of cells in each stage and the time spent in each stage.

Stage	Cells counted
Interphase	150
Prophase	24
Metaphase	10
Anaphase	6
Telophase	10

Example: Where Are the Cells Dividing?

A student counts 200 cells in each of two parts of an onion root: the growth zone near the tip, and the elongation zone farther up. Write a claim, evidence, and reasoning: which zone has more cells that are dividing?



Mitosis

Big Ideas

- Mitosis divides the nucleus; cytokinesis divides the cytoplasm
- The order of the stages is prophase, metaphase, anaphase, telophase
- In anaphase, sister chromatids separate and move to opposite ends
- The two daughter cells have the same DNA as the parent cell
- The share of cells in a stage shows the share of time spent in it