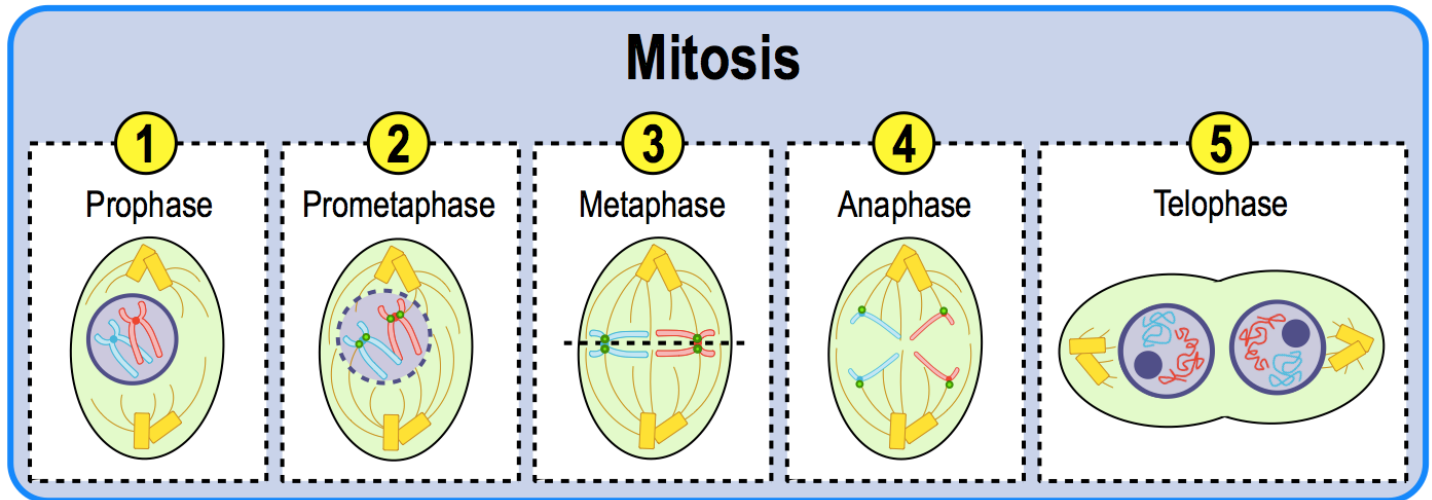
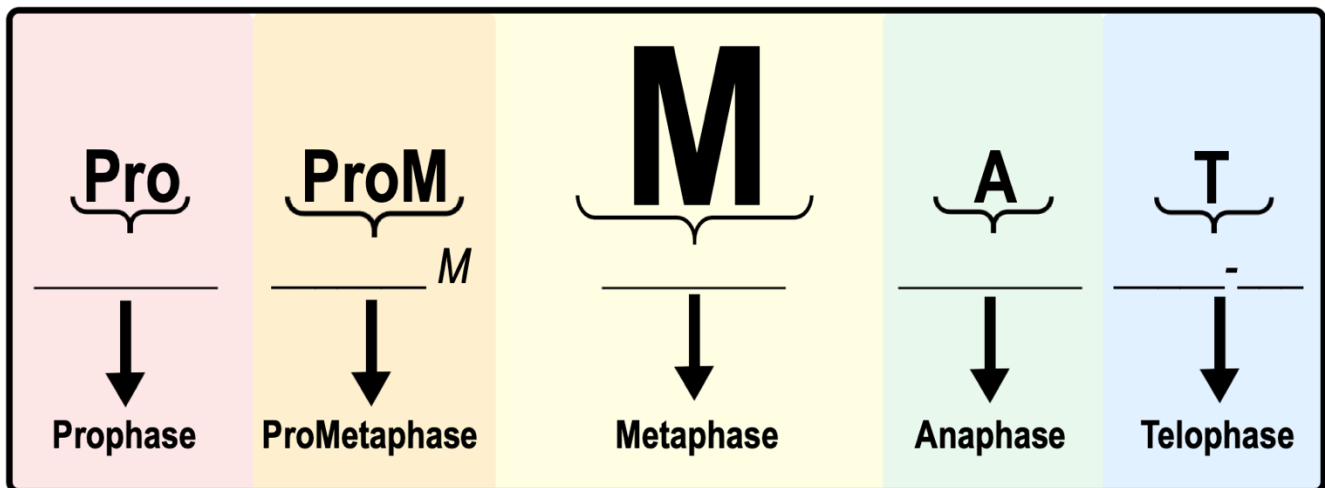


## CONCEPT: PHASES OF MITOSIS

- Recall: \_\_\_\_\_: the asexual process of dividing the nucleus & the *genetic material* of a *somatic* (body) cell.
  - Starts with one *diploid* cell & ends with \_\_\_\_\_ genetically *identical* \_\_\_\_\_ cells.
  - Mitosis consists of \_\_\_\_\_ different phases:



## How to Remember the Order of the Phases of Mitosis



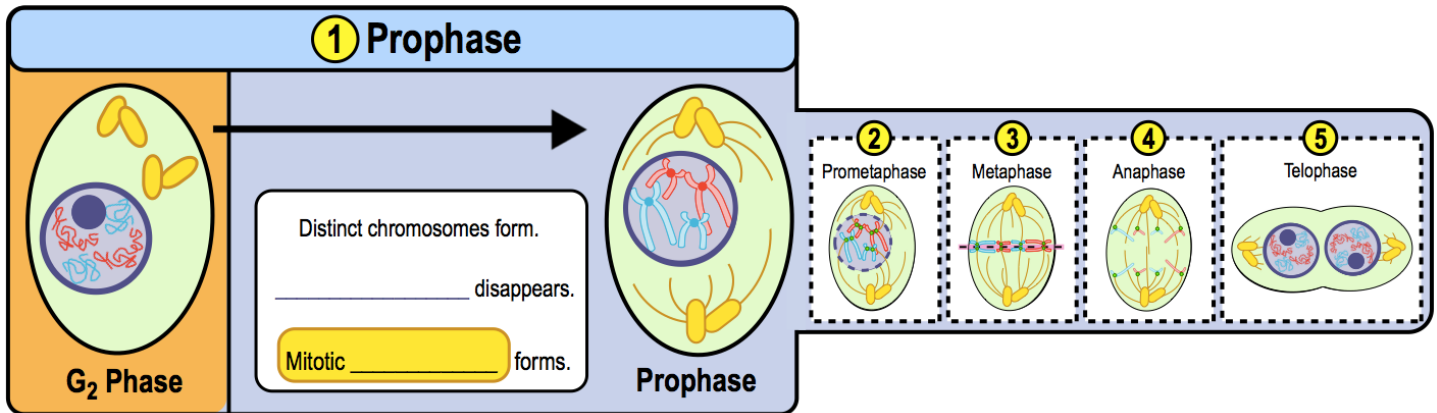
**PRACTICE:** The correct sequence for the phases of mitosis is:

- a) Prophase - prometaphase - metaphase - anaphase – telophase.
- b) Prophase - prometaphase - anaphase - metaphase – telophase.
- c) Prophase - prometaphase - metaphase - anaphase – telophase.
- d) Prometaphase - prophase - metaphase - anaphase – telophase.
- e) Metaphase - anaphase - interphase - prophase – telophase.

## CONCEPT: PHASES OF MITOSIS

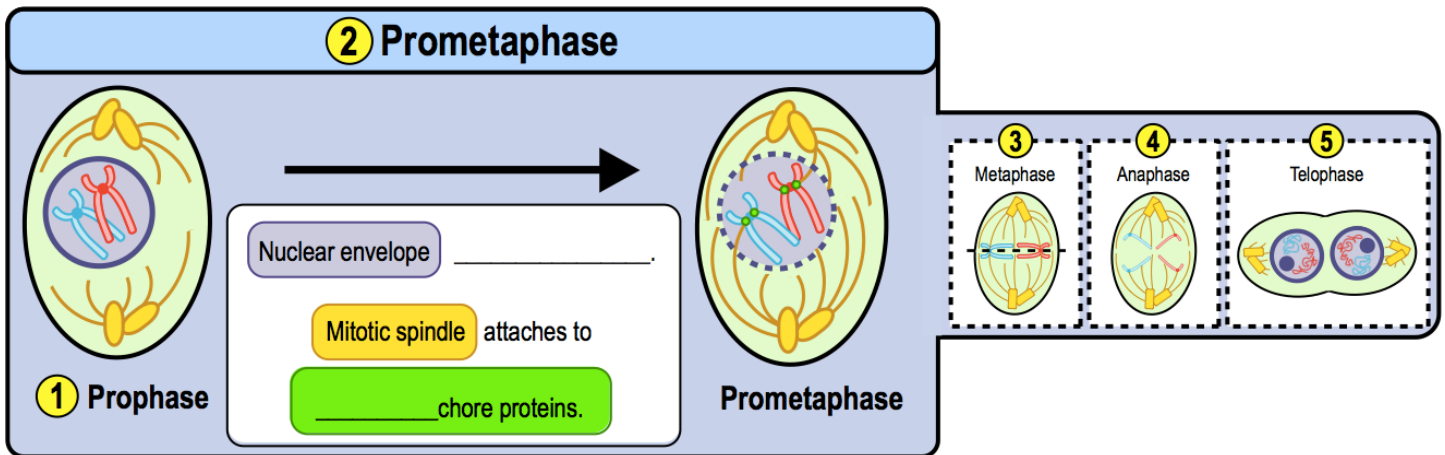
### 1) Prophase

- Loosely coiled *chromatin* condenses to form distinct \_\_\_\_\_ with sister chromatids linked at the centromere.
  - The **nucleolus** (location of ribosome synthesis) \_\_\_\_\_ from the nucleus.
  - The two *centrosomes* migrate to \_\_\_\_\_ poles of the cell & begin forming the **mitotic spindle**.



### 2) Prometaphase

- Prometaphase is also sometimes referred to as "\_\_\_\_\_ " prophase.
  - Nuclear Envelope** \_\_\_\_\_, exposing chromosomes to the cytoplasm.
  - Mitotic spindle links to chromosomes by attaching to \_\_\_\_\_ **proteins** in the centromere.



**PRACTICE:** The phase of mitosis where chromosomes condense and centrosomes move to opposite poles of the cell is:

- a) Prometaphase.      b) Metaphase.      c) Prophase.      d) Anaphase.      e) Telophase.

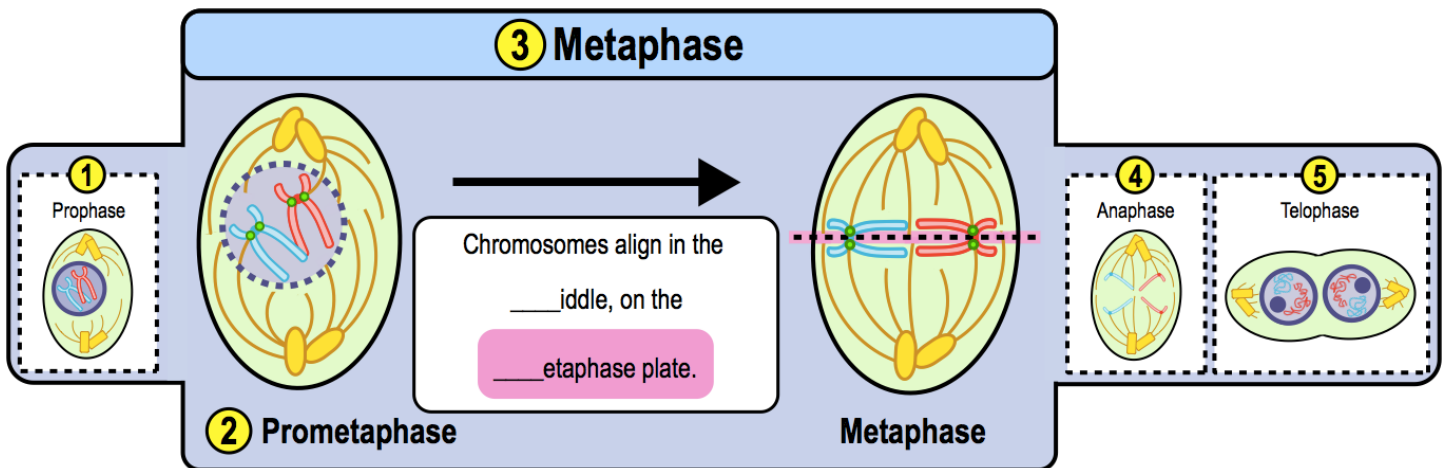
## CONCEPT: PHASES OF MITOSIS

**PRACTICE:** Why does the nuclear envelope break down during prometaphase?

- a) To allow the chromosomes to condense.
- b) To allow the sister chromatids to form.
- c) To allow the mitotic spindle to form.
- d) To allow spindle fibers to attach to chromosomes.

### 3) Metaphase

- **Metaphase:** *mitotic spindles* align chromosomes in the *middle* of the cell in a *row*.
  - The equator or middle of the cell is called the **Metaphase** *plate*.



**PRACTICE:** The mitotic spindle plays a critical role in which of the following processes of cellular division?

- a) Splitting the cytoplasm following mitosis.
- b) Triggering the condensation of chromosomes.
- c) Dissolving the nuclear membrane.
- d) Moving the chromosomes within the cell.

**PRACTICE:** Which of the following events characterizes metaphase of mitosis?

- a) I.
  - b) II.
  - c) III.
  - d) I and II.
  - e) All of these
- I. Movement of chromosomes to the equatorial plane (metaphase plate) of the cell.
  - II. A spindle fiber attaches to each sister chromatid.
  - III. Separation of sister chromatids that are being pulled to the poles of the cell.

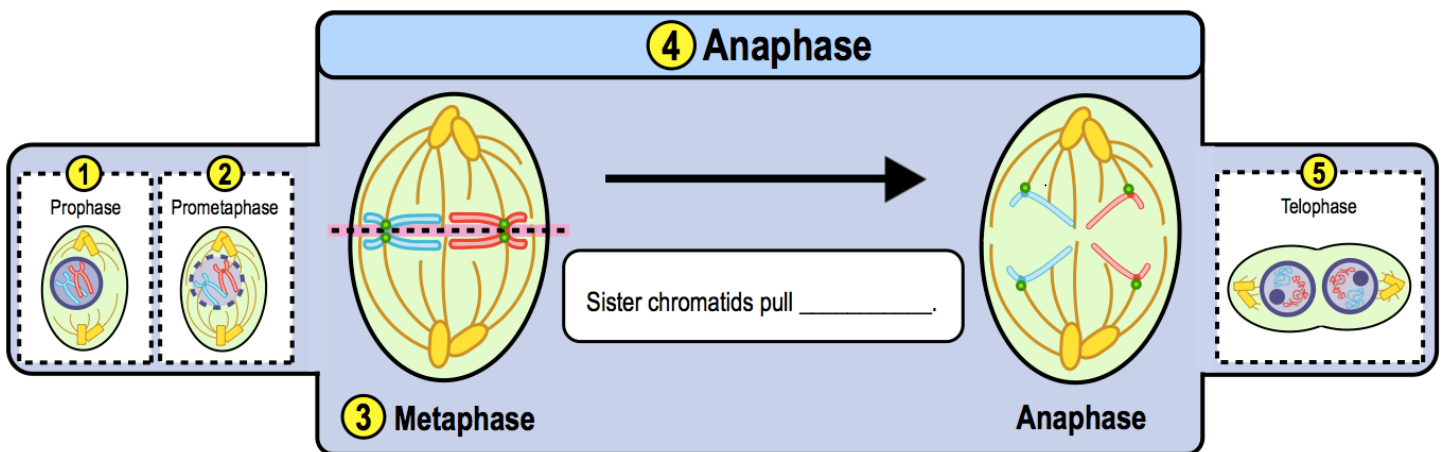
## CONCEPT: PHASES OF MITOSIS

**PRACTICE:** Metaphase is characterized by \_\_\_\_\_.

- a) Separation of the sister chromatids.
- b) Separation of the cytoplasm.
- c) Alignment of chromosomes along the cell's equator.
- d) Alignment of the mitotic spindle along the cell's equator.

### 4) Anaphase

- anaphase: *sister chromatids* are pulled part towards opposite ends of the cell.
  - Some parts of the mitotic spindle *shorten*, pulling chromatids apart, whereas others *lengthen*, stretching the cell.



**PRACTICE:** In what way do kinetochore microtubules facilitate the process of splitting the sister chromatids?

- a) They use motor proteins to hydrolyze the centromere at specific arginine residues.
- b) They create tension by pulling toward opposite poles.
- c) They slide past each other like actin microfilaments.
- d) They phosphorylate the centromere, thereby changing its conformation.

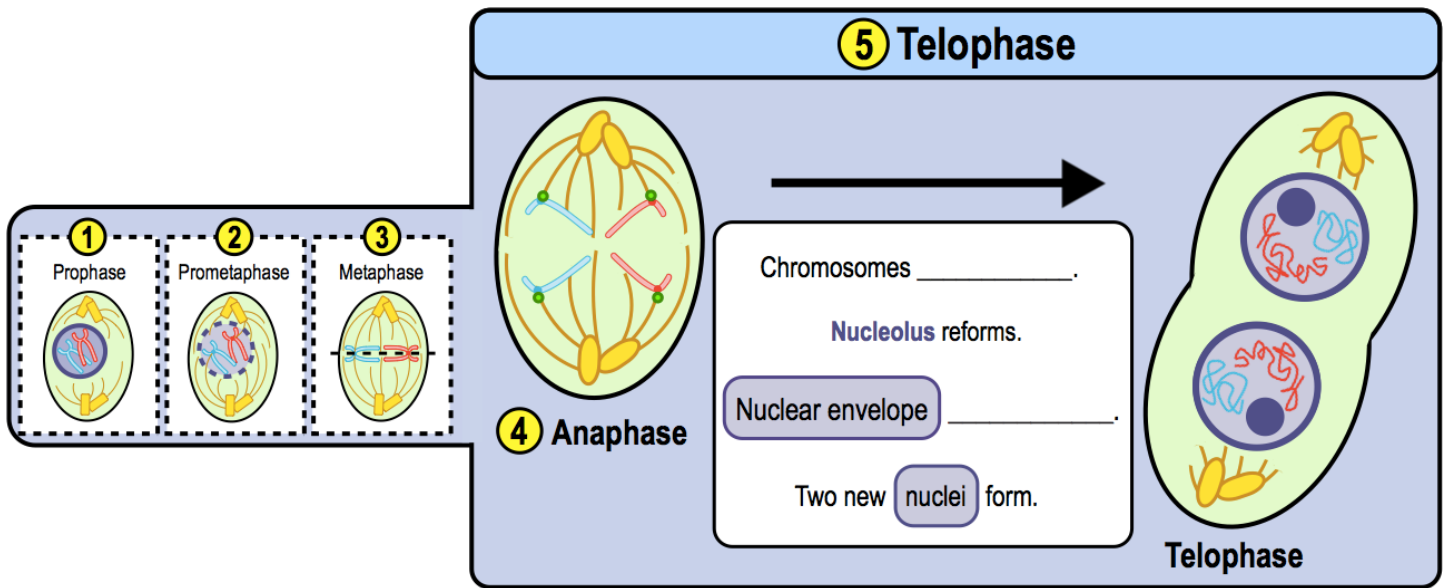
**PRACTICE:** Which of the following is a function of the non-kinetochore microtubules?

- a) Maintaining an appropriate spacing among the moving chromosomes.
- b) Starting the separation of the cytoplasm once the final stage of mitosis is complete.
- c) Providing the ATP needed by the kinetochore microtubules to move the chromosomes.
- d) Pulling the poles of the cell closer together.
- e) Pushing the poles of the cell further apart.

## CONCEPT: PHASES OF MITOSIS

### 5) Telophase

- The final step of mitosis, *telophase*, is practically the \_\_\_\_\_ or *reverse* of prophase & prometaphase.
  - Chromosomes begin to \_\_\_\_\_ back to its *loose*, \_\_\_\_\_ state.
  - Mitotic spindle \_\_\_\_\_.
  - **Nucleolus** & nuclear envelope \_\_\_\_\_ at each end of the cell to form \_\_\_\_\_ nuclei.



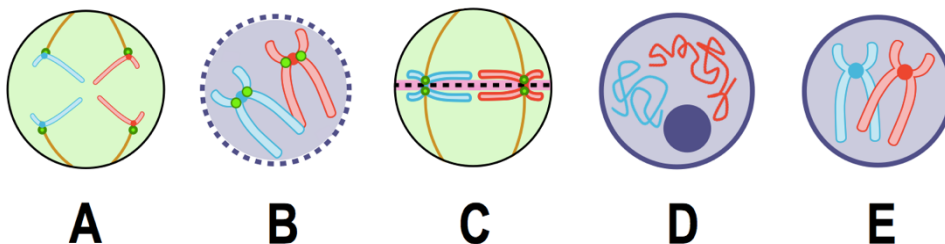
**PRACTICE:** The nuclear envelopes form and the mitotic spindles disassembles during telophase in preparation for what?

- The merging of the two nuclei.
- The division of the cell into two daughter cells, each with their own nuclei.
- The division of the cell into four daughter cells, each with half a nuclei.
- Nothing, the cell now possesses two nuclei and twice the amount of genetic material.

**PRACTICE:** The circles labeled A to E each represent the chromosomes within a cell during a single phase of mitosis.

Which image is showing one of the newly created nuclei at the end of telophase?

- A.
- B.
- C.
- D.
- E.



**CONCEPT: PHASES OF MITOSIS**

**PRACTICE:** At which phase of the cell cycle do centrosomes begin to move apart in animal cells?

- a) Anaphase.
- b) Metaphase.
- c) Telophase.
- d) Prophase.

**PRACTICE:** Scientists isolate cells in various phases of the cell cycle. They isolate a group of cells that have 1 1/2 times more DNA than G1 phase cells. What is the most likely part of the cell cycle from which these cells were isolated?

- a) between the G1 and S phases in the cell cycle.
- b) in the G2 phase of the cell cycle.
- c) in the M phase of the cell cycle.
- d) in the S phase of the cell cycle.

**PRACTICE:** If there are 40 centromeres in a cell at anaphase of mitosis, how many chromosomes will be found in each daughter cell following cytokinesis?

- a) 10.
- b) 20.
- c) 40.
- d) 80.

**PRACTICE:** Taxol is an anticancer drug extracted from the Pacific yew tree. In animal cells, Taxol prevents microtubule depolymerization (breaking down). Thus, Taxol stops mitosis by interfering with which of the following structures or processes?

- a) The mitotic spindle.
- b) Cytokinesis.
- c) DNA replication.
- d) Chromosome condensation.