

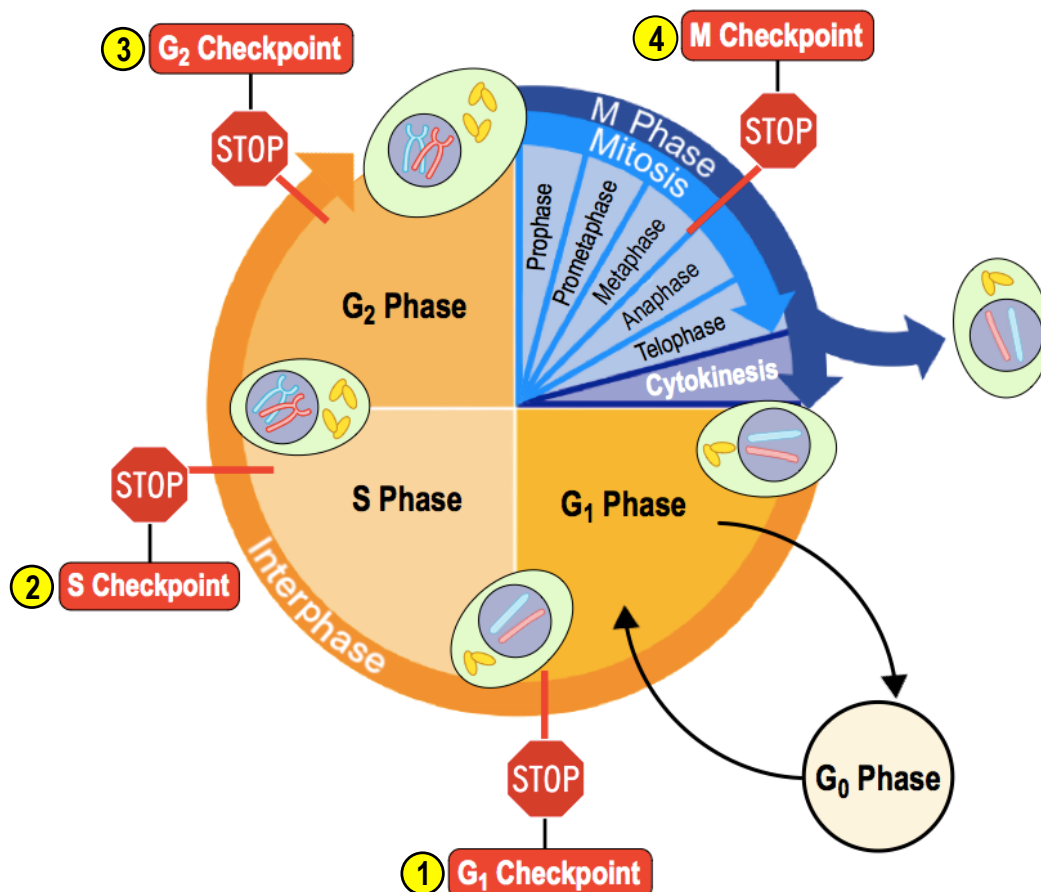
CONCEPT: CELL CYCLE REGULATION

- Cell division is controlled/activated by a variety of cellular signals in the form of proteins called _____ factors.
 - **Growth factor:** a biological substance that _____ cell division.
- Also, multiple Cell Cycle “_____” *prevent* the cell from entering the next phase *prematurely*.
 - If an error is detected at any checkpoint, a protein called *p53* can trigger repair or _____ (cell death).
 - A cell that “ignores” cell cycle checkpoints can lead to _____.

Cell Cycle Checkpoints

- _____ major checkpoints control the progress of the Cell Cycle:
 - These checkpoints don't need to be memorized if you understand the cell cycle.
- ① _____ **Checkpoint:** the cell fixes damaged/mutated DNA in preparation for DNA replication in the S phase.
- ② _____ **Checkpoint:** confirms proper _____ of *genetic material* & attempts to fix any errors.
- ③ _____ **Checkpoint:** ensures all enzymes & proteins needed for mitosis & cytokinesis are available.
- ④ _____ **(Metaphase) Checkpoint:** confirms that all *chromosomes* are aligned & *spindle fibers* are attached properly.

EXAMPLE: Checkpoints of the Cell Cycle.



CONCEPT: CELL CYCLE REGULATION

PRACTICE: What is the purpose of cell cycle checkpoints?

- a) To coordinate a cell's specialization for its role in particular tissues.
- b) To prevent the cell from pausing the cell cycle when problems are detected.
- c) To ensure that cells containing errors in their DNA do not undergo apoptosis.
- d) To coordinate movement of vesicles through the cell.
- e) To ensure that a cell only proceeds to the next phase in the cell cycle if it is ready.

PRACTICE: Checkpoints within the cell cycle:

- a) Are located within interphase and allow entry to G₀.
- b) Are located within G₁, S and G₂.
- c) Are located within G₁, M and G₂.
- d) Are located within G₁, M, S and G₂.
- e) Are located within all the phases of the cell cycle.

PRACTICE: The M phase checkpoint ensures that all chromosomes are attached to the mitotic spindle. If this does not happen, cells would most likely be arrested in _____.

- a) Telophase.
- b) Prophase.
- c) G₂.
- d) Metaphase.

PRACTICE: Which of the following cell cycle checkpoints ensures that the genetic material is fully replicated before mitosis?

- a) G₀.
- b) M.
- c) G₁.
- d) G₂.
- e) S.