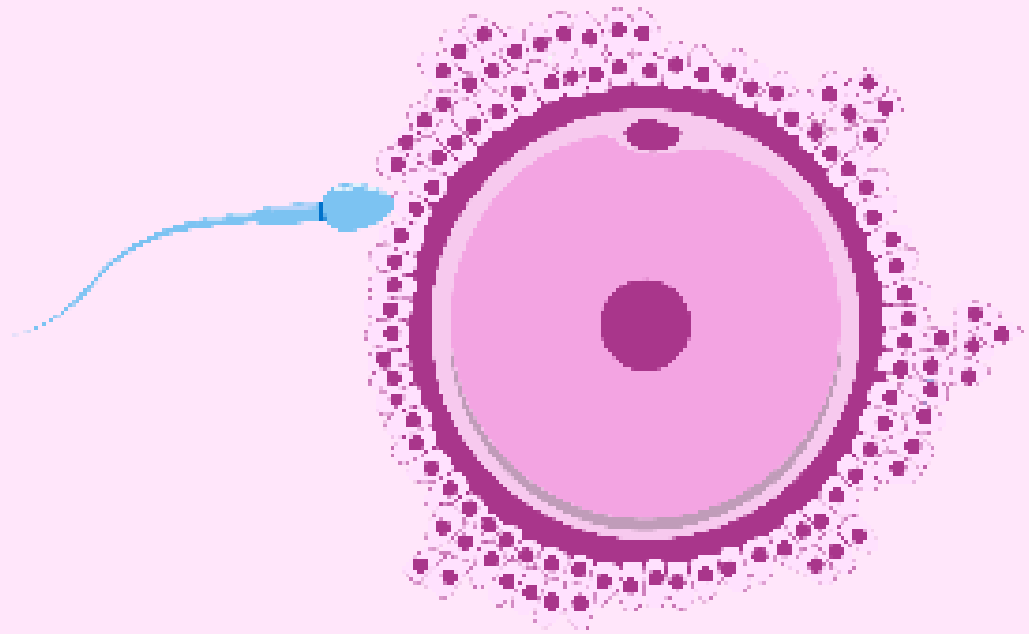
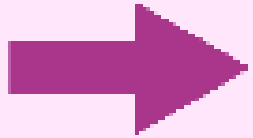
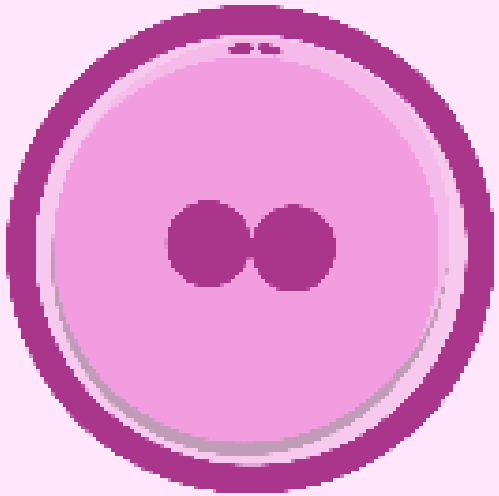
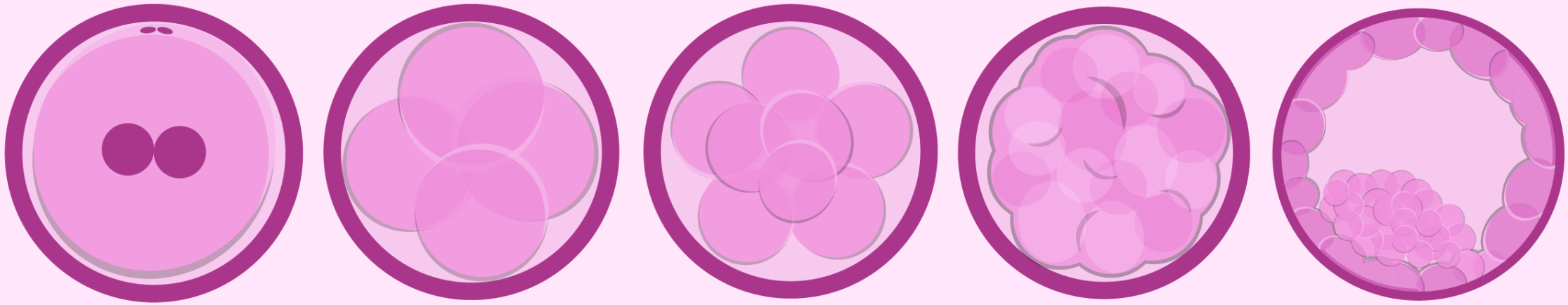


Fertilization





Zygote

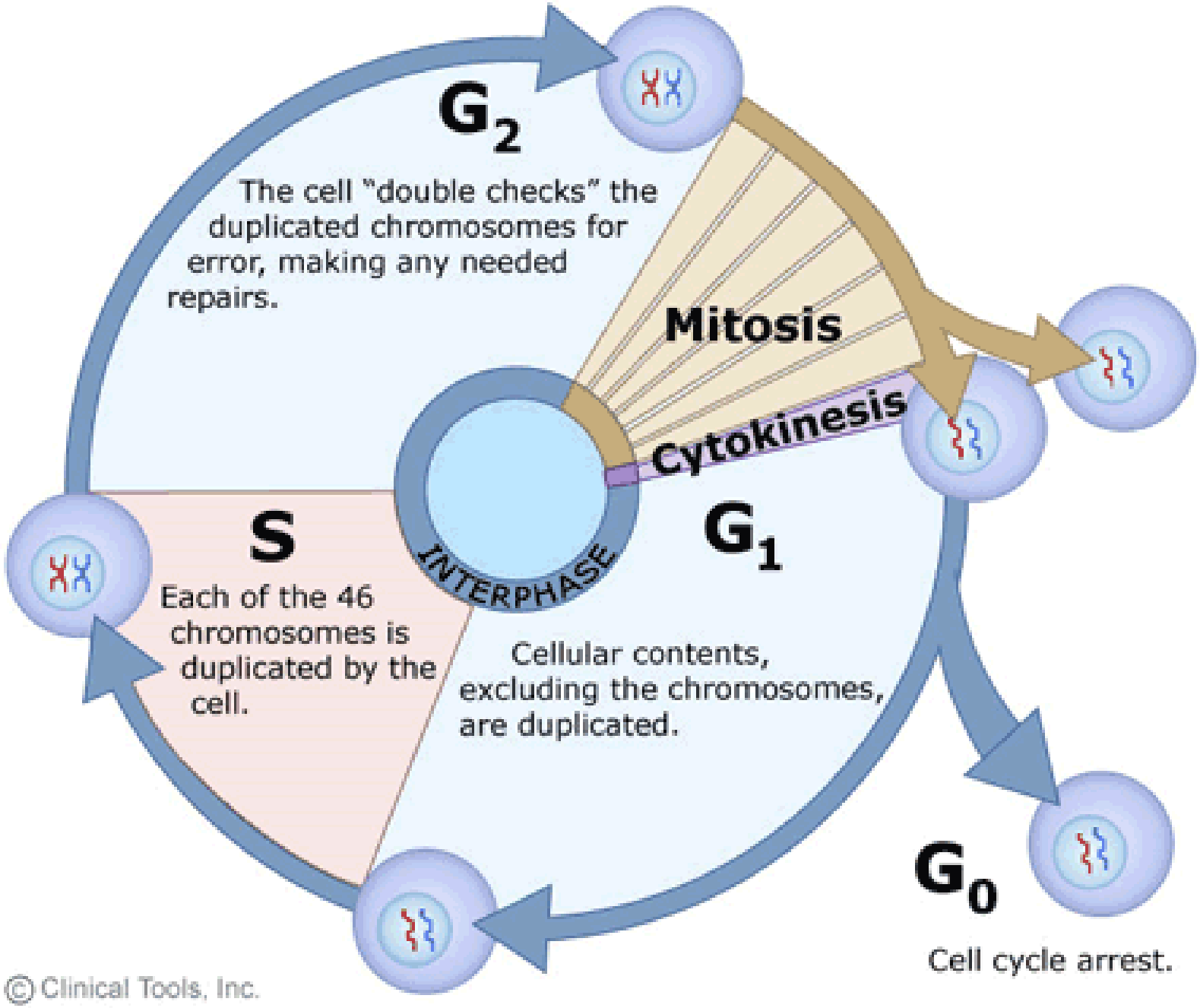

Zygote
Day-2 embryo
Day-3 embryo
Morula
Blastocyst

Why do cells divide?

So that organisms can grow

In order to create specialized cells

To replaced dead or damaged cells



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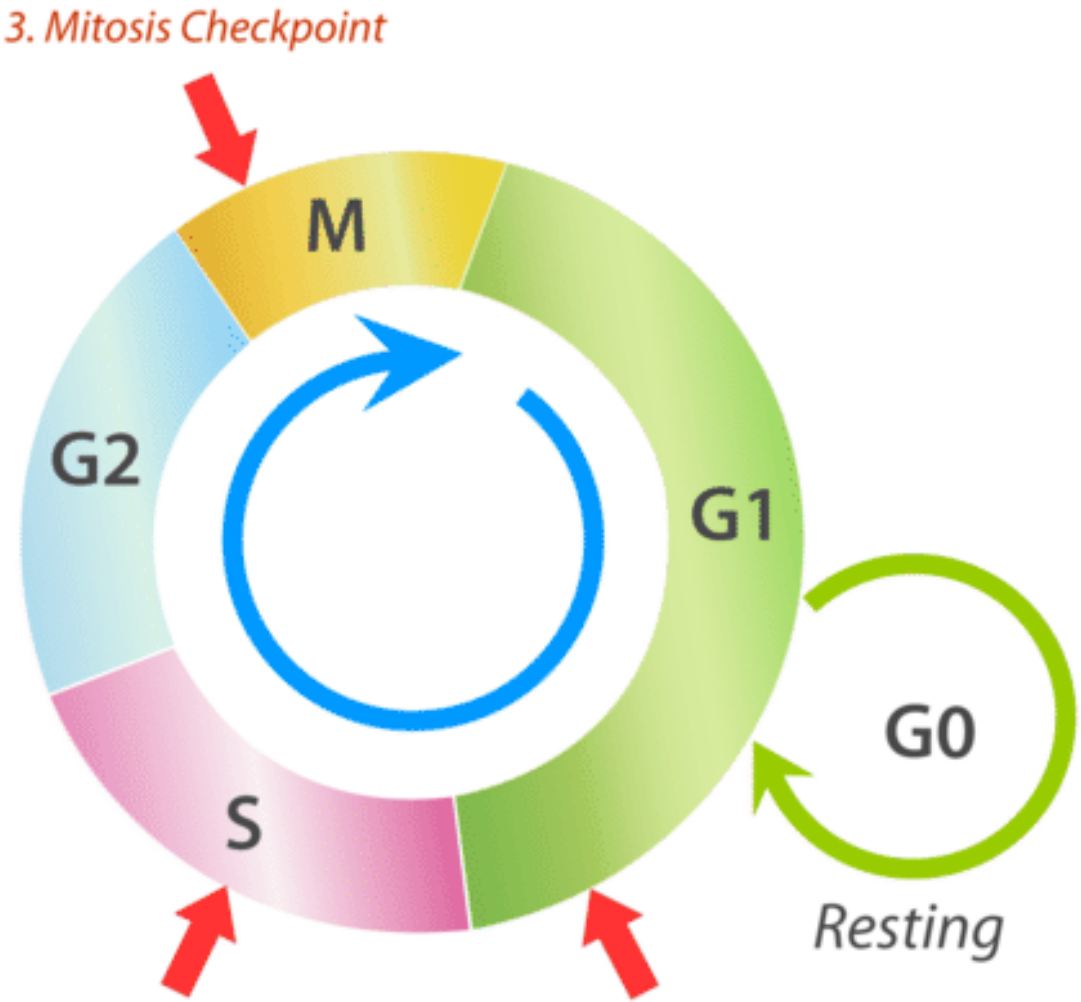
The Cell Cycle and the Checkpoints



1. Cell Growth Checkpoint

- Occurs toward the end of growth phase 1 (G1).
- Checks whether the cell is big enough and has made the proper proteins for the synthesis phase.
- If not, the cell goes through a resting period (G0) until it is ready to divide.

2. DNA Synthesis Checkpoint

- Occurs during the synthesis phase (S).
- Checks whether DNA has been replicated correctly.
- If so, the cell continues on to mitosis (M).

3. Mitosis Checkpoint

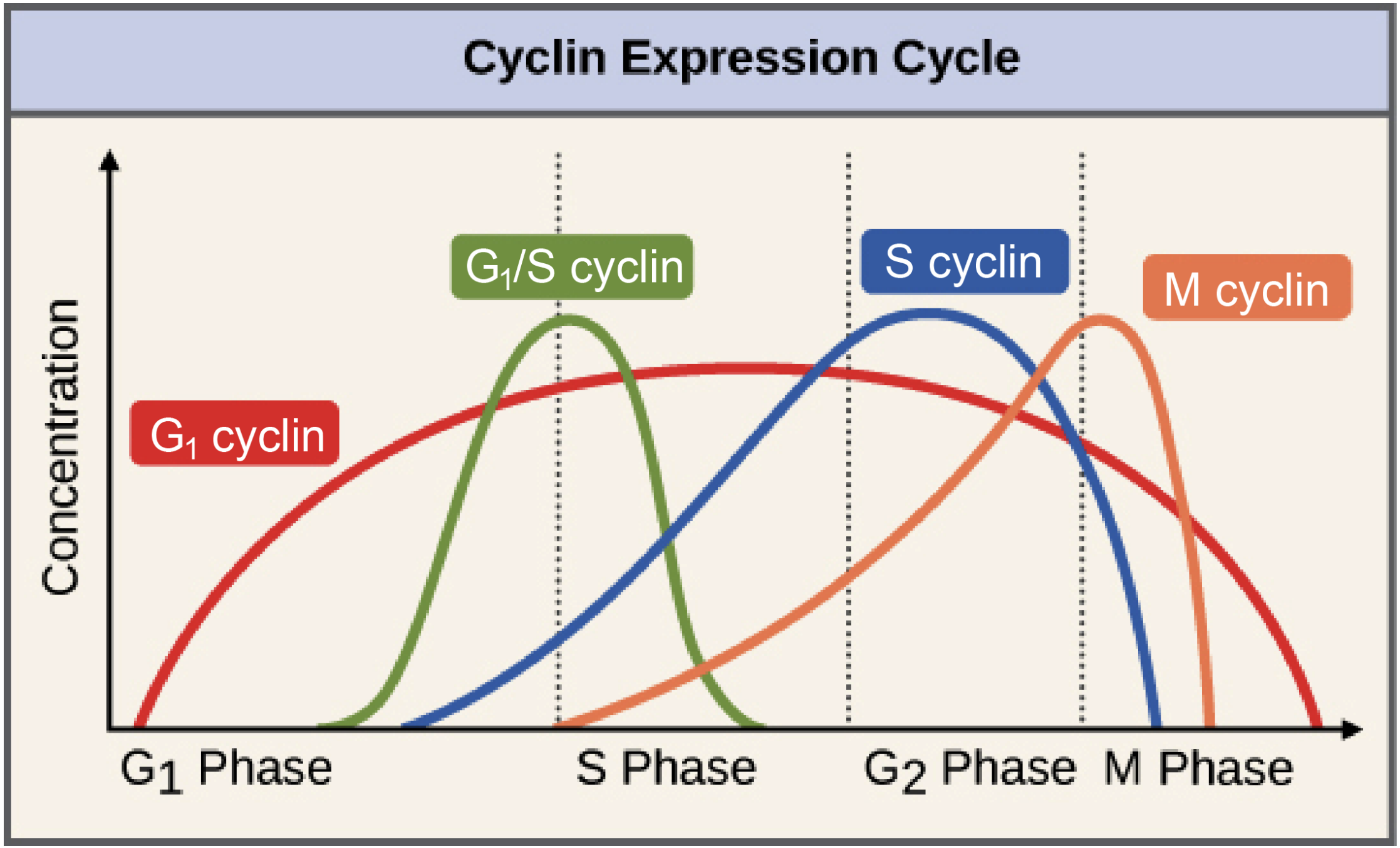
- Occurs during the mitosis phase (M).
- Checks whether mitosis is complete.
- If so, the cell divides, and the cycle repeats.

Cyclins

Cell cycle regulatory proteins

Each cyclin is associated with a particular phase or transition in the cell cycle

Help drive the events of that phase or transition


Cyclin Expression Cycle
Concentration
G1 cyclin
G1/S cyclin
S cyclin
M cyclin
G1 Phase
S Phase
G2 Phase
M Phase

Cyclin-dependent kinases (Cdks)

In order to drive the cell cycle forward, a cyclin must activate or inactivate many target proteins inside of the cell

Cyclins partner with enzymes called the cyclin-dependent kinases

A lone Cdk is inactive, but the binding of a cyclin activates it, making it a functional enzyme and allowing it to modify target proteins