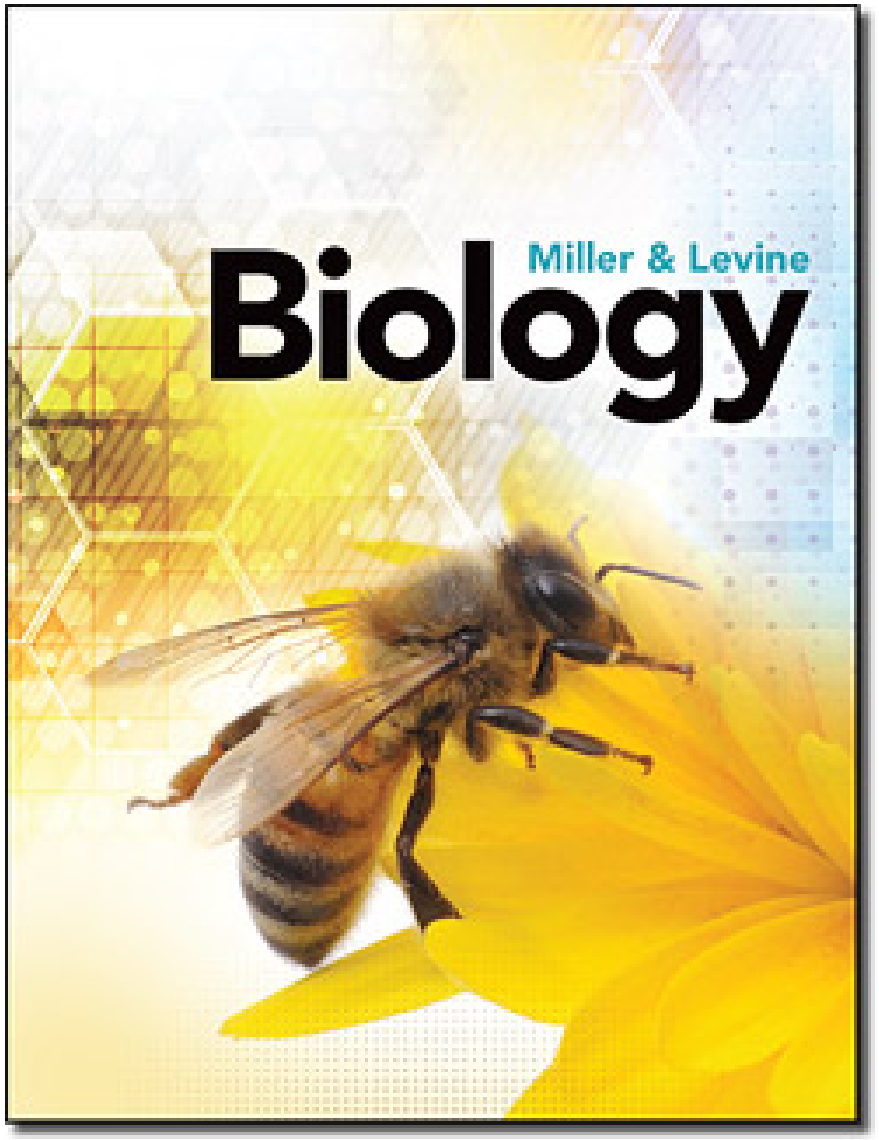


Lesson Overview

11.2 The Process of Cell Division

Chromosomes

genetic information passed from parent to offspring is carried by **chromosomes.**

Chromosomes enable precise DNA separation during cell division.

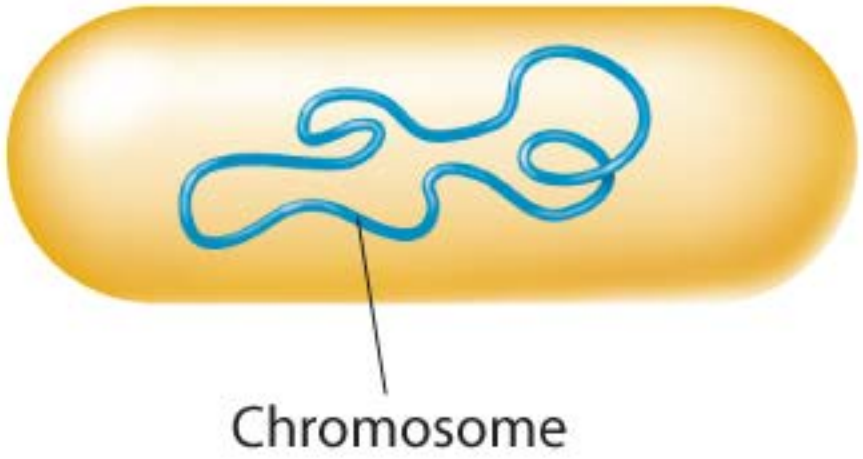
Every cell must copy its genetic information before cell division begins.

Each daughter cell gets its own copy of that genetic information.

Cells of every organism have a specific number of chromosomes.

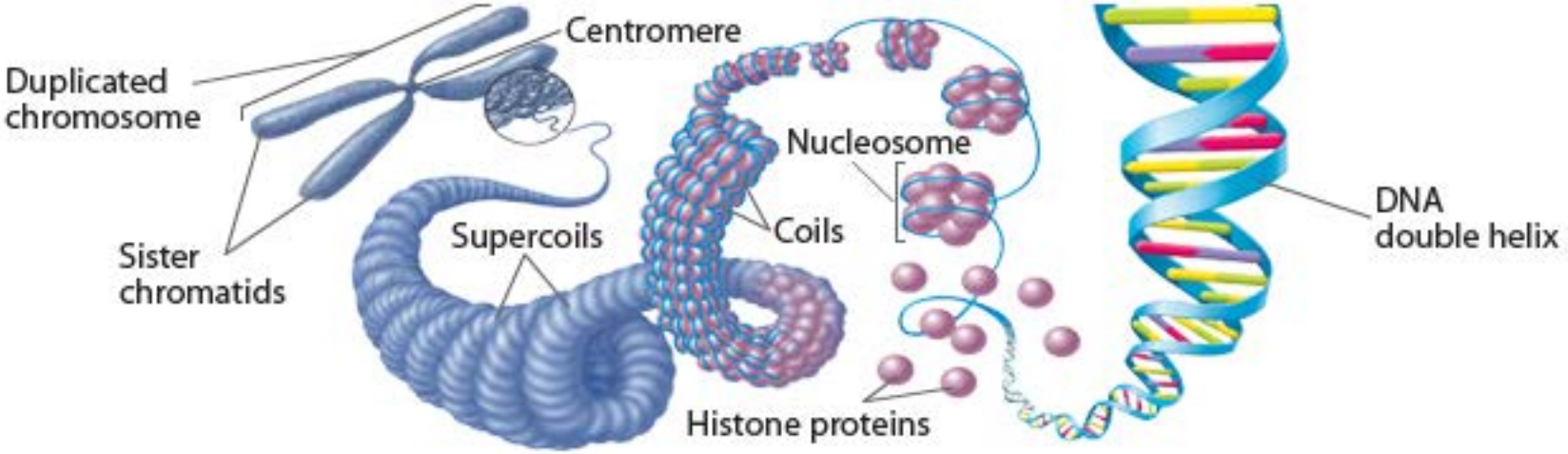
Prokaryotic Chromosomes

prokaryotes contain a single, circular DNA molecule, or **chromosome**

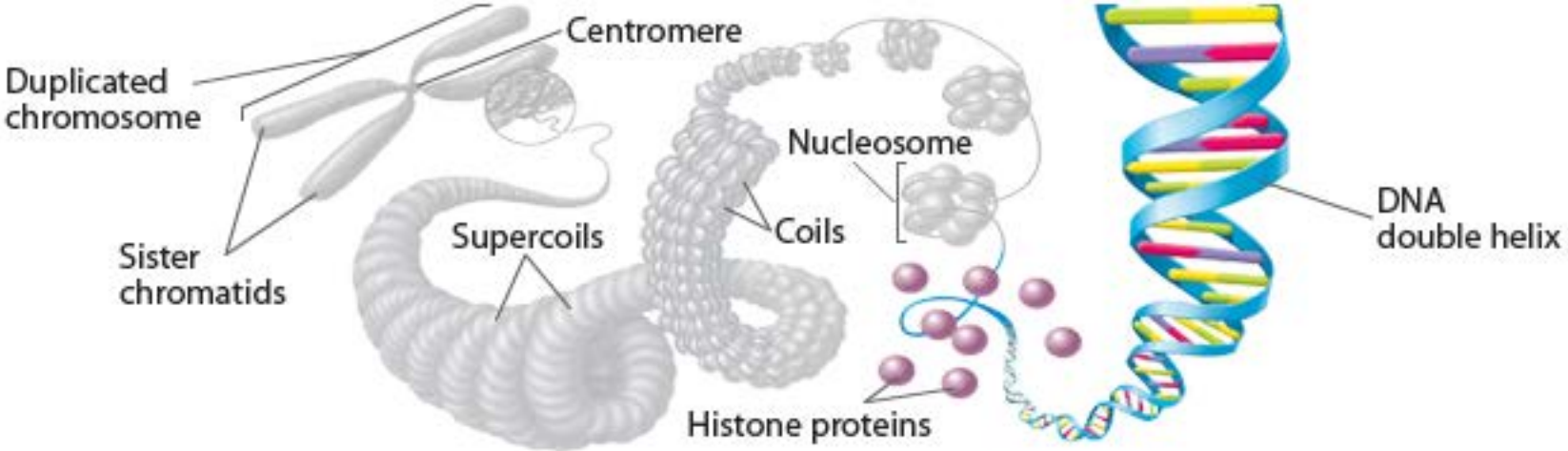


Eukaryotic Chromosomes

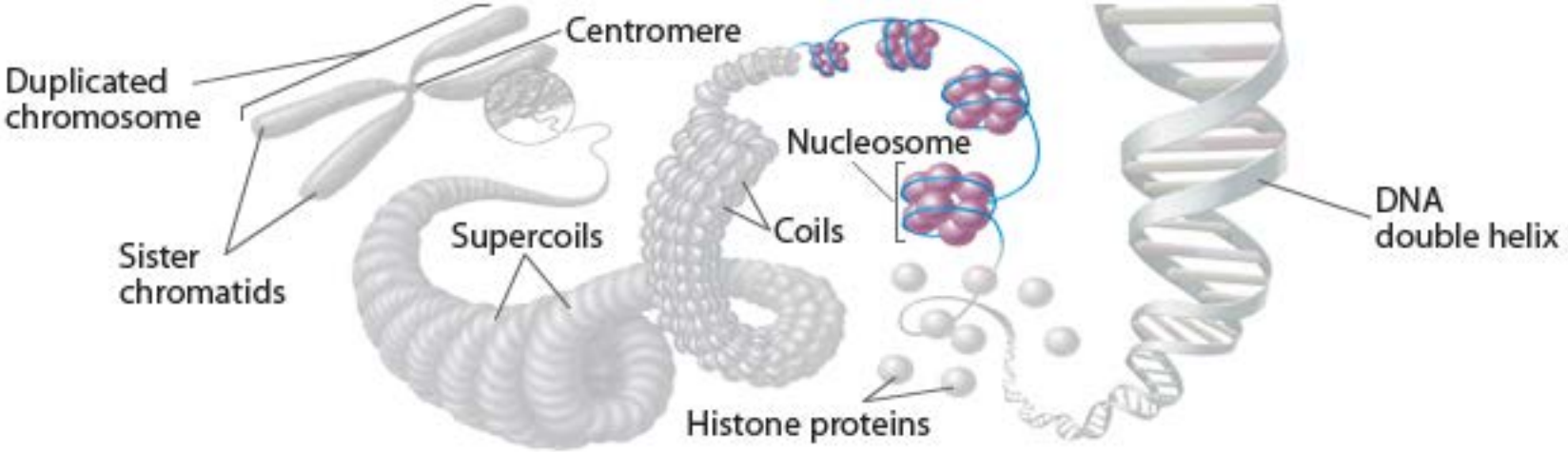
eukaryotic chromosomes are in the nucleus, and are made of **chromatin.**



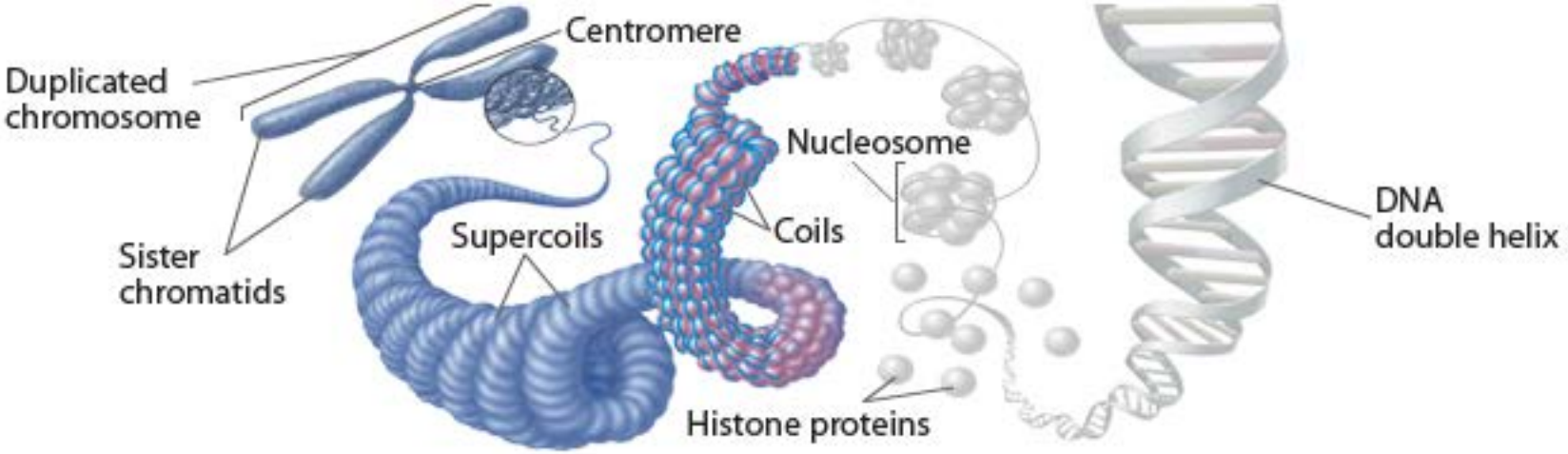
Chromatin is composed of DNA and histone proteins.



DNA coils around histone proteins to form nucleosomes.



nucleosomes form coils and supercoils that make chromosomes.



The Cell Cycle

During the cell cycle, a cell grows, prepares for division, and divides to form two daughter cells.

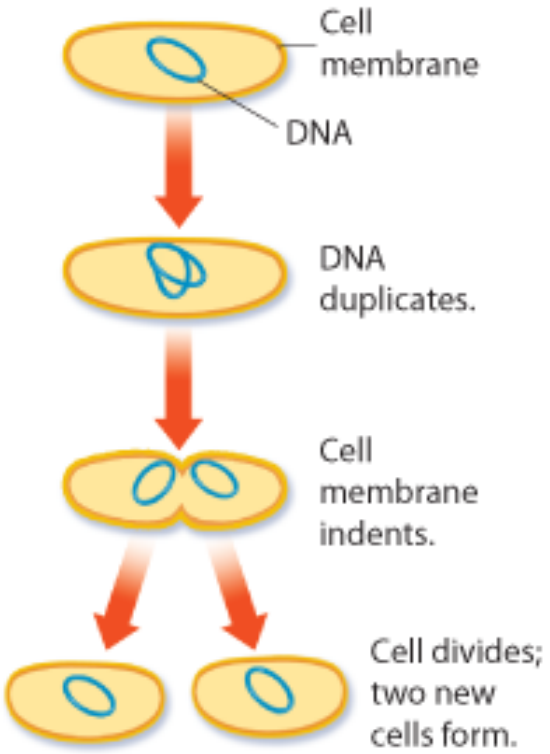
Occurs in prokaryotes and eukaryotes

The Prokaryotic Cell Cycle

At the end of their cell cycle, prokaryotes divide by binary fission.

Binary fission - form of asexual reproduction which produces 2 genetically identical cells

For example, bacteria reproduce by binary fission.



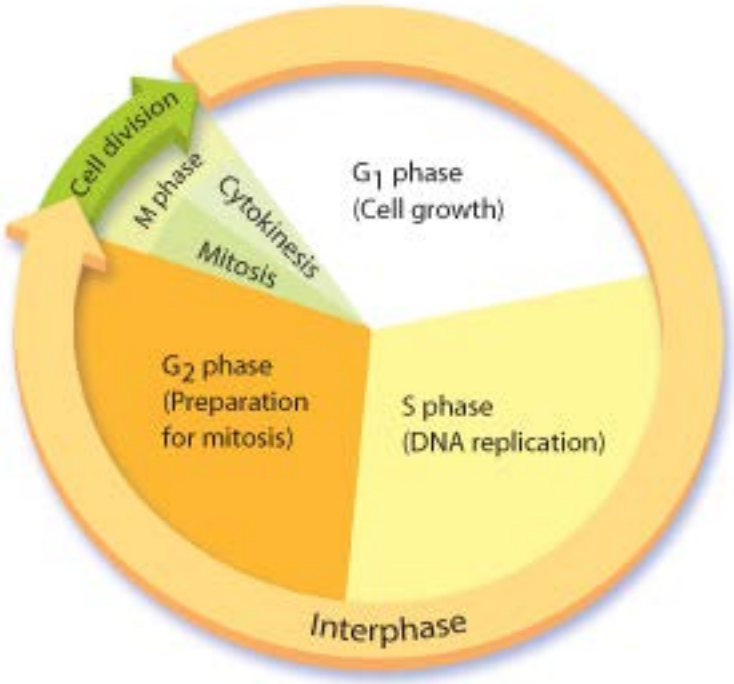
The Eukaryotic Cell Cycle

The eukaryotic cell cycle consists of four phases: G1, S, G2, and M.

Interphase - time between cell divisions.

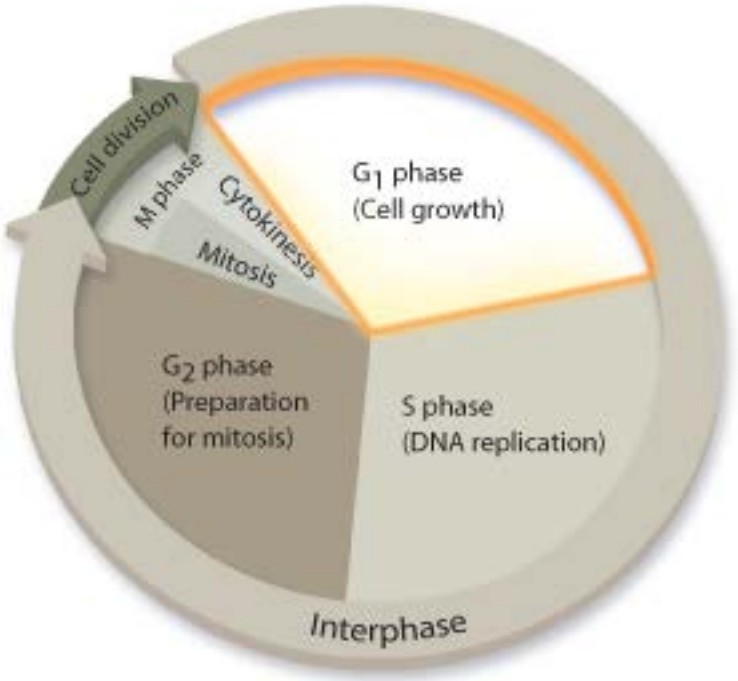
- period of growth
- consists of the G1, S, and G2 phases.

M phase - period of cell division.



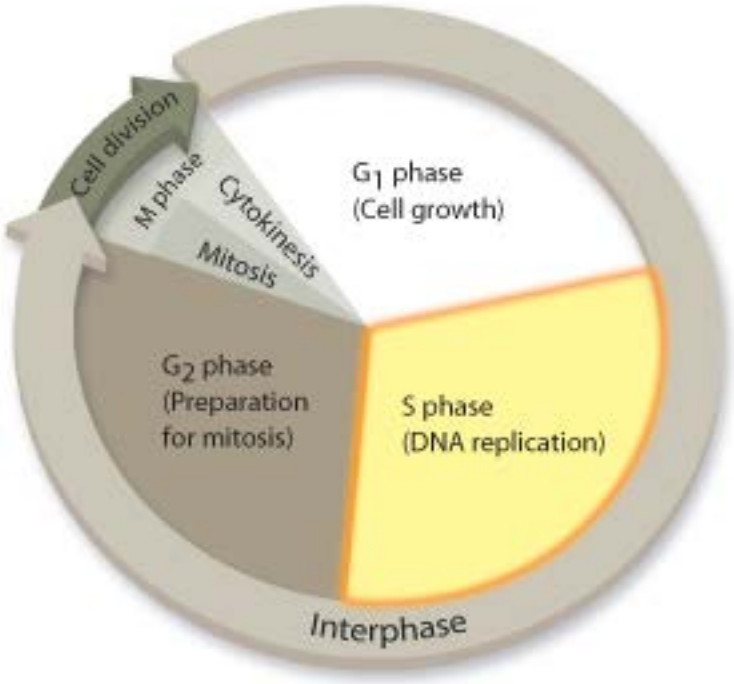
G_1 Phase: Cell Growth

cells increase in size and make new proteins and organelles.



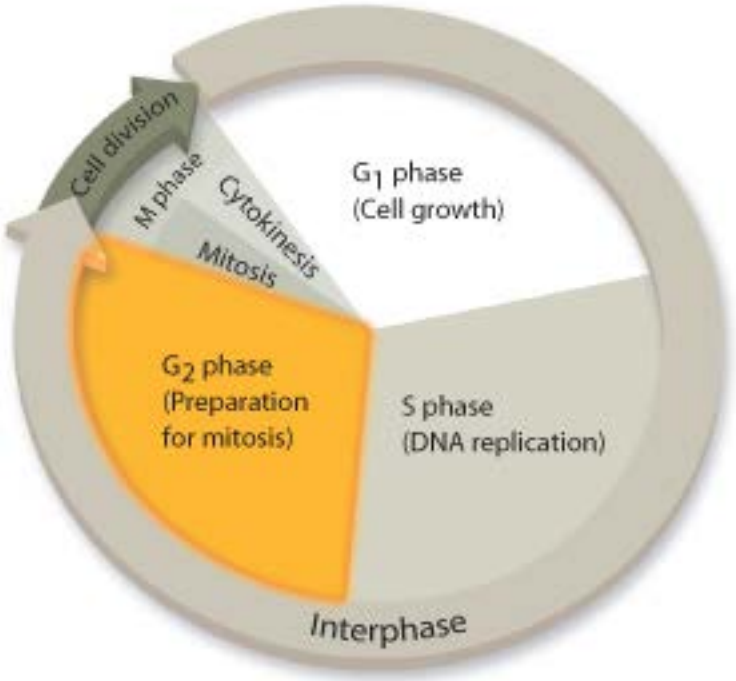
S Phase: DNA Replication

DNA is made when the chromosomes are replicated.



G_2 Phase: Preparing for Cell Division

organelles and molecules required for cell division are made

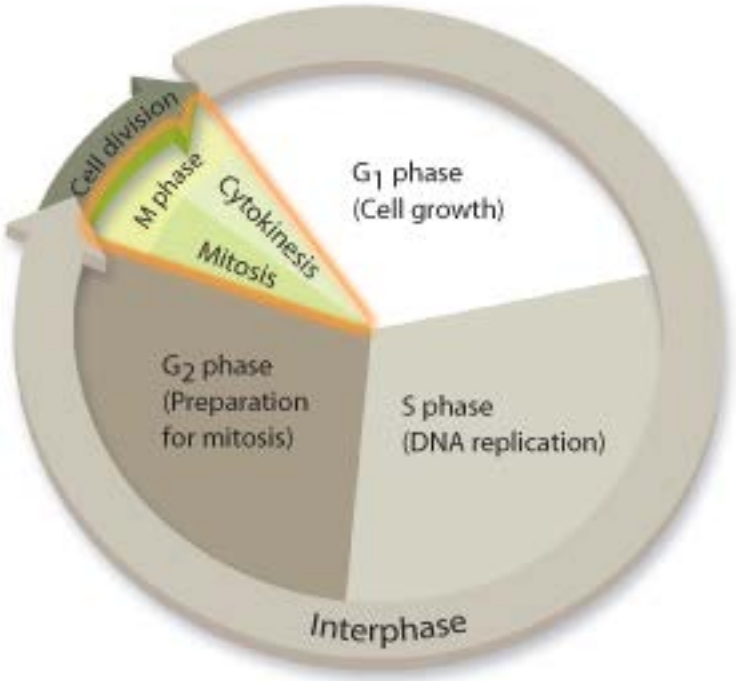


M Phase: Cell Division

In eukaryotes, cell division occurs in two stages: mitosis and cytokinesis.

Mitosis - division of the cell nucleus.

Cytokinesis - division of the cytoplasm.



Important Cell Structures Involved in Mitosis

Chromatid – each strand of a **duplicated** chromosome

Centromere – the area where each pair of chromatids is joined

Centrioles – tiny structures located in the cytoplasm of animal cells that help organize the spindle

Spindle – a fanlike microtubule structure that helps separate the chromatids

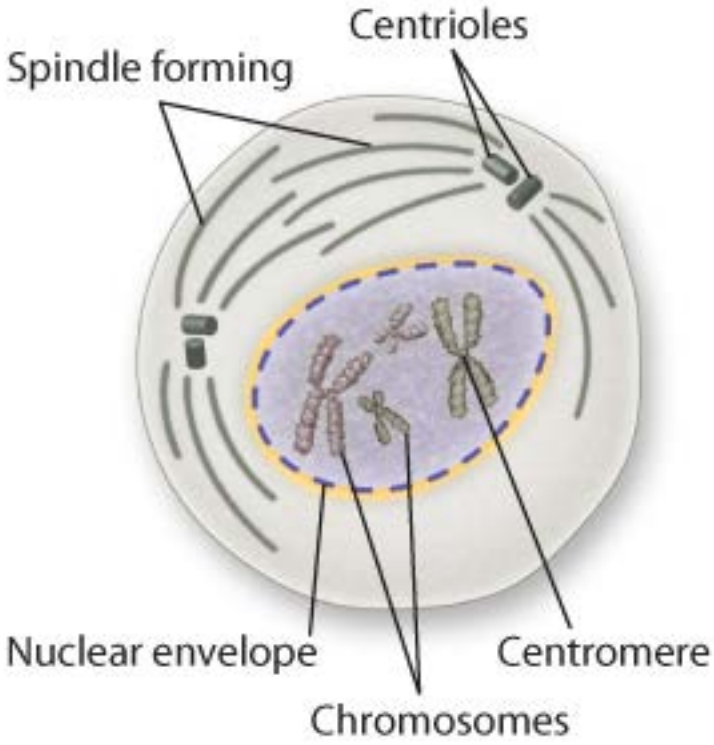
Prophase

duplicated chromosome condenses and becomes visible.

centrioles move to opposite sides of nucleus and help organize the spindle.

spindle forms and DNA strands attach at their **centromere**.

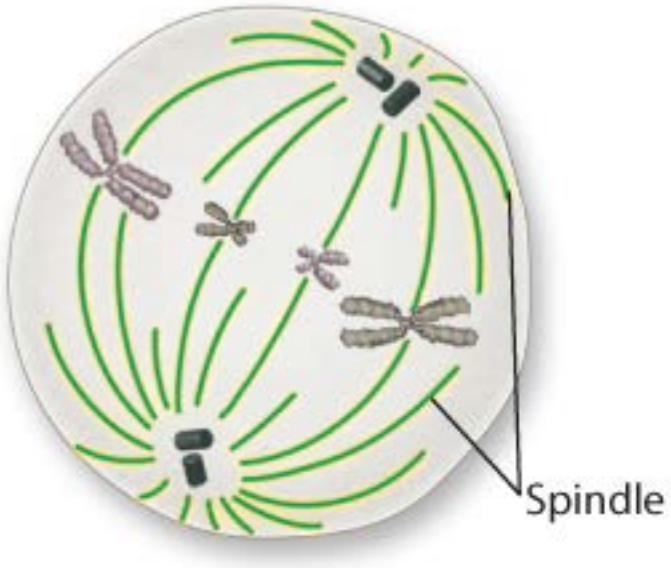
nucleolus disappears and nuclear envelope breaks down.



Metaphase

centromeres of duplicated chromosomes line up in center of cell.

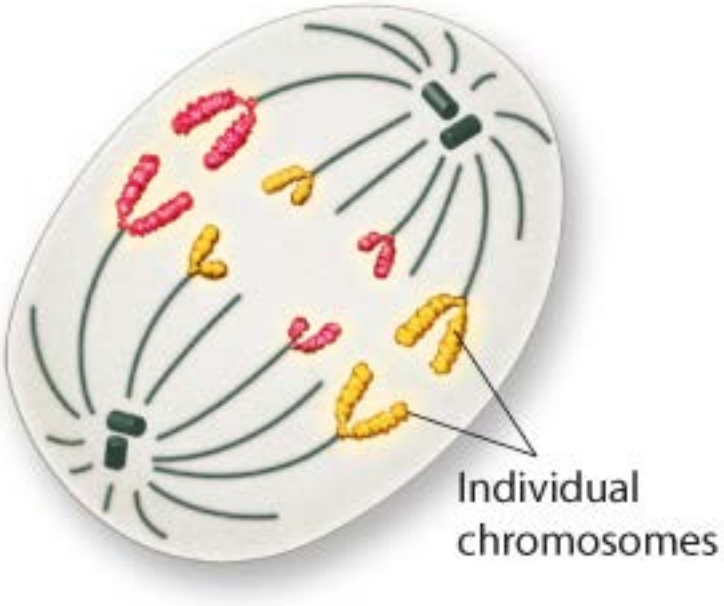
spindle fibers connect the centromere of each chromosome to the poles of the spindle.



Anaphase

centromeres pull apart and chromatids separate to become individual chromosomes.

chromosomes separate into two groups near the poles of the spindle.



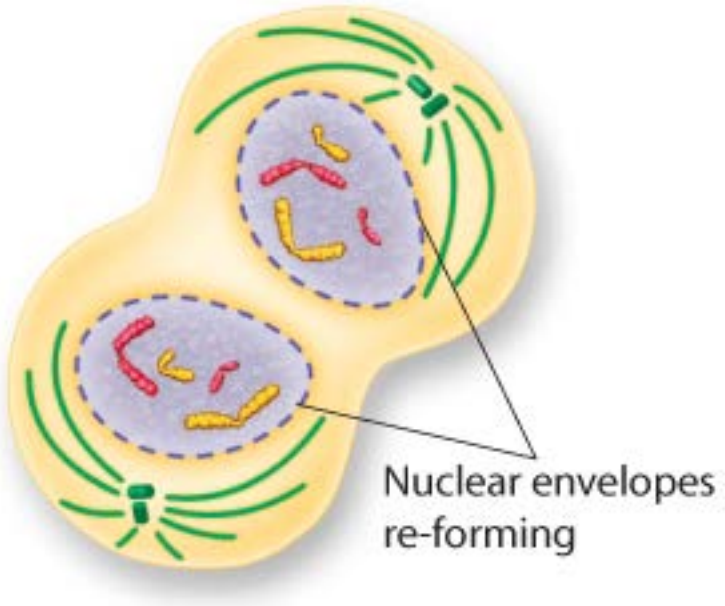
Telophase

chromosomes form into chromatin.

nuclear envelopes re-form.

spindle breaks apart

nucleolus appears in each daughter nucleus.



Cytokinesis

- division of the cytoplasm.

In animal cells, the cell membrane pinches in and cytoplasm divides into two equal parts.

In plant cells, a cell plate forms and develops into cell membranes.

A cell wall then forms in between the two new membranes.