

Mitosis:the basis of asexual reproduction

The Cell Cycle

Cell Replacement and Development

As you continue to grow, your cells have continued to divide.

Soon, your growth will slow down but your body will continue to replace cells that take a lot of wear and tear

Bone growth requires new cells to be made

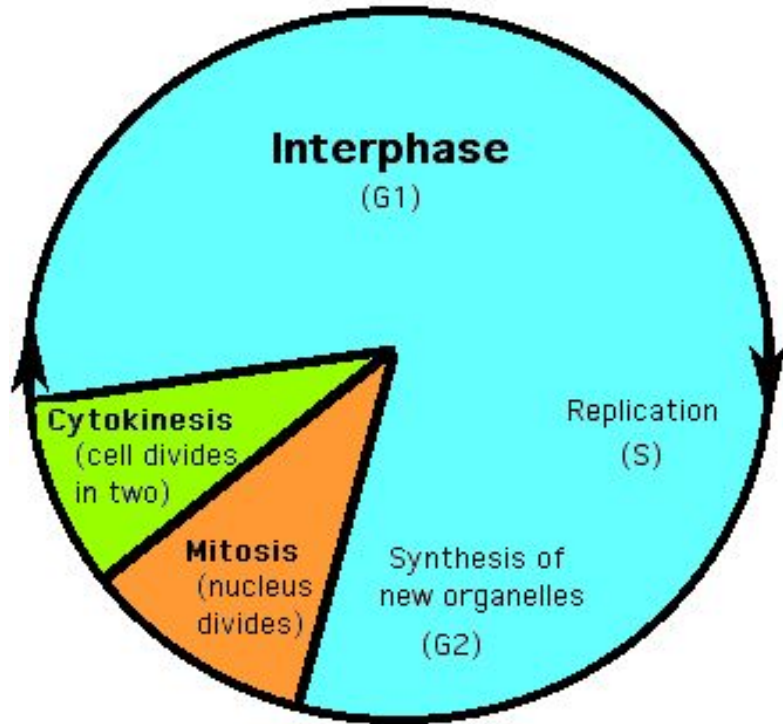
Skin cells shed or cells get damaged (cuts/burns); cells need to be replaced

Division of cells in the human body divide at different rates

skin cells every 20 days liver cells every 200 days brain cells every 30-50 yrs

red blood cells every 120 days stomach lining every 2 days

Cell Cycle: Three Stages

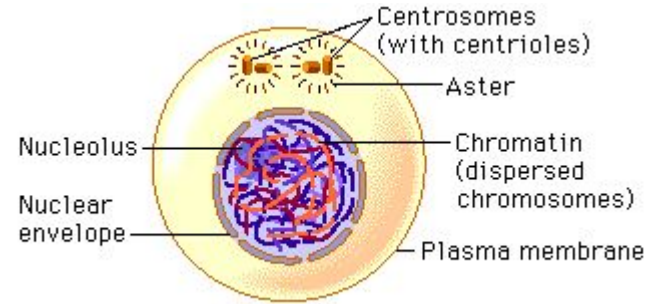


1. **Interphase** where cells carry out the functions necessary for survival and cells that divide prepare for reproduction
2. **Mitosis** divides the duplicated contents of the cell's nucleus into two equal parts
3. **Cytokinesis** separates the two nuclei and cell contents into two daughter cells

Stage 1 Interphase: longest stage in the cell cycle

Growth and Preparation

- cell increases in size and makes proteins and molecules necessary to function
- once it reaches max size, must divide to survive



Replication

- nucleus makes a copy of its DNA in a process called replication
- temporarily there are 2 sets of DNA in the nucleus

Continued Growth and Preparation

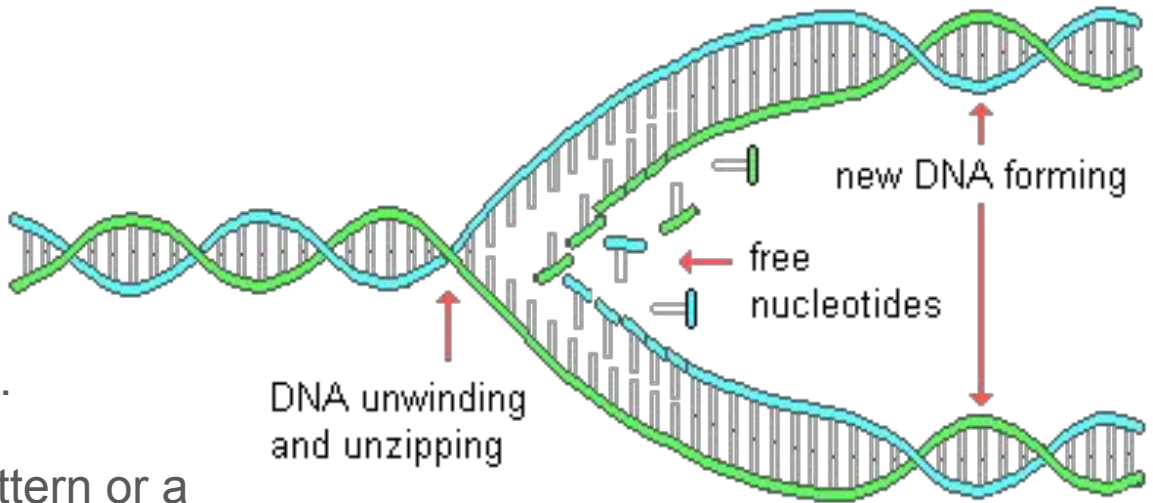
- cell continues to grow and is making proteins for the new cell
- organelles such as mitochondria and chloroplasts will be duplicated

Replication

DNA unwinds and the steps
of the DNA ladder break apart.

Each side then becomes a pattern or a
template on which a new side forms.

Replicating ensures that newly formed DNA has the identical copy of the genetic
information contained in the original molecule



NORMAL HUMAN KARYOTYPE



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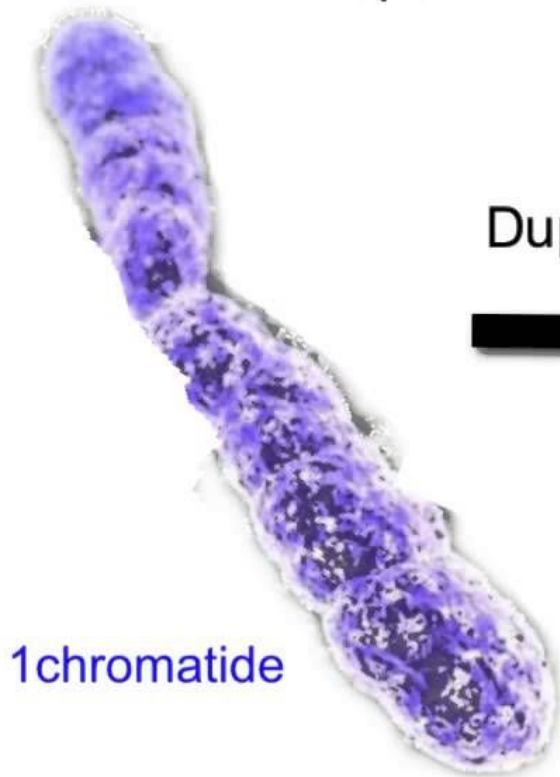
or



Autosomes

X X (female)
X Y (male)
Sex Chromosomes

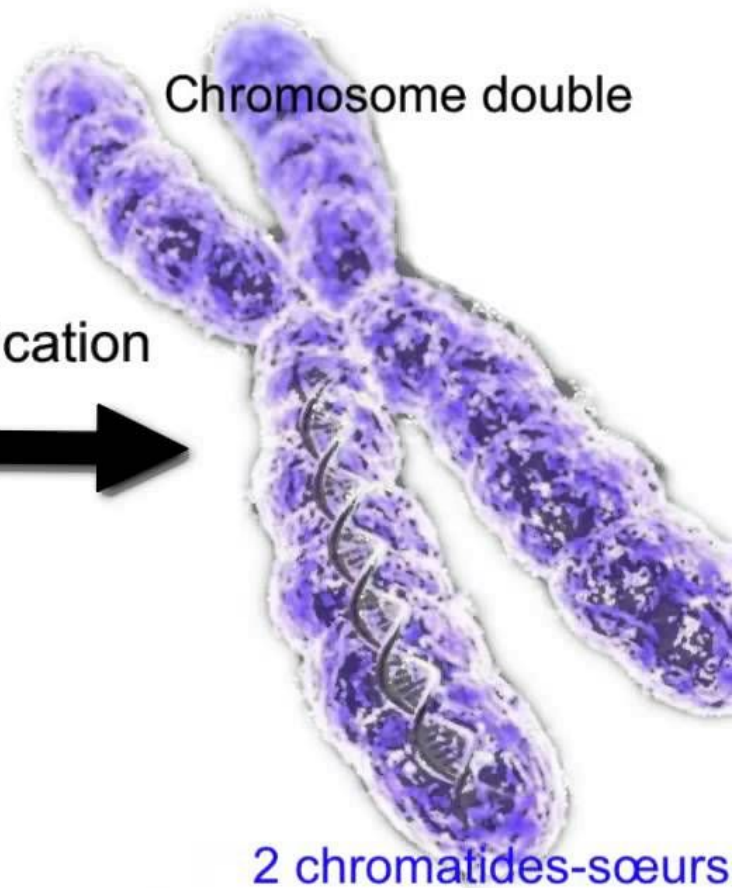
Chromosome simple



Duplication



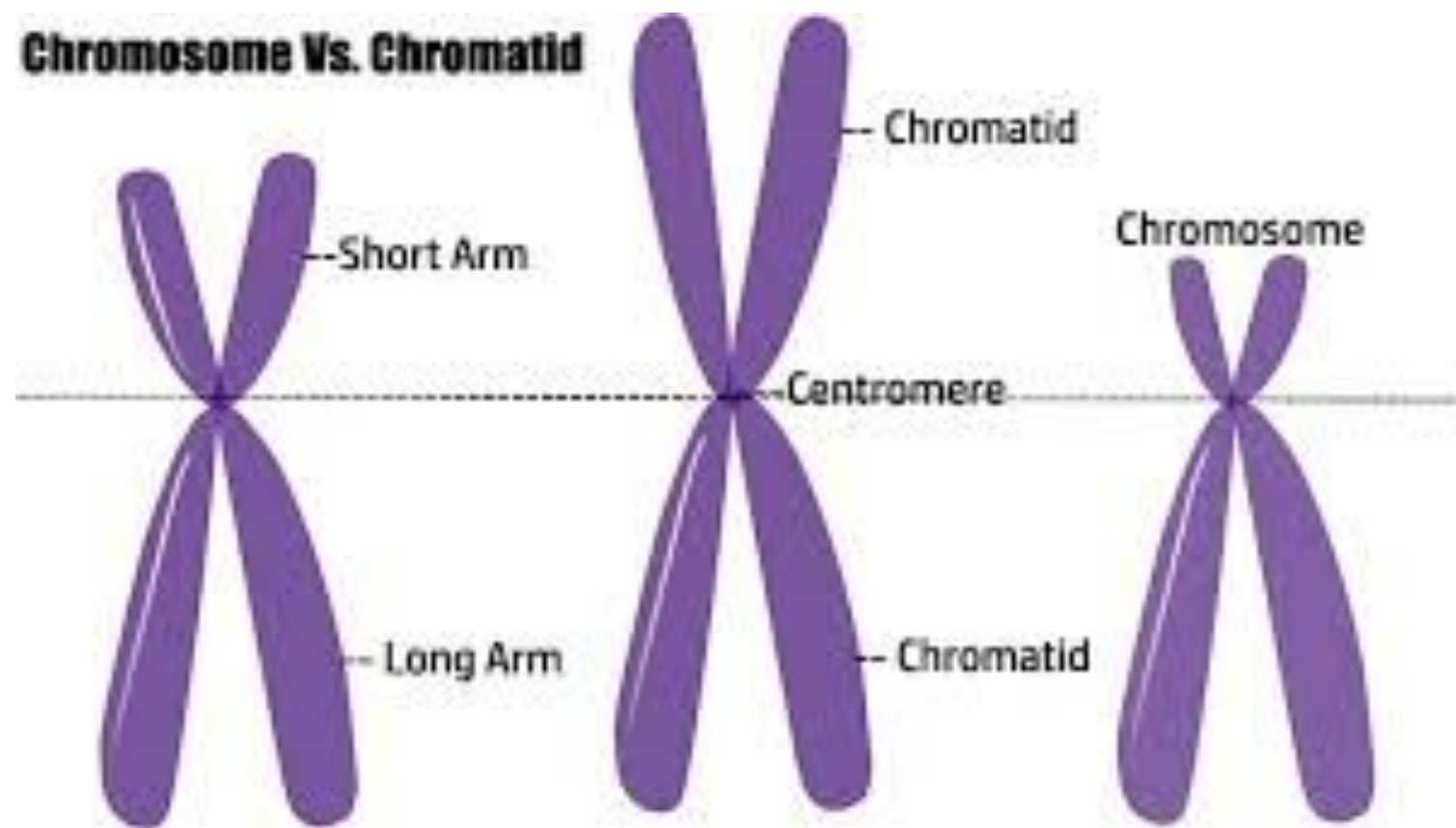
Chromosome double





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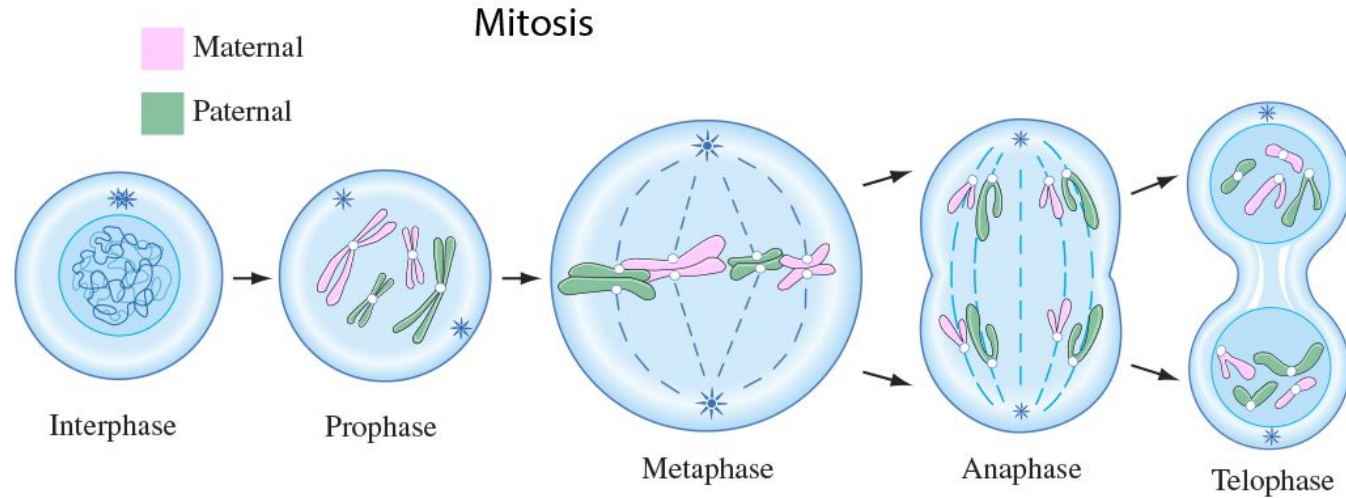
Chromosome Vs. Chromatid



Stage 2 Mitosis: usually shortest stage

There are four phases of mitosis

1. Prophase
2. Metaphase
3. Anaphase
4. Telophase



1st Phase: Prophase

Early Prophase

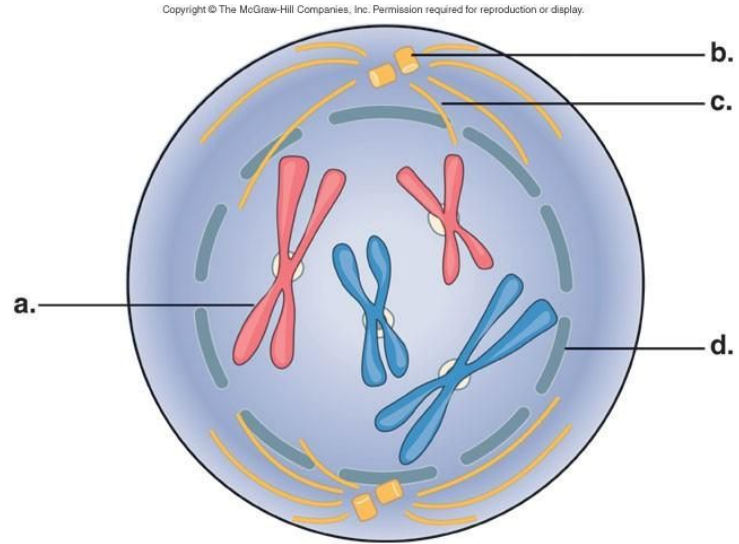
Duplicated chromosomes form into an X shape

Spindle fibres (tiny tube-like structures made of protein) begin to form in plant and animal cells

Centrioles (organelles that organize spindle fibres) move to opposite ends of cell

Spindle fibres stretch across the cell from centrioles

a- chromosome b- centriole c- spindle fibres



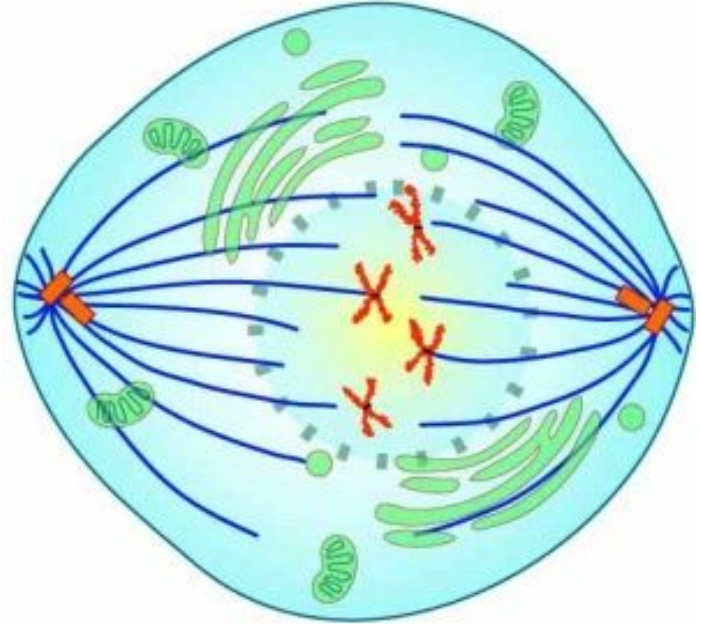
1st Phase: Prophases

Late Prophase

Spindle fibres complete forming

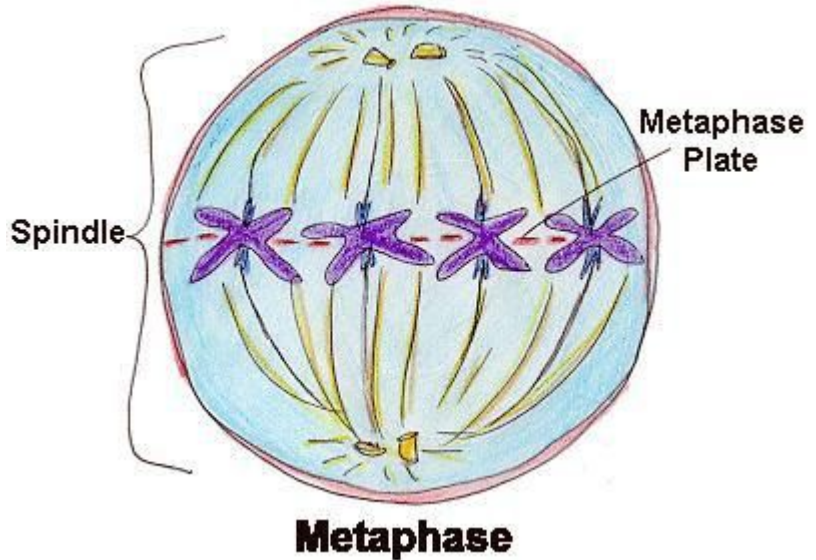
Chromosomes attach to the spindle fibres at centromeres

Nuclear membrane disappears



2nd Phase: Metaphase

A tugging action from the spindle fibres pulls the X shaped chromosomes into a single line across the middle (equator) of the cell

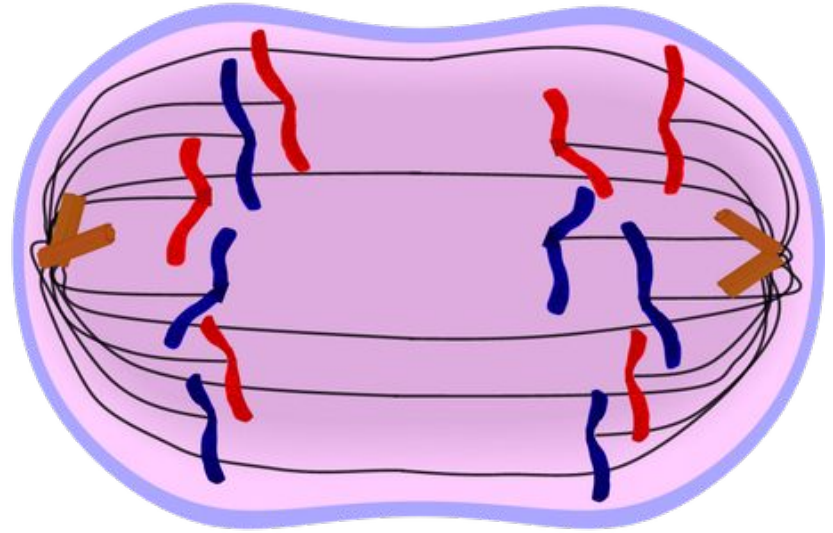


3rd Phase: Anaphase

Spindle fibres begin to contract and shorten causing centromeres to pull apart.

Duplicated chromosomes move apart to opposite ends of the cell.

Once separated, each sister chromatid is considered to be a chromosome



4th Phase: Telophase

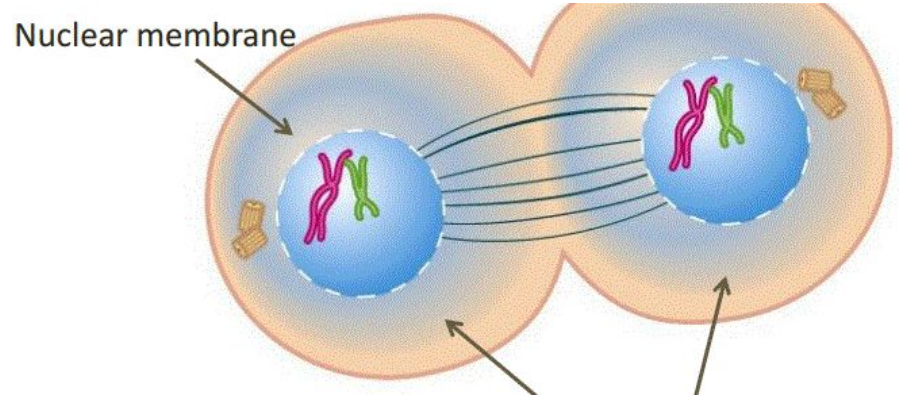
Each set of chromosomes is now at each pole of the cell

Spindle fibres begin to disappear

Nuclear membrane forms around each set of chromosomes

Nucleolus appears within nucleus

There are two nuclei in one cell and the cell is ready to divide



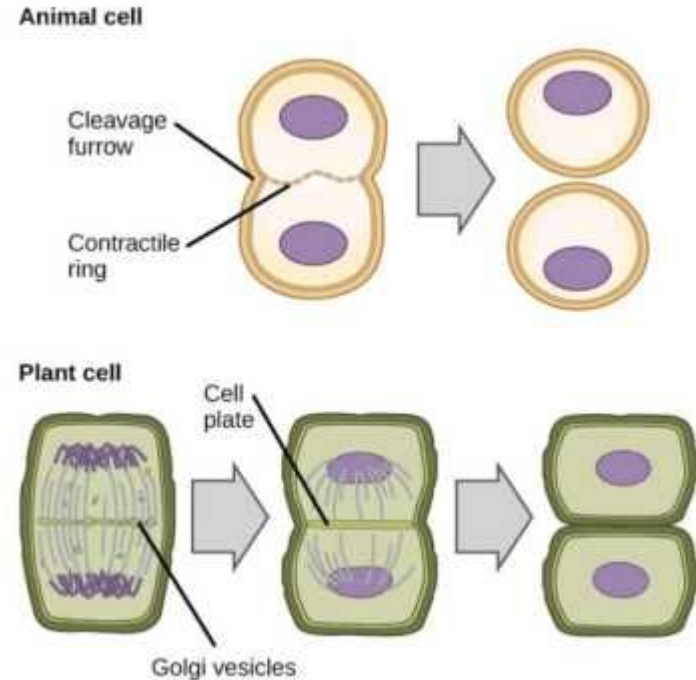
Stage 3 Cytokinesis: the final stage

Two nuclei separate into two daughter cells.

The new cells are identical to the original parent cell

Animal cells: cell membrane pinches off dividing cell's cytoplasm and organelles

Plant cell: cell plate forms along the center of the cell wall dividing the cell



Check Points in the Cell Cycle

Activities within the cell during cell cycle are monitored and controlled at specific stages “CHECK POINTS”

“Check Point” proteins send messages to the nucleus.

The nucleus then instructs the cell whether or not to divide BEFORE next stage of cell cycle can begin.

They ensure:

1. Cell has enough nutrients to support cell growth and division
2. DNA has been replicated
3. Replicated DNA is not damaged

Cell Cycle: Three Stage Review

Stage 1: Interphase

Stage 2: Mitosis

Phase 1: Early and Late Prophase

Phase 2: Metaphase

Phase 3: Anaphase

Phase 4: Telophase

Stage 3: Cytokinesis

Start all over again



Check Points



