Topic 2: Mitosis

By the end of this topic, you should be able to…

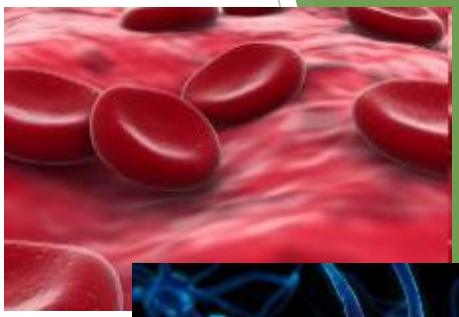
- *Explain why cells must divide*
- *Draw and label the stages of mitosis*
- *Compare and contrast cell division (cytokinesis) in plant and animal cells*
- *Compare and contrast prokaryotic and eukaryotic division*

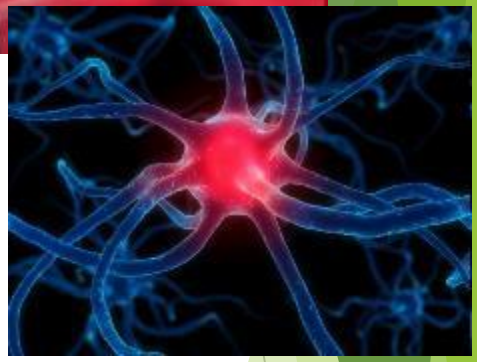
Purpose of Mitosis

- To create two **identical daughter cells** from one parent cell
- Cells begin **diploid** (2 sets of chromosomes) and end **diploid**

Vocab

- **Diploid Cells (2n)** = 2 sets of chromosomes…one from each parent (Example: human body cell) --- SOMATIC CELLS



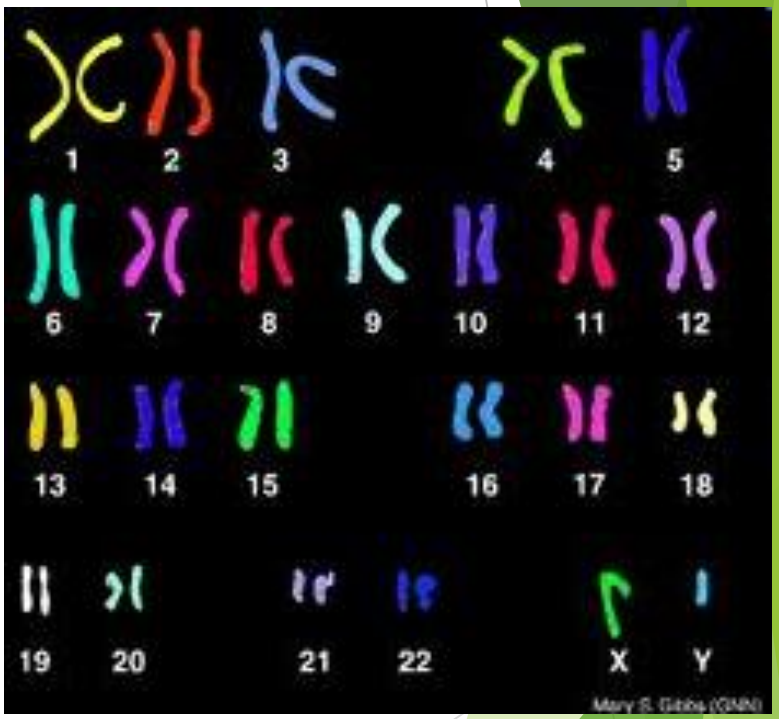


- **Haploid Cells (n)**= only have 1 set of chromosomes (Example: Sperm or Egg Cell) --- SEX CELLS

Types of Chromosomes

- **Sex chromosomes** = determine the **sex** of an organism; either X or Y

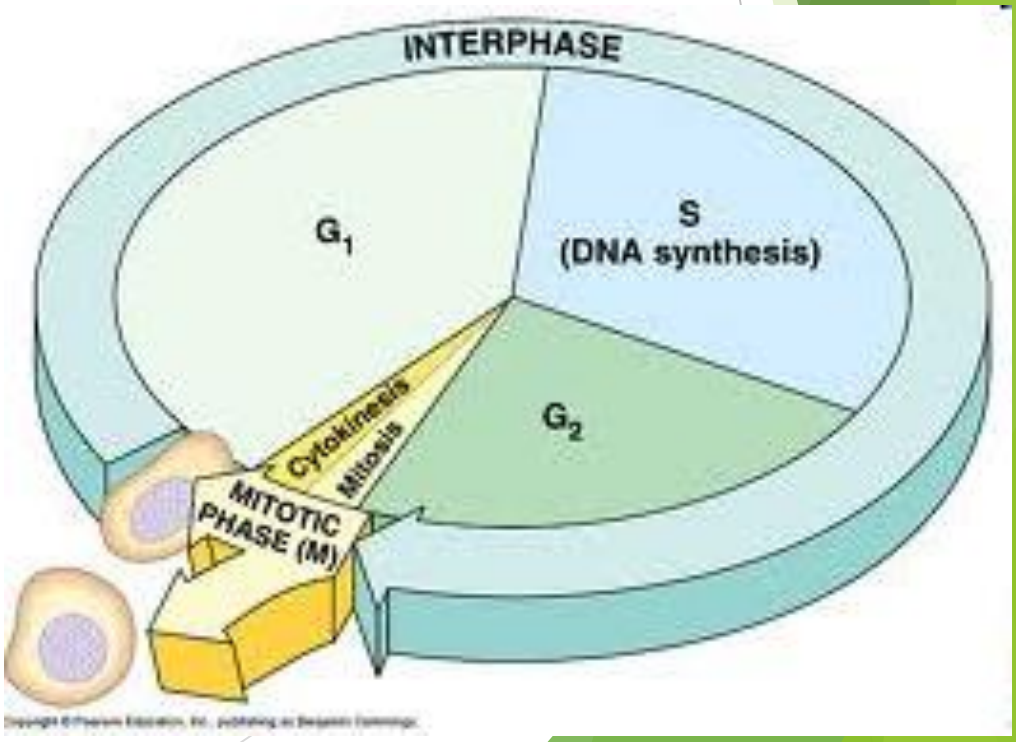
- **Autosomes** = all the other **chromosomes** in an organism



Cell Cycle

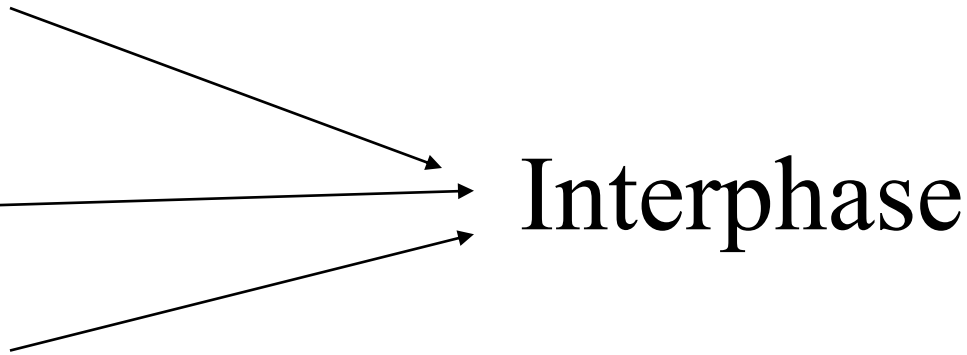
- The series of events that cells go through as the **grow** and **divide**
- During the cycle, a cell grows, prepares for division, and divides to form 2 **daughter cells**, each of which then begins the cycle again

- **2 Main Parts**
  1) Interphase
  2) Cell Division (mitosis + cyto-kinesis)



Stages of the Cell Cycle

- G1
- S
- G2
- Mitosis
- Cytokenesis



The Steps Prior to Cell Division

- the cell doubles in size (**G1 Phase**)
- chromosomes replicate (**S Phase**)
- the number of organelles doubles (**G2 Phase)**
  - most doubling is directed by the nucleus

What is DNA Replication?

- A chromosome is unzipped and thus starts as one strand of DNA
- Each daughter cell **needs its own copy** of the DNA strand.
- The DNA strand is duplicated and the two parts are “tied” together.

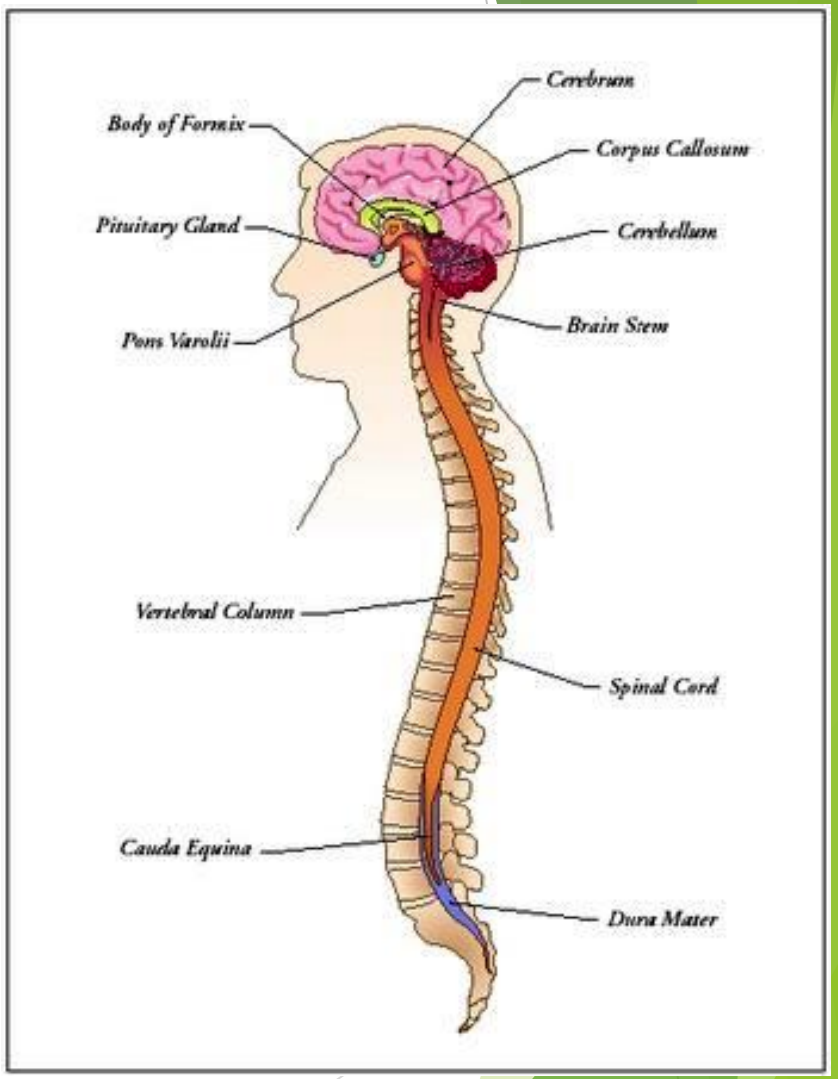
Important Details

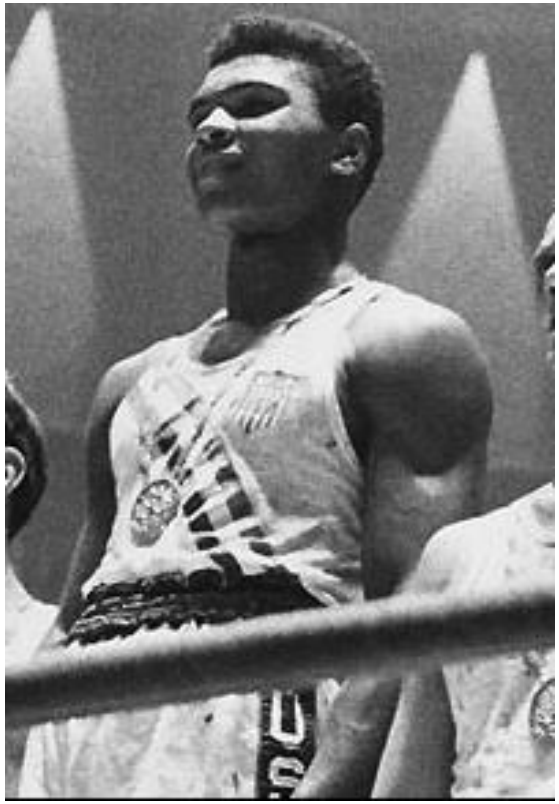
- DNA replication occurs during **S phase**, NOT mitosis
- Mitosis and **cytokinesis** overlap

Important Details

- Cells can also enter a G_0 phase in which they no longer divide
- Cells move to the next stage when enough "**trigger protein**" has built up

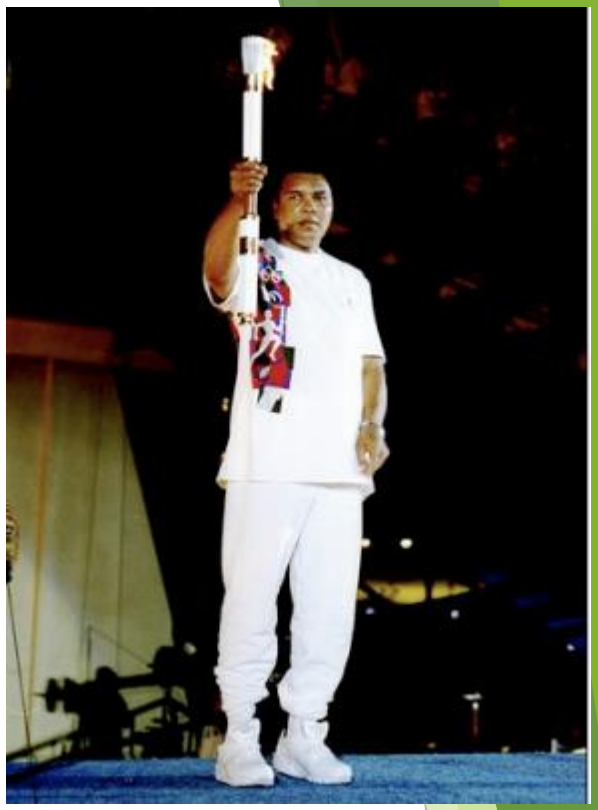
Cells of the *adult* central nervous system, (brain and spinal cord,) do NOT divide.





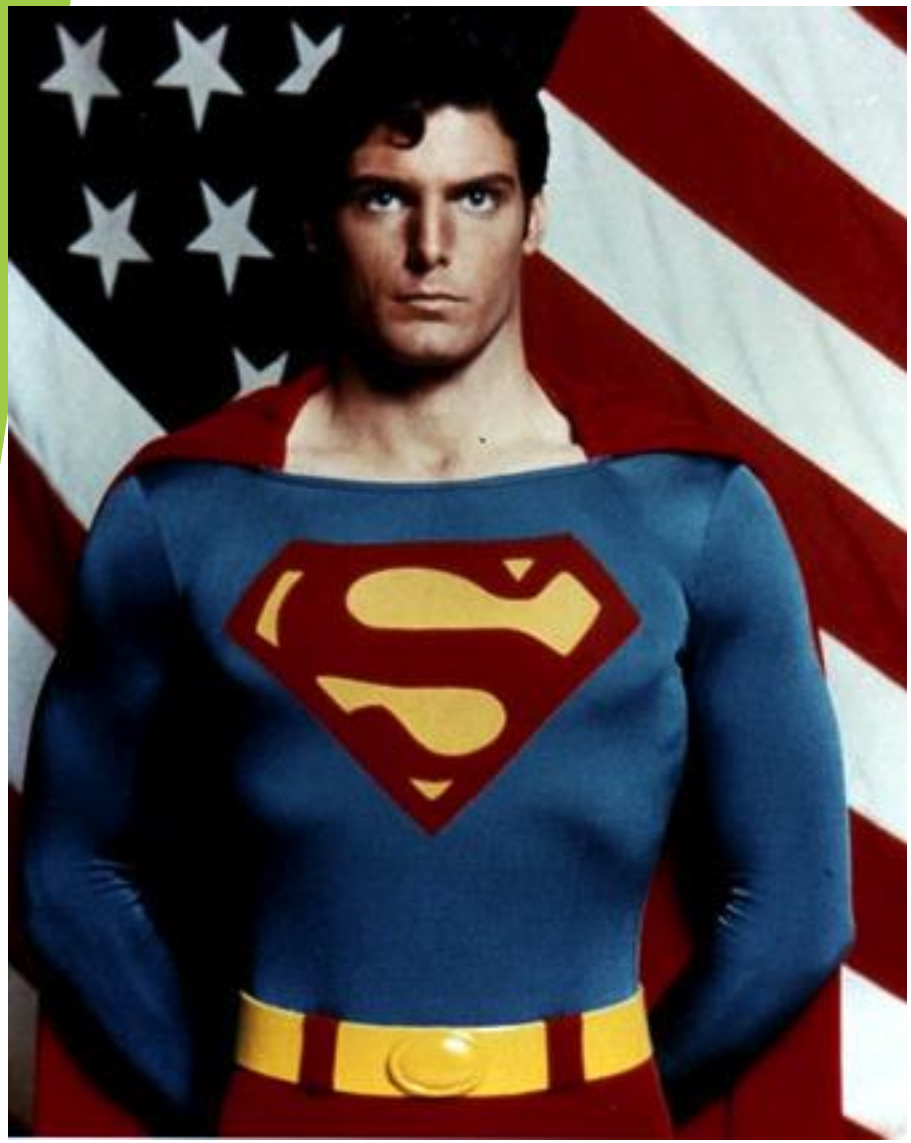
Cassius Clay

PARKINSON'S



Muhammad Ali

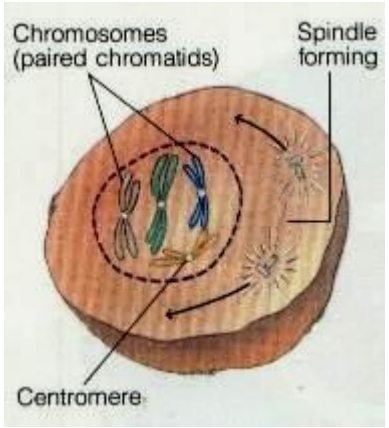
Progressive nervous system disorder- nerve cells break down and die



Christopher Reeve

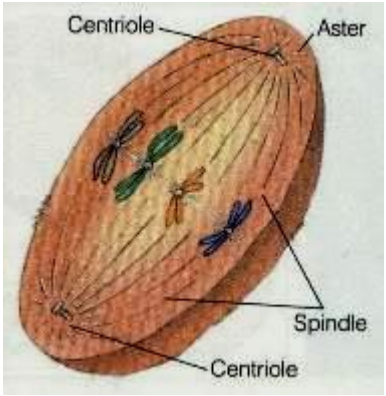
Horseback injury left him paralyzed

Mitosis is the process of dividing just the nucleus (not the whole cell.)



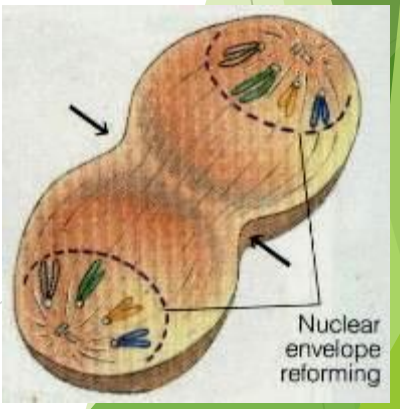
Prophase

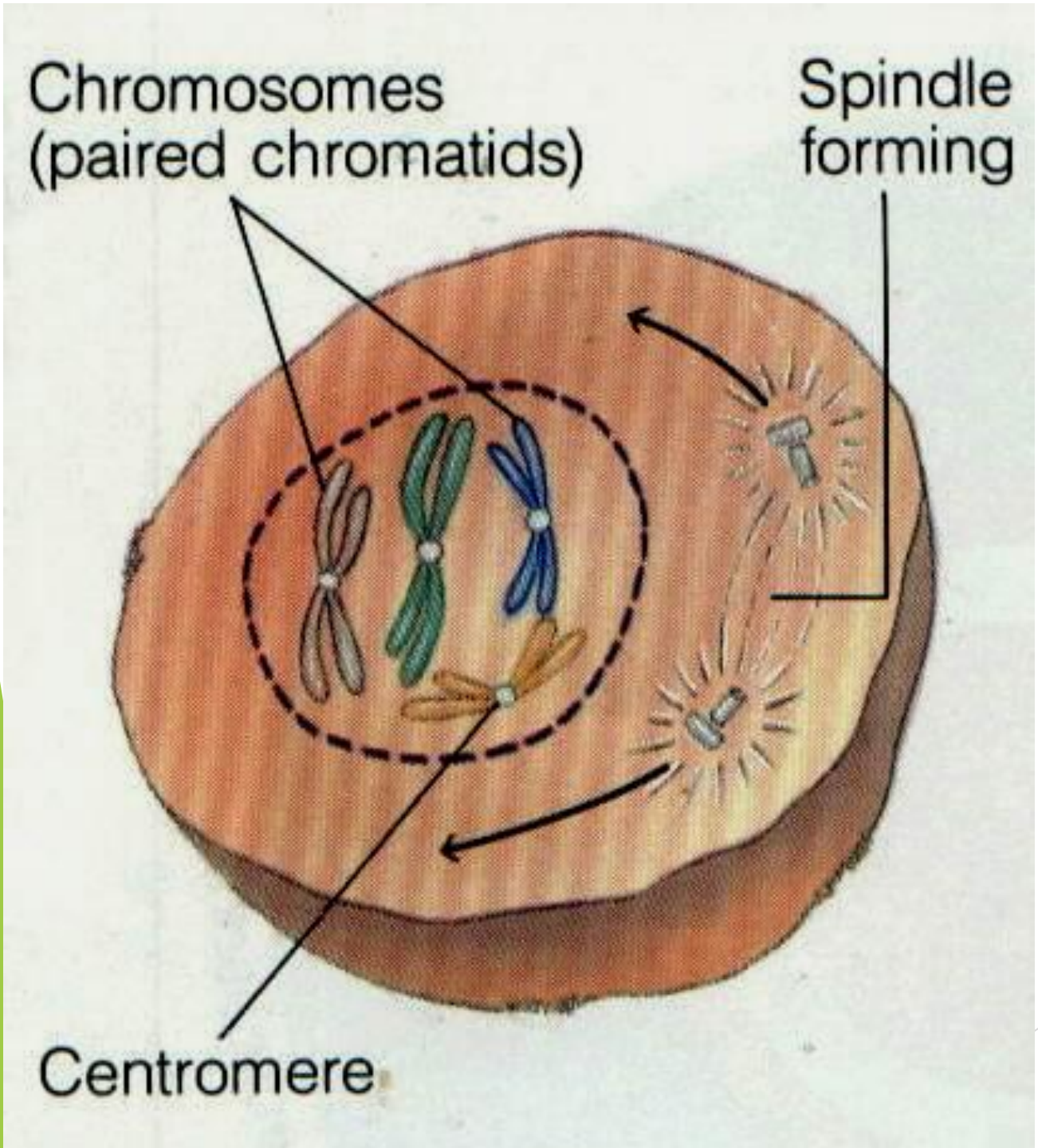
Metaphase



Anaphase

Telophase



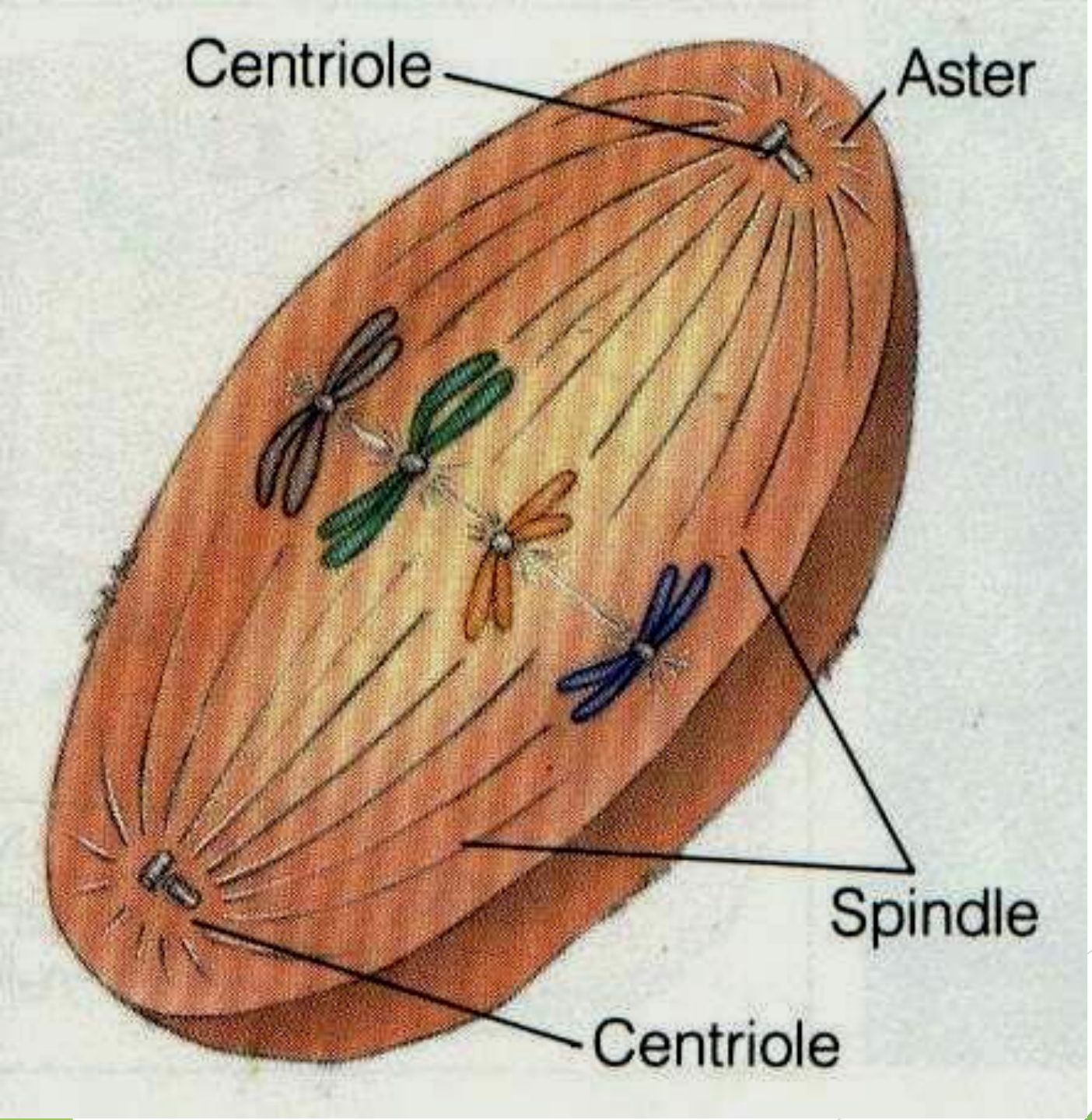

Chromosomes
(paired chromatids)
Spindle
forming
Centromere

PROPHASE

Steps of MITOSIS

PROPHASE

1. Nuclear membrane is broken down
2. Chromosomes appear
3. Centrioles migrate (plants DON'T have centrioles)



METAPHASE

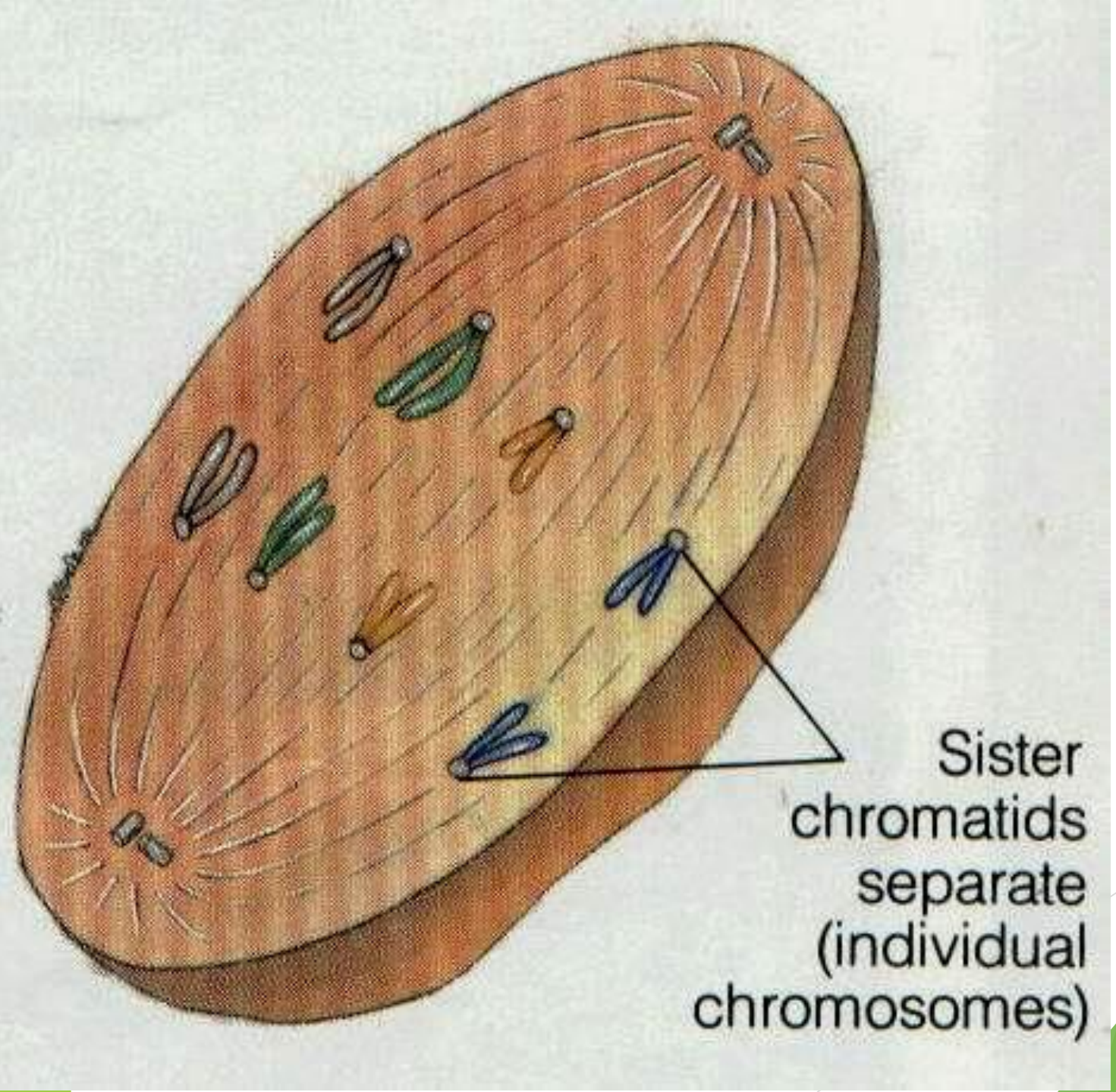
Steps of MITOSIS

METAPHASE

chromosomes align on the equatorial plane

Spindle fibers attach to chromosomes

ANAPHASE

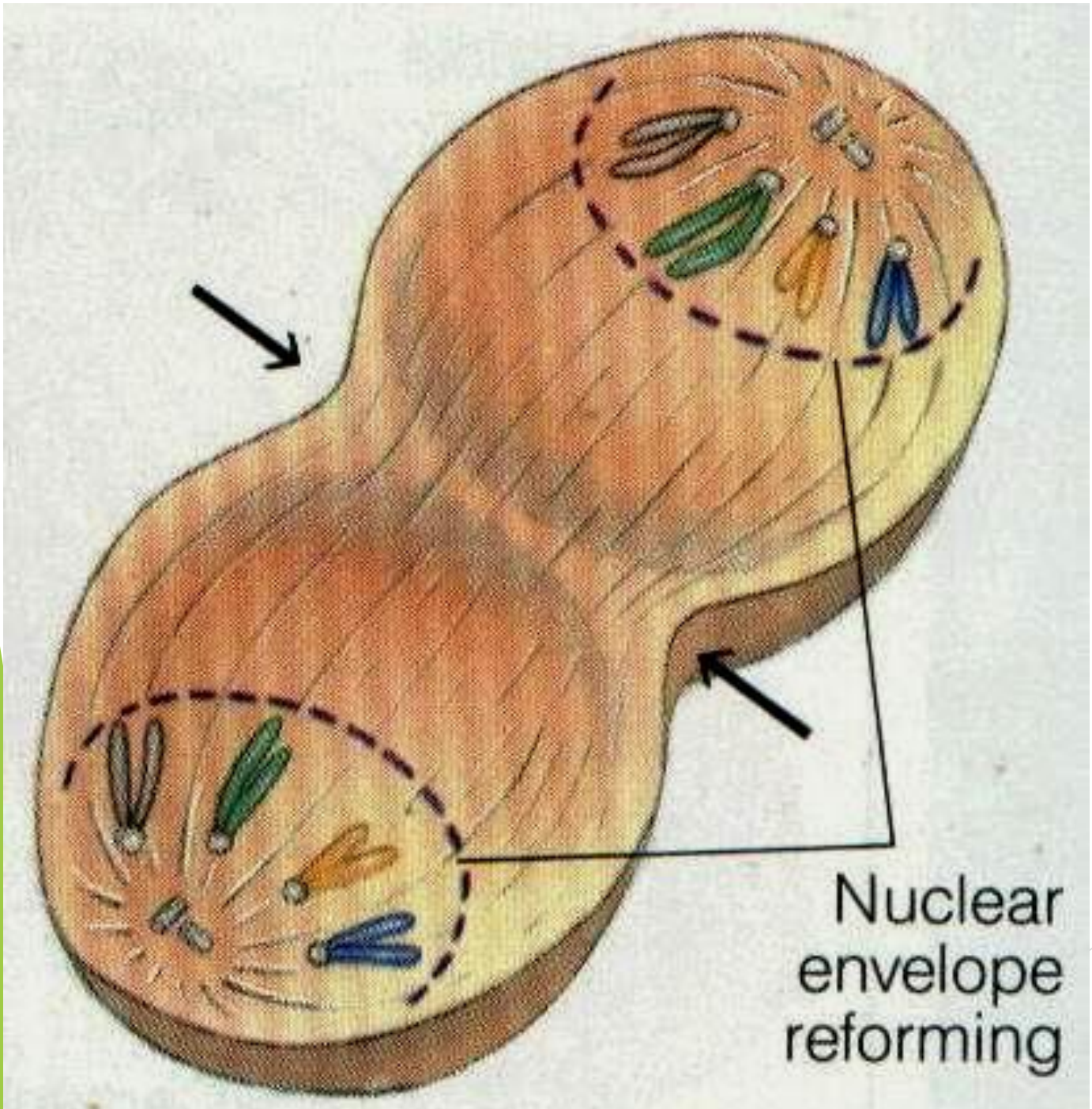


Steps of MITOSIS

ANAPHASE

chromatids move to opposite ends of the cell with the help of spindle fibers

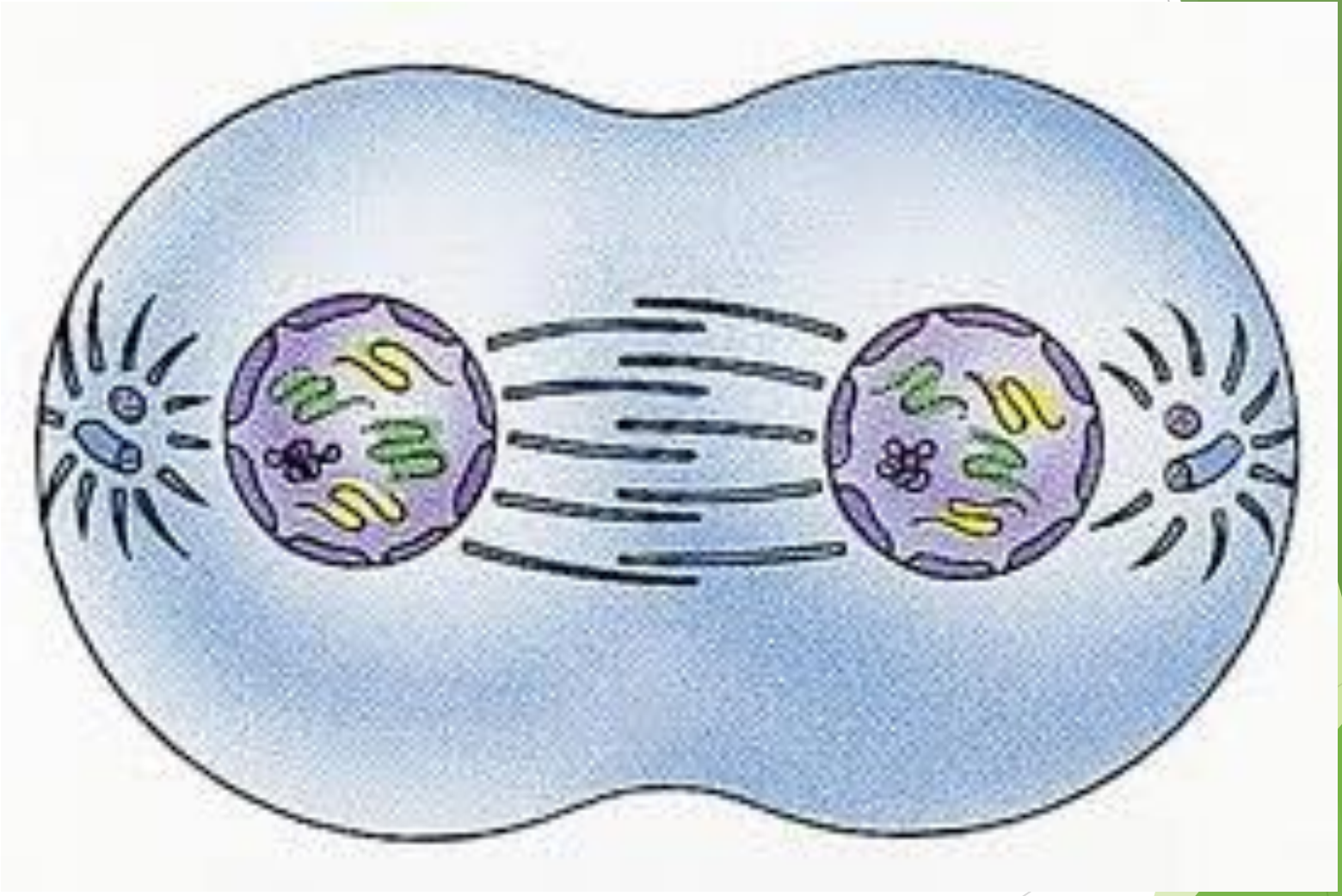
TELOPHASE

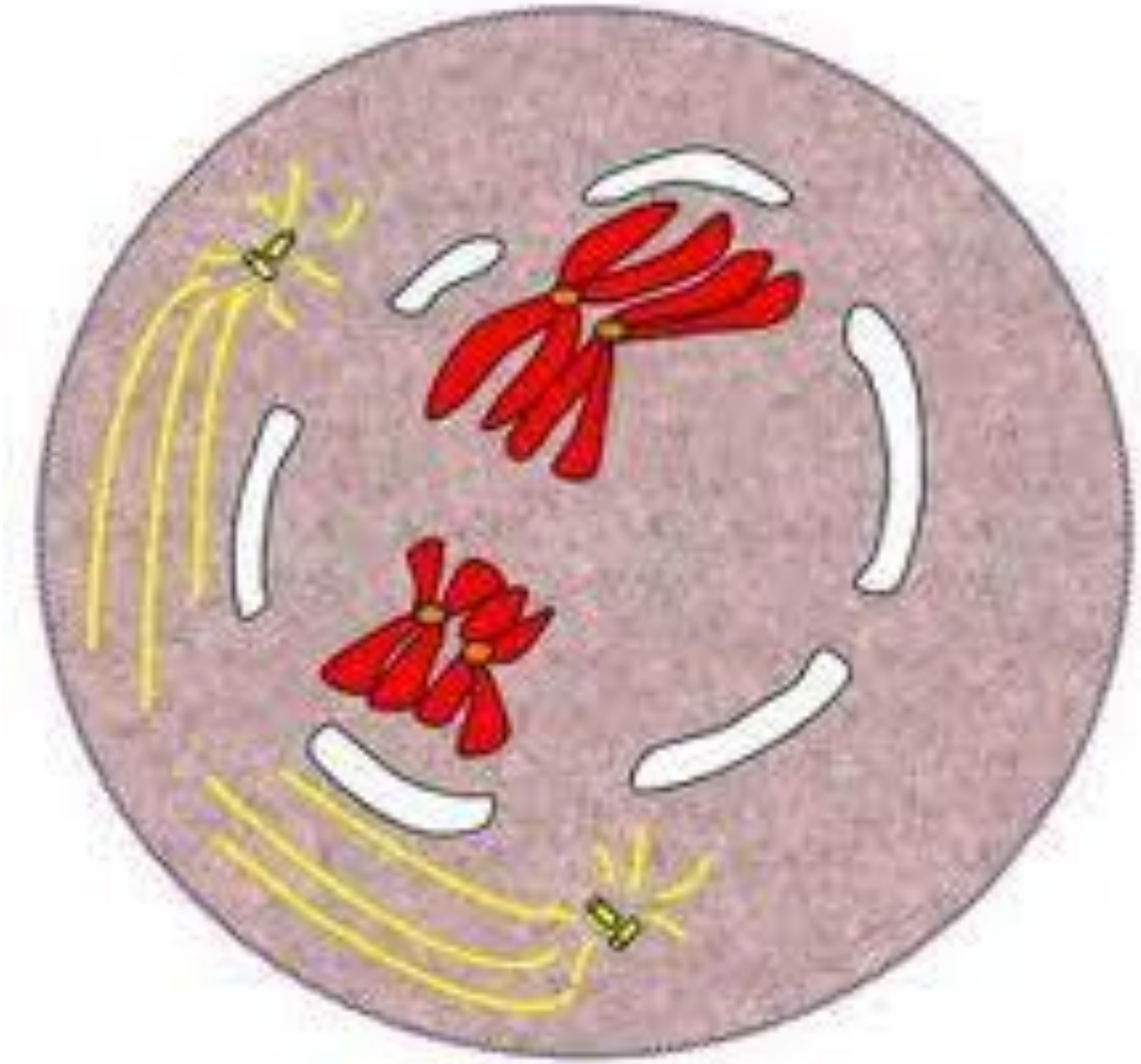


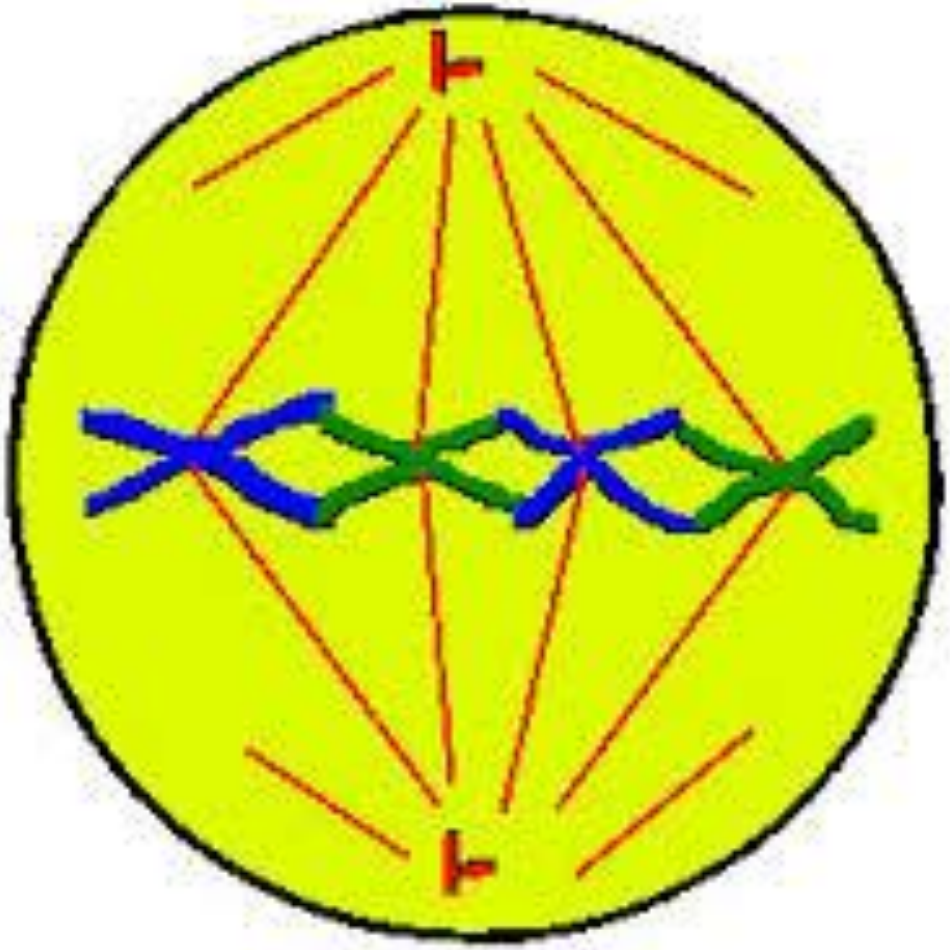
Steps of MITOSIS

TELOPHASE

chromosomes stop moving and the nuclear membrane reforms





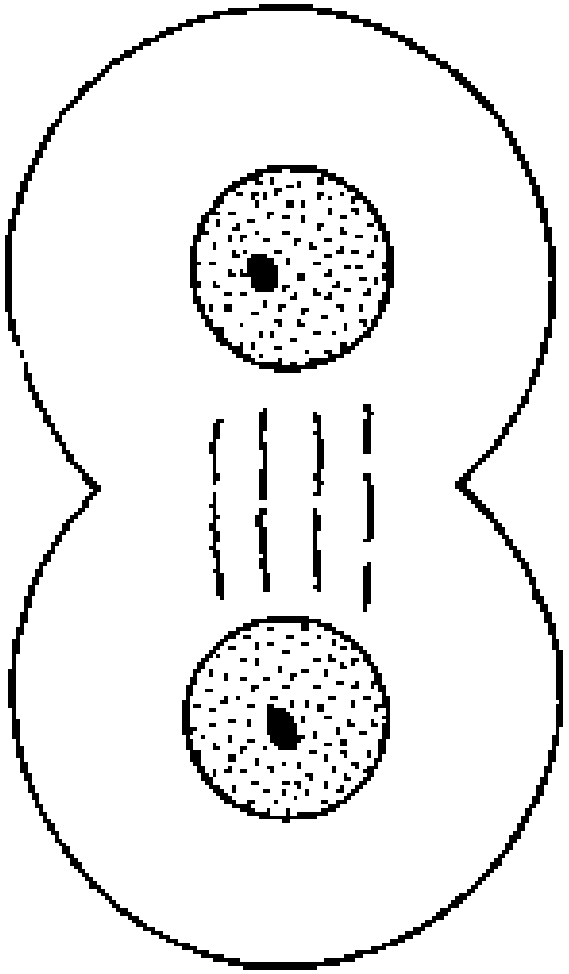


CYTOKINESIS

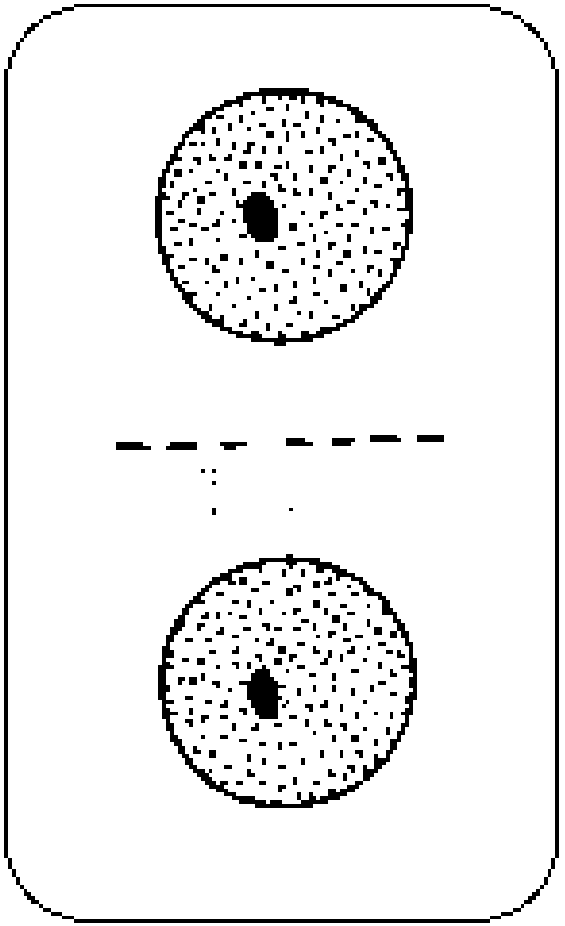
- Division of the entire cell after the nucleus divides
- Differs for plants and animals because plant cells have cell walls

Cytokinesis

Animal Cell



Plant Cell



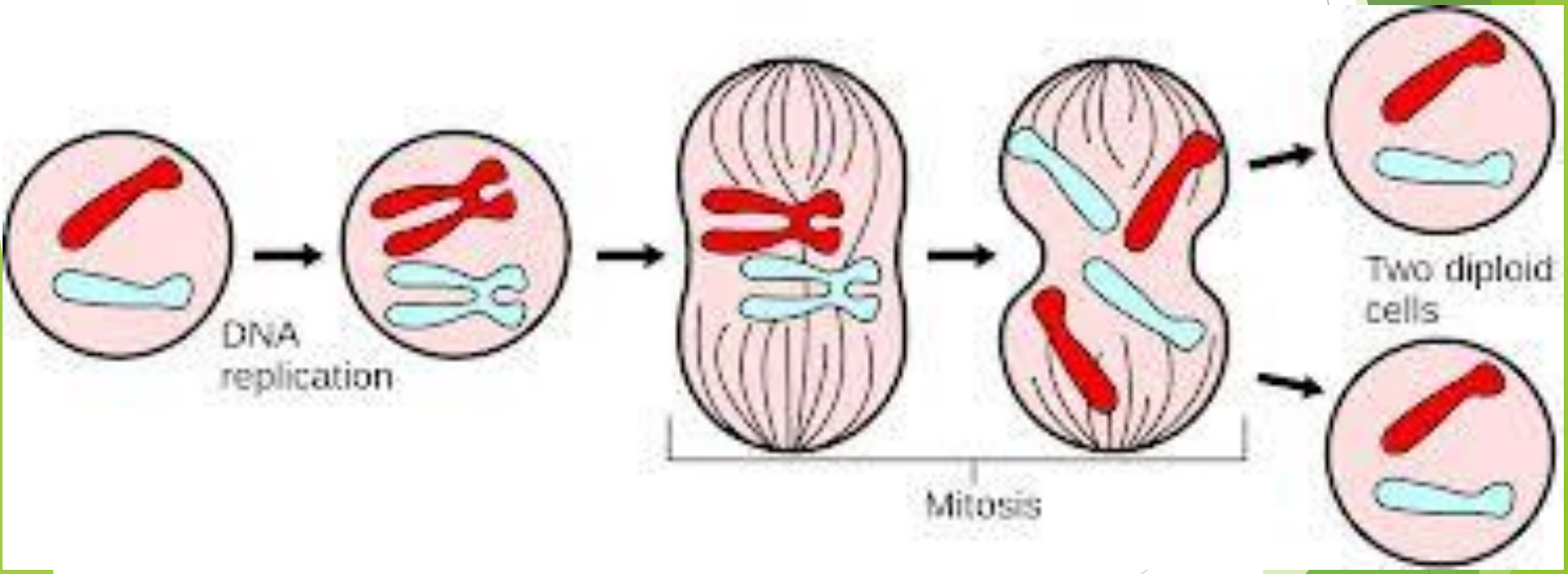
Animal Cell Division

- the cell membrane constricts to make a groove and divide
- This groove is referred to as the cleavage furrow

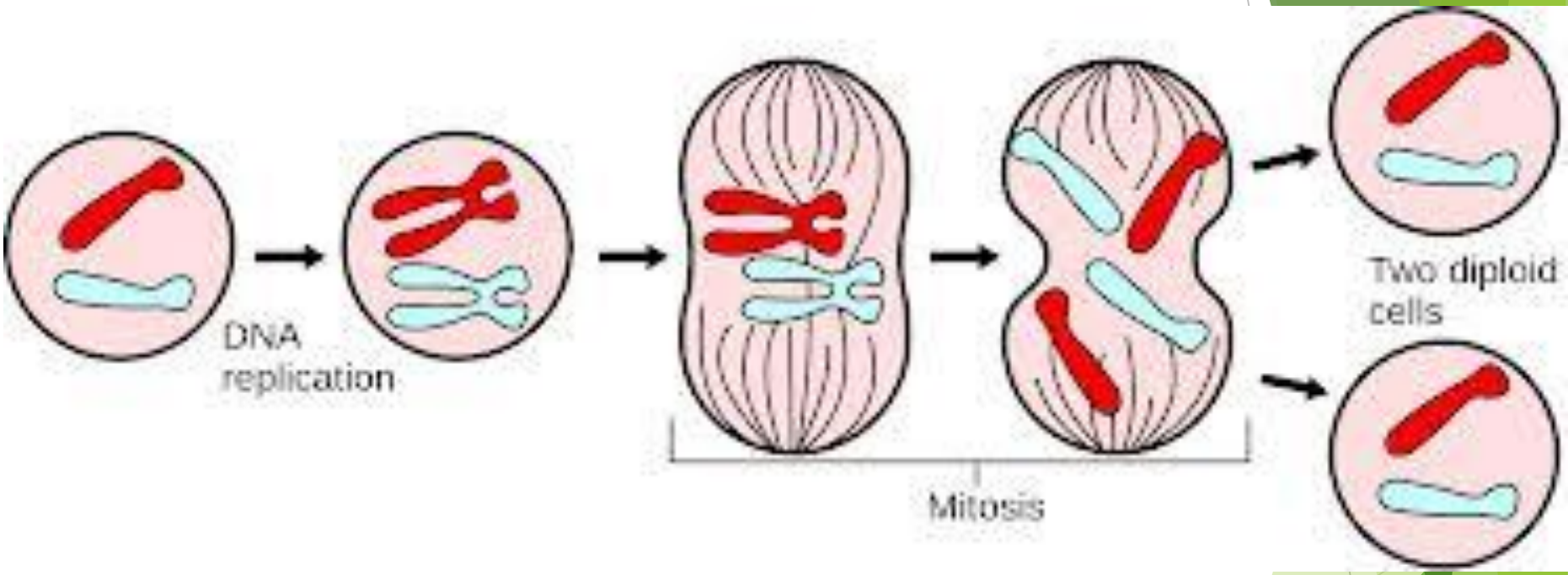
Plant Cell Division

- Vesicles produced by golgi bodies form a midline in the cell
- Vesicles fuse to make a **cell plate** which attaches to cell wall

How does the beginning cell differ from the ending cells?



Mitosis Rap



- http://www.youtube.com/watch?v=pOsAbTi9tHw