

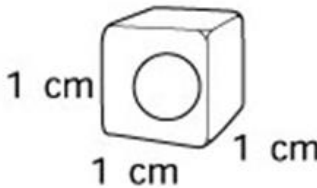
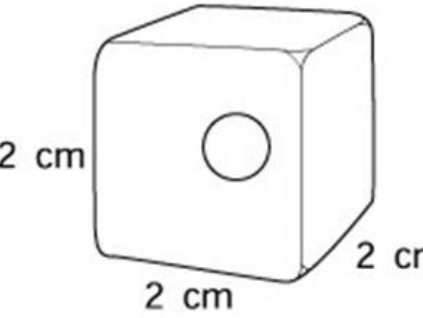
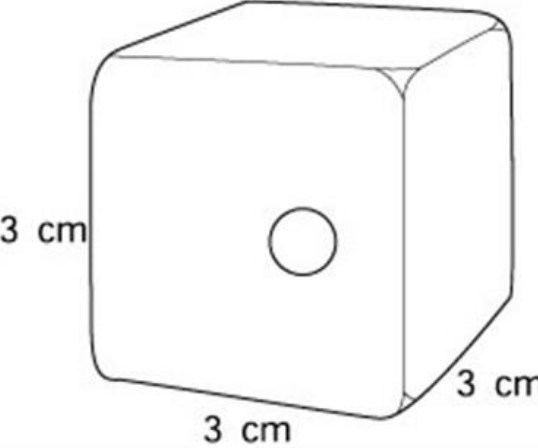


# Cell Division

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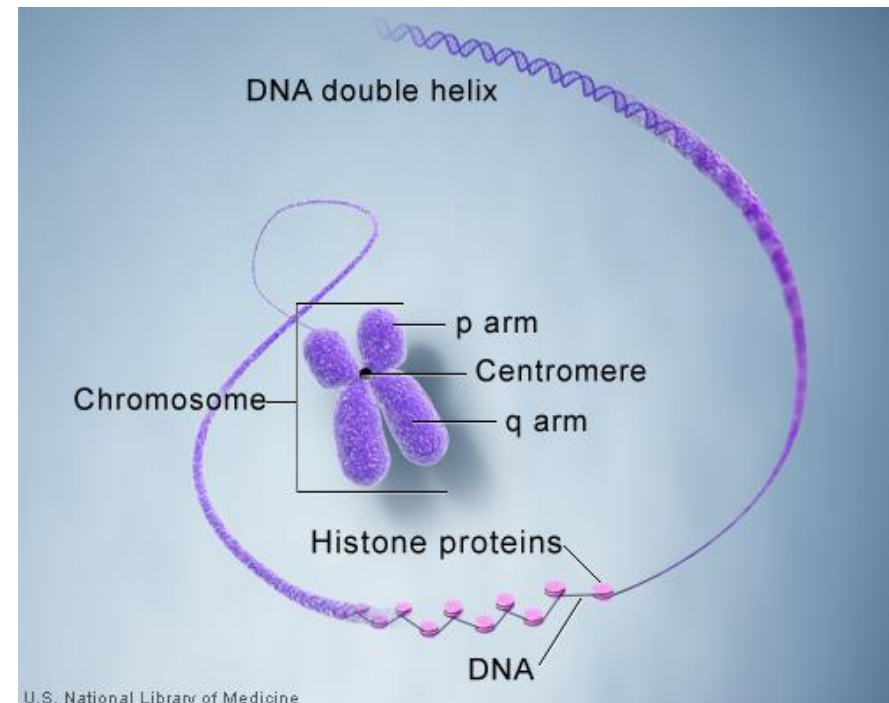
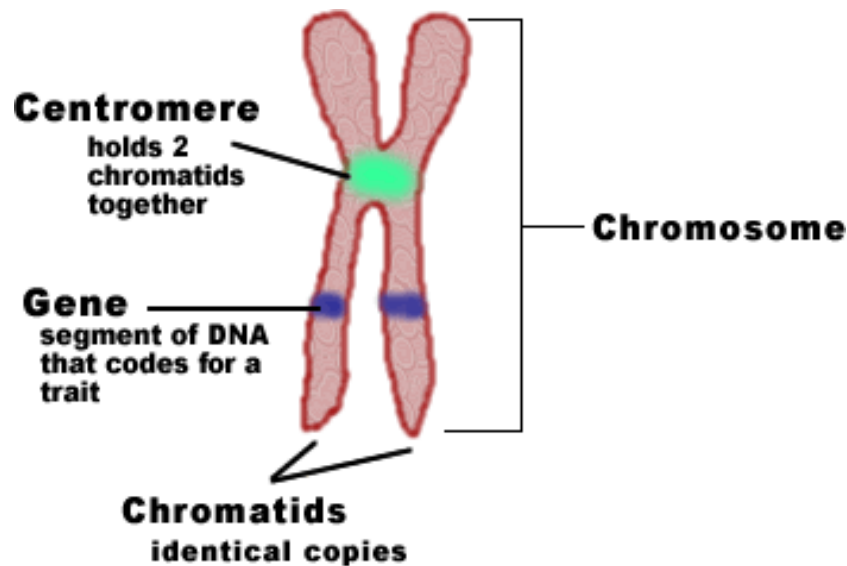
Chapter 10.2



Cell Size			
<b>Surface Area</b> (length x width x 6)	$1 \text{ cm} \times 1 \text{ cm} \times 6$ $= 6 \text{ cm}^2$	$2 \text{ cm} \times 2 \text{ cm} \times 6$ $= 24 \text{ cm}^2$	$3 \text{ cm} \times 3 \text{ cm} \times 6 = 54 \text{ cm}^2$
<b>Volume</b> (length x width x height)	$1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm}$ $= 1 \text{ cm}^3$	$2 \text{ cm} \times 2 \text{ cm} \times 2 \text{ cm}$ $= 8 \text{ cm}^3$	$3 \text{ cm} \times 3 \text{ cm} \times 3 \text{ cm} = 27 \text{ cm}^3$
<b>Ratio of Surface Area to Volume</b>	$6 / 1 = 6 : 1$	$24 / 8 = 3 : 1$	$54 / 27 = 2 : 1$

# Chromosomes

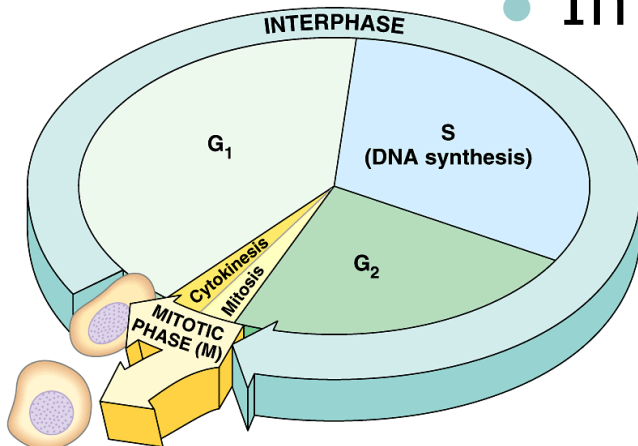
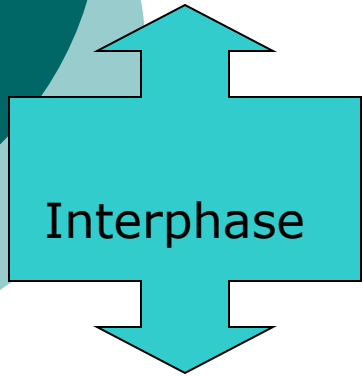
- Made of DNA and protein
- Carry genetic information
- Specific number
- Humans have 46



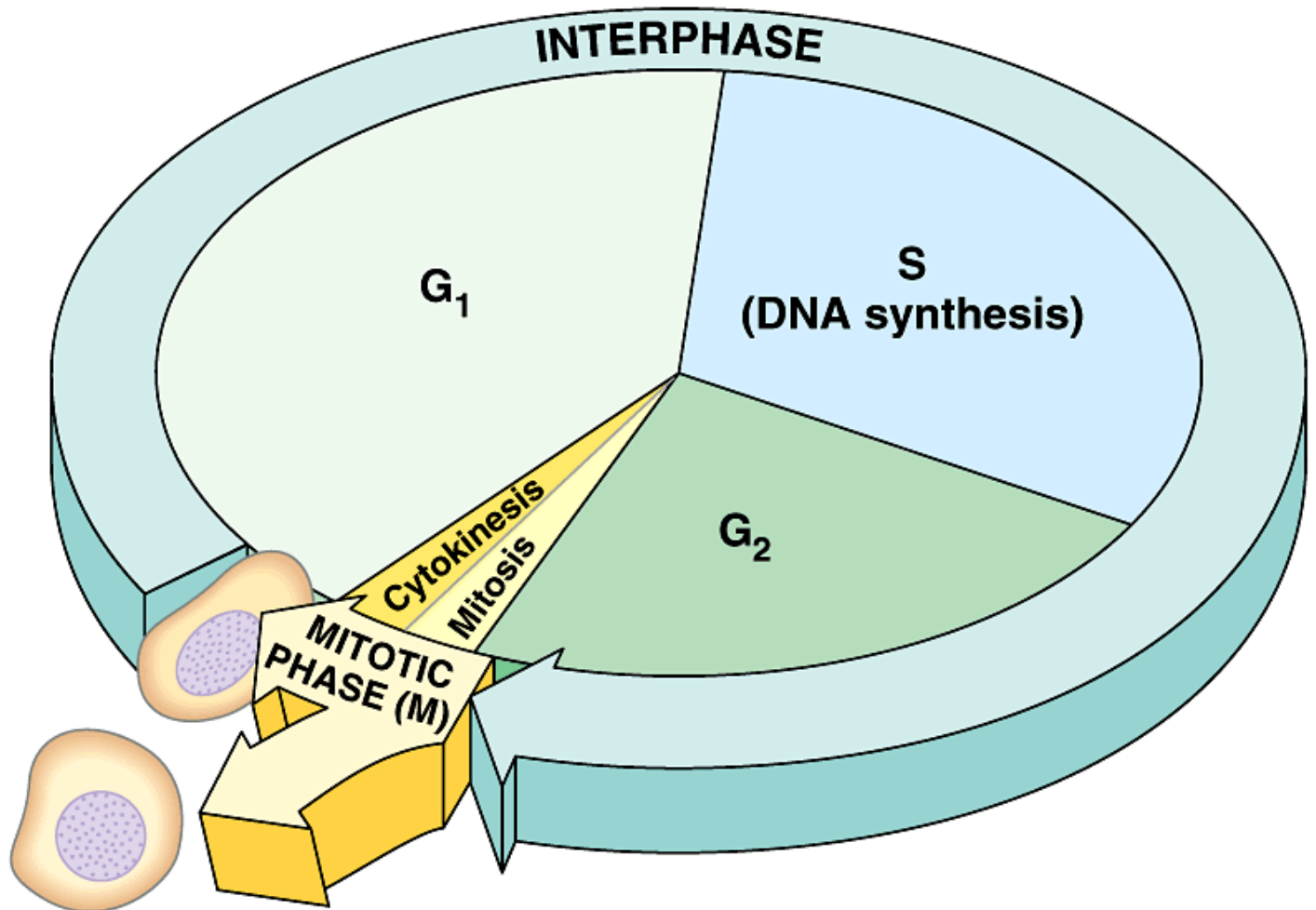
# Cell Cycle

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- G1 phase – cell growth
  - S phase – DNA is synthesized
  - G2 phase – preparation for mitosis, shortest phase
- 
- M phase – mitosis
    - Important for growth and repair

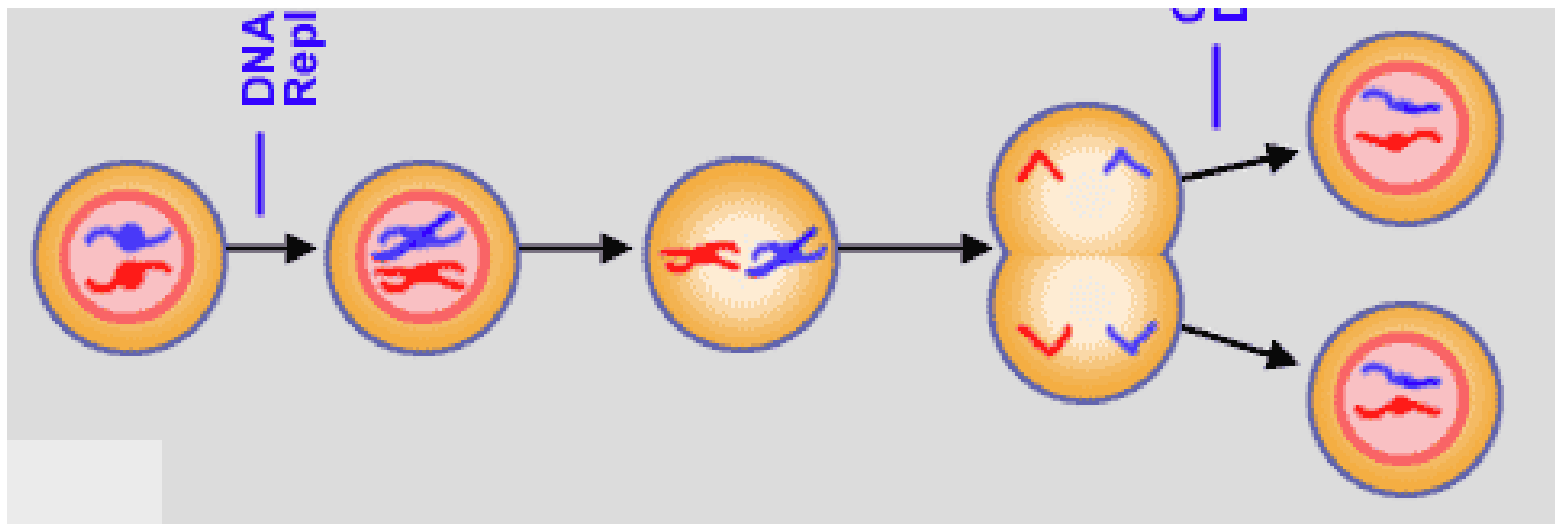


# Cell Cycle



# Mitosis

- Parent cell divides into 2 identical daughter cells
- Each daughter cell is identical to parent cell
- If parent cell has 46 chromosomes then each daughter cell has 46 chromosomes

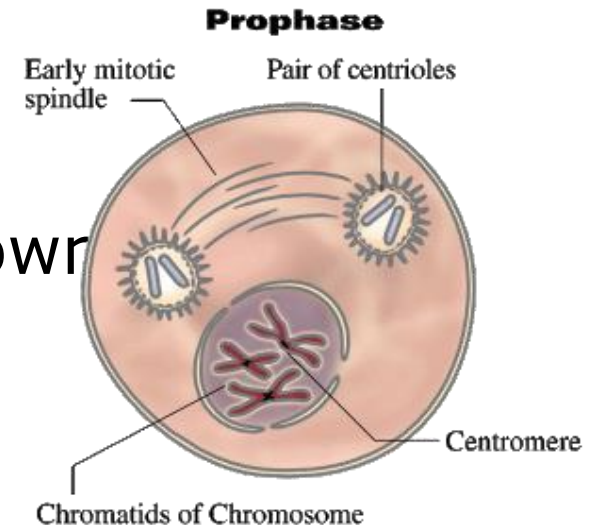


# Mitosis

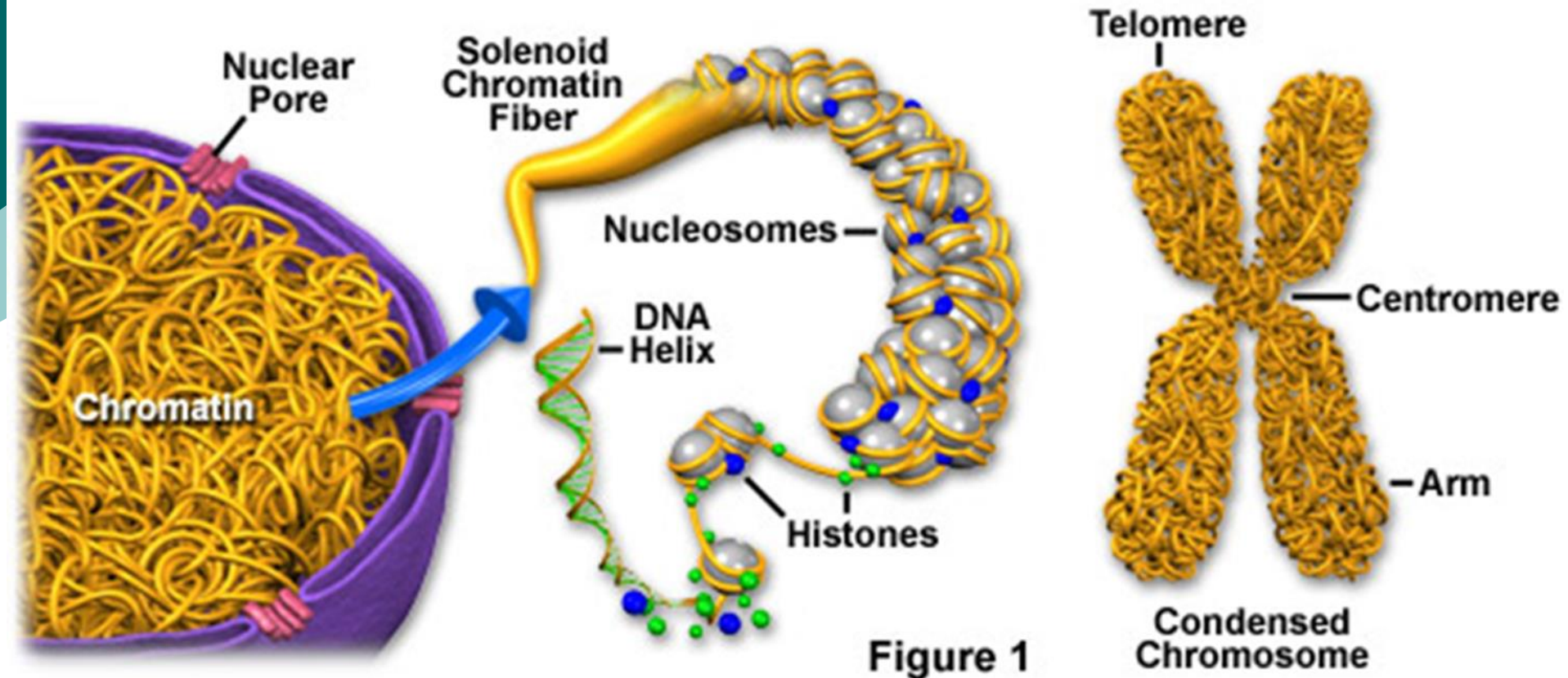
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## ○ Prophase

- Longest
- Chromosomes form (2 identical chromatids)
- Centrioles on opposite sides of nucleus
- Centrioles form spindle
- Nucleolus disappears
- Nuclear envelope breaks down



## Chromatin and Condensed Chromosome Structure



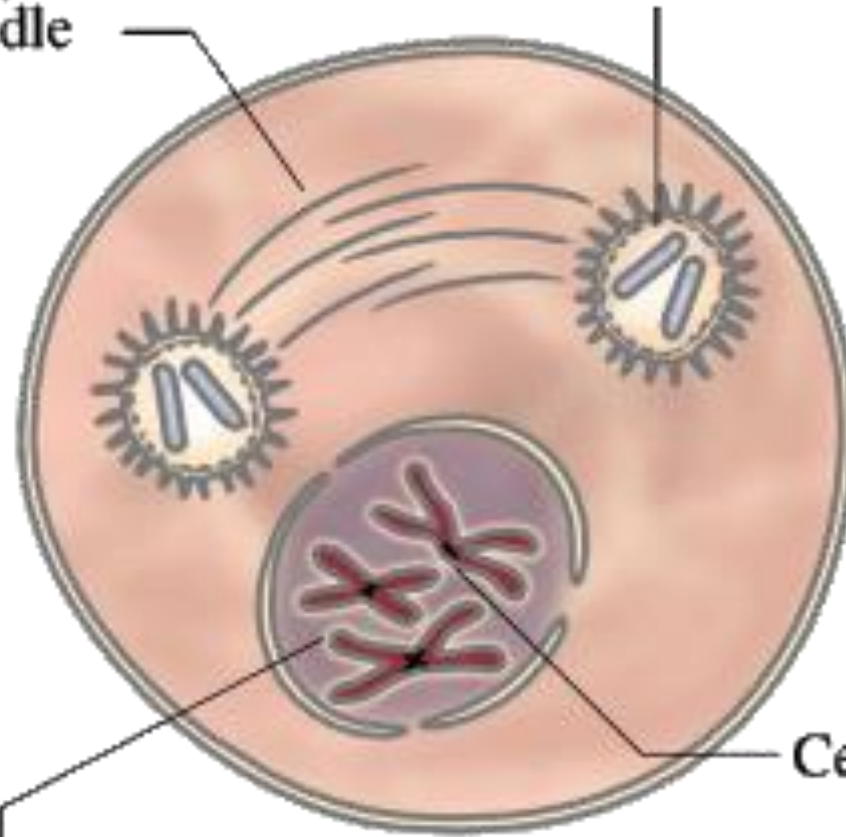


# Prophase

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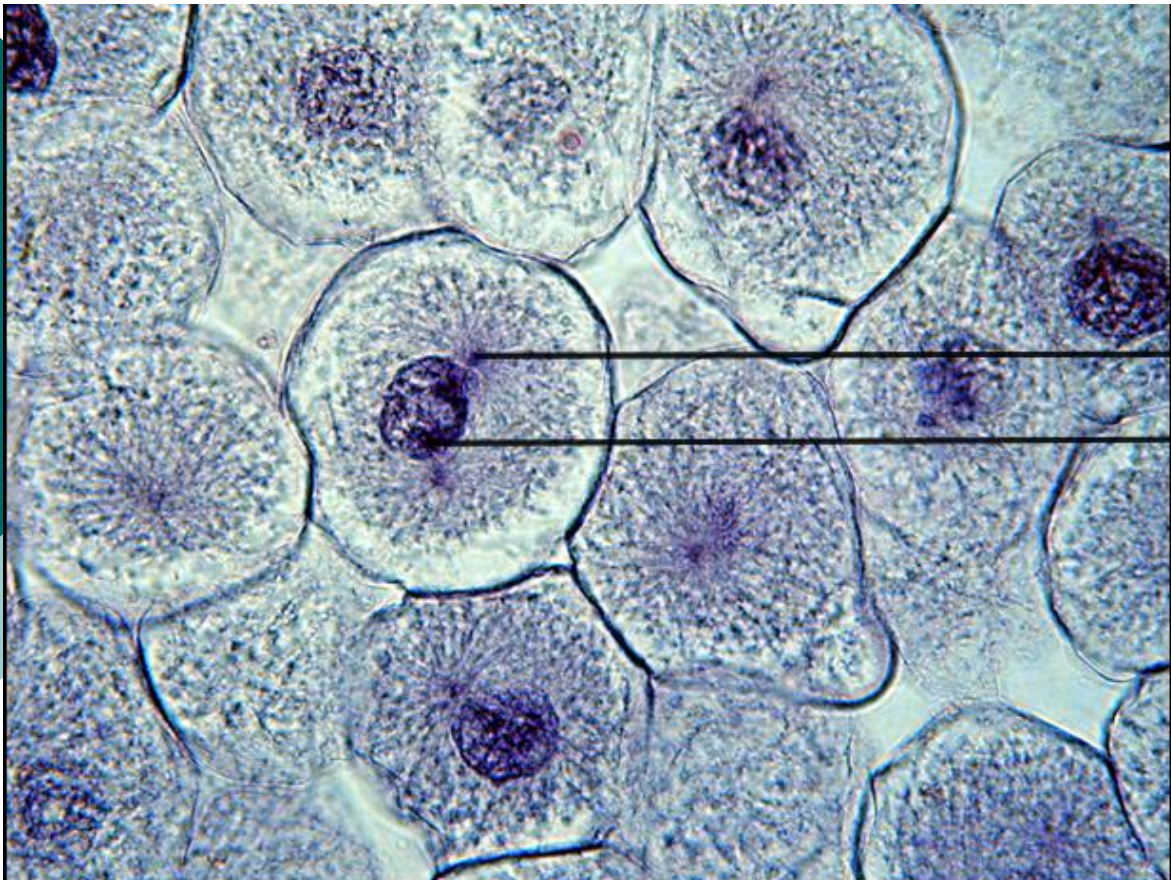
Early mitotic spindle

Pair of centrioles



Centromere

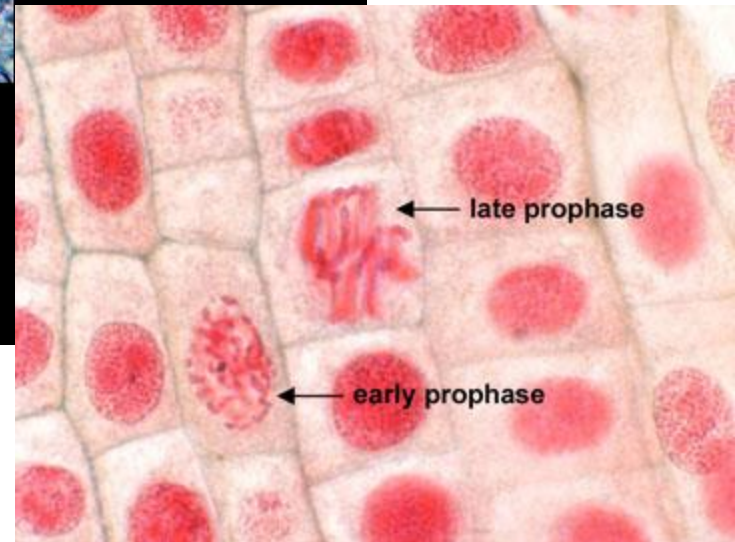
Chromatids of Chromosome



Centriole

Note:  
chromosomes  
are visible

Prophase of Mitosis (1000)

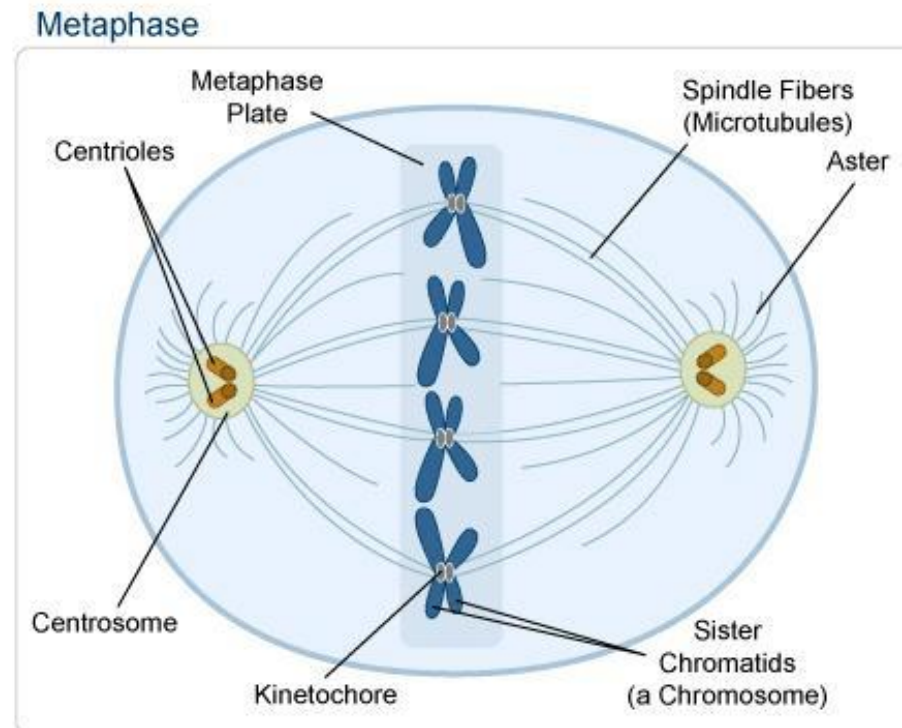


← late prophase

← early prophase

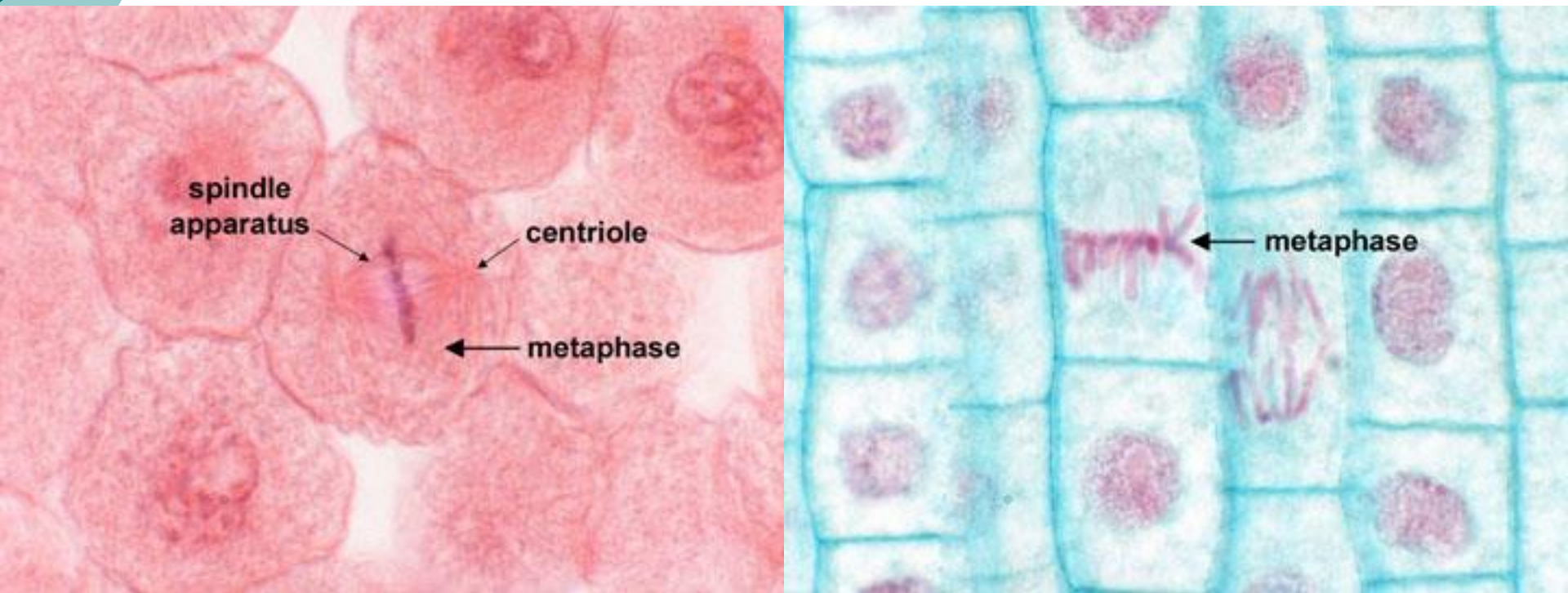
# Metaphase (middle)

- Spindle microtubules connect to centromere of each chromosome
- Chromosomes line up in center of cell



# Metaphase

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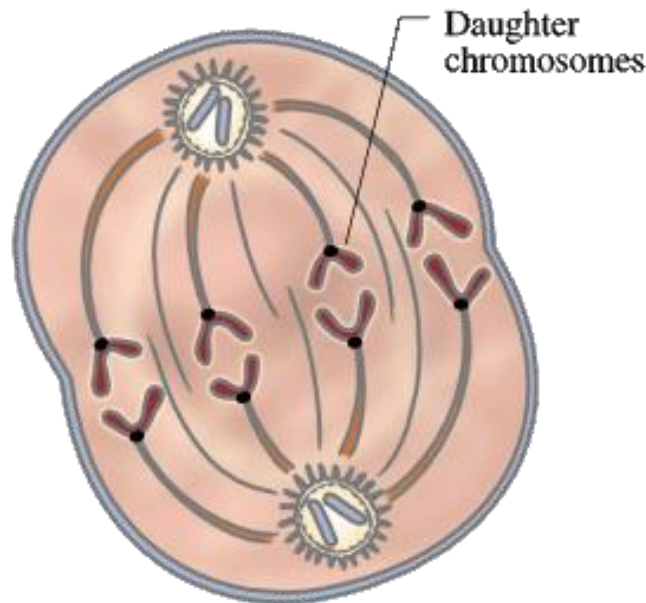


# Anaphase (apart)

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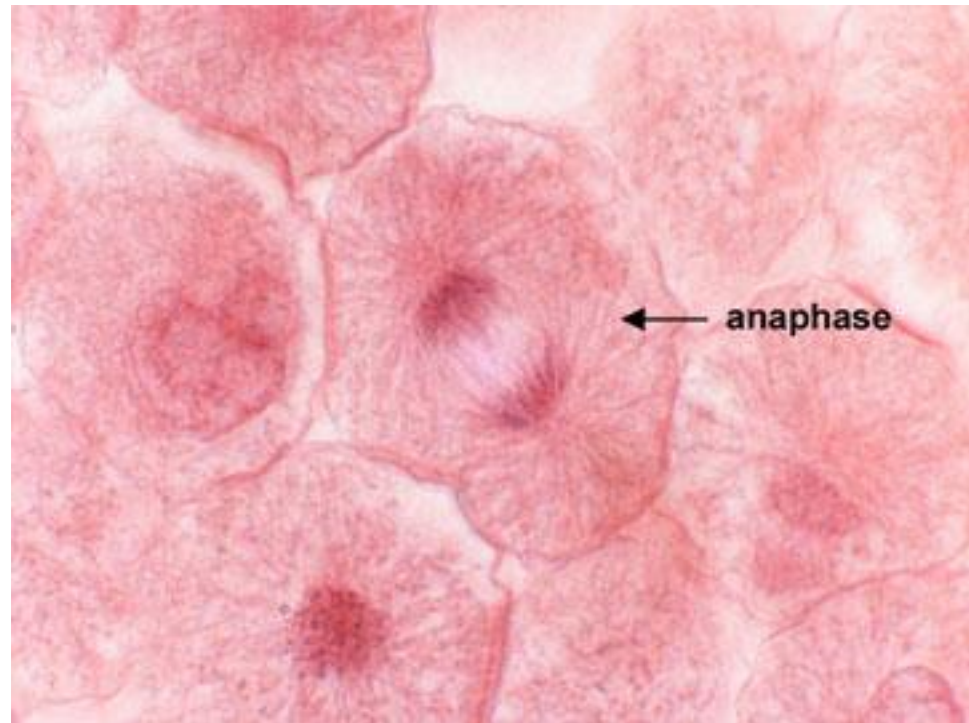
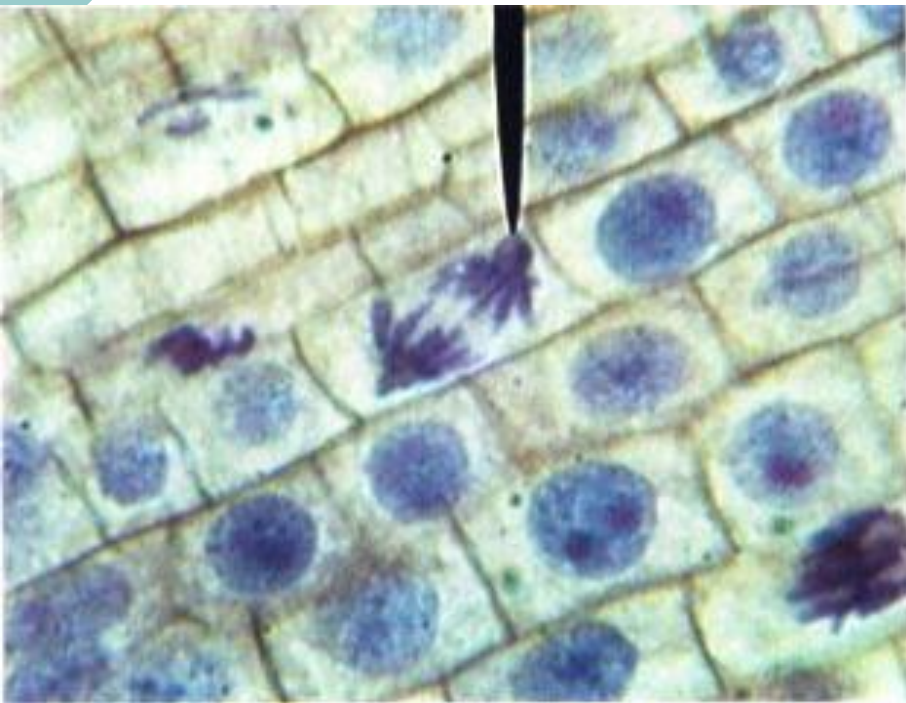
- Sister chromatids separate
- Spindle pulls chromatids apart
- Each chromatid = 1 complete chromosome

## **Anaphase**



# Anaphase

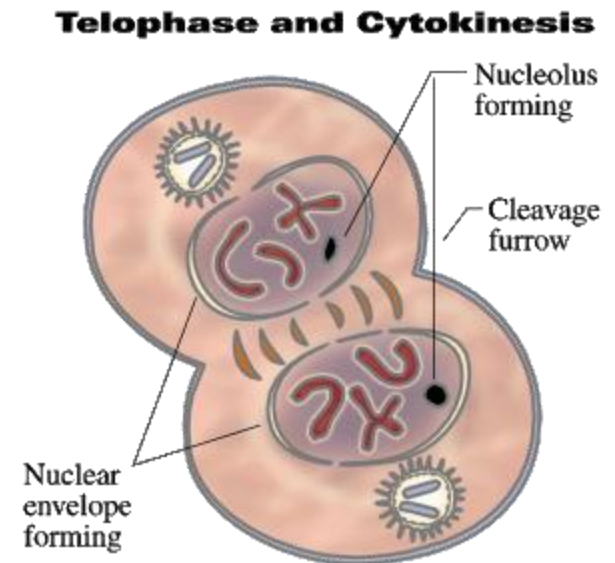
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# Telophase

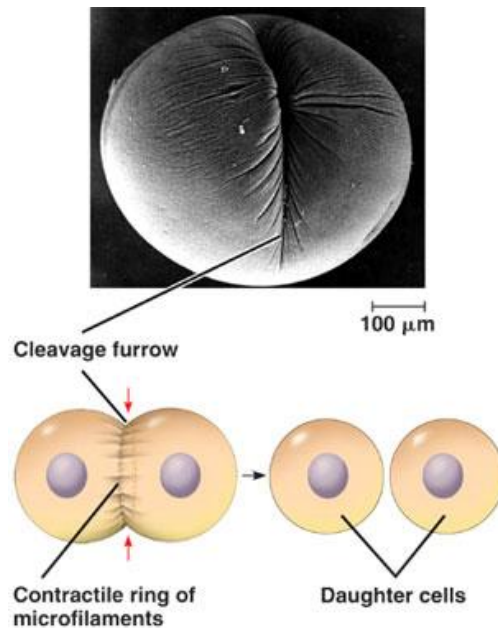
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- Chromosomes disperse into chromatin
- Nuclear envelope reforms
- Spindle breaks apart
- Nucleolus reforms
- Final phase of Mitosis

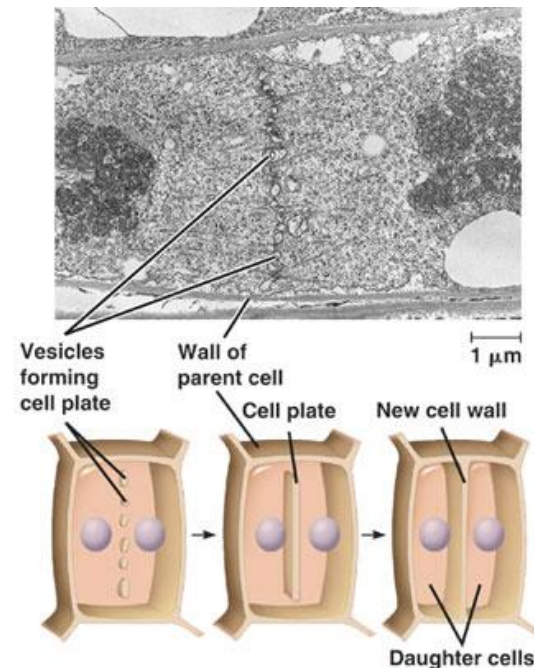


# Cytokinesis

- Cell divides
- Animal – cell membrane pinches
- Plant – cell plate forms cell wall between two nuclei



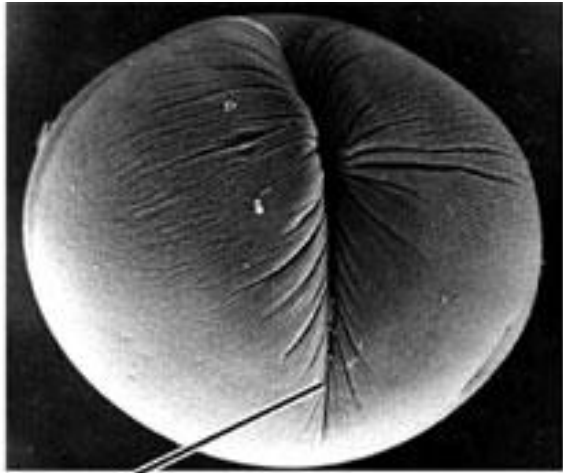
(a) Cleavage of an animal cell (SEM)



(b) Cell plate formation in a plant cell (TEM)

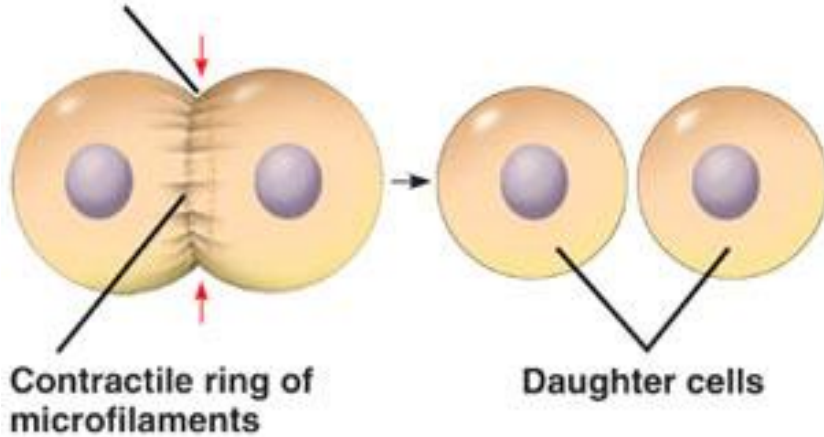


# Cytokinesis



100  $\mu\text{m}$

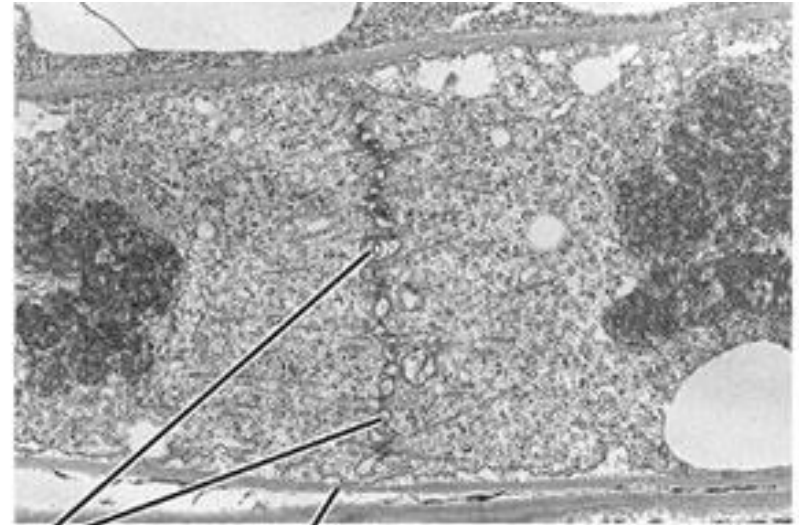
Cleavage furrow



Contractile ring of microfilaments

Daughter cells

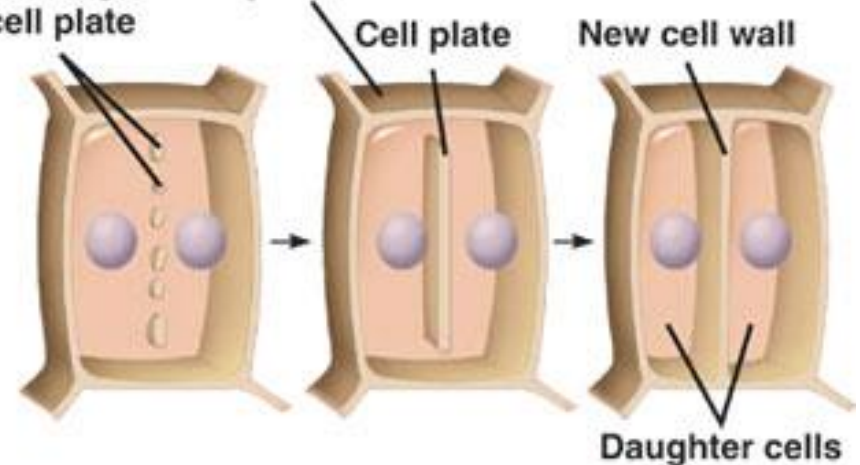
(a) Cleavage of an animal cell (SEM)



1  $\mu\text{m}$

Vesicles forming cell plate

Wall of parent cell

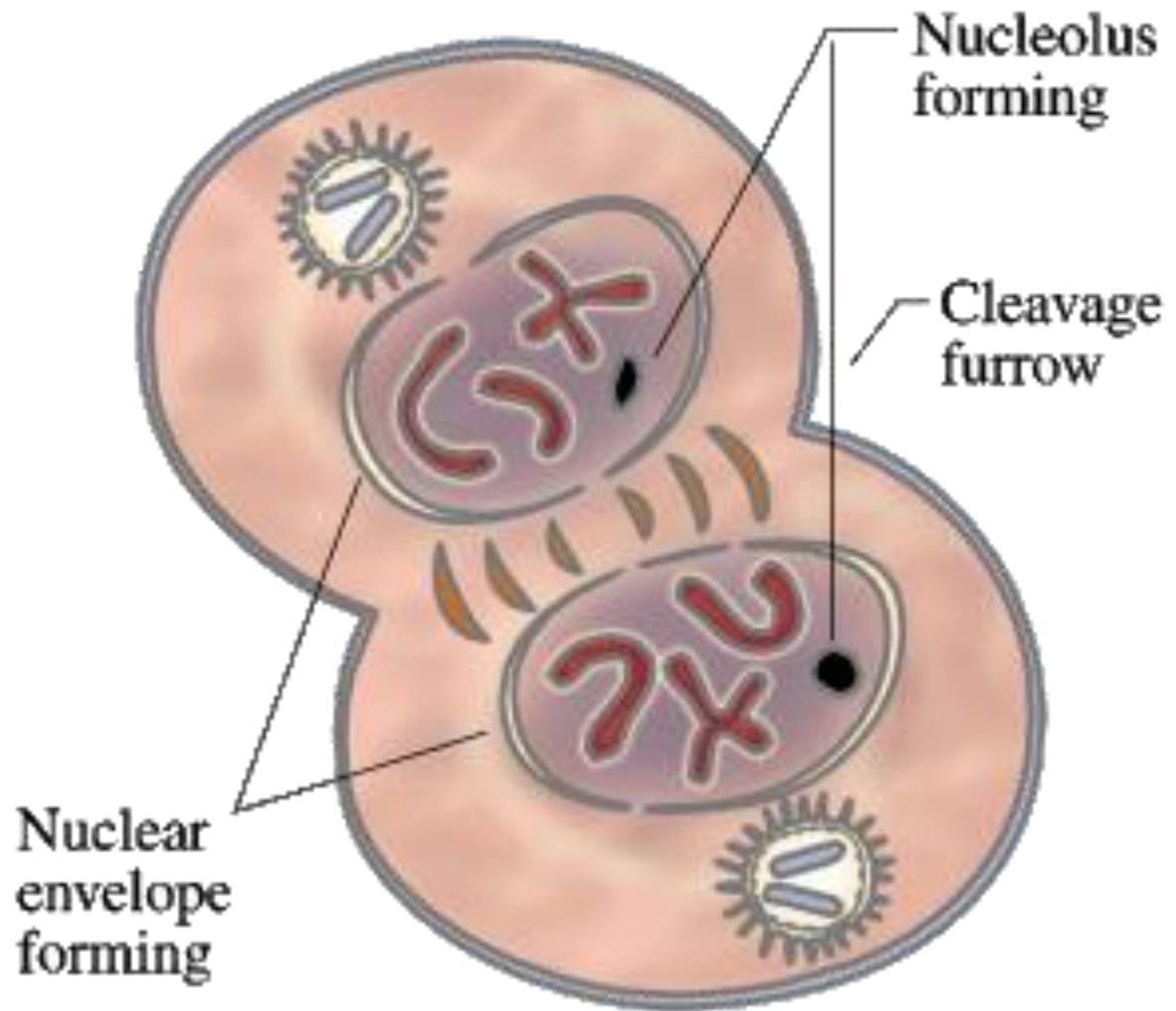


Daughter cells

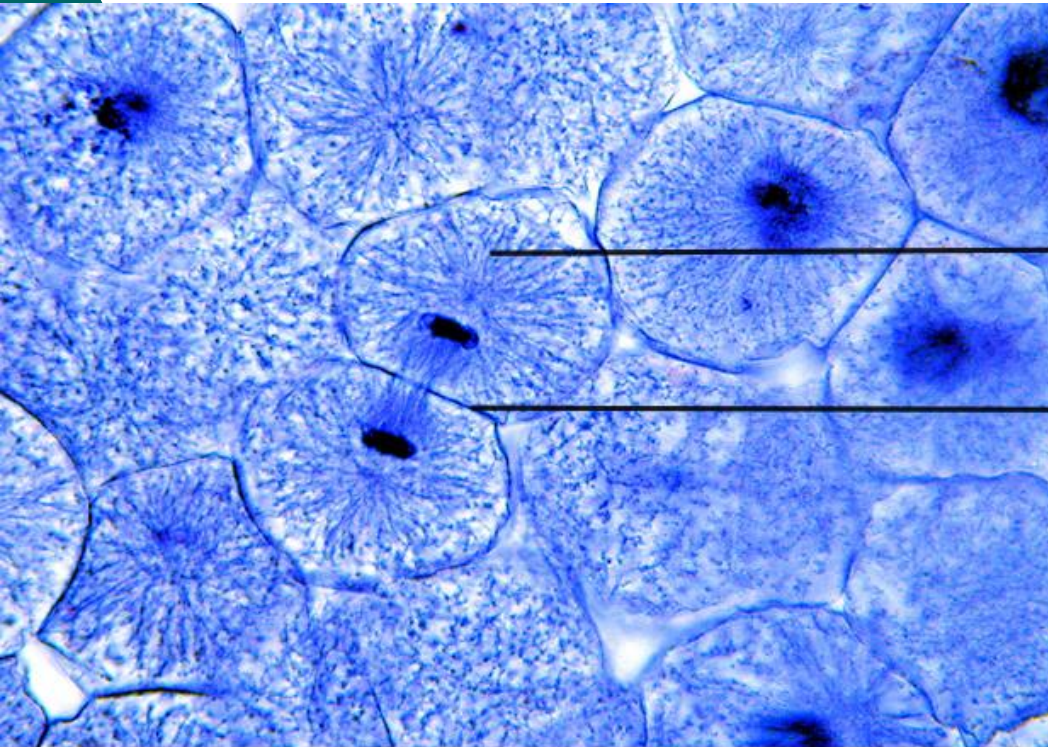
(b) Cell plate formation in a plant cell (TEM)

## Telophase and Cytokinesis

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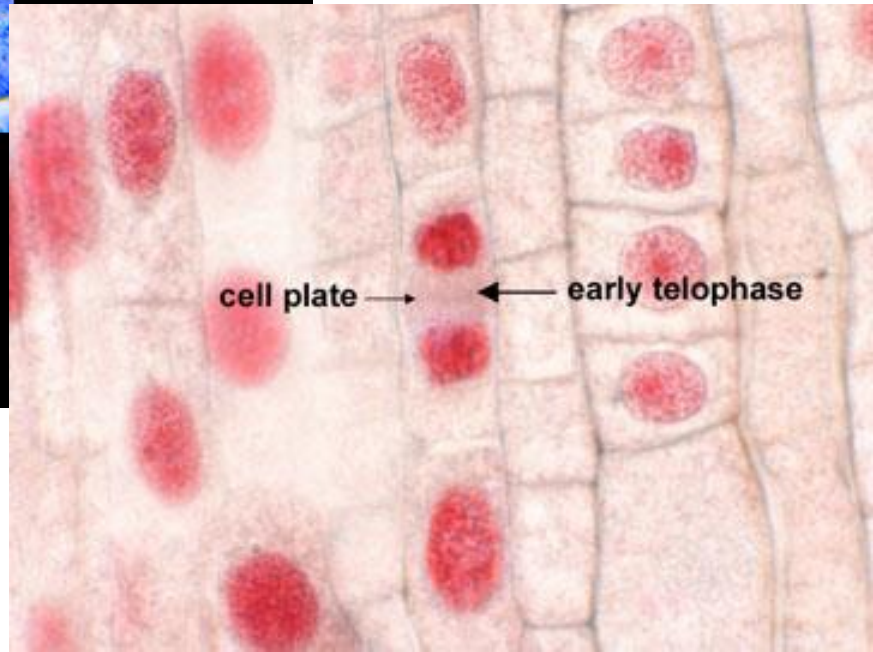
# Telophase and cytokinesis



Spindle fibers

Cleavage furrow

Telophase of Mitosis (1000)



cell plate

early telophase

