

Mitosis and the Cell Cycle



Cell reproduction



Some Definitions

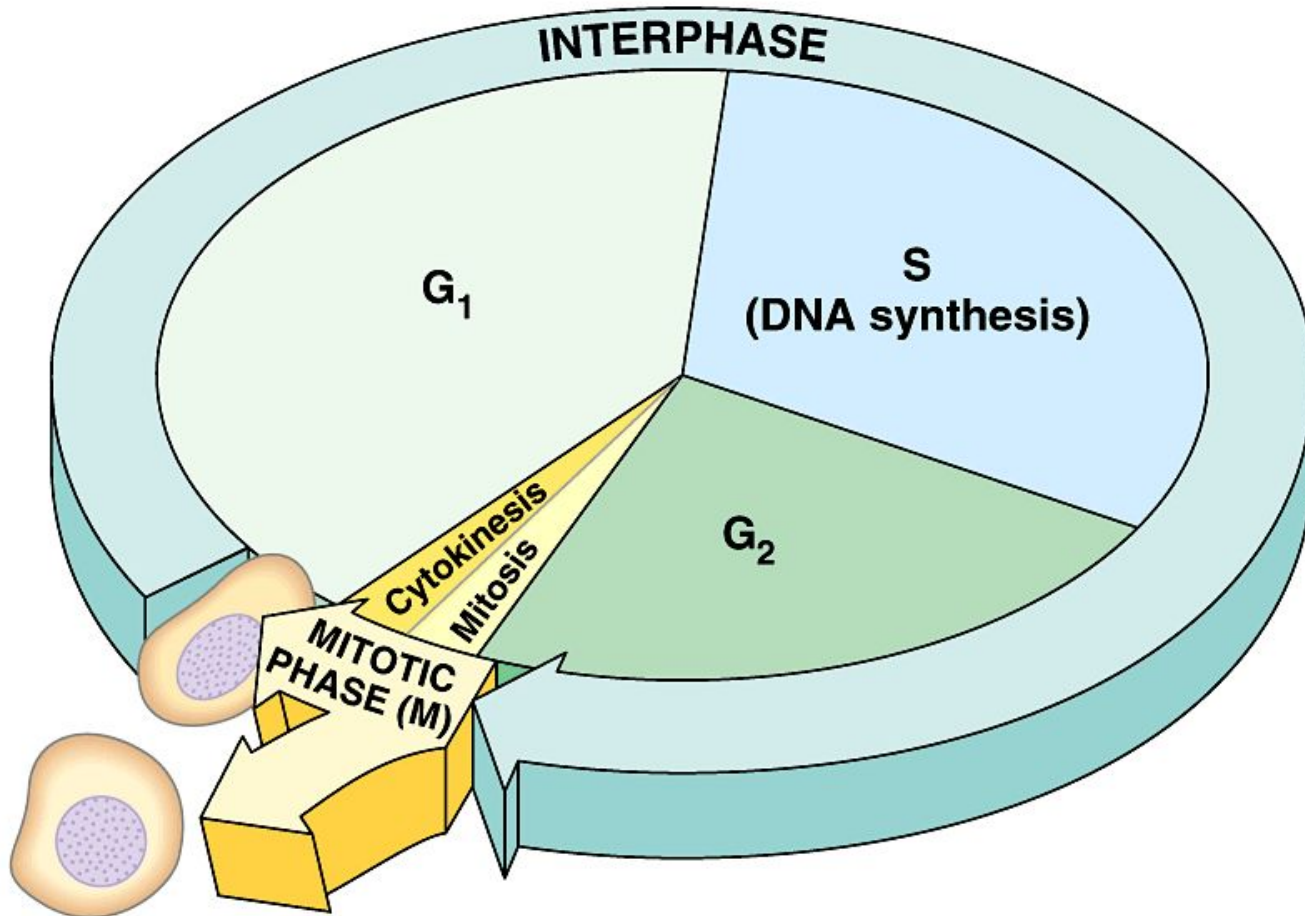
- Somatic Cells – body cells
 - Produced through mitosis
 - Has 46 chromosomes (23 pairs)
- Homolog – each member of a chromosome pair
- Diploid ($2n$) – total of 46 chromosomes in people – zygote & somatic cells
- Haploid (n) – total of 23 chromosomes in people, gametes (sperm & egg)



The Cell Cycle

- The sequence of growth and division of a cell.
- 95% of cell cycle in interphase
- 5% of cell cycle in mitosis

Cell cycle





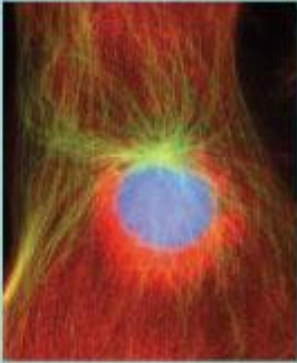
Interphase

- Growth Stage 1 (G_1) – metabolic activity of the cell
- Synthesis Stage (S) – metabolic activity of the cell, replication of DNA
- Growth Stage 2 (G_2) – metabolic activity of the cell, prepare for division

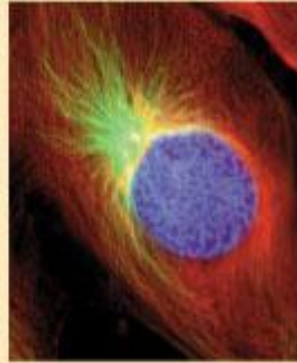


Mitosis

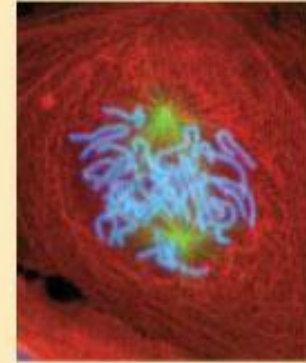
- Happens in **all** cells
- Cell division process
- 5 major stages



G₂ OF INTERPHASE

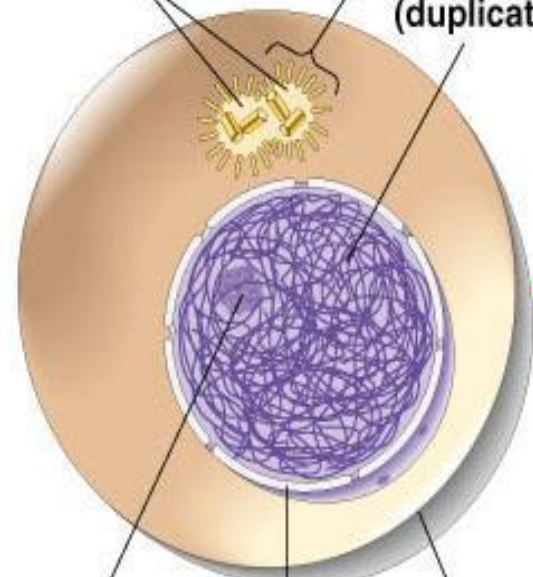


PROPHASE



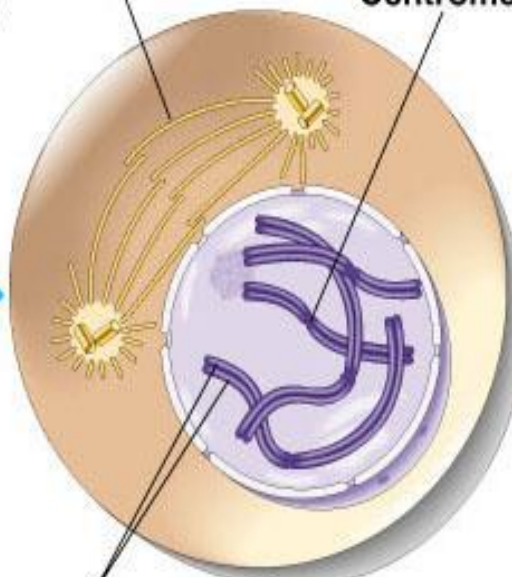
PROMETAPHASE

Centrosomes (with centriole pairs)
Aster
Chromatin (duplicated)



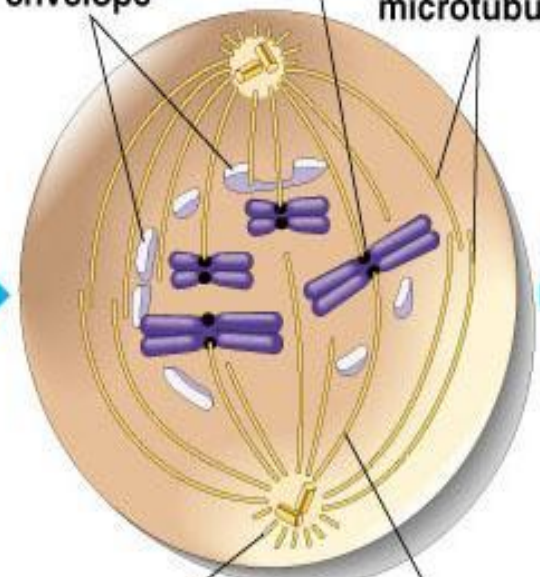
Nucleolus
Nuclear envelope
Plasma membrane

Early mitotic spindle
Centromere

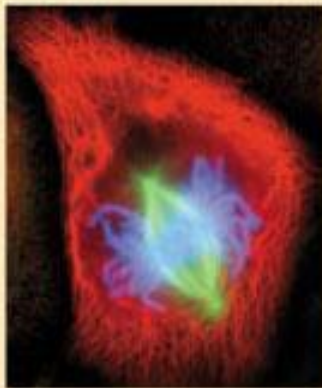


Chromosome, consisting of two sister chromatids

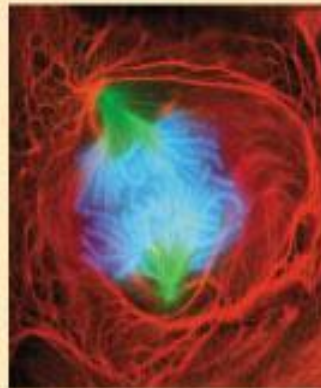
Fragments of nuclear envelope
Kinetochores
Nonkinetochore microtubules



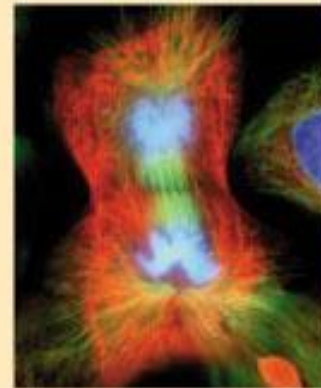
Spindle pole
Kinetochores
Kinetochores
Kinetochores
Kinetochores
Kinetochores



METAPHASE

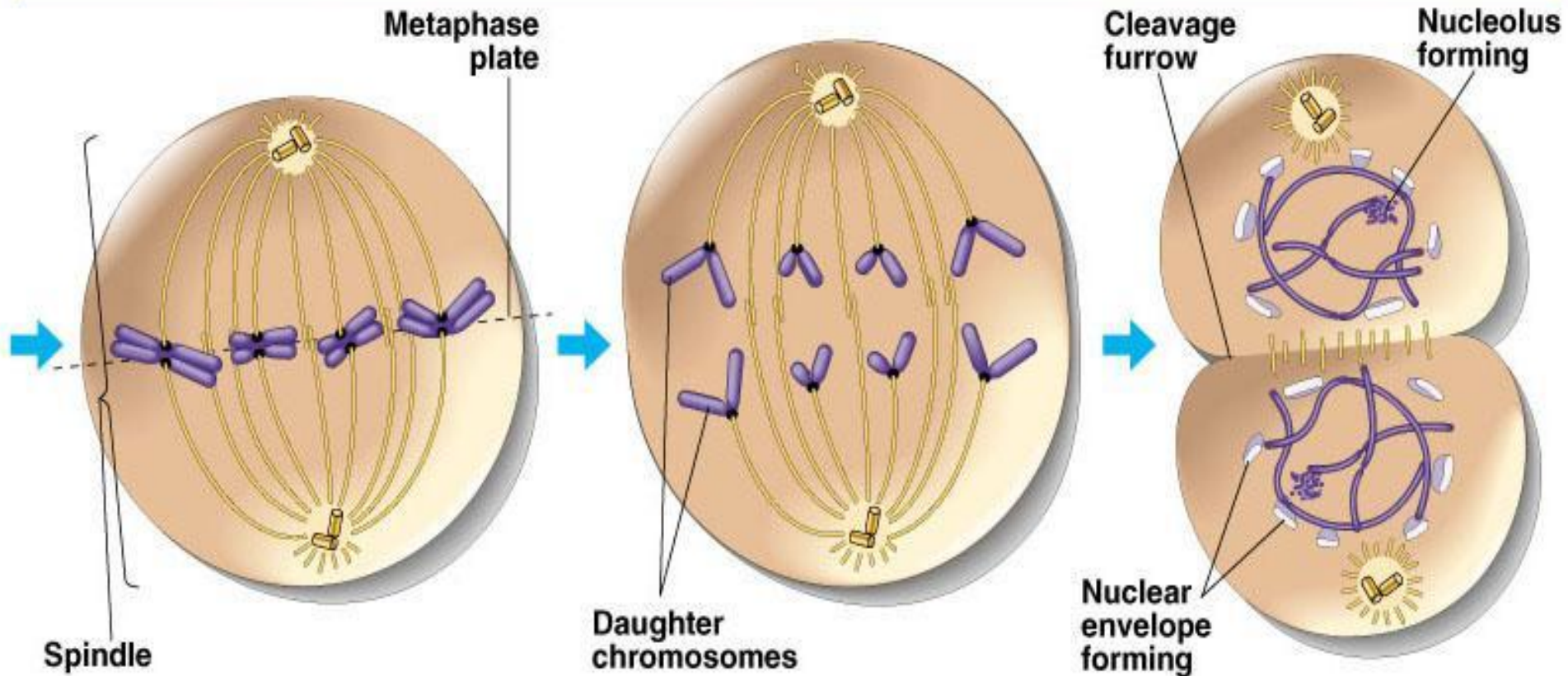


ANAPHASE



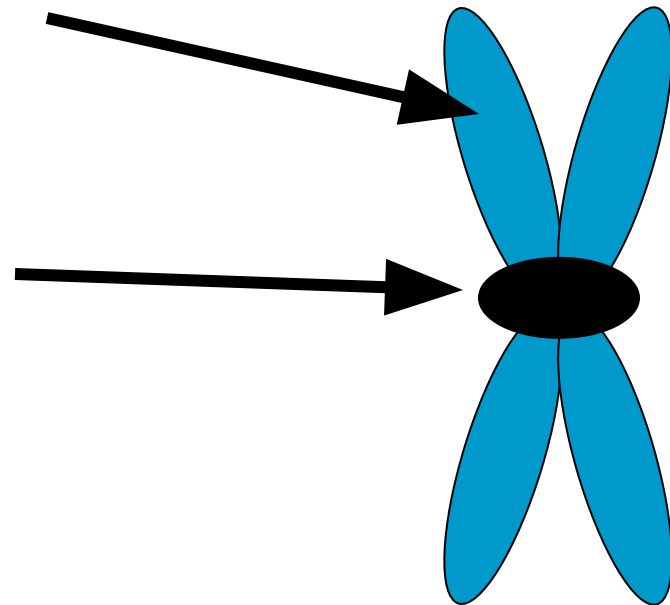
25 μm

TELOPHASE AND CYTOKINESIS



Prophase

- Nuclear envelope disappears
- Chromosomes condense – can see sister chromatids
- Spindle forms



A vertical chromosome is shown on the left side of the slide. It consists of a central centromere (black) and two arms. The arms are decorated with various colored bands: blue, yellow, light blue, dark blue, and black. The chromosome is oriented vertically, with the centromere in the middle.

Metaphase

- Chromosomes move to the equator of spindle
- Each chromatid is attached to spindle with centromere



Anaphase

- Centromeres split
- Sister chromatids are pulled apart to opposite poles of the cell
- Each chromatid is now a separate chromosome



Telophase

- Nuclear envelopes (2) reform
- Chromosomes begin to uncoil



Cytokinesis

- Cytoplasm divides
- Two new daughter cells are now separate