

Cell Growth

Chapter 10.1

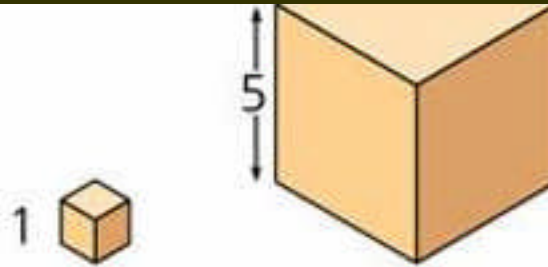
Limits to Cell Growth

- ❖ Most living things grow larger by producing more cells rather than larger cells.
- 1. **DNA Overload:** DNA is the “reference manual” for the cell, but there are only 2 copies per cell.

2. Surface Area:Volume

- Surface area determines the rate at which nutrients enter and wastes leave the cell.
- Volume determines the rate at which nutrients are used up and wastes are produced.

Cells can only grow so large because the need for nutrients (volume) grows faster than the ability to absorb nutrients (surface area).



Total surface area (height × width × number of sides × number of boxes)	6	150
Total volume (height × width × length × number of boxes)	1	125
Surface-to-volume ratio (surface area ÷ volume)	6	1.2

Cell Division

The process by which a cell replicates its DNA and divides into 2 daughter cells.

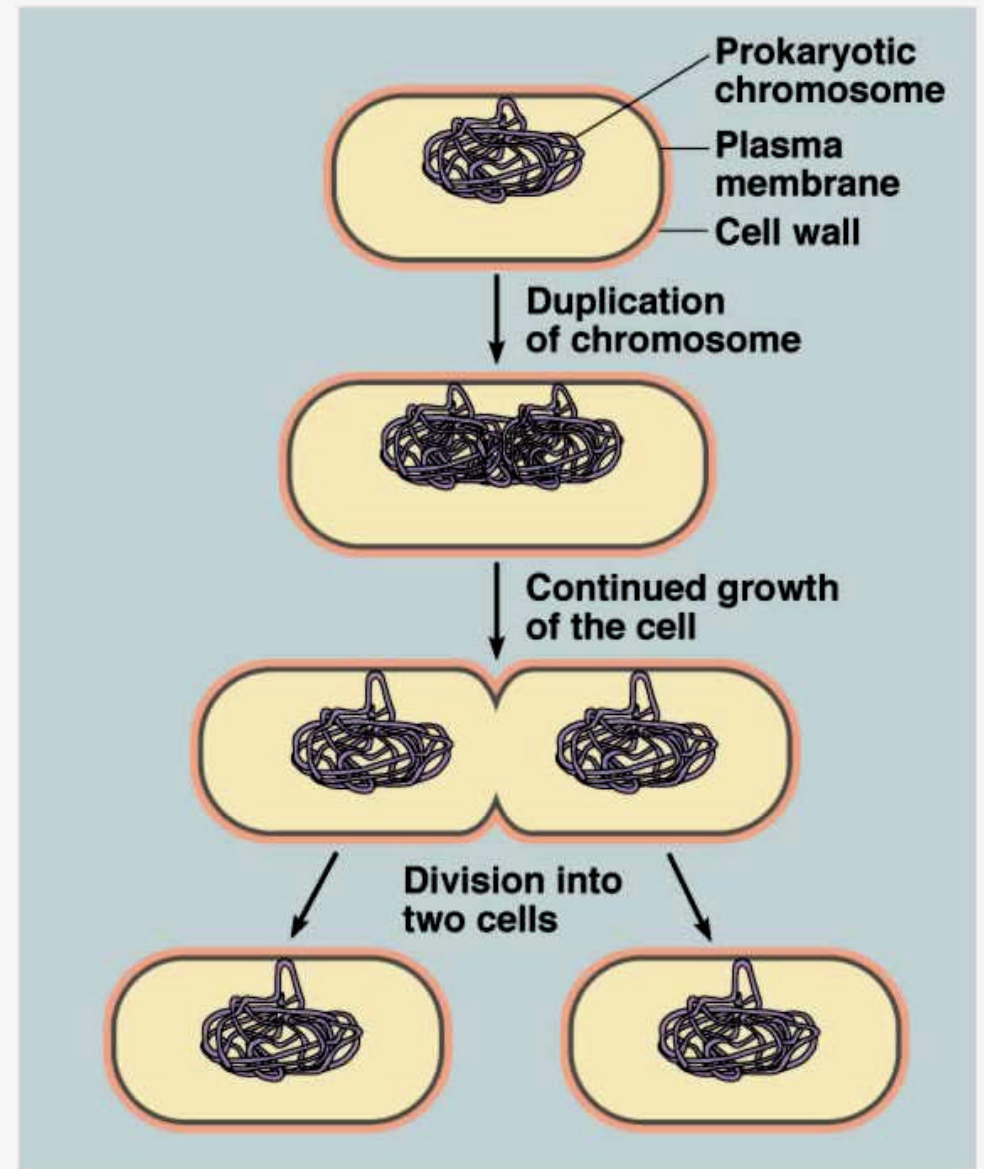
Cell Division

Chapter 10.2

I. Types of cell division

A. Prokaryotes:

- Identical daughter cells produced by Binary Fission



B. Eukaryotes:

Mitosis:

- Produces 2 identical daughter cells from a non-sex cell.

Meiosis:

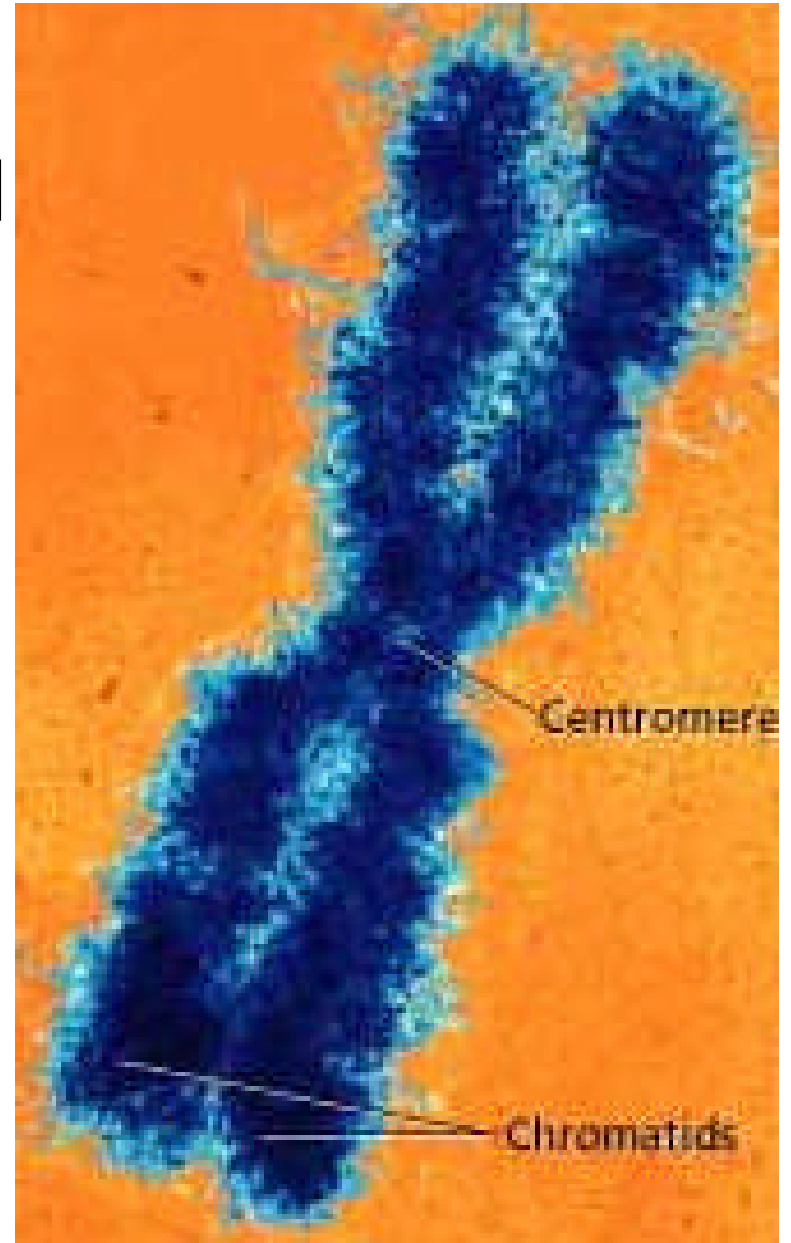
- Produces 4 non-identical cells with half the chromosomes (CH 11)
- Sex cells only.

II. Chromosome Structure

Chromosomes: rod-shaped structures made of tightly coiled DNA and proteins

Sister Chromatids: Two identical halves of a chromosome

Centromere: Holds chromatids together



Chromosome Numbers

- Each species has a certain number of chromosomes in each cell

Fruit Fly = 8

Carrot = 18

Human = 46

Chimpanzee = 48

Horses = 64

Adder's Tongue Fern = 1,260

III. Cell Cycle

Describes the life cycle of a cell and includes:

1. Cell growth
2. DNA replication
3. Division

INTERPHASE

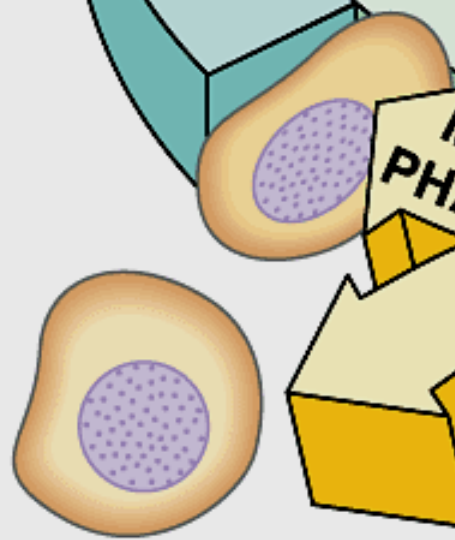
G_1

S
(DNA synthesis)

G_2

Cytokinesis
Mitosis

MITOTIC
PHASE (M)



A. Interphase

Chromosomes are not visible.

G1: 1st growth phase

S: DNA is replicated

G2: 2nd growth phase

INTERPHASE

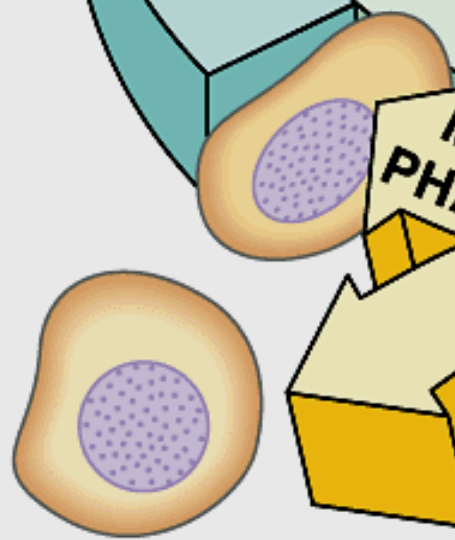
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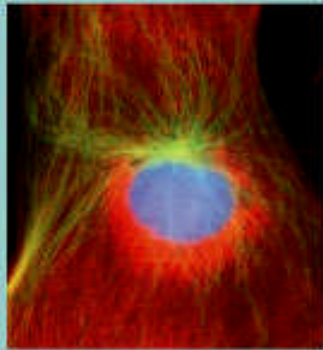


B. Mitosis

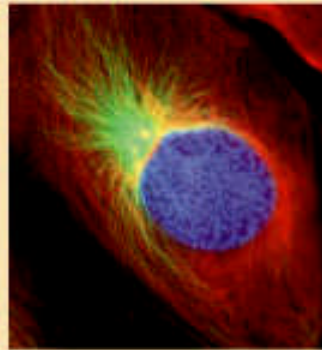
Divided into 4 Phases

- 1. Prophase:** Chromosomes condense (visible), spindles form, nuclear envelope breaks down.
- 2. Metaphase:** Chromosomes line up across the center of the cell.
- 3. Anaphase:** Sister chromatids separate.
- 4. Telophase:** Chromosomes gather at each end of cell and 2 nuclear envelopes form.

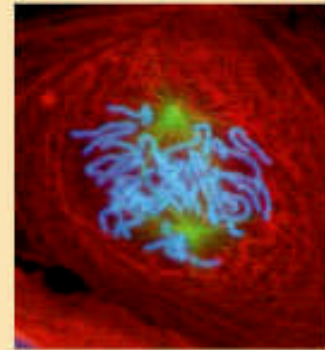
PMAT



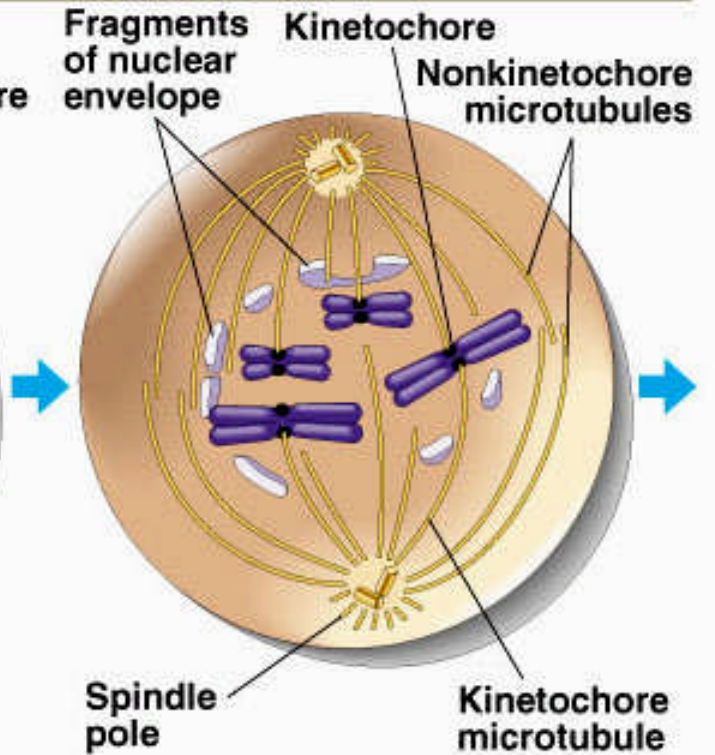
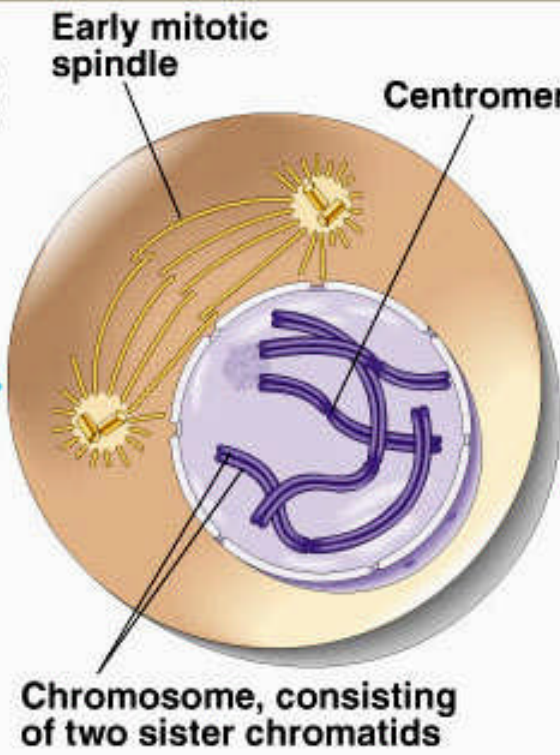
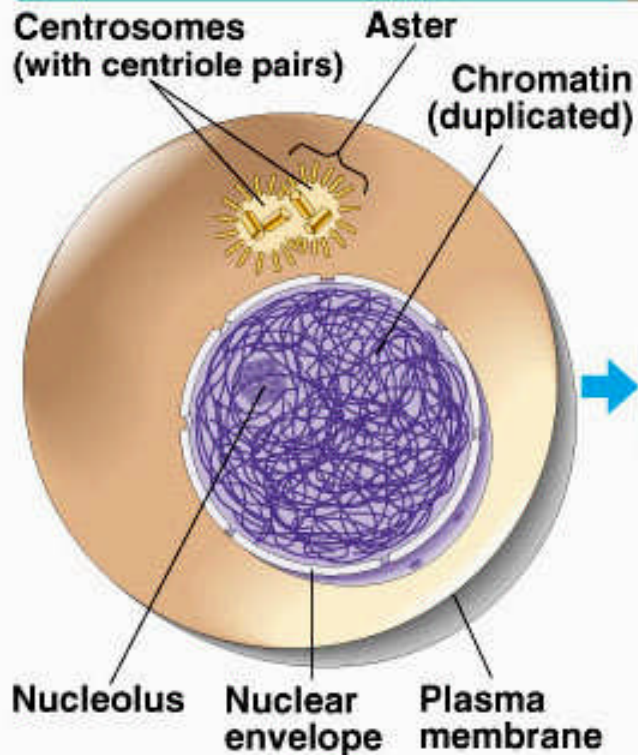
G₂ OF INTERPHASE

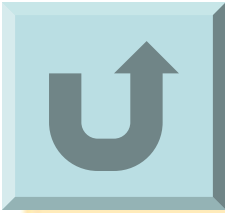


PROPHASE



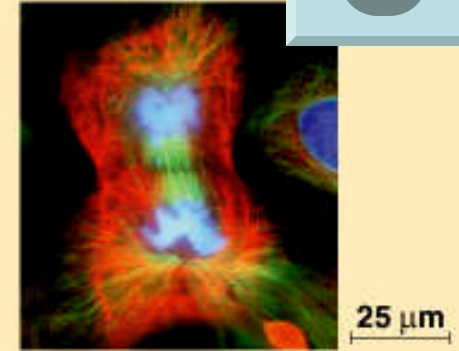
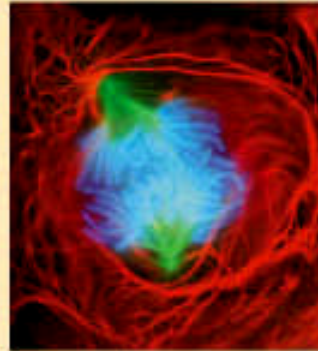
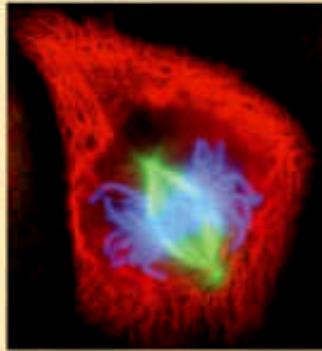
PROMETAPHASE





Self-check

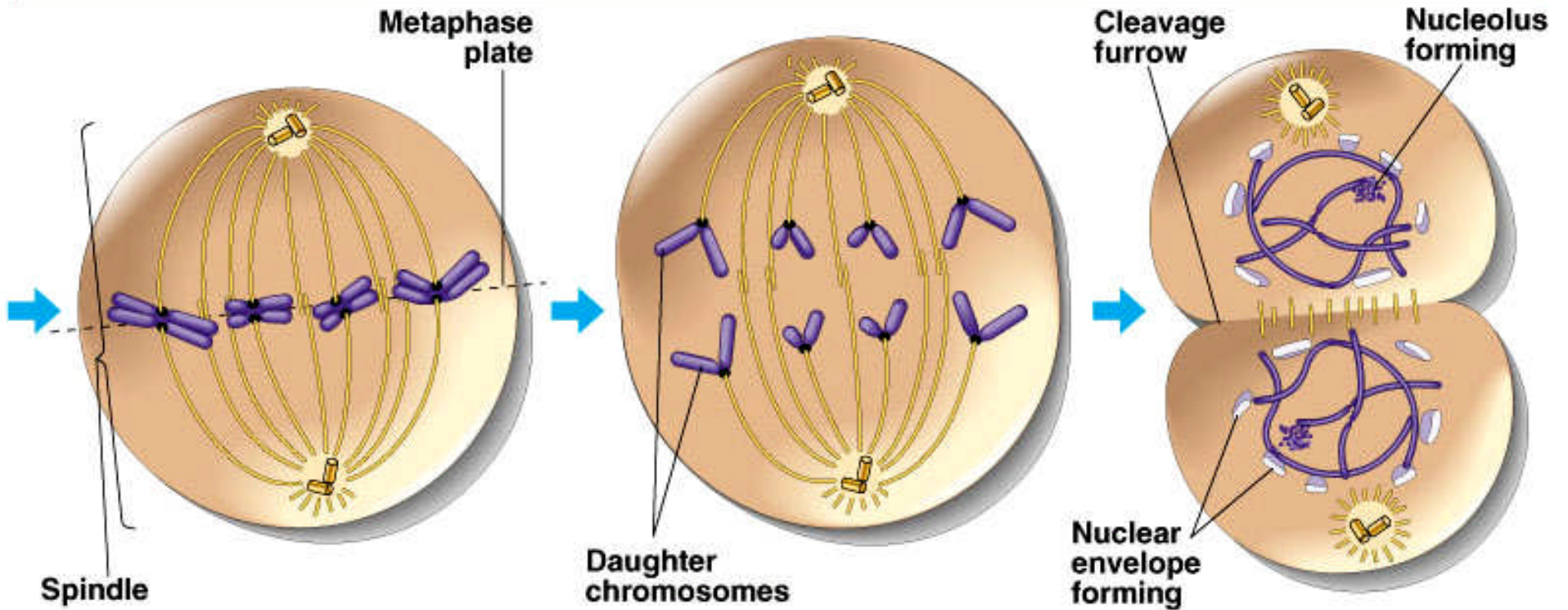
Meiosis

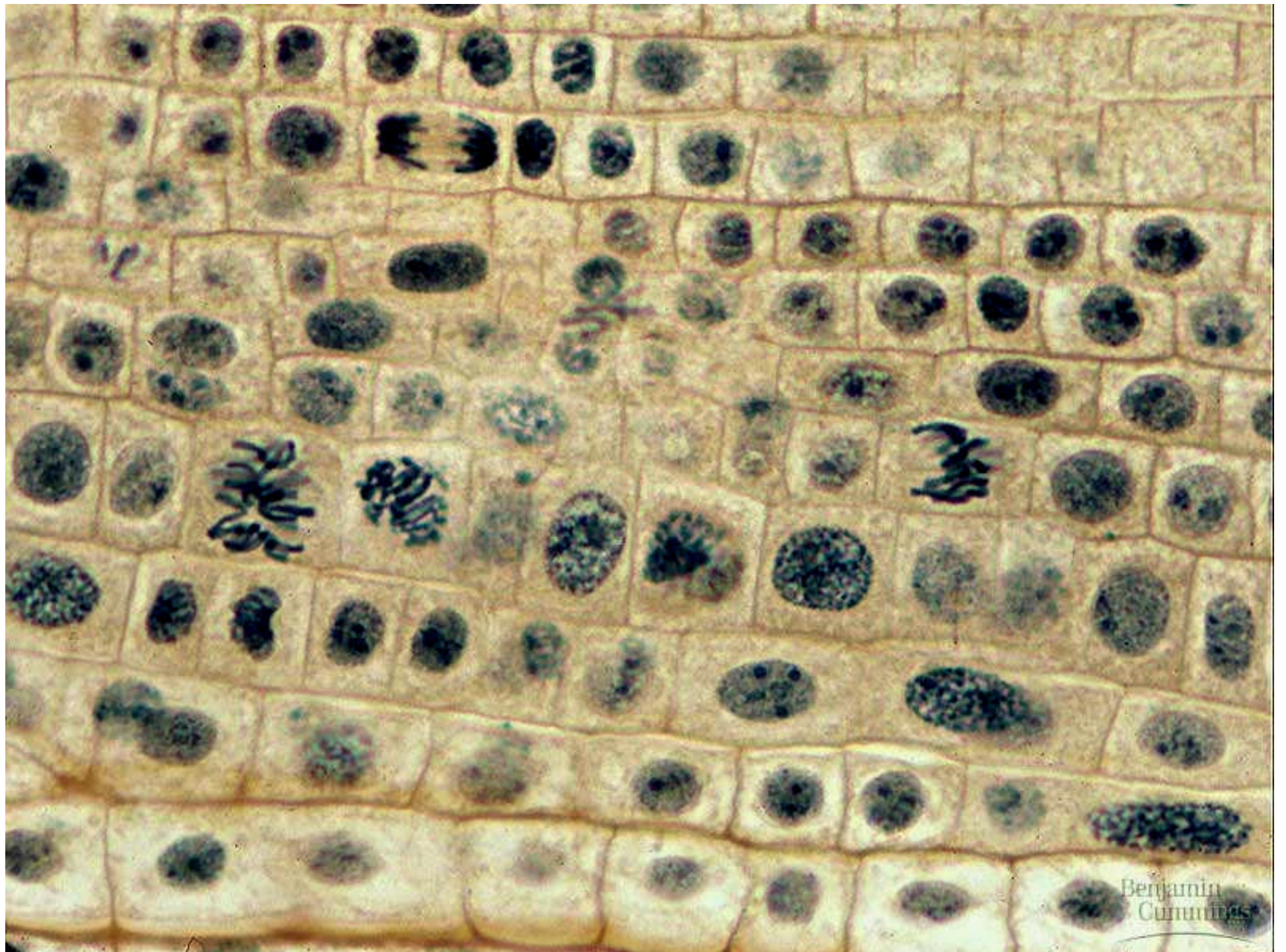


METAPHASE

ANAPHASE

TELOPHASE AND CYTOKINESIS

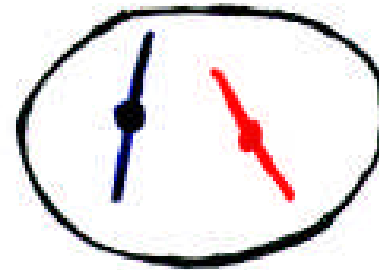




Benjamin
Cummins

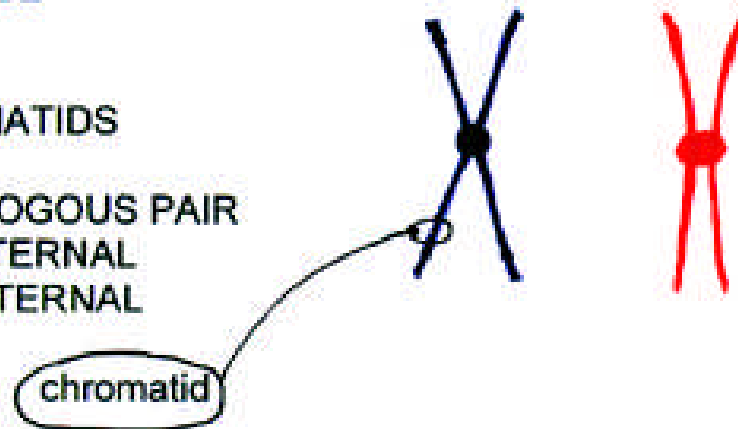
HOMOLOGOUS PAIR
OF CHROMOSOMES IN A
DIPLOID PARENTAL CELL

1 pair

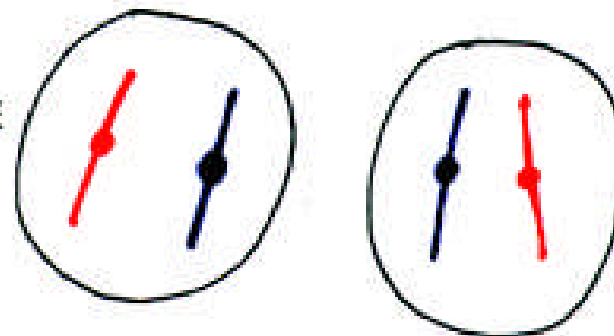


CHROMOSOME REPLICATE
DURING "S" PHASE

4 SISTER CHROMATIDS
2 HOMOLOGUES
OF A HOMOLOGOUS PAIR
ONE PATERNAL
ONE MATERNAL



DURING MITOSIS
CHROMATIDS OF A HOMOLOGUE
SEPARATE



Mitosis

- For both plant and animal cells, the offspring cells are equal in size and have identical DNA
- Each offspring cell also has half the cytoplasm and organelles