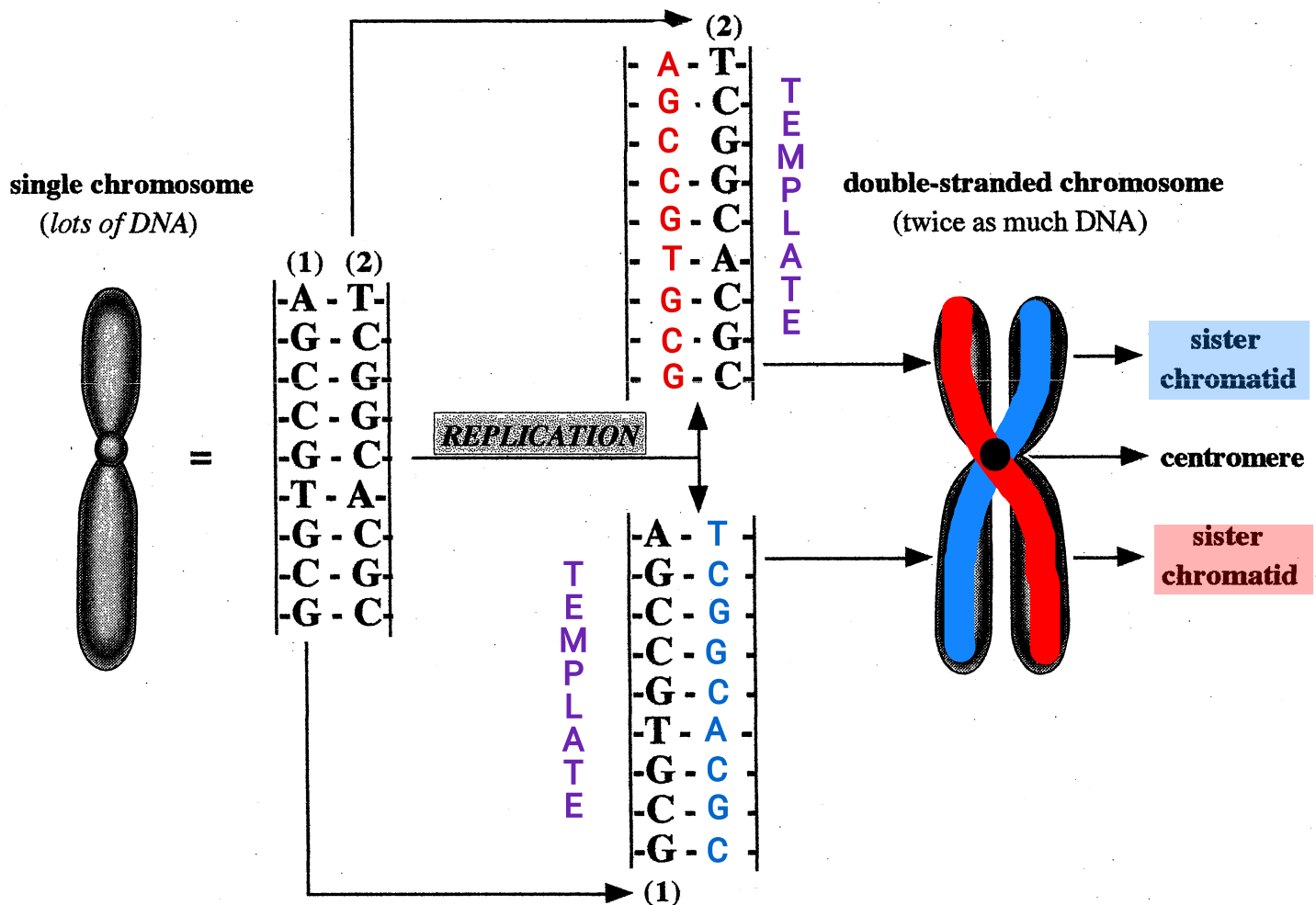
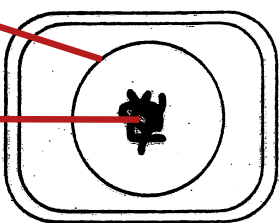
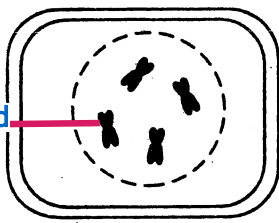
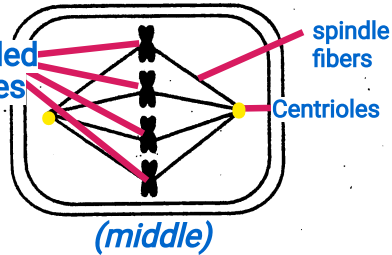
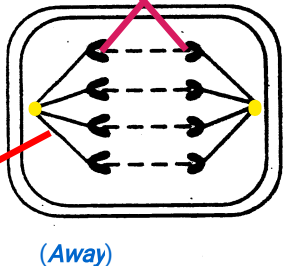
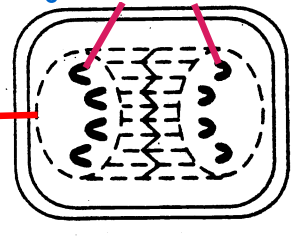


A. DNA REPLICATION

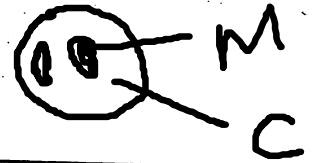
- During replication DNA "unzips" or splits down the center allowing the base pairs to separate. This produces 2 distinct strands of DNA.
- Free nucleotides come in, match up with the correct bases, and join together to form a *complimentary* strand for each original strand. The result is 2 identical strands of DNA which coil up tightly to form a replicated chromosome held together at the centromere.
- The double-stranded chromosome then divides and each chromosome ^(sister chromatid) ends up in the nucleus of each genetically identical daughter cell.
- This replication and division of the nucleus is called mitosis.



B. STAGES OF MITOSIS: (IPMAT)

Stage Name:	Stage Description:
 <p>(1) INTERPHASE</p>	<p>(1) DNA Replication occurs. (Single-stranded → Double-stranded chromosome)</p>
 <p>(2) PROPHASE</p>	<p>(1) Double-stranded chromosomes condense. (2) Nuclear membrane breaks down. (3) Centrioles move to opposite sides of the cell. (4) Spindle fibers emerge from the centrioles.</p>
 <p>(3) METAPHASE</p>	<p>(1) Double-stranded chromosomes line up along the equator (center) of the cell. "middle"</p>
 <p>(4) ANAPHASE</p>	<p>(1) Double-stranded chromosomes separate at the centromere. (2) Chromosomes migrate (move) to opposite sides of the cell.</p>
 <p>(5) TELOPHASE</p>	<p>(1) 2 sets of chromosomes reach opposite sides of the cell. (2) Nuclear membrane reforms around the 2 nuclei. RESULT = 1 cell with 2 genetically identical nuclei</p>

C. CYTOKINESIS (movement of the cytoplasm)



CYTOLOGY REVIEW:

Do you remember the **MAIN** differences between animal and plant cells?

- (1) Animal cells have centrioles used in cell division.
- (2) Plant cells have chloroplast filled with chlorophyll used in photosynthesis.
- * (3) Plant cells have a cell wall composed of cellulose.

- At the ^(telophase) end of mitosis, we are left with 1 cell with 2 genetically identical nuclei. In order to get TWO cells, the cytoplasm must divide forming two separate cells.
- This process is called cytokinesis.
- Due to the structural differences between animal and plant cells, the process of cytokinesis is NOT the same for both kinds of cells.

1. CYTOKINESIS IN ANIMAL CELLS [Figure 20-4]

- Cytoplasmic division occurs by the pinching in of the cytoplasm

2. CYTOKINESIS IN PLANT CELLS [Figure 20-6]

- Cytoplasmic division occurs by the formation of a cell plate that joins with and turns into the cell wall
(cellulose)

II. **ASEXUAL REPRODUCTION** (404 - 411)

Not

REPRODUCTION - the life function by which living things produces new organisms of their *own kind* or species.

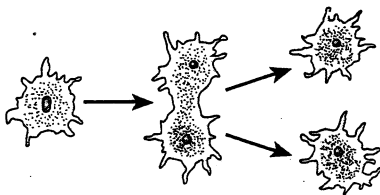
A. **2 TYPES OF REPRODUCTION**

ASEXUAL	SEXUAL
(1) Involves only <u>1</u> parent. (2) Offspring are genetically <u>IDENTICAL</u> to parent. ↓ <u>CLONES</u>	(1) Involves <u>2</u> parents (2) Offspring contain genetic material (<u>DNA</u>) from <u>2</u> parents and are <u>NOT</u> genetically identical to either one. ↓ <u>VARIATION</u> (genetically different)

B. **EXAMPLES OF ASEXUAL REPRODUCTION**

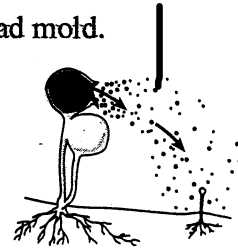
(1) **Binary Fission**

- Parent organism divides into two EQUAL parts. **Ameba**



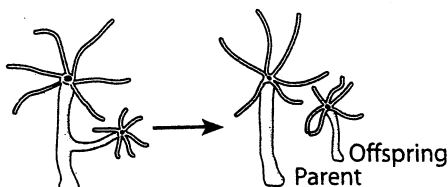
(3) **Sporulation**

- Bread mold forms **SPORES** to produce more bread mold.



(2) **Budding**

- Parent organism divides into two UNEQUAL parts. **Hydra**



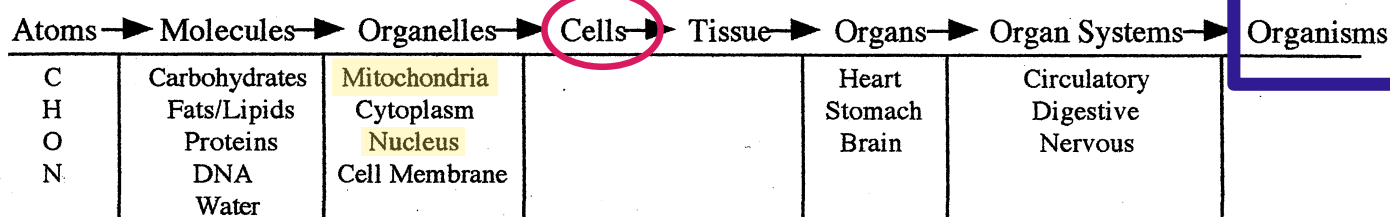
(4) **Vegetative Propagation**

- When plants reproduce using roots, stems, and leaves.



III. THE SCIENCE OF AGING (1960's)

Review of Biological Organization



A. Possible Causes of Cellular Aging

- (1) High calorie diet: obesity + diabetes = diabetes
- (2) The slow deterioration (shortening) of telomeres after each cell division.
- (3) Oxidation of $C_6H_{12}O_6$ due to eating too much sugar.

(Noble Prize in Medicine 2009)

B. The Telomere Hypothesis

"Normal" cells can only divide by mitosis a limited number of times and this number of cell divisions is related to the age and lifespan of an organism.

EXAMPLES:

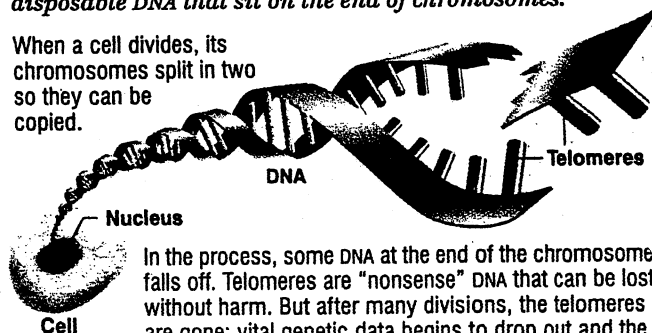
Organism	Cell Divisions	Life Span
Fruitfly	15	30 days
Butterflies	15	84 days
Mice	20	2-4 years
Dogs	30	15 years
Humans	50	122 years
G. Tortoise	100	175 years

(Progeria)

The cellular time bomb

One theory of aging focuses on telomeres, bits of disposable DNA that sit on the end of chromosomes.

When a cell divides, its chromosomes split in two so they can be copied.



In the process, some DNA at the end of the chromosome falls off. Telomeres are "nonsense" DNA that can be lost without harm. But after many divisions, the telomeres are gone; vital genetic data begins to drop out and the cell begins to malfunction.