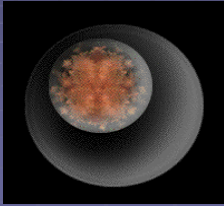


## The Process of Cell Division

### Section 10.2

Biology B



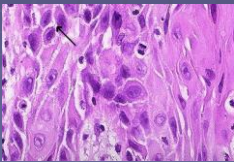
## Section 10.2: The Process of Cell Division

- The student will investigate and understand common mechanisms of inheritance and protein synthesis.
- Key concepts include:
  - a) cell growth and division;
  - b) gamete formation; and
  - c) cell specialization.

## Cell Division

7 week old embryo

- Some cells divide constantly: cells in the embryo, skin cells, gut lining cells, etc.



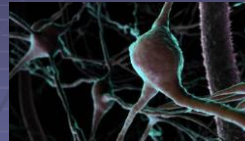
Epithelial Cell



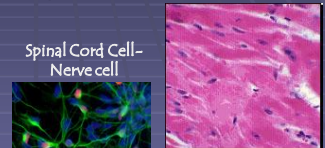
Intestinal Cell

## Cell Division

- Other cells divide rarely or never.



Brain Cell – Nerve cell



Spinal Cord Cell-  
Nerve cell



Cardiac Cell  
(Heart Muscle)

## Cell Division Vocabulary

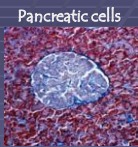
- somatic cell – a body cell; a cell whose genes will not be passed on to future generations.
- sex or germ cell – a cell that is destined to become a gamete (egg or sperm); a cell whose genes can be passed on to future generations.

## Cell Division Vocabulary

- diploid (2N) – a cell with 2 chromosome sets in each of its cells; all body (somatic) cells
- haploid (N) – a cell with 1 chromosome set in each of its cells; all gametes (sperm, eggs)

## Cell Division

- 2 kinds of cell division:
  - 1. Mitosis: Division of somatic cells
  - 2. Meiosis: Creation of new sex cells



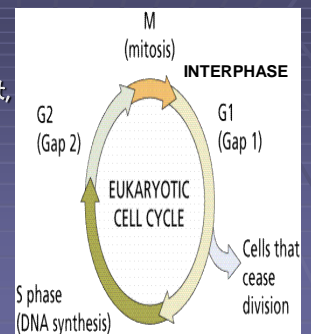
Sperm cells



Human egg cell

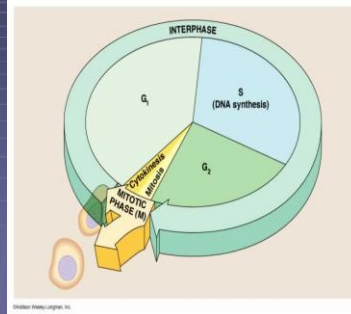
## Cell Cycle

- A typical cell goes through a process of growth, development, and reproduction called the cell cycle.
- Most of the cycle is called interphase.



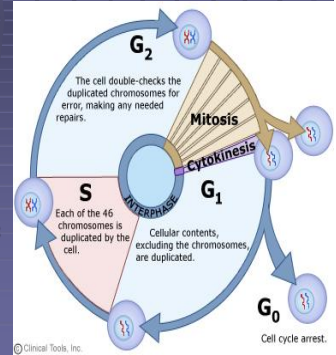
## Cell Cycle

- The longest phase in the cell cycle is interphase.
- The 3 stages of interphase are called  $G_1$ , S, and  $G_2$ .



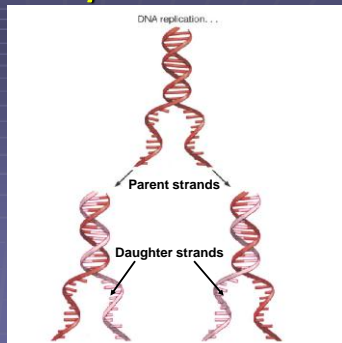
## Cell Cycle

- Cells spend most of their time in  $G_1$ ; it is the time when the cell grows and performs its normal function.
- Control of cell division occurs in  $G_1$ ; a cell that isn't destined to divide goes into  $G_0$ .



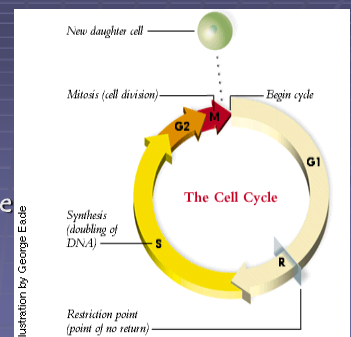
## Cell Cycle

- The S phase ("Synthesis") is the time when the DNA is replicated.

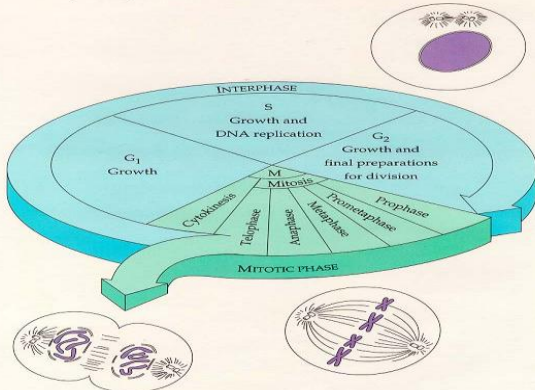


## Cell Cycle

- $G_2$  is the period between S and mitosis.
- DNA replication is checked and the cell is getting ready to divide.



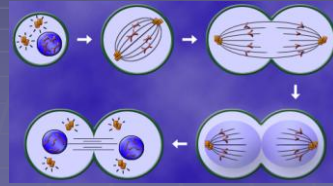
The cell cycle (Figure 11.5)



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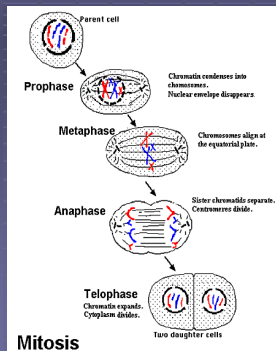
## Cell Division

- All living cells come from other living cells.
- During mitosis, the nucleus of the cell divides, forming two nuclei with identical genetic information.



## Mitosis

- Mitosis produces two genetically identical cells.
- Mitosis is referred to in the following stages: prophase, metaphase, anaphase, and telophase.

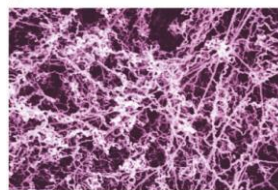


Mitosis

## Prophase

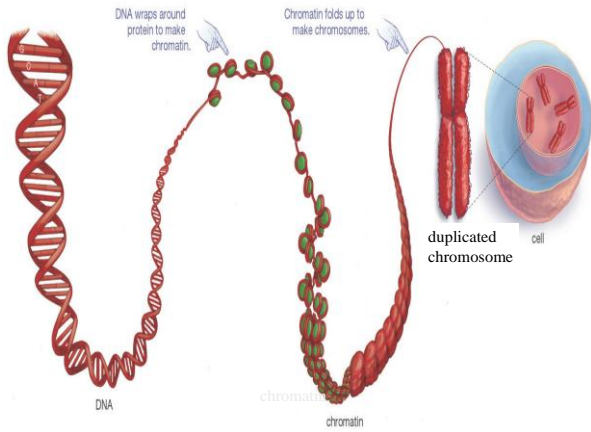
- In prophase, the cell begins the process of division.
- The chromosomes condense.

(a) DNA in uncondensed form



(b) DNA condensed into duplicated chromosomes





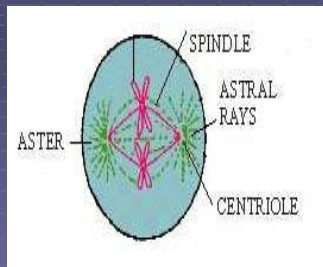
## Prophase

- Nuclear envelope disappears.



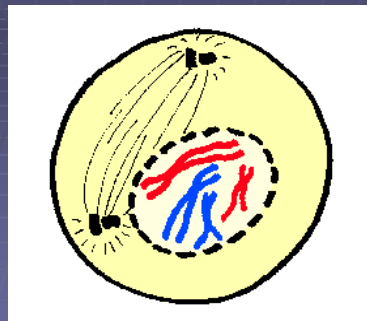
## Prophase

- Centrioles migrate to opposite poles of the cell.
- Asters and spindle fibers form.

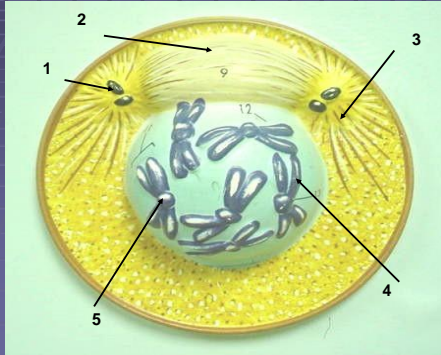


Aster and the mitotic apparatus in an animal cell

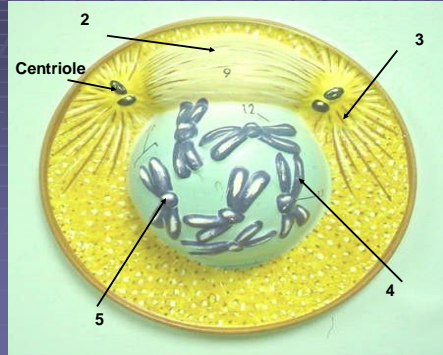
## Draw Prophase



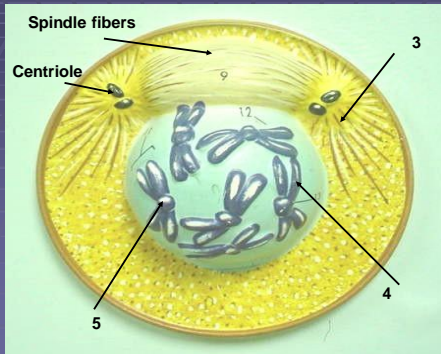
### Prophase



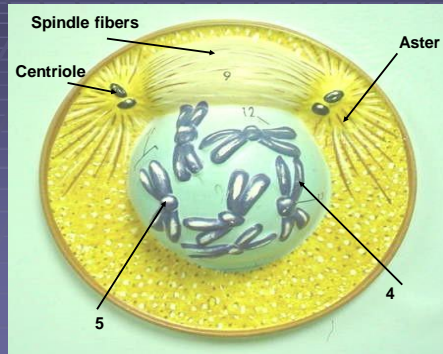
### Prophase



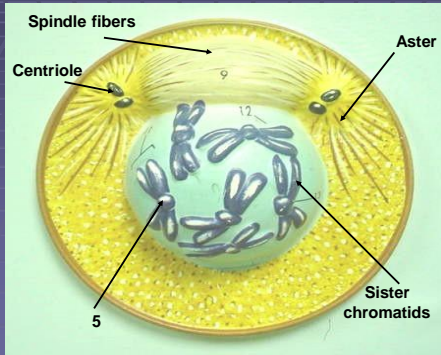
### Prophase



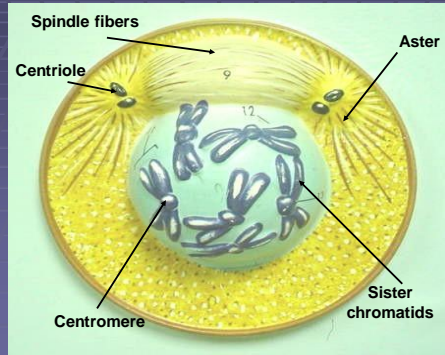
### Prophase



## Prophase

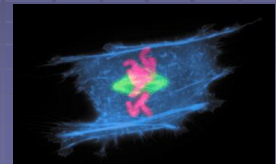
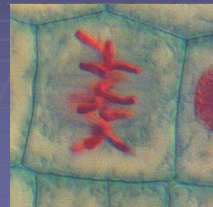
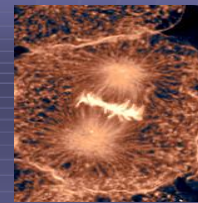
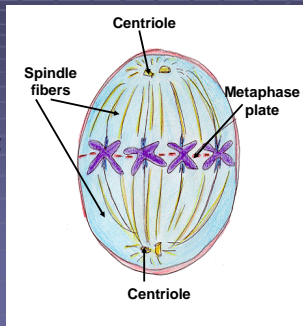


## Prophase

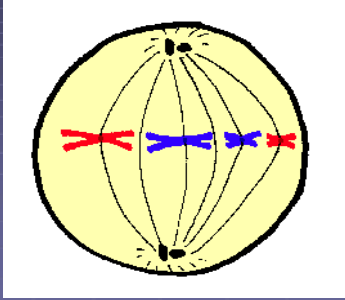


## Metaphase

- The chromosomes line up at the equator of the cell (metaphase plate), with the centrioles at opposite ends and the spindle fibers attached to the centromeres.

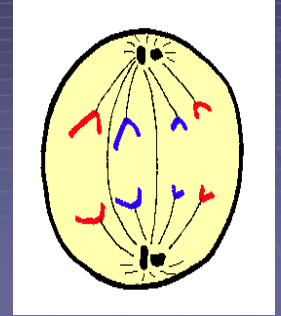


## Draw Metaphase



## Anaphase

- In anaphase, the centromeres divide.
- At this point, each chromosome goes from having 2 sister chromatids to being 2 separate chromosomes

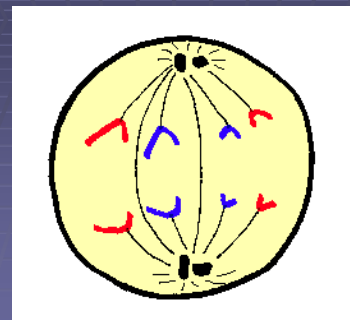


## Anaphase

- The spindle fibers contract and the chromosomes are pulled to opposite poles.

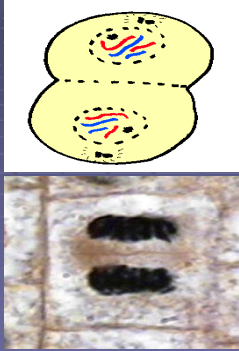


## Draw Anaphase

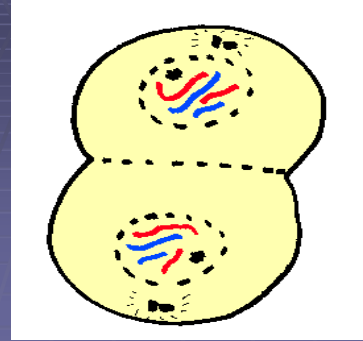


## Telophase

- In telophase the cell actually divides.
- The chromosomes are at the poles of the cell.
- The nuclear envelope reforms around the two sets of chromosomes.

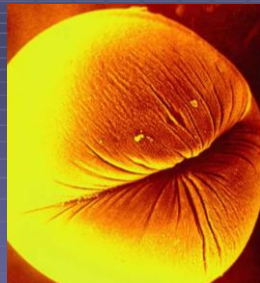


## Draw Telophase



## Cytokinesis

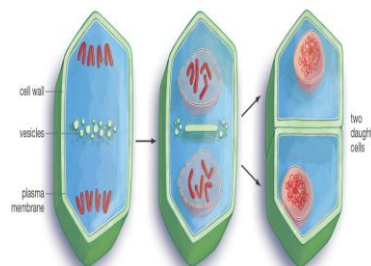
- The division of the cytoplasm.
- In animal cells, a Cleavage Furrow forms and separates Daughter Cells



Cleavage furrow in a dividing frog cell.

## Cytokinesis

- In plant cells, a Cell Plate forms and separates Daughter Cells.



Cell Plate forming

## ANIMAL VS. PLANT MITOSIS

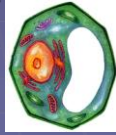
### ANIMAL CELL

- Centriole and aster present
- Daughter cells separated by cleavage furrow

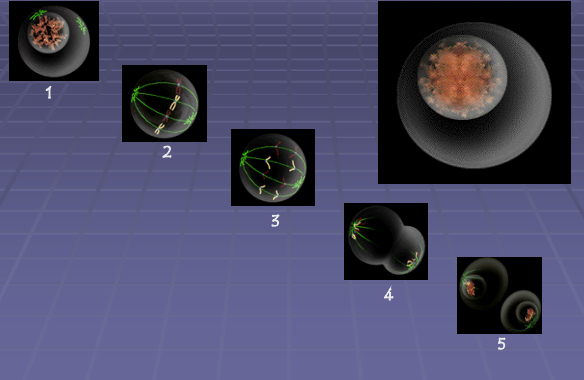


### PLANT CELL

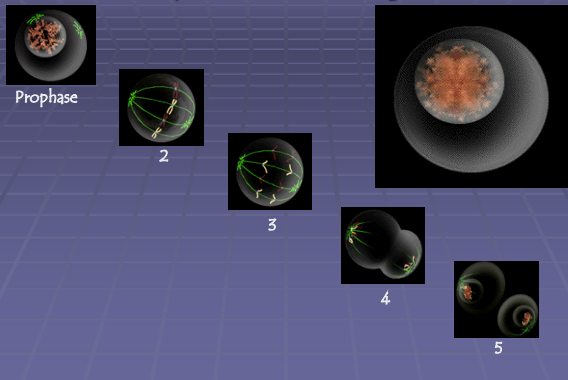
- No visible centriole or aster
- Daughter cells separated by cell plate



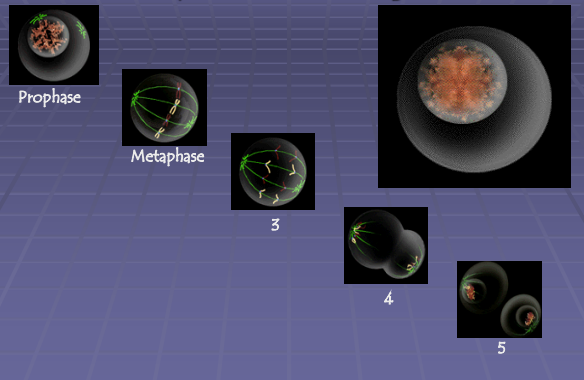
Mitosis: Can you name the stages?

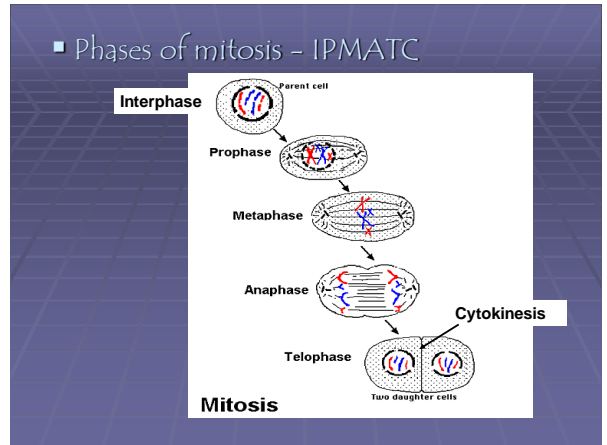
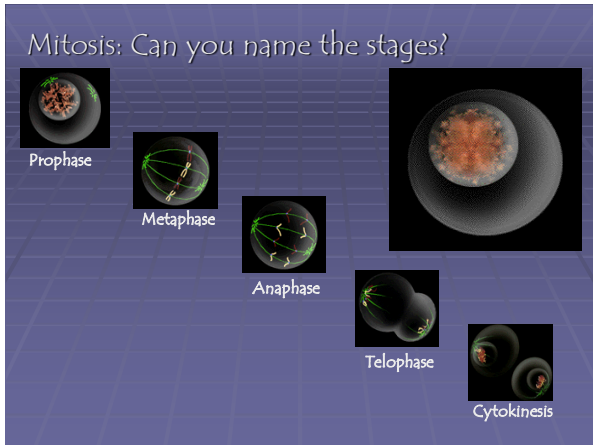
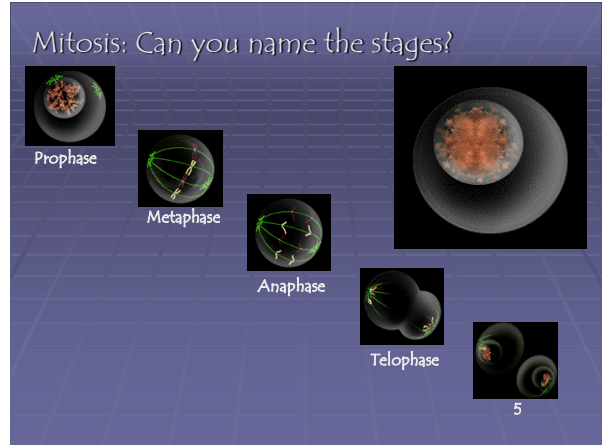
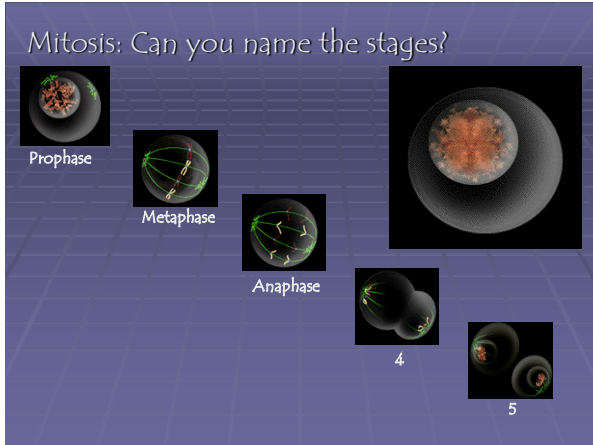


Mitosis: Can you name the stages?



Mitosis: Can you name the stages?





- Phases of mitosis - IPMATC

Important                      Impatient

People                              People

Must                                May

Analyze                          Attack

Tasks                              Teachers

Correctly                        Constantly