

## Cell Growth and Division

- protein synthesis within cells causes them to grow
- **Why must Cells Divide?**
  - : Strength of the plasma membrane
    - can't accommodate the volume of the cytoplasm (too big for its skin)
  - : Surface area to Volume Ratio
    - the rate of diffusion through the plasma membrane is not fast enough to sustain the life functions of the cell ○
  - : Nuclear Control of the Cell
    - messages must travel from the nucleus to all parts of the cell quickly
  - : Regeneration
    - replace injured cells in multicellular organisms
  - : Reproduction
    - continuity of the species for unicellular organisms (binary fission)
- **Cell Division**
  - occurs in all somatic (body) cells
  - is the process by which the total number of cells in an organism increases
    - = why you get bigger
  - one parent cell triggers to asexually reproduce itself **exactly** forming 2 **identical** daughter cells
  - the mother cell passes on its characteristics through duplicable strands called **chromosomes**
  - chromosomes are made of **Deoxyribonucleic Acid (DNA)** and contain the hereditary codes and instructions of the cell
  - before the mother cell splits, its chromosomes must be duplicated into 2 sets ○
    - when the mother cell splits 1 set of chromosomes goes to each of the 2 daughter cells
- **The Cell Cycle**
  - : the life cycle of a cell has 3 phases: interphase, mitosis and cytokinesis, each of these is further divided for convenience
  - A) Interphase**
    - the time of cell growth and development
    - the phase the cell spends most of its time in
    - is divided into 3 stages:
      - G1 Phase = First Growth Phase
        - period directly following Mitosis
        - the cell grows and develops

S Phase = Synthesis Phase

- the DNA replicates (chromosomes make an exact copies of themselves)  
= **identical twin sister**

G2 Phase = Second Growth Phase

- the cell completes its maturation and prepares to divide

**B) M Phase** = division of the nucleus

- is divided into stages:

Prophase

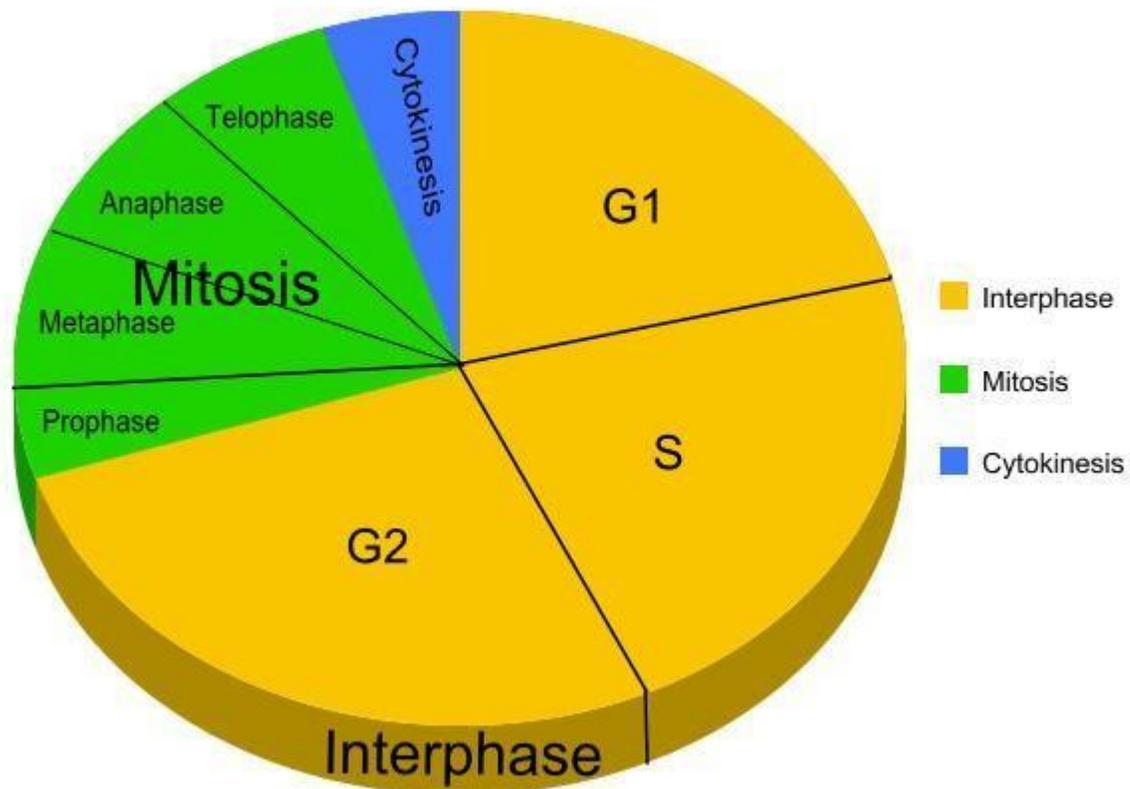
Metaphase

Anaphase

Telophase

- each phase is identifiable by the events which take place

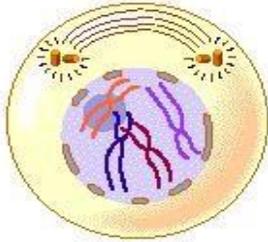
**C) Cytokinesis** = division of the cytoplasm



## • Stages of Mitosis (Animal Cells)

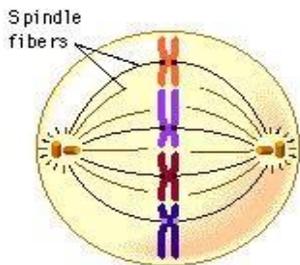
### 1. Prophase

- The replicated chromosomes become visible and can be seen to be comprised of two sister chromatids still joined together at the centromere = **double stranded chromosomes**



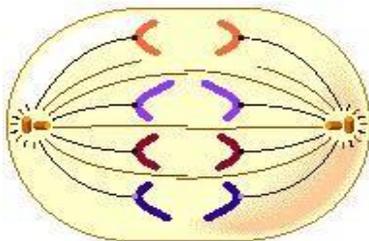
- the nuclear membrane breaks down,
- centrioles move to opposite poles
- and the spindle forms between them.

### 2. Metaphase



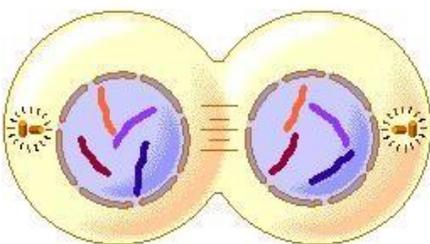
- The chromosomes attach to the spindle at the centromere
- The chromosomes are now at their most condensed.
- They line up at the equator of the spindle.
- Asters are visible at each pole.

### 3. Anaphase



- The centromeres divide.
- the sister chromatids are pulled apart to opposite poles by contracting spindle fibres.

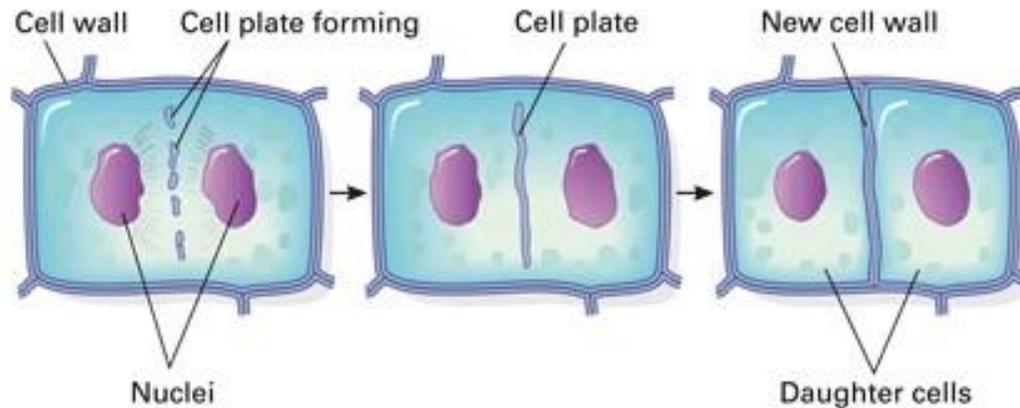
### 4. Telophase



- A nuclear membranes reforms around the single stranded chromosomes at each pole.
- the chromosomes de-condense and get thinner.
- Cytokinesis begins, cytoplasm pinches inwards.
- This phase ends when the daughter cells return to interphase.

## Mitosis in Plant Cells

- differs in certain ways from the Animal Cell Mitosis
- plant cells do not have centrosomes
- plant cells do not form asters
- during cytokinesis a division plate or cell plate forms in the center and grows outward creating a cell wall.



## Rate of Cell Division

- differs with the kind of tissues and organisms
- generally, the simpler the organism, the faster the division
  - ie) Amoeba = every 20 minutes
  - Skin Cells = every few days

## - Factors Affecting the Rate of Cell Division

- injury of cells  
(cutting grass, skin)
- tissue separation  
(during surgery)
- absence of essential nutrients  
( don't eat, don't grow)
- presence of poisons inhibits growth  
(chemotherapy)
- presence of growth factors  
(hormones)
- cell density

- cells can only divide a set number of times through mitosis and then die
  - = explains aging and death of organisms