

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

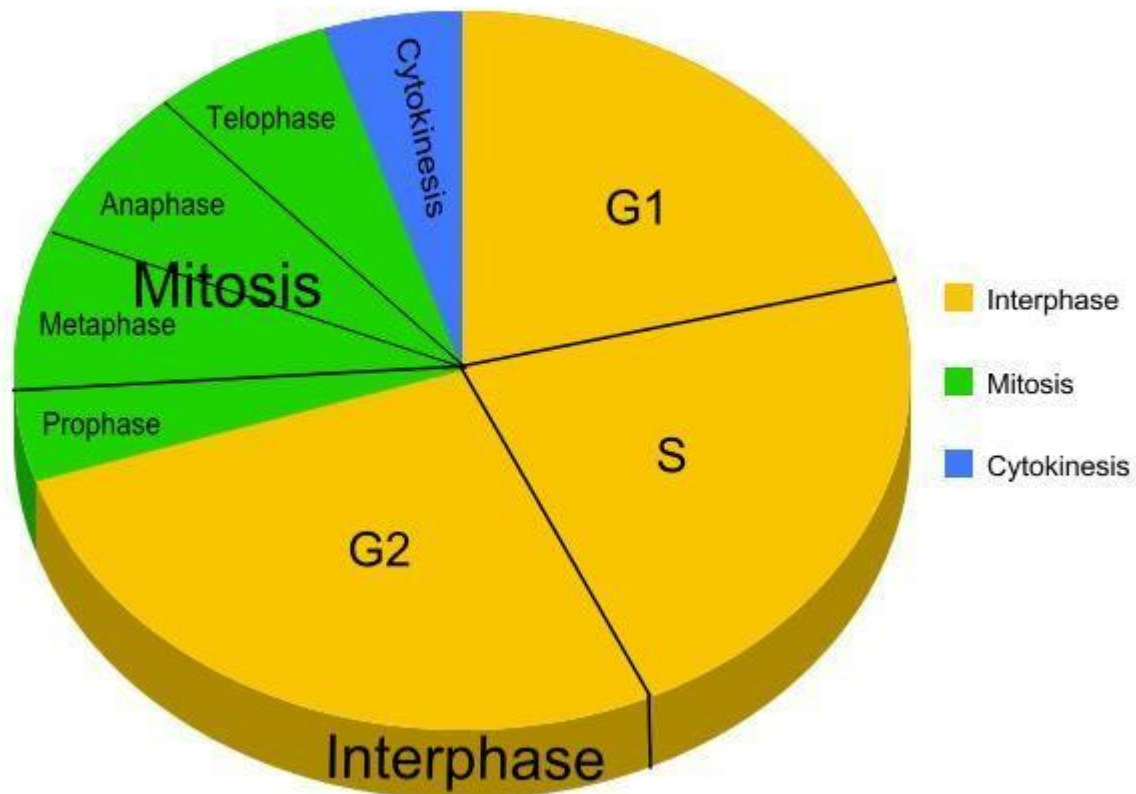
Metaphase

Anaphase

Telophase

- each phase is identifiable by the events which take place

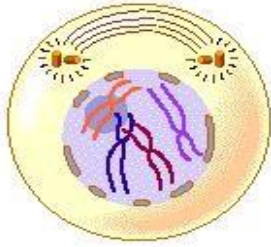
C) Cytokinesis = division of the cytoplasm



• Stages of Mitosis (Animal Cells)

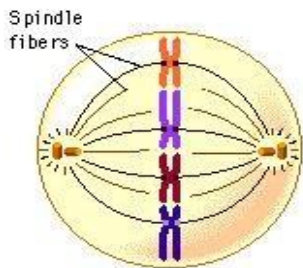
1. Prophase

- 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**



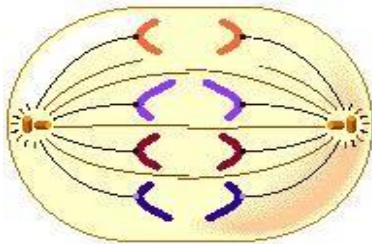
- the nuclear membrane breaks down,
- centrioles move to opposite poles
- and the spindle forms between them.

2. Metaphase



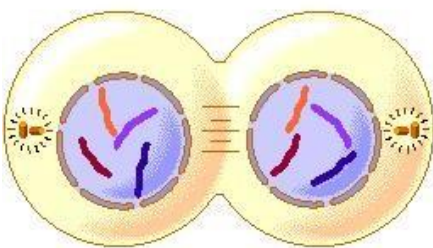
- The chromosomes attach to the spindle at the centromere
- The chromosomes are now at their most condensed.
- They line up at the equator of the spindle.
- Asters are visible at each pole.

3. Anaphase



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

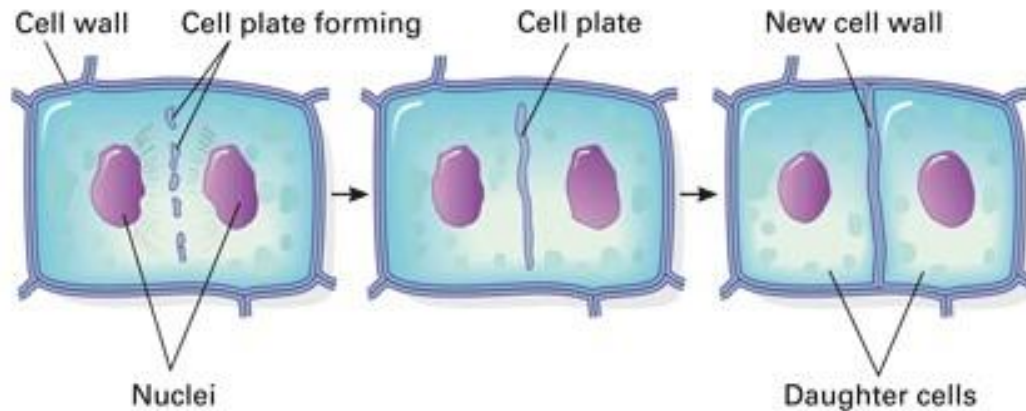
4. Telophase



- 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