

## Chapter 9: Mitosis and Meiosis

- **Chromosomes** – made up of chromatin (DNA and proteins), all have unique information in them, different species differ in #
- 3 reasons cells divide
  1. growth
  2. repair damaged parts
  3. reproduction
- Interphase
  1. G1 – 1<sup>st</sup> growth stage, cell grows
  2. S – synthesis stage, DNA is replicated (chromosomes duplicated)
  3. 2<sup>nd</sup> growth stage, protein synthesis, cell prepares to divide
- Mitosis
  1. Prophase – chromosomes coil, twins pair up into sister chromatids, mitotic spindle forms, centrioles move towards the poles, nuclear envelope breaks down and disappears
  2. Metaphase – chromatids line up along the center of the cell, mitotic spindles attach to the centromeres
  3. Anaphase – chromatids are separated into chromosomes, the cell elongates
  4. Telophase – chromosomes uncoil, mitotic spindles disappear, envelope reforms around the chromosomes, the cell divides
- Differences between plants and animals
  1. Plants lack centrioles in the process
  2. plants form a cell plate to divide within cell wall
- **Cytokinesis** – division of cytoplasm and cell organelles, cell plate moves out in plants and animal cells pinch together
- **Gametes** – special reproductive cells that result in genetic variation in offspring
  1. Spermatogenesis – formation of sperm, 4 haploid cells
  2. Oogenesis – meiosis forms 1 haploid egg cell and 3 polar bodies
- Meiosis
  1. Meiosis 1
    - 1) Prophase I – nuclear envelope broken down, chromosomes condense, spindle fibers form, centrioles move towards poles, tetrads form in 4's by synapsis, maternal and paternal homologues cross over
    - 2) Metaphase I – Tetrads line up on equatorial plate, mitotic spindles attach, (crossing over and independent assortment occurs here at the chiasmata or point of crossing over)
    - 3) Anaphase I – chromosomes separate to different poles, sister chromatids remain attached at centromeres
    - 4) Telophase I – chromatids may condense, cytokinesis may occur
    - 5) Interkinesis – very brief, Interphase without synthesis
  2. Meiosis 2
    - 1) Prophase II – no crossing over, no tetrads, nuclear envelope breaks apart
    - 2) Metaphase II – chromatids line up in the middle of the cell and spindles attach
    - 3) Anaphase II – chromatids pull apart and move to separate poles
    - 4) Telophase II – nuclear envelopes form, full cytokinesis

Mitosis	Meiosis
1 stage	2 stages
2 cells produced	4 cells produced
Forms diploid cells	Forms haploid cells
Identical cells	Unique cells

- Cancer cells have longer **telomeres** which shorten every time in mitosis so they can live longer and divide rapidly

