* Prokaryotic Cell Reproduction
  + Binary fission
    - Starts at specific place on chromosome
      * Origin of replication
    - Origins of new replicated chromosomes move away toward opposite ends of cells
    - Bind to plasma membrane
    - New cell wall between the chromosomes
    - Occurs every 20 mins in optimal conditions
* Eukaryotic Cell Reproduction
  + DNA replication, copy separation, division of cytoplasm
  + Organized nuclear matrix
    - Maintains spatial relations among nuclear components
  + Eukaryotic chromosomes
    - Two sets of chromosomes
      * One maternal and one paternal
      * Homologous pair
        + Alike in structure and size
        + Genetic information for same set of hereditary characteristics
        + Allele: one copy of the same gene
      * Diploid: carry two sets of genetic information
        + Haploid: single set of chromosomes,reproductive cells
        + Polyploid: more than two sets of genetic information
  + Chromosome structure
    - Larger and more complex
    - Highly folded and condensed
    - Three essential elements
      * Centromere
        + Attachment point for spindle microtubules (filaments responsible for moving chromosomes in cell division)
        + Constricted region
        + Kinetochore assembles sentromere before cell division
        + Classification of chromosomes based on centromere location

Metacentric

Submetacentric

Acrocentric

telocentric

* + - * Telomeres
        + Natural ends or tips of linear chromosome
        + Provide stability
        + Aging and cancer role
      * Origin of replication
        + Site where DNA synthesis begins
        + Not observable through microscopy
    - Chromosomes replicate to make identical copies
      * Sister chromatids
      * Held together at centromere
      * Each is one molecule of DNA
* The Cell Cycle and Mitosis
  + Cell cycle: life story of cell
    - Pass genetic instructions to daughter cells
    - Checkpoints: ensure that all cellular components are present and in good working order
      * Defects at checkpoints lead to unregulated cell growth
  + Interphase
    - Period between cell divisions
    - Extended period of growth and development
    - DNA synthesized
    - Checkpoints
    - Three subphases
      * G1 (Gap 1)
        + Cell grows and proteins for division synthesized
        + Several hours
        + G1/S checkpoint holds cell in G1 until ready to replicate DNA
        + Typically 10 hours
      * G0
        + Exit from ell cycle
        + Non-dividing phase
        + Can re-enter G1
      * S (Synthesis)
        + DNA synthesis
        + Chromosomes duplicate
        + Typically 9 hours
      * G2 (Gap 2)
        + G2/M checkpoint holds cell until DNA is completely replicated and undamaged
        + Typically 4 hours
  + M Phase (Mitotic phase: mitosis and cytokinesis)
    - Prophase
      * Mitotic spindle forms
    - Prometaphase
      * Spindle microtubules enter nuclear region
      * Attach to kinetochores of chromatids
    - Metaphase
      * Chromosome arrange in single plane between centrosomes
    - Anaphase
      * Sister chromatids separate and move to opposite poles
    - Telophase
      * Nuclear membrane reforms
      * Cytokinesis
* Genetic Consequences of the Cell Cycle
  + Cell cycle produces two cells that contain same genetic instructions
  + Full complement of chromosomes
    - No net reduction or increase in chromosome number