I. Reproduction and the life cycle
A. Reproduction - production of a new generation of cell(s) that may or may not be identical to those of the parents
B. The life cycle: cell division - growth - DNA duplication - prepare for division - cell division
C. What structures and substances are necessary for inheritance?
   1. DNA - RNA - protein
D. How are substances divided?
   1. Prokaryotic fission - bacteria (binary fission - two parts)
   2. Mitosis & cytokinesis - eukaryotes (asexual reproduction, bodily growth, and repair - can differentiate for specialization; i.e., photosynthesis, support, etc.)
   3. Meiosis & cytokinesis - eukaryotes (sexual reproduction)
E. General trend of division
   1. Sexual reproduction begins with meiosis
      a) Formation of sex cells [gametes - sperm (anther) & egg (ovary)]
   2. Union of gametes results in a zygote (fertilization)
   3. Zygote grows through mitosis - result is an organism
F. General differences between meiosis & mitosis
   1. Meiosis
      a) Two parts - Meiosis I & Meiosis II
      b) Result is half the chromosome (DNA and associated protein) number (haploid)
   2. Mitosis
      a) One part
      b) Result is full chromosome number (diploid)
II. Mitosis (the simplest of the two) and the cell cycle
A. Occurs primarily in regions of actively dividing cells (meristems)
B. The cell cycle (which includes mitosis)
   1. Interphase (the longest phase)
      a) "G1" or gap - accumulation of enzymes needed for DNA synthesis
      b) "S" or synthesis - DNA duplicates
      c) "G2" or gap - premitosis phase (mitosis proteins produced)
   2. MITOSIS
      a) Prophase
         1) Chromosomes visible & "thick"
         2) Nucleolus disappears
         3) Spindle apparatus (microtubules) develops
      b) Metaphase
         1) Chromosomes move to equilateral plane of the cell
         2) Kinetochore [protein near "middle" (centromere)] attach to spindle fibers from sister (duplicate DNA's) chromatids to pole of spindle
         3) Nuclear membrane is gone
      c) Anaphase
         1) Sister chromatids of each chromosome migrate to opposite poles
      d) Telophase
         1) Chromosomes group at opposite poles
         2) New nuclear membrane forms
         3) Each nucleus has same number of chromosomes as the original one
         4) Spindle dissolves
   3. Cytokinesis
      a) Division of cytoplasm
      b) Cell plate (plants) or cleavage furrow (animals) forms
      c) Coincides with late anaphase through telophase