GENERAL BOTANY Lecture 13 - Mitosis & Meiosis Part I

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) "G_1" (gap or growth 1) - accumulation of enzymes needed for DNA synthesis
    - b) "S" or synthesis - DNA duplicates
    - c) "G_2" (gap or growth 2)- premitosis phase (mitosis proteins produced)
  - 2. MITOSIS
    - a) Prophase
      - 1) Chromosomes visible, shorter, and "thick"
      - 2) Nucleolus disappears
      - 3) Spindle apparatus (microtubules) develops
    - b) Metaphase
      - 1) Chromosomes move to equilateral plane of the cell
      - 2) Kinetochores [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 separate and 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