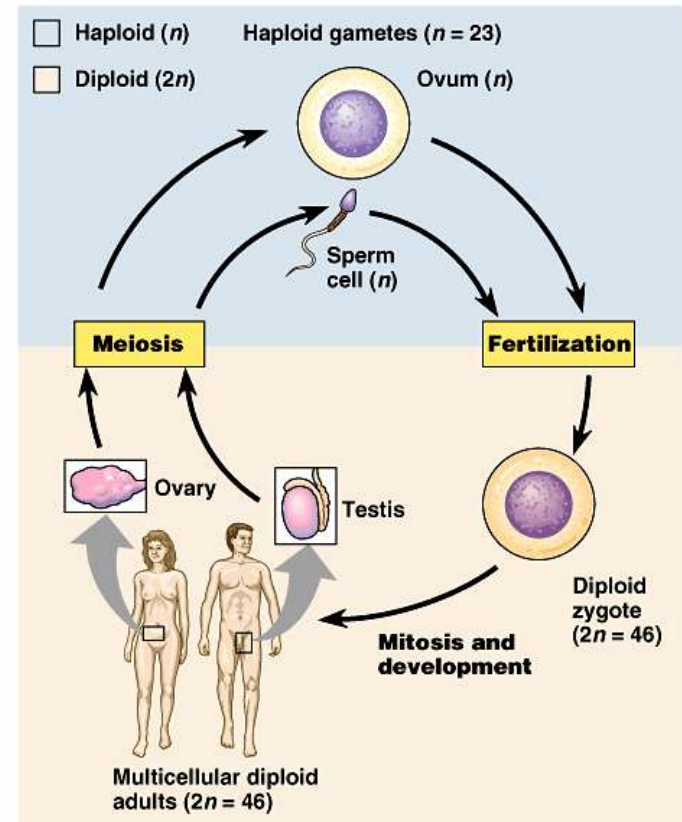




- Meiosis and the Sexual Life Cycle

Heredity

- Heredity: the transmission of traits from one generation to the next
- Asexual reproduction: clones
- Sexual reproduction: variation
- Human life cycle:
 - 23 pairs of homologous chromosomes (46);
 - 1 pair of sex and 22 pairs of autosomes;
- gametes are haploid (1N)/ all other cells are diploid (2N);
- fertilization (syngamy) results in a zygote
- Meiosis: cell division to produce haploid gametes



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

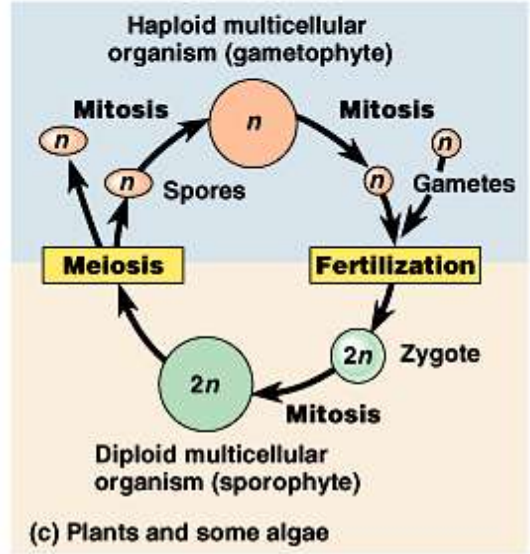
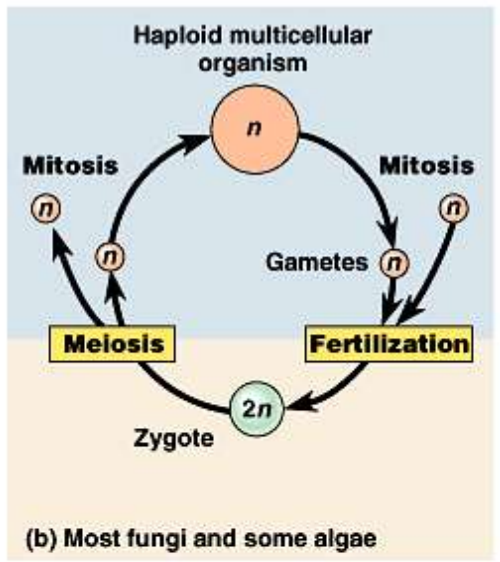
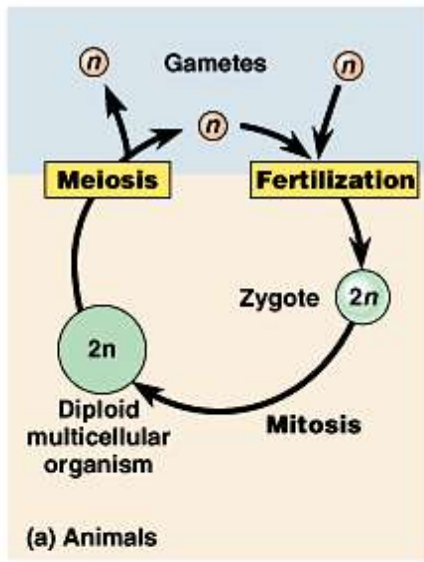
Alternative life cycles

- Fungi/some algae

- meiosis produces 1N cells that divide by mitosis to produce 1N adults (gametes by mitosis)

- Plants/some algae

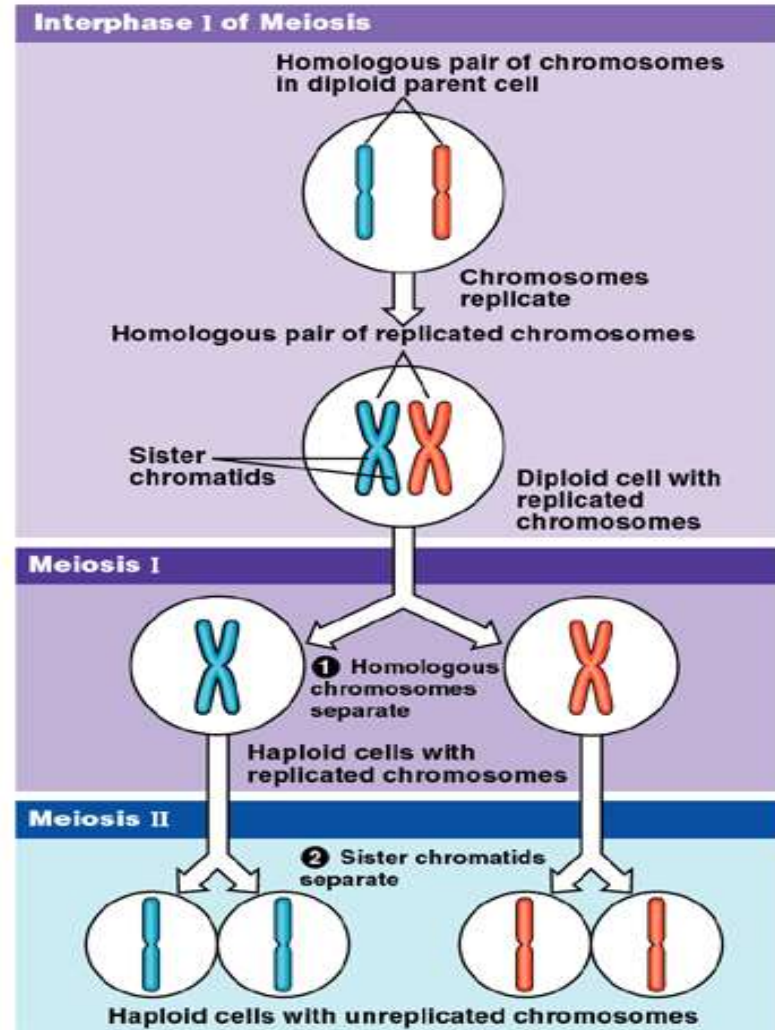
- *Alternation of generations*: 2N sporophyte, by meiosis, produces 1N spores; spore divides by mitosis to generate a 1N gametophyte; gametes then made by mitosis which then fertilize into 2N sporophyte



□ Haploid
 □ Diploid

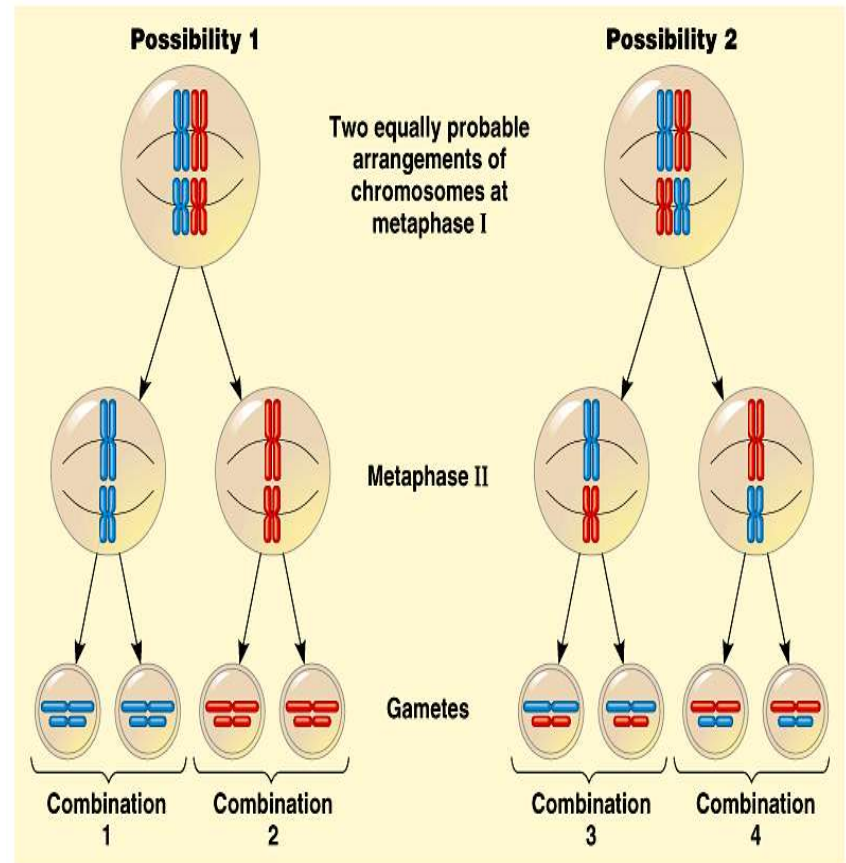
Meiosis

- Preceded by chromosome replication, but is followed by 2 cell divisions (Meiosis I & Meiosis II)
- 4 daughter cells; 1/2 chromosome number ($1N$); variation



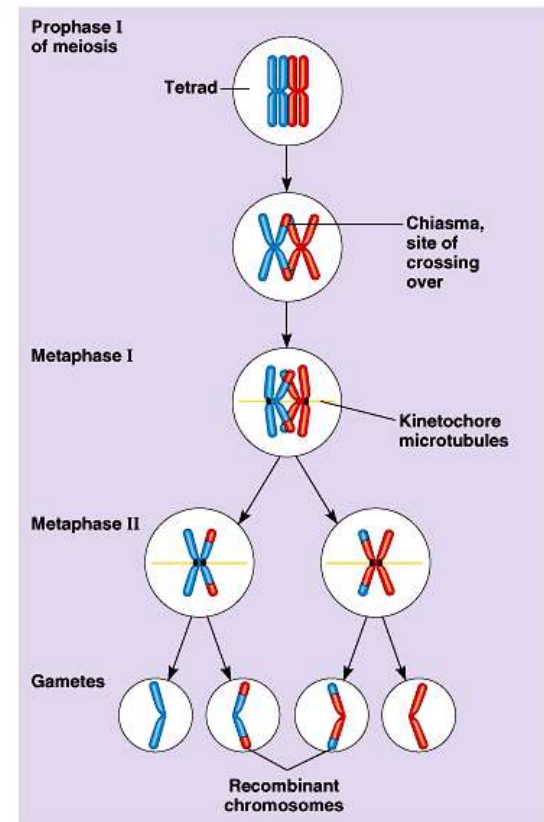
Origins of Genetic Variation, I

- Independent assortment: homologous pair of chromosomes position and orient randomly (metaphase I) and nonidentical sister chromatids during meiosis II
- Combinations possible: 2^n ; with n the haploid number of the organism



Origins of Genetic Variation, II

- Crossing over (prophase I): the reciprocal exchange of genetic material between nonsister chromatids during synapsis of meiosis I (recombinant chromosomes)
- Random fertilization: 1 sperm (1 of 8 million possible chromosome combinations) x 1 ovum (1 of 8 million different possibilities) = 64 trillion diploid combinations!



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

Meiosis vs. mitosis

- Synapsis/tetrad/chiasmata (prophase I)
- Homologous vs. individual chromosomes (metaphase I)
- Sister chromatids do not separate (anaphase I)
- *Meiosis I separates homologous pairs of chromosomes, not sister chromatids of individual chromosomes.*

