

GENERAL BIOLOGY Lecture 17 - Mitosis & Meiosis Part II

- I. Meiosis and the cell cycle**
- A. Why is meiosis important?**
1. Meiosis leads to variation - a basis of evolutionary change
 - a) How: genes are shuffled during meiosis and combined uniquely at fertilization
- B. Important terms**
1. Chromosome - a thread-like structure carrying the genetic material (DNA) and associated proteins
 2. Homologous chromosomes - chromosomes from male and female which have the same length, shape, and genes
 3. Chromatid - one of the thread-like structures of a replicated chromosome
 4. Sister chromatids - replicates of the chromatid
 5. Centromere - unduplicated area between chromatids where kinetochore is found
 6. Gene - a section of DNA encoding a particular trait
 7. Allele - an alternative form of a gene
- C. Overview of meiosis**
1. Interphase - meiosis I - cytokinesis - interkinesis - meiosis II - cytokinesis
 2. First division (meiosis) involves recombination and reduction in chromosome number
 3. Second meiotic division is much like mitosis
 4. Start with one diploid cell and get four haploid cells
- D. Where does meiosis occur?**
1. Sex cells - ovary & anther
- E. Meiosis makes....gametes in animals and megaspores (female) and microspores (male) in plants**
1. In plants, meiosis is followed by mitosis to yield the final gametes
- F. The cell cycle**
1. Interphase
 2. Meiosis I
 - a) Prophase I
 - 1) Chromosomes duplicated and visible - composed of sister chromatids
 - 2) Synapsis occurs - homologous chromosomes come together to form a tetrad
 - 3) Crossing over occurs - non-sister chromatids of homologous chromosomes exchange parts
 - 4) Spindle forms and nucleolus disappears
 - b) Metaphase I
 - 1) Homologous chromosomes line up on equilateral plane (note in mitosis, sister chromatids line up)
 - 2) *****MANY, MANY COMBINATIONS - in humans, 2^{23} , or 8,388,608 combinations.
 - c) Anaphase I
 - 1) Homologous chromosomes (duplicated) separate (note in mitosis, sister chromatids separate)
 - d) Telophase I
 - 1) Haploid number of (duplicated) chromosomes clustered at each pole
 3. Cytokinesis
 4. Interkinesis (transition period)
 5. Meiosis II (just like mitosis except start with haploid cell)
EACH OF THE TWO NEW CELLS UNDERGO MEIOSIS II
 - a) Prophase II - new spindles form, etc. (no crossing over!)
 - b) Metaphase II - chromosomes line up to prepare sister division
 - c) Anaphase II - sister chromatids separate
 - d) Telophase II - haploid number of single chromosomes at each pole
 6. Cytokinesis