CONCEPT: MEIOSIS

Overview of Meiosis

● **Meiosis** is the process of cell division which creates daughter cells with _____ the genetic material

□ There are two divisions

- **Reductional division** is the first division, and the chromosomes are reduced by ½

- But at this point there are two copies of each chromosome

- **Equational division** is the second division, and the sister chromatids are divided into daughter cells

□ There are many chromosomal _____ during meiosis

- At the beginning of meiosis you start of with *homologous chromosomes*

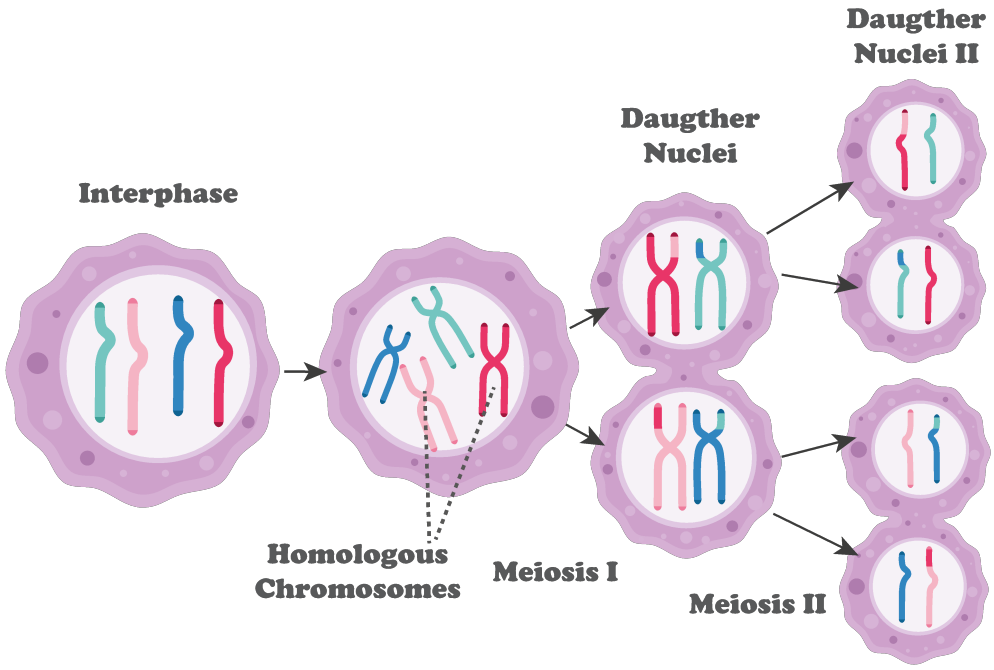
- After the DNA is replicated, there are two **sister chromatids** for each chromosome

- A **bivalent** is the pair of two homologous chromosomes

- A **tetrad** refers to the four chromatids that form after replication

- A **dyad** refers to two sister chromatids

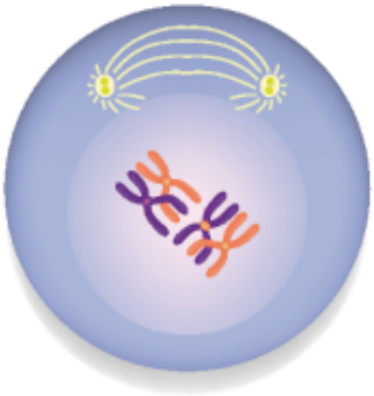
EXAMPLE:



Meiosis Steps

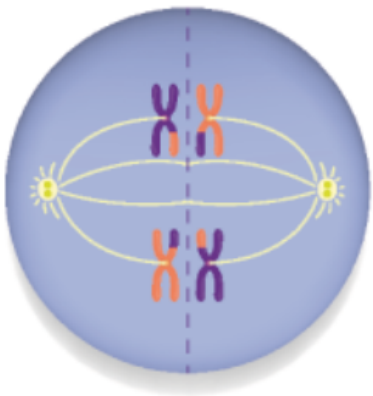
- Meiosis is completed in two parts **meiosis I** and **meiosis II**
    - □ **Prophase I** involves 5 steps
        - **Leptonema:** Chromatin begins condensing into chromosomes
        - **Zygonema:** Chromosomes align, and a **synaptonemal complex** forms between the homologs
        - **Pachynema:** Crossing over occurs, can see **chiasmata** which forms between crossing over homologs
        - **Diplonema:** Chromosomes remain as tetrads
        - **Diakinesis:** Chromosomes begin to pull apart, but the chiasmata keep them together

EXAMPLE:



- □ **Metaphase I:** The tetrads line up in the *metaphase plate*
    - The homologous chromosomes lie on either side of the metaphase plate
    - Two sister chromatids lie on either side of the metaphase plate

EXAMPLE:



□ **Anaphase I:** Each dyad separates to one cell pole

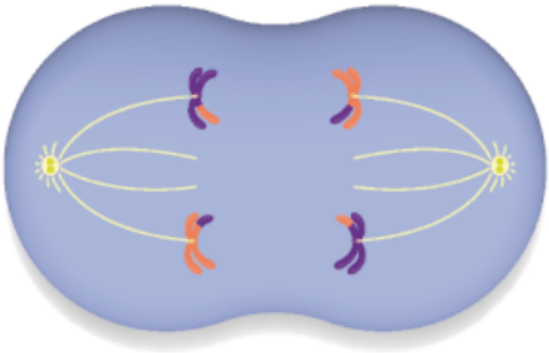
- **Disjunction** is when the homologous chromosomes separate properly

- **Nondisjunction** is when the separation doesn't occur properly

□ **Telophase I:** The nuclear membrane begins to reform around dyads

□ **Cytokinesis:** The cells form two **haploid** cells

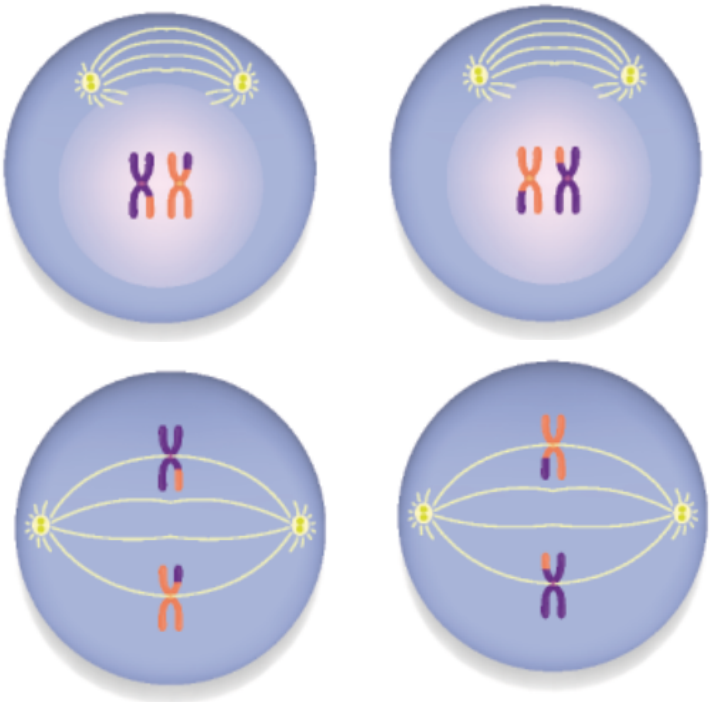
EXAMPLE:



□ **Prophase II:** Is a short phase where two cells have one pair of sister chromatids

□ **Metaphase II:** Is when the sister chromatids line up on either side of the metaphase plate

EXAMPLE:

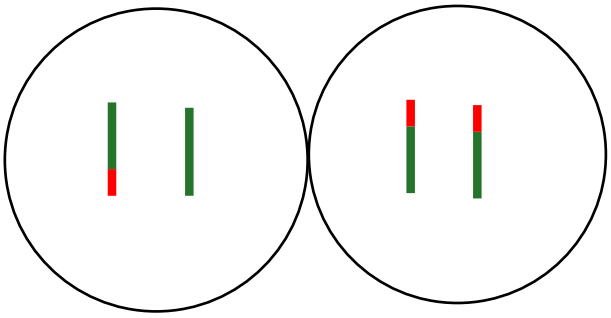


□ **Anaphase II:** The sister chromatids are separated

□ **Telophase II:** One chromosome is present at each pole

□ **Cytokinesis:** Cytoplasmic division create four **haploid** cells

EXAMPLE:



PRACTICE

1. In which step of prophase I does crossing-over occur?
    a. Leptonema
    b. Zygonema
    c. Pachynema
    d. Diplonema
    e. Diakinesis

2. Are the two daughter cells produced from meiosis I diploid or haploid?
    a. Diploid
    b. Haploid

3. Are the four daughter cells produced from meiosis II diploid or haploid?
    a. Diploid
    b. Haploid

4. Which of the following are sources of genetic variation during meiosis?
    a. Crossing over, independent assortment
    b. Crossing over, DNA replication
    c. DNA replication, independent assortment
    d. Disjunction, crossing over

5. During which stage of meiosis do sister chromatids separate?
    a. Prophase I
    b. Anaphase I
    c. Prophase II
    d. Anaphase II