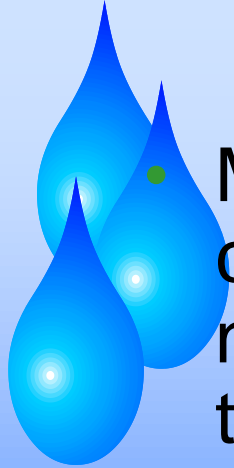
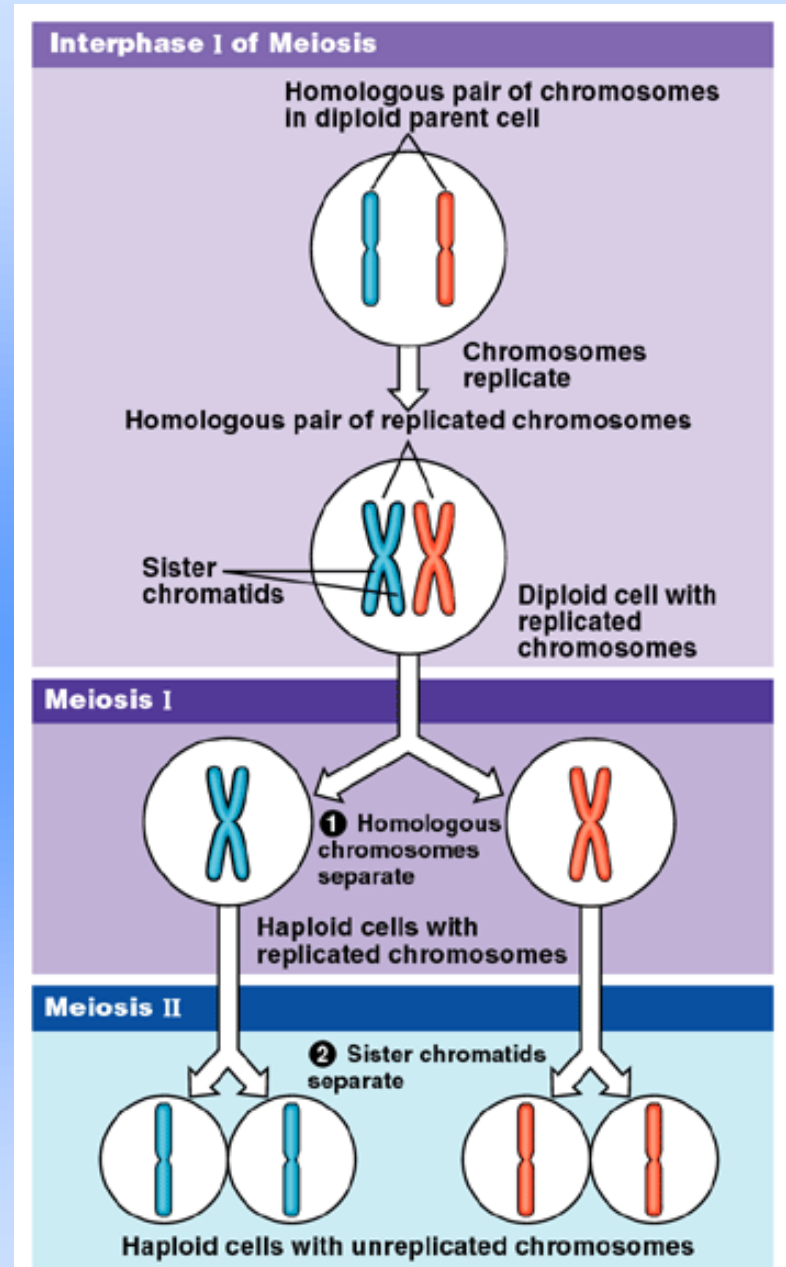


**Aim: What happens during  
meiosis?**



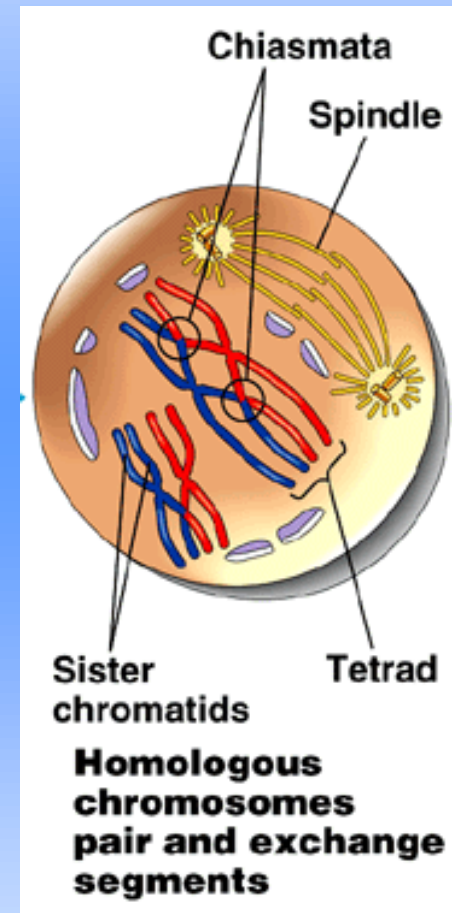
- Meiosis reduces chromosome number by copying the chromosomes once, but dividing twice.
- The first division, meiosis I, separates homologous chromosomes.
- The second, meiosis II, separates sister chromatids.

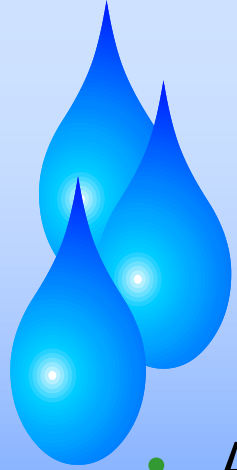


# Meiosis I

• In prophase I, the chromosomes condense and homologous chromosomes pair up to form tetrads.

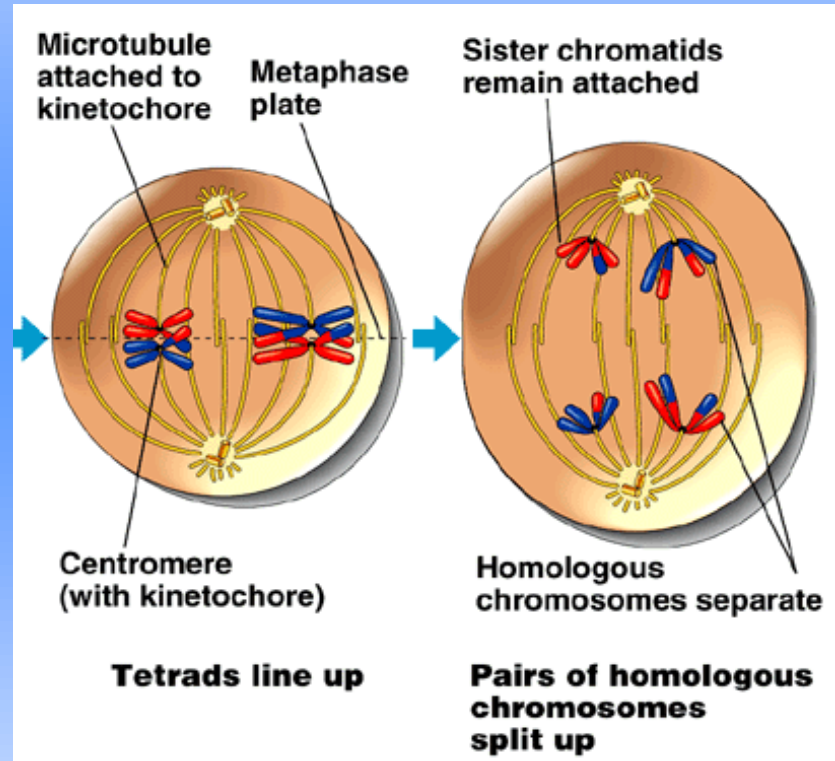
- In a process called synapsis, special proteins attach homologous chromosomes tightly together.
- At several sites the chromatids of homologous chromosomes are crossed (chiasmata) and segments of the chromosomes are traded.
- Spindle fibers form.

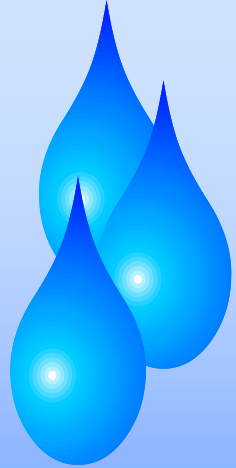




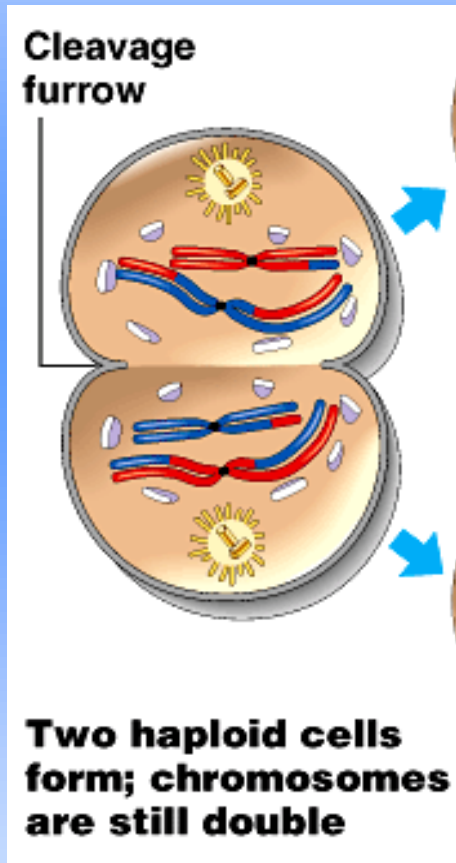
# Meiosis I

- At metaphase I, the tetrads are all arranged at the metaphase plate.
- In anaphase I, the homologous chromosomes separate (disjunction) and are pulled toward opposite poles.



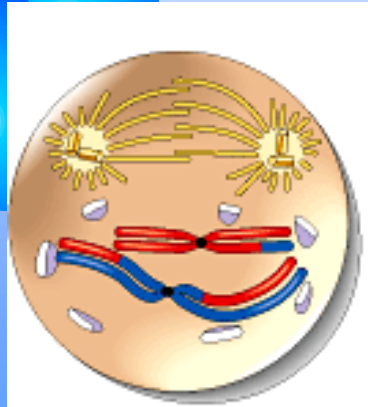


# Meiosis I



- In telophase I, movement of homologous chromosomes continues until there is a haploid set at each pole.
  - Each chromosome consists of linked sister chromatids.
- Cytokinesis by the same mechanisms as mitosis usually occurs simultaneously.

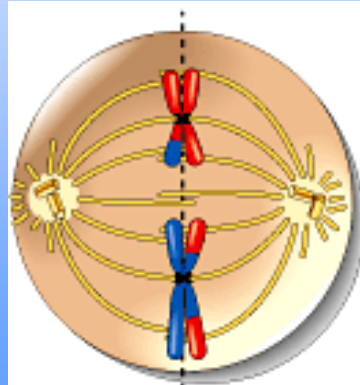
- Meiosis II is very similar to mitosis.



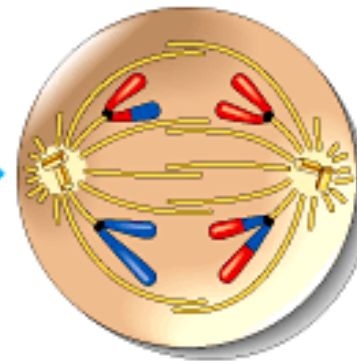
Prophase II



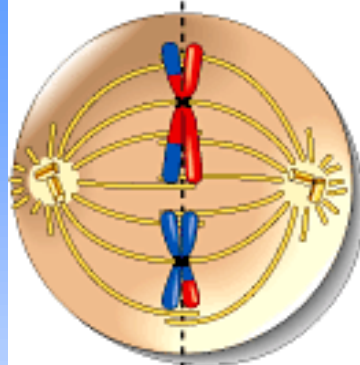
Metaphase II



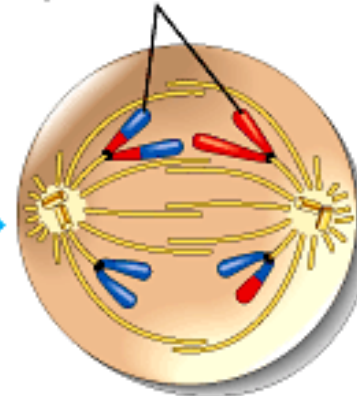
Anaphase II



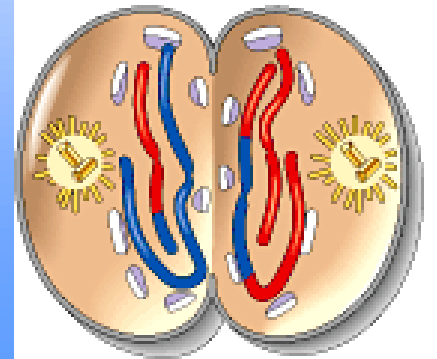
Sister chromatids separate



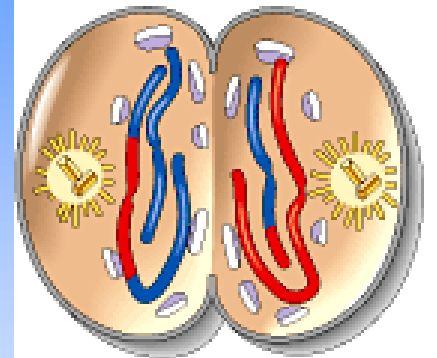
Anaphase II

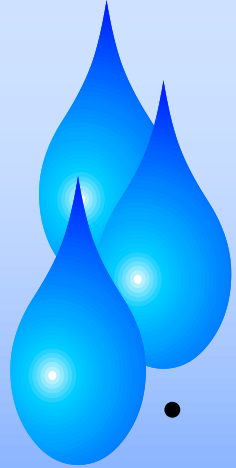


Telophase and Cytokinesis



Haploid daughter cells forming





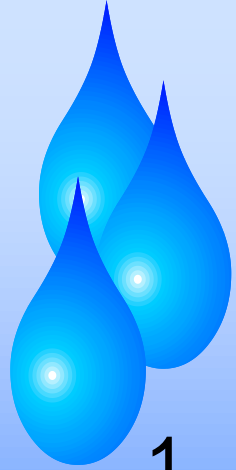
# Comparison of Asexual and Sexual Reproduction

## Asexual Rep.

- Single individual is the sole parent.
- Single parent passes on *all* its genes to its offspring.
- Offspring are genetically identical to the parent.
- Results in a *clone*, or genetically identical individual. Rarely, genetic differences occur as a result of *mutation*, a change in DNA

## Sexual Rep

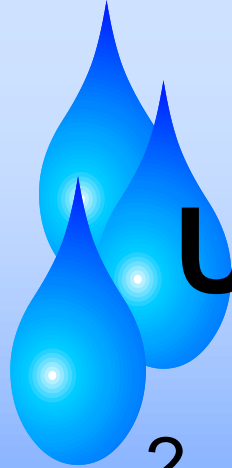
- Two parents give rise to offspring.
- Each parent passes on *half* its genes, to its offspring
- Offspring have a unique combination of genes inherited from both parents.
- Results in greater genetic variation; offspring vary genetically from their siblings and parents



# Unique events in meiosis

1. During prophase I, homologous chromosomes pair up in a process called **synapsis**.
  - A protein zipper, the *synaptonemal complex*, holds homologous chromosomes together tightly.
  - Later in prophase I, the joined homologous chromosomes are visible as a tetrad.
  - At X-shaped regions called **chiasmata**, sections of nonsister chromatids are exchanged.
  - Chiasmata is the physical manifestation of crossing over, a form of genetic rearrangement.





# Unique events in meiosis (2)

2. At metaphase I homologous pairs of chromosomes, not individual chromosomes are aligned along the metaphase plate.
  - In humans, you would see 23 tetrads.
3. At anaphase I, it is homologous chromosomes, not sister chromatids, that separate and are carried to opposite poles of the cell.
  - Sister chromatids remain attached at the centromere until anaphase II.





## Comparison of mitosis and meiosis

Event	Mitosis	Meiosis
DNA Replication	S interphase	S interphase
Number of Divisions	One	Two
Synopsis	No	Yes
Number of daughter cells	Two diploid and identical to parent	Four monoploid; vary with parent
Role in animal body	Somatic cell reproduction	Gamete formation