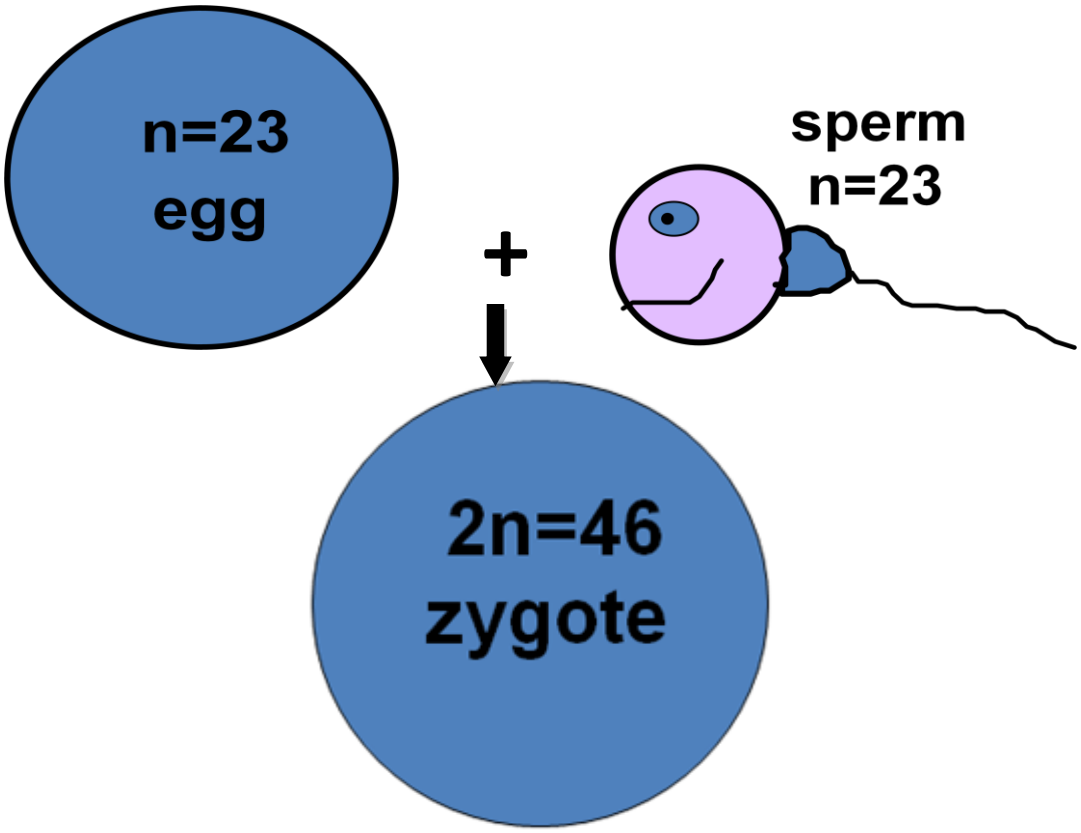
Meiosis

Gametes (The Male Gamete is the Sperm and is produced in the male gonad the Testes).

The Female Gamete is the Ovum (ova = pl.) and is produced in the female gonad the Ovaries

Sperm + Ovum (egg) = Zygote by fertilization process



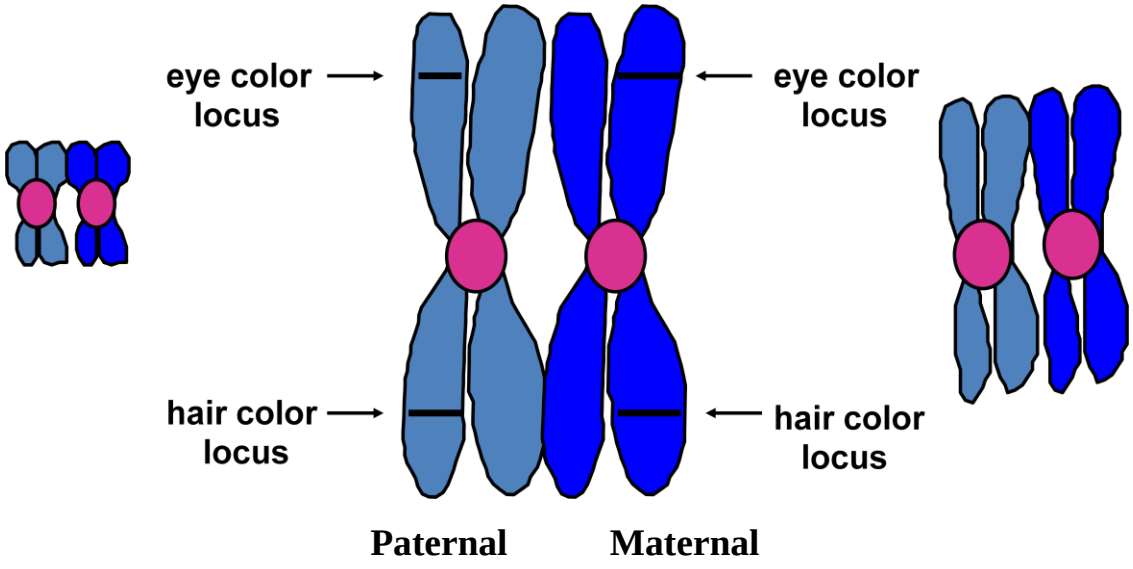
Homologous Chromosomes:

Pair of chromosomes (maternal and paternal) that is similar in shape and size. Homologous pairs (tetrads) carry genes controlling the same inherited traits. Each locus (position of a gene) is in the same position on homologues.

- Humans have 23 pairs of homologous chromosomes.

22 pairs of autosomes

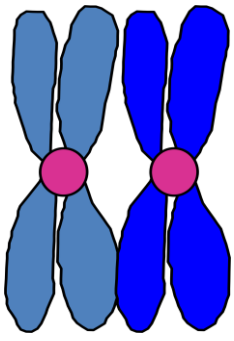
1 pair of sex chromosomes



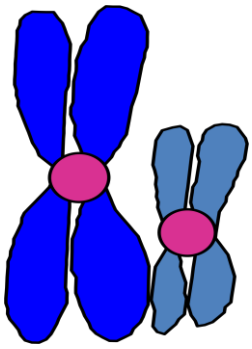
Homologous Chromosomes

Sex Chromosomes:

The Sex Chromosomes code for the sex of the offspring. ** If the offspring has two "X" chromosomes it will be a female. ** If the offspring has one "X" chromosome and one "Y" chromosome it will be a male.

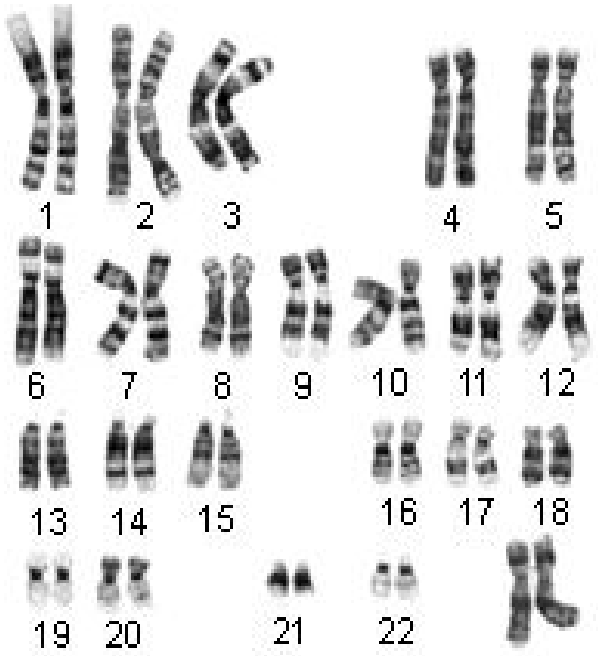


XX chromosome – female



XY chromosome – male

Sex Chromosomes



(23) "Sex Chromosomes" .the 23rd set

This person has 2 "X" chromosomes… and is a female

Meiosis in humans:

Is the process by which"gametes" (sex cells), with half the number of chromosomes, are produced. During Meiosis diploid cells are reduced to haploid cells

Diploid (2n) → Haploid (n)

Meiosis in males is called spermatogenesis and produces sperm.

Meiosis in females is called Oogenesis and produces ova.

Meiosis similar to mitosis except in two events:

1-Synapsis: Pairing of homologous chromosomes

- Dad's chromosome pairs with Mom's.
- The four paired chromatids equals a **Tetrad**

2- Crossing Over: Exchange of genes.

If Meiosis did not occur the chromosome number in each new generation would double…. The offspring would die.

Meiosis is two cell divisions (Called meiosis I and meiosis II)

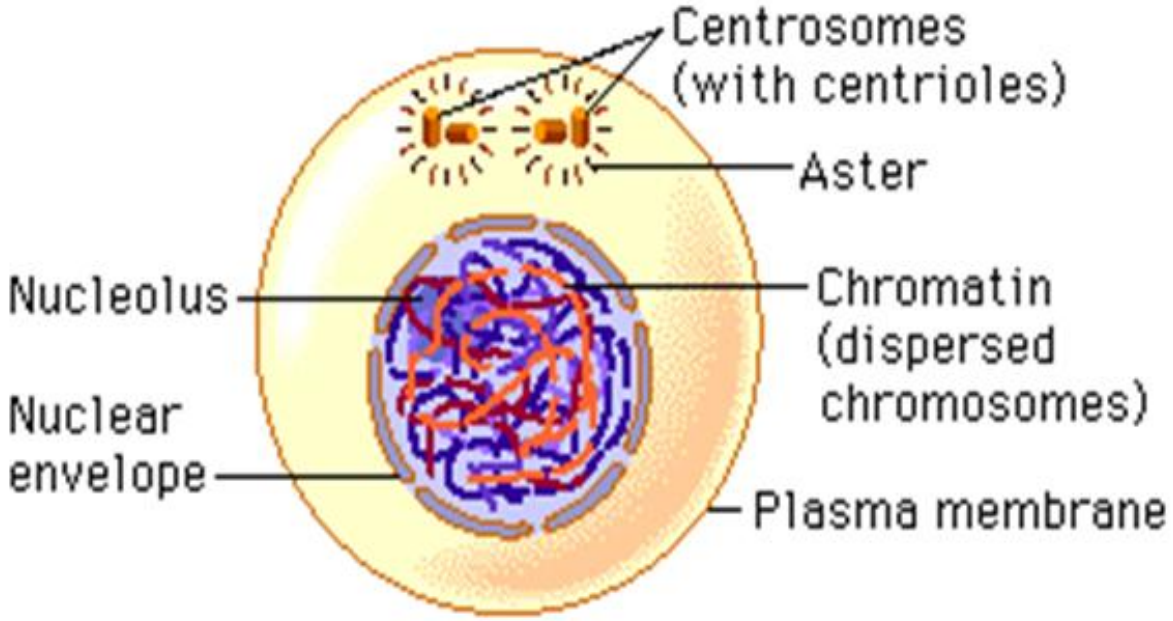
Meiosis I : Cell division that reduces the **chromosome** number by **one-half.**

Interphase I

- Similar to **mitosis** interphase.
- **Chromosomes** replicate **(S phase).**
- Each duplicated **chromosome** consists of two identical sister **chromatids** attached at their **centromeres**.
- **Centriole** pairs also replicate.

Interphase I

- **Nucleus** and **nucleolus** visible.



Meiosis I (four phases)

1. Prophase I
2. Metaphase I
3. Anaphase I
4. Telophase I

1-Prophase I

- **Longest** and most complex phase.
- **90%** of the meiotic process is spent in Prophase I
- **Chromosomes** condense.

This stage divided into 5 stages;

a) Leptotene

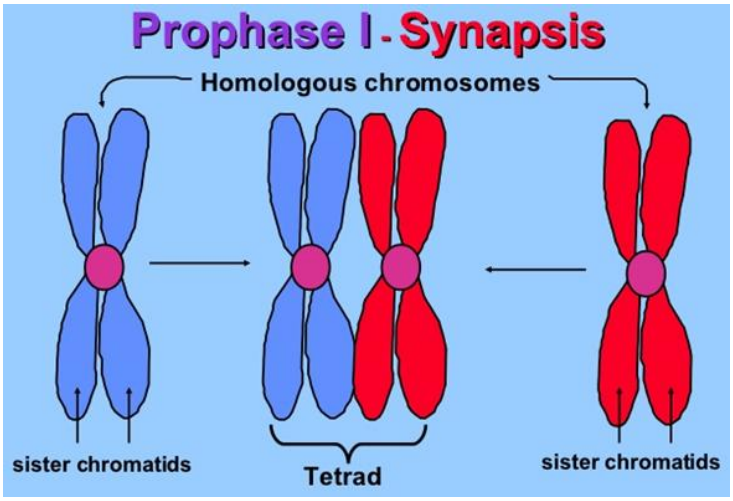
b) Zygotene

c) Pachytene

d) Diplotene

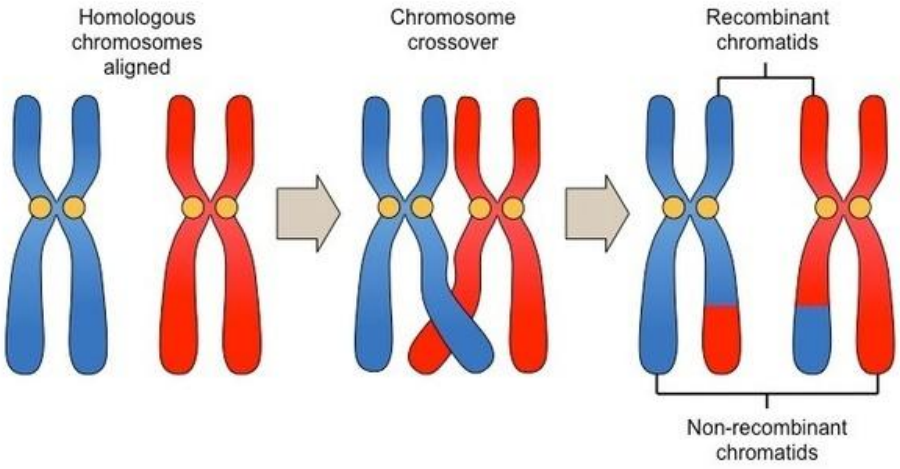
e) Diakinesis

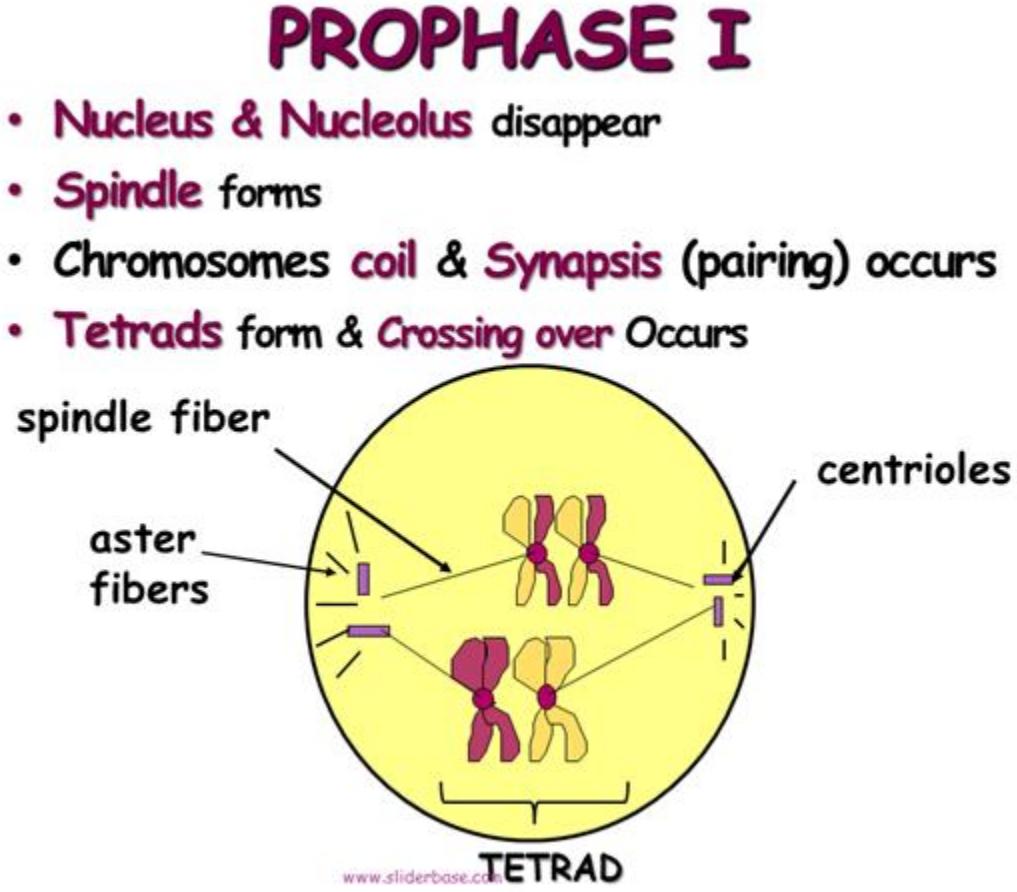
Synapsis: homologous chromosomes come together to form a tetrad. Tetrad is two chromosomes or four chromatids (sister and nonsister chromatids).



During Prophase I

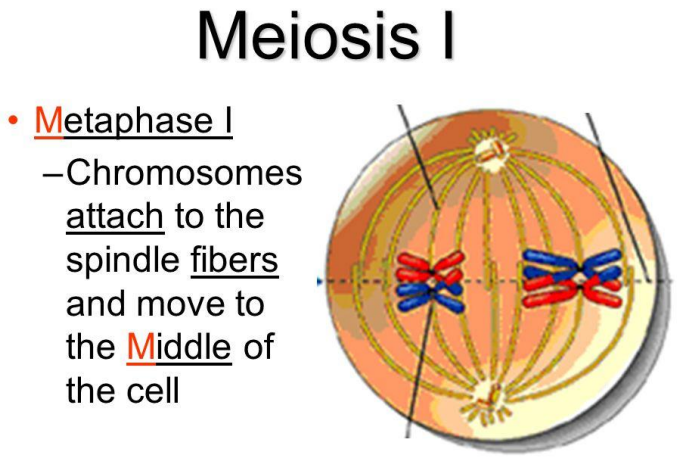
Crossing Over: Creates variation (diversity) in the offspring's traits.





2-Metaphase I

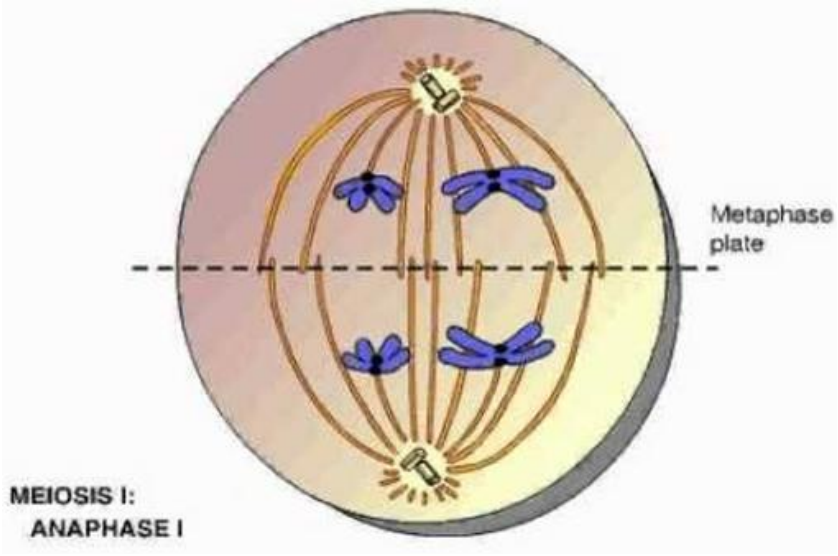
- Shortest phase
- Tetrads align on the metaphase plate.
- Independent Assortment Occurs:
- Orientation of homologous pair to poles is random



Metaphase I

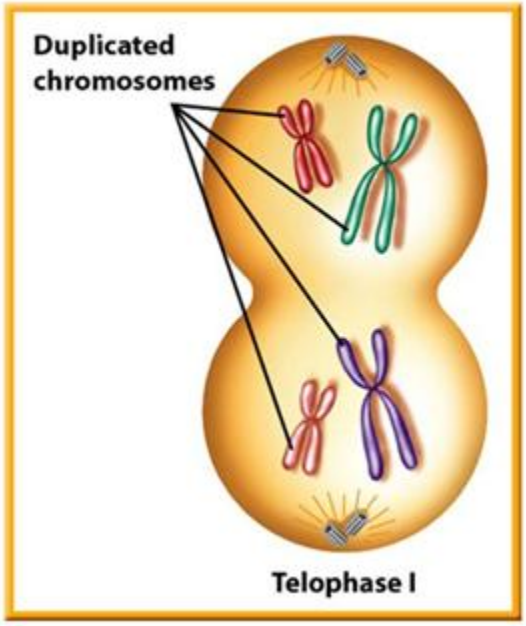
3-Anaphase I

- Homologous chromosomes separate and move towards the poles.
- Sister chromatids remain attached at their centromeres.



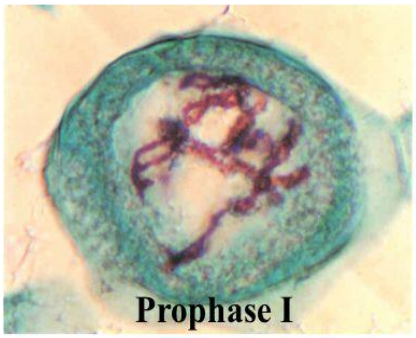
4-Telophase I

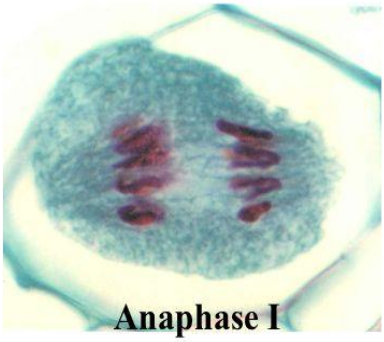
- Each pole now has haploid set of chromosomes.
- Cytokinesis occurs and two haploid daughter cells are formed.

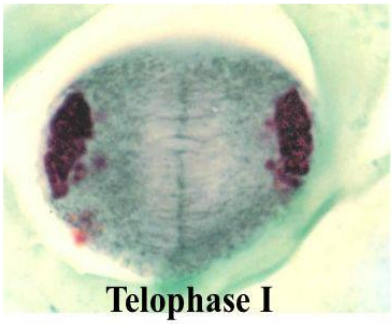


- Chromosomes gather at the poles.
- The cytoplasm divides.

Meiosis I: Review

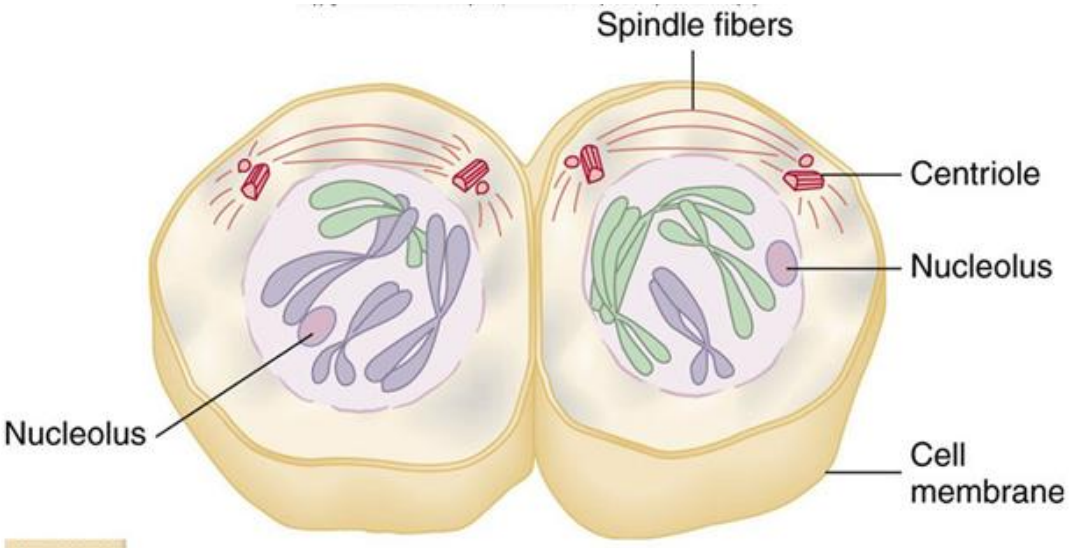






1-Prophase II

- Same as prophase in mitosis



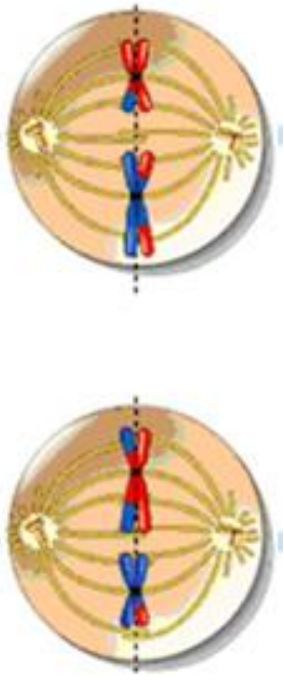
chromosomes condense, nuclear envelope fragments, spindles form

2-Metaphase II

- Same as metaphase in mitosis

Metaphase II

–Chromosomes line up in the center of each cell (similar to mitosis)



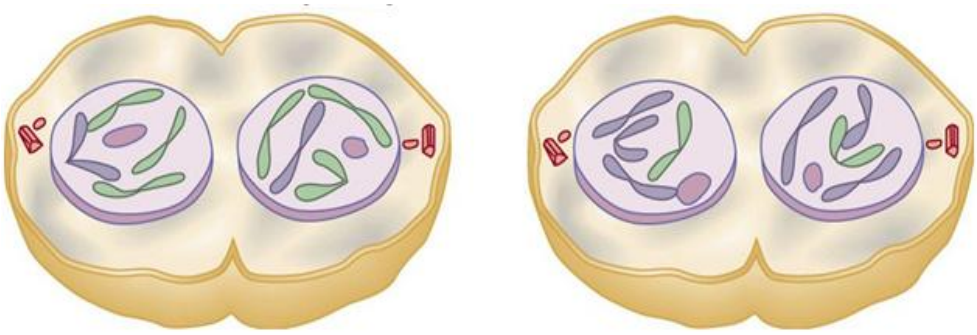
3-Anaphase II

- Same as anaphase in mitosis
- Sister chromatids separate

- During anaphase II, the sister chromatids of each duplicated chromosome are pulled apart.
- They then move toward opposite ends of the cells.

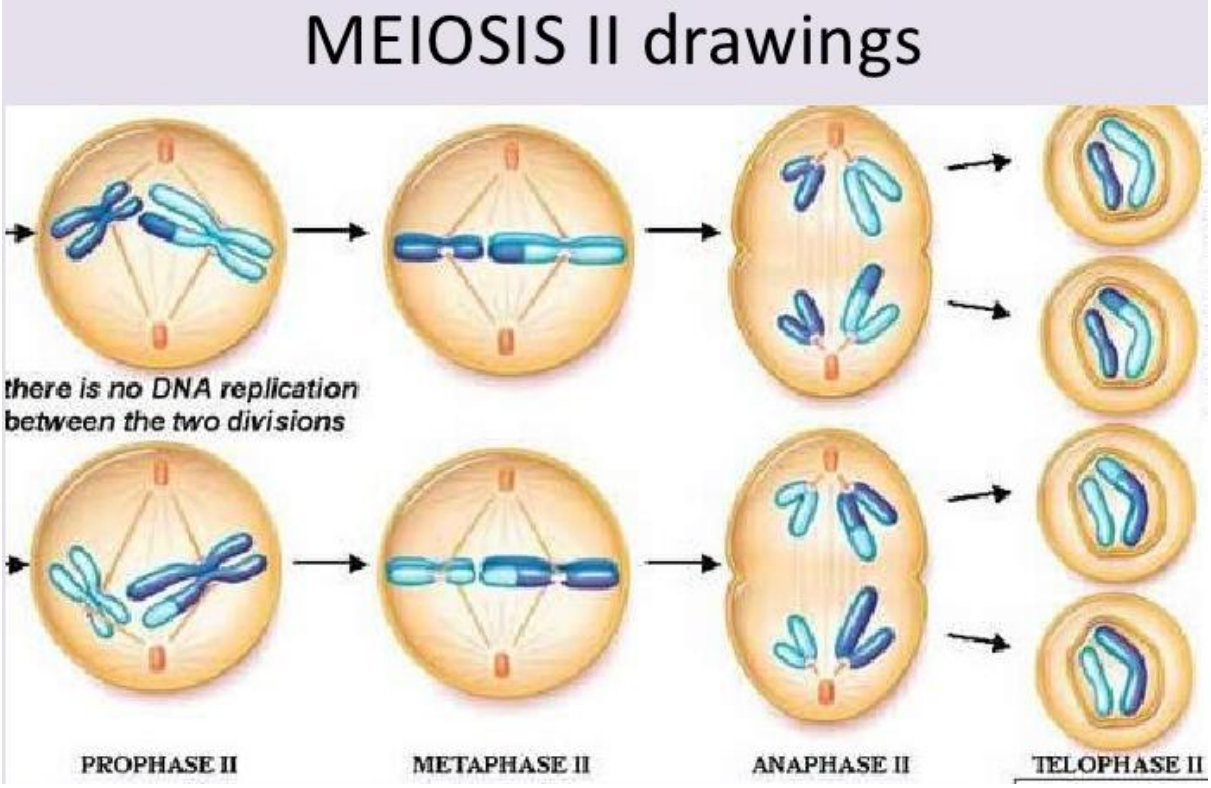
4-Telophase II

- Same as telophase in mitosis.
- Nuclei form.
- Cytokinesis occurs.

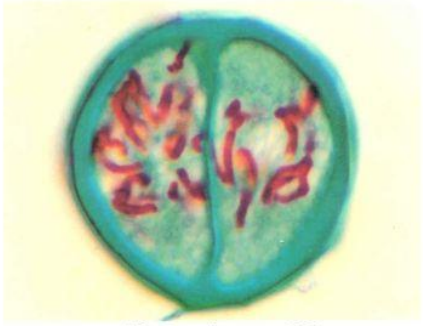


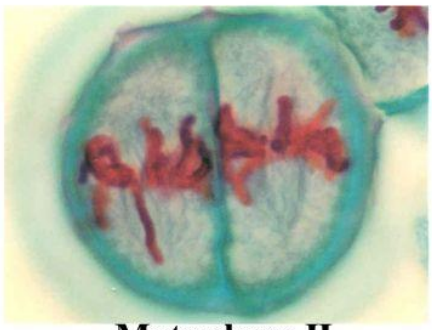
Cell division is complete.
Four haploid daughter cells are produced.

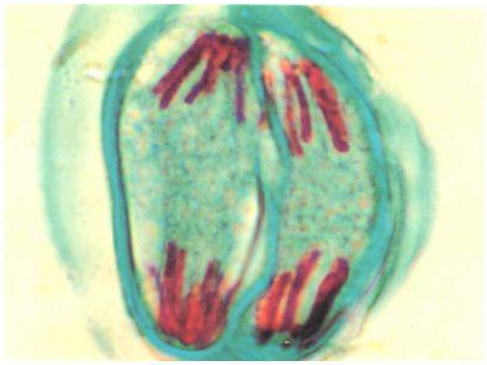
The DNA in each cell is different



Review: Meiosis II


Prophase II


Metaphase II


Anaphase II

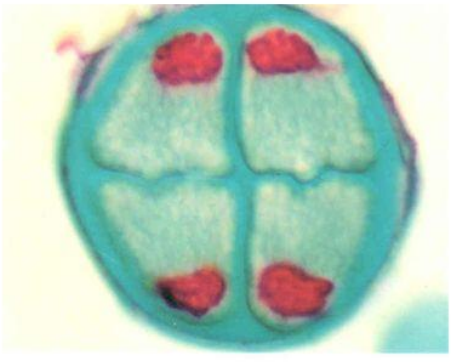

Telophase II

Chart comparing Mitosis and Meiosis

Mitosis	Meiosis
One division = 2 cells	Two divisions = 4 cells
DNA replication occurs in interphase	DNA replication before first division also in interphase
SYNAPSIS does NOT occur	SYNAPSIS DOES occur
2 Identical Cells formed that are DIPLOID (2n)	Four unique Haploid cells are formed (1n)
Only in BODY (Somatic) Cells	Only in reproductive cells (Gametes)
Mitosis is for GROWTH and REPAIR	Meiosis is for REPRODUCTION of the species