MEIOSIS I

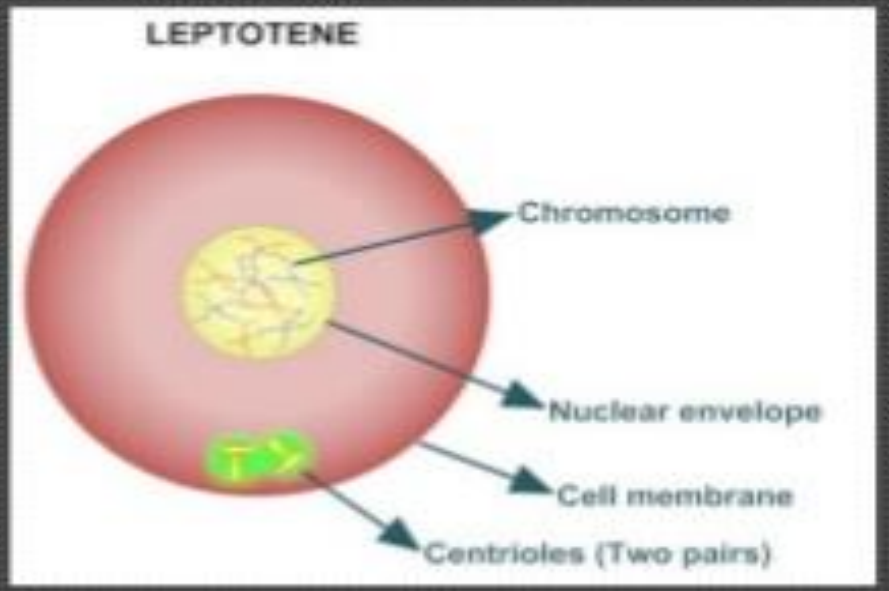
- Meiosis I separate homologous chromosomes and produce two cells with haploid chromosome number (N) for that reason it is known as **Reductional Division**.
- Meiosis I consist of four stages,
  - Prophase I
  - Metaphase I
  - Anaphase I and
  - Telophase I.

PROPHASE I

- Prophase I is the longest in duration compared to Prophase in mitosis.
- It takes about 85 - 95 percent of the total time for meiosis and also much more complex.
- The Prophase I divided into 5 stages (Le Za Pa Di Dia).
  - Leptotene
  - Zygotene
  - Pachytene
  - Diplotene and
  - Diakinesis

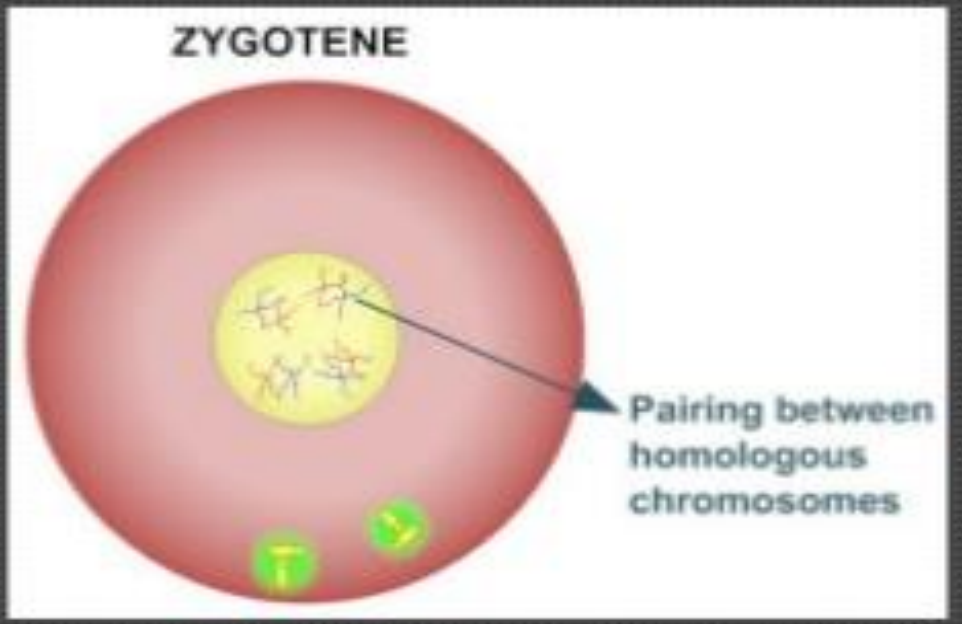
LEPTOTENE

- The first stage of Prophase I is called ***Leptotene*** or ***leptonema***.
- All the chromosomes begin to condense, so, they become visible as fine thread.
- There is marked increase in the nuclear volume.
- A process of ***'homology search'*** which is essential to the initial pairing of homologs, begins during

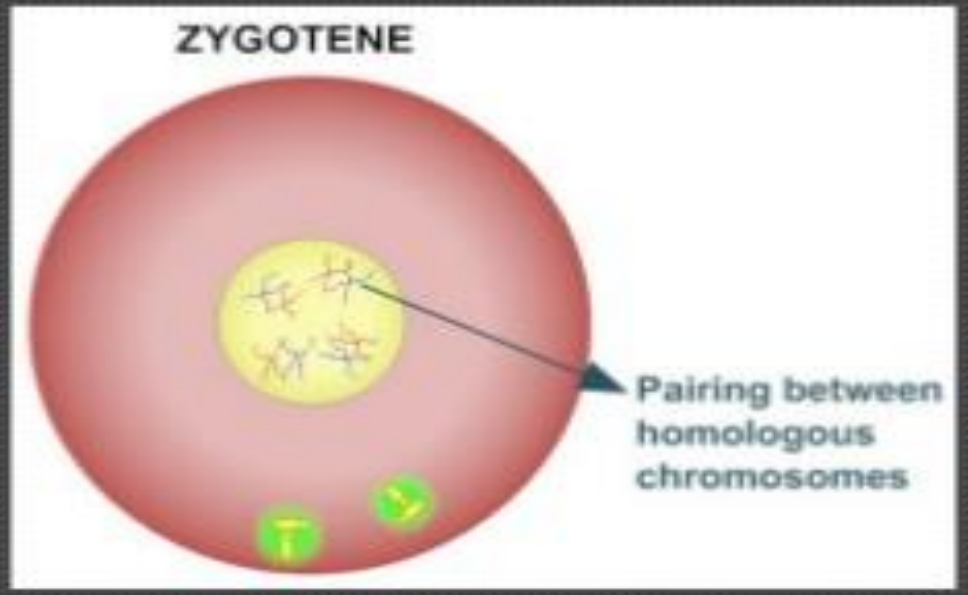


ZYGOTENE

- The ***zygotene*** stage also known as ***zygonema***.
- This stage begins with the initiation of pairing between homologus chromosomes and it ends with complete pairing.
- The process of pairing (at end to end) between homologus chromosomes is known as **Synapsis (Homologous dyads)**.

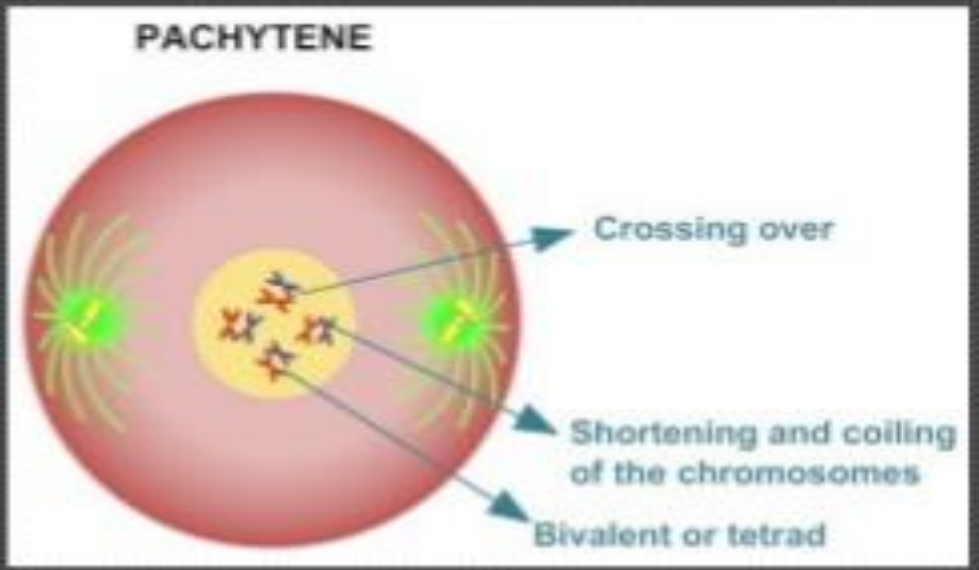


- The syneptonemal complex is form during these zygotene stage.
- At the completion of zygotene, the paired homologs take the form of bivalents.
- ***The number of bivalents in each species is equal to the haploid number.***

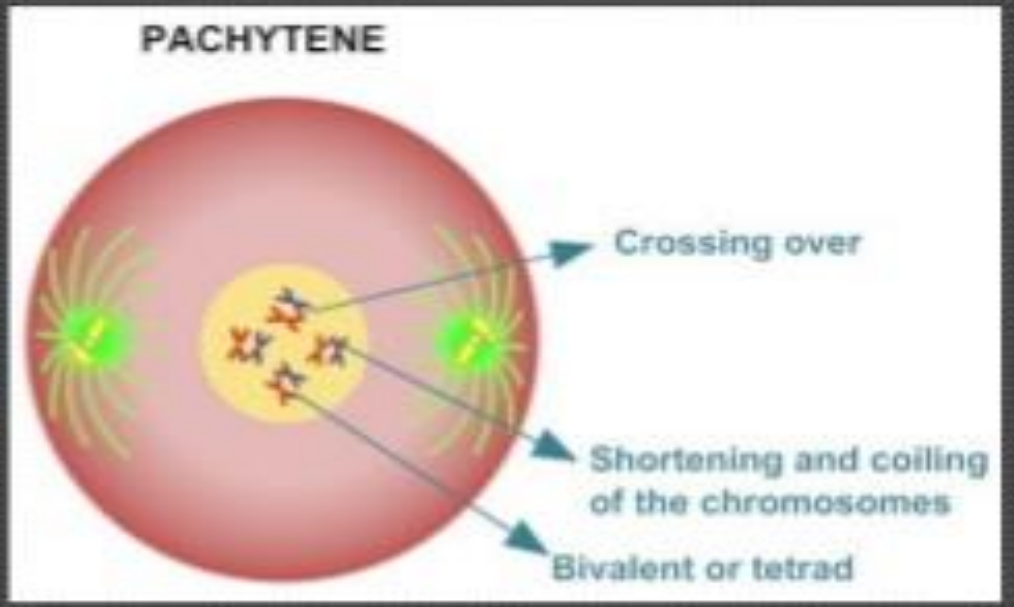


PACHYTENE

- The ***pachytene*** stage also known as ***pachynema***.
- The process of synapsis is complete.
- The two homologus of each bivalent appears to be attached with each other at one or more points, these attachments are known as **chiasmata**.

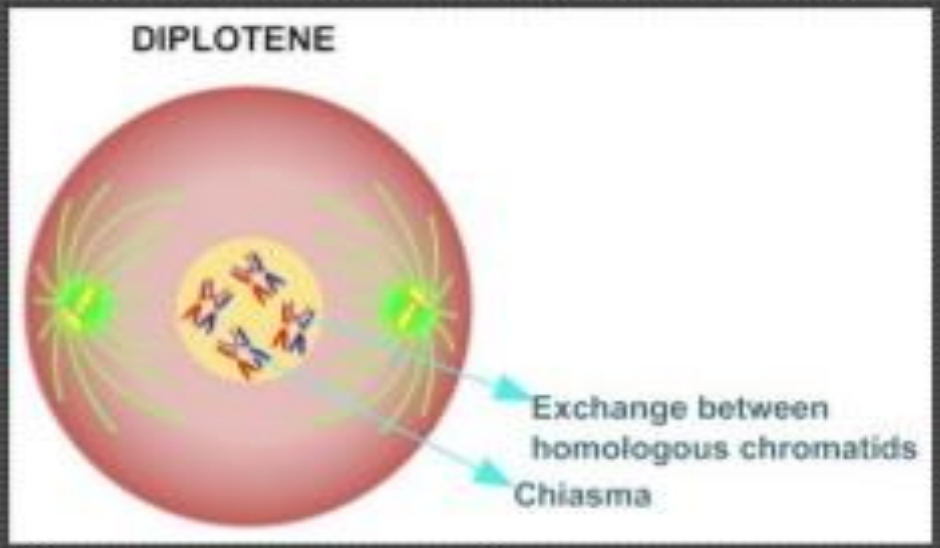


- Crossing over is a precise breakage, swapping and reunion between two non-sister chromatids.
- Crossovers make new gene combinations and which are an important source of genetic variations in populations.

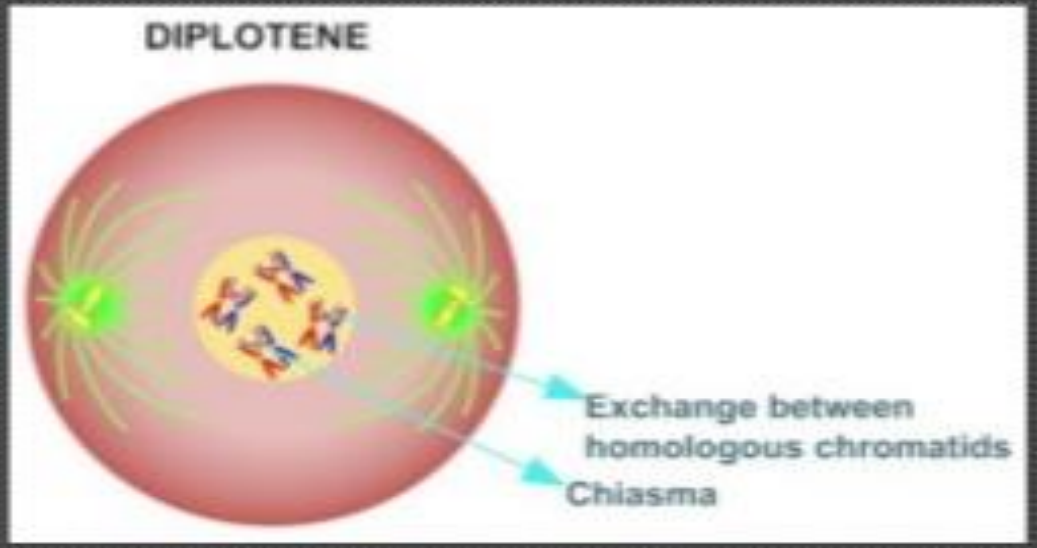


DIPLOTENE

- The diplotene stage also known as **diplonema**.
- DNA recombination is complete.
- The chromatids continue to shorten and thicken and the four sister chromatids in a group is called a **tetrad**.
- The synaptonemal complex begins to break down.

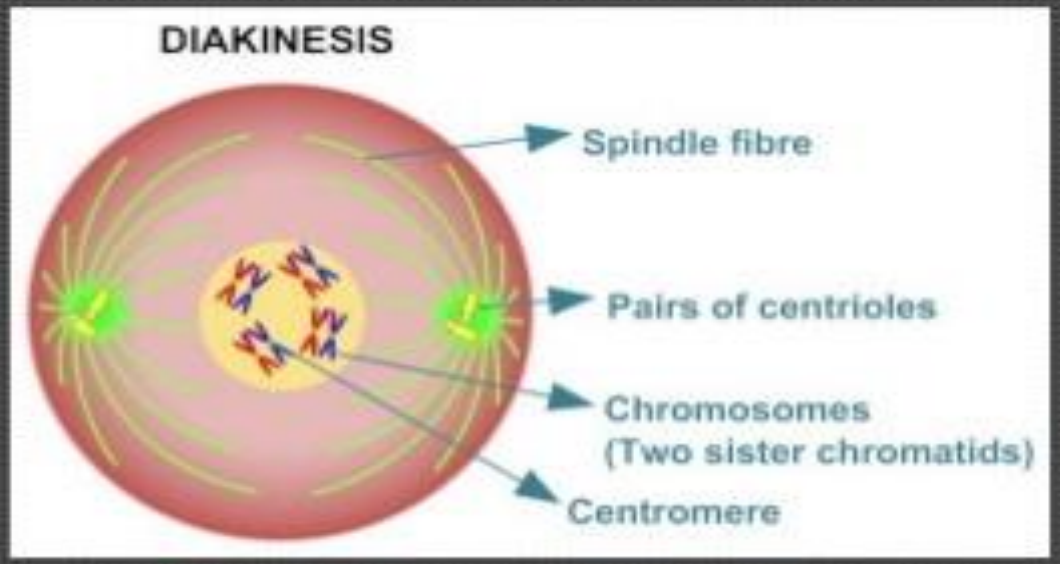


- The paired chromatids begin to pull apart, causing the strands to separate longitudinally.
- The chiasmata tend to become terminalised as the meiotic prophase continues.



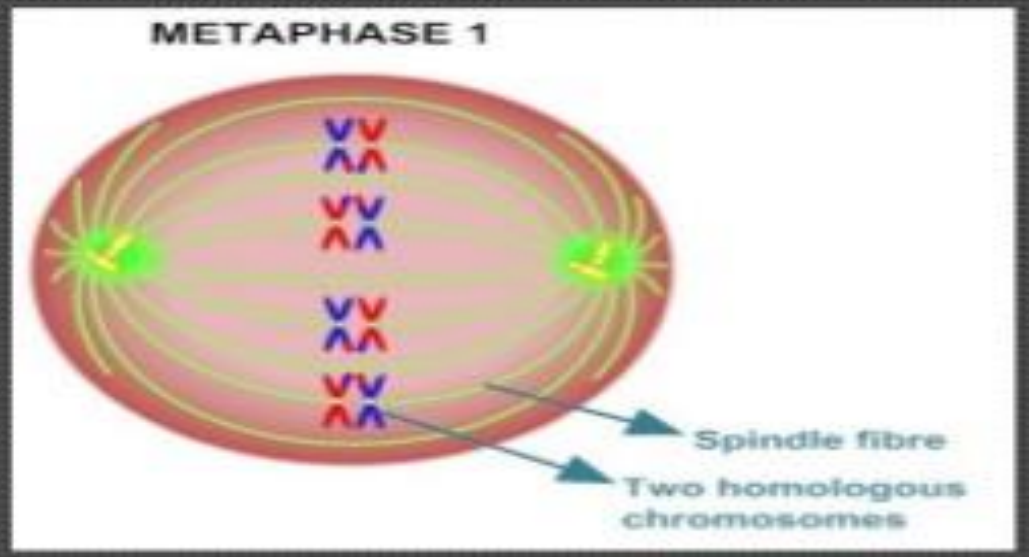
DIAKINESIS

- The chromomes become shorter and thicker due to condensation.
- Nucleolus and nuclear envelope disappear towards the end of diakinesis.
- The spindle apparatus becomes organized.
- The centrioles migrate away from one another.

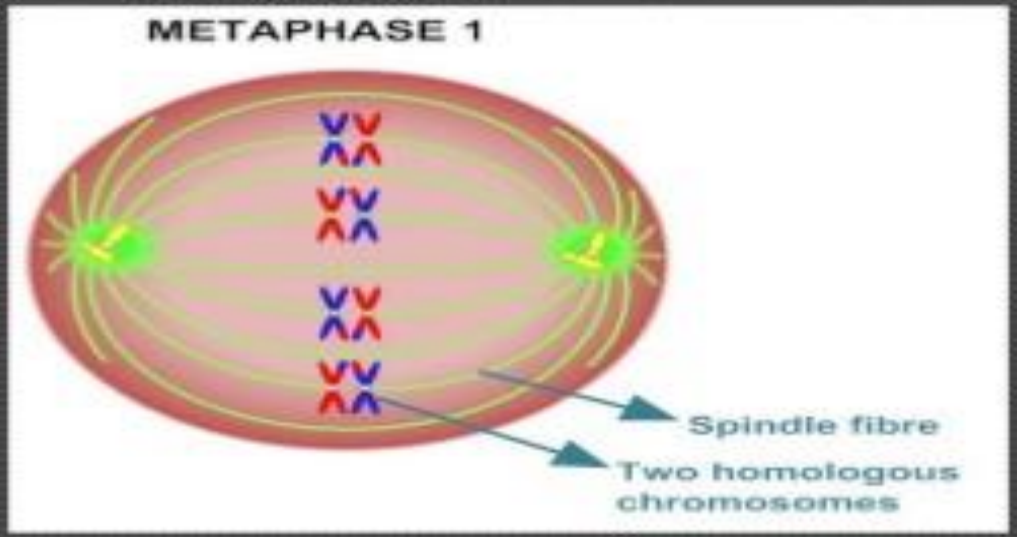


METAPHASE I

- All the bivalents migrate within a cell migrate to metaphase plate.
- One homologue is pulled above the metaphase plate, the other below.
- The centromeres of homologous chromosomes of each bivalent stretch out on either side.

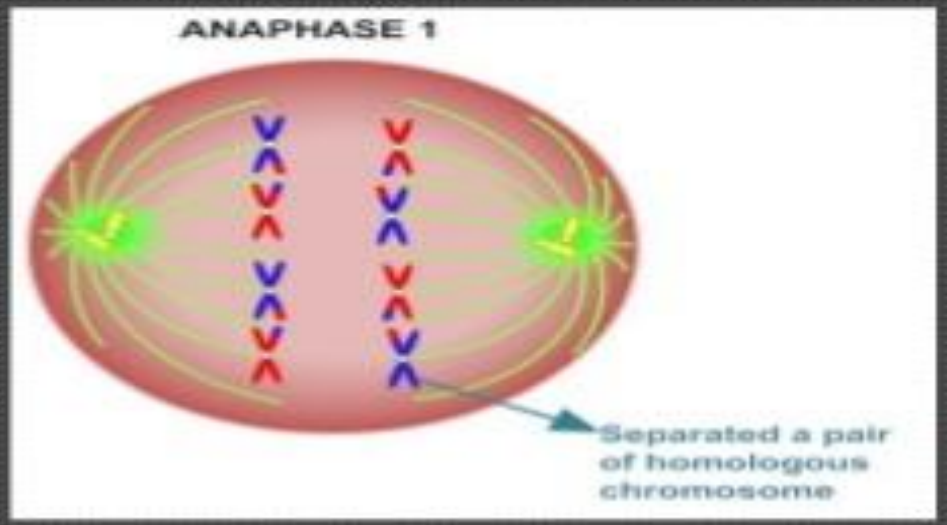


- The centrioles are at opposite poles of the cell.
- Spindle fibers from one pole of the cell attach to one chromosome and spindle fibers from the opposite pole attach to the homologous chromosome.

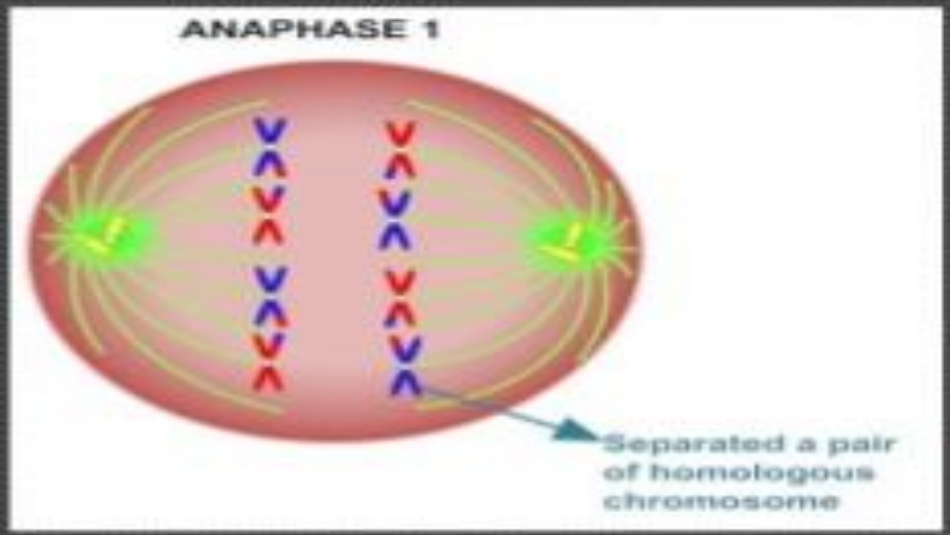


ANAPHASE I

- Chromosomes move to the opposite poles.
- The microtubules and the kinetochore fibers interact, which cause the movement.
- ***A difference between mitosis and meiosis is that sister chromatids remain joined after metaphase in meiosis I, whereas in mitosis they separate.***

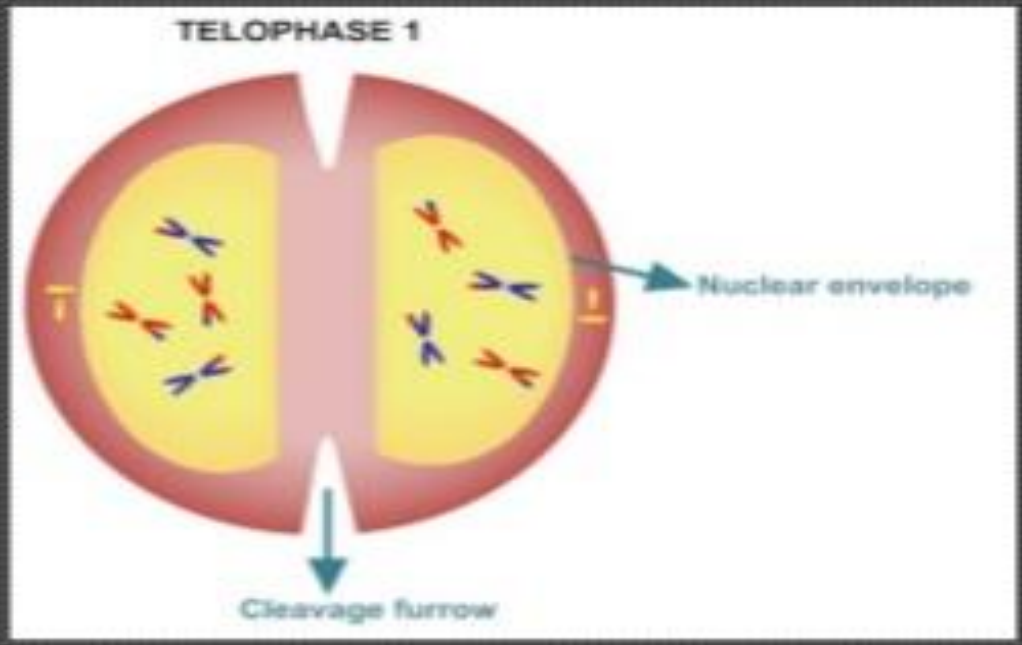


- During Anaphase I original chromosomes separate, so reduction in the number of chromosomes from 2N to N number, yet the sister chromatids remain together.



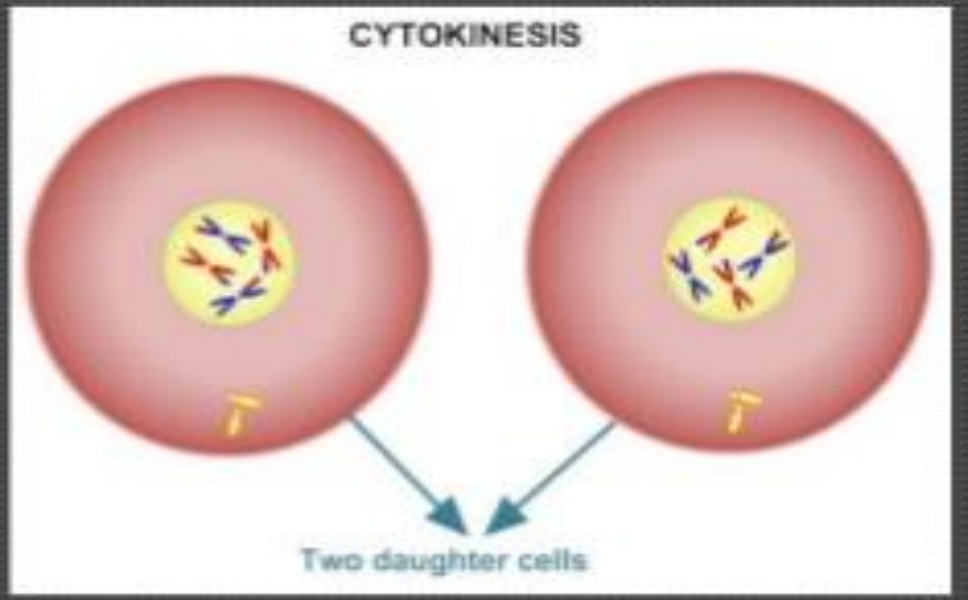
TELOPHASE I

- The homologous chromosome complete their migration to the two poles b/c shortning of spindles.
- The nuclear envelope organized around two groups of chromosomes.
- The nucleolus also reappears.



Cytokinesis

- Cytokinesis involves the formation of a cleavage furrow, resulting in the pocketing of the cell into two cells.
- At the end of Telophase I and Cytokinesis, two daughter cells are produced, each with one half of the number of chromosomes (haploid set of replicated chromosomes) of the original parent cell.



Significance of meiosis

1] Produce gametes.

2] Meiosis forms spores from the spore mother cells & maintains the alternation of generation in organisms.

3] Produces haploid gametes so that the diploid no. of the species remains constant generation of generation

4] Source of genetic variation bcoz Crossing over brings together new gene combination on chromosome.

Differences between meiosis and mitosis

Mitosis	Meiosis
Occurs in body cells	Occurs in reproductive cells
Number of chromosomes remains the same in the daughter cells	Number of chromosomes is halved in the daughter cells
Daughter cells are identical to parent cells and each other	Daughter cells are genetically different to the parent cells and each other
Two daughter cells are formed	Four daughter cells are formed
Homologous chromosomes do not come together	Homologous chromosomes come together
There is no exchange of genetic material between Chromosomes	There is exchange of genetic material between chromosomes

Meiosis I	Meiosis II
Similarities	
1. Consists of **4 stages**, ie. prophase, metaphase, anaphase and telophase 2. Involves **division of nucleus and cytoplasm**	
Differences	
Synapsis occur	No synapsis
Crossing over occurs	No crossing over
In metaphase I, **paired homologous chromosomes** line up at equator	In metaphase II, **sister chromatids** line up at equator
In anaphase I, **paired homologous chromosomes** separate and move to opposite poles	In anaphase II, **sister chromatids** separate and move to opposite poles
At the end of meiosis I, **2** haploid cells are formed	At the end of meiosis II, **4** haploid cells are formed