

MEIOSIS

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LEPTOTENE

Chromosomes – distinct long **uncoiled**

Diploid and beadlike chromosomes

Centrioles divides into two

MEIOSIS

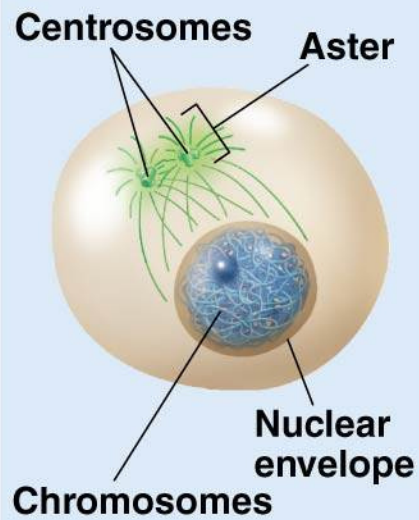
MEIOSIS I: Separates homologous chromosomes

Prophase I

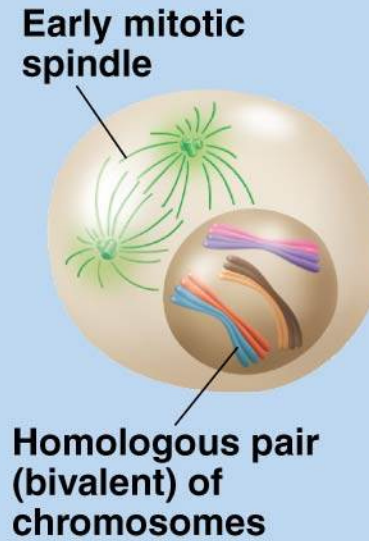
Prophase I

Leptotene

Zygotene



Prophase I: Leptotene



Prophase I: Zygotene

zygotene

- Two **homologous chromosomes**- begin to pair. The pairing called **synapsis**.
- The pairing usually starts from the ends proceeds towards the centromere. This peculiar state of orientation, polarization and describe as **boquet** stage.
- The chromosomes become shorter and thicker.
- The centrioles move to the opposite poles.

Pachytene

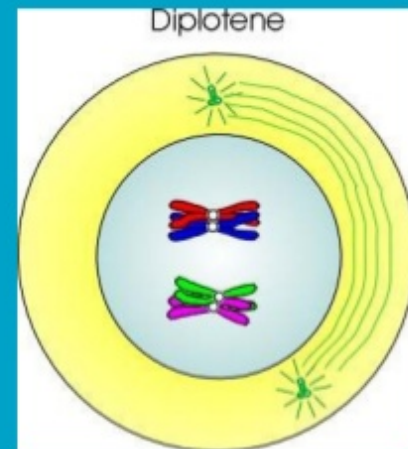
- Each bivalent begins to **split longitudinally into two similar chromatids**. Each bivalent now contains four chromatids. This is described as tetrad stage.
- The two homologous chromosomes do not completely separate but remain attached together at one or more point .
- The **interchange of the chromatin materials** is described as **crossing over**.

Diplotene

- The **chiasmata** begin to move along the length of the chromosomes from the centromere towards the end.
- The **displacement** of chiasmata is termed as **termination**.

Diplotene (double stage)

- Homologous chromosomes start separating called disjunction.
- Separation will not take place at chiasmata.
- **Chiasmata** are clearly visible as 'X' shape.
- Chiasmata are the sites where the crossing over occurred during pachytene.
- Chiasmata helps in holding homologous chromosomes.

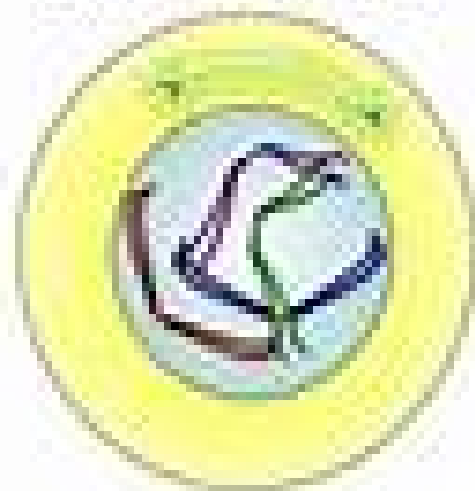


Diakinesis

- Terminalization is completed.
- The bivalents tend to repel.
- The nucleolus and nuclear membrane disappear.
- Spindle fibres make their appearance in the cytoplasm.

Prophase I

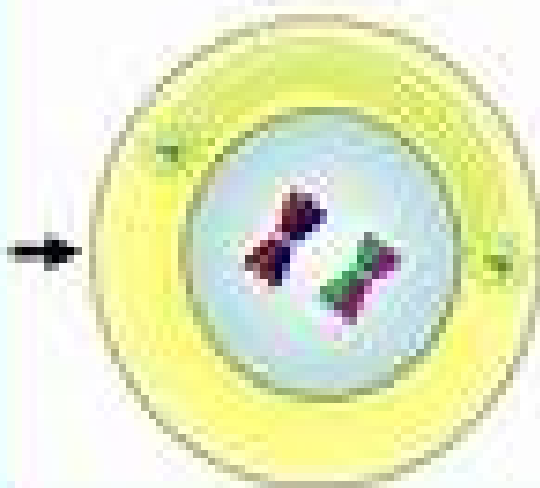
Leptotene. 1



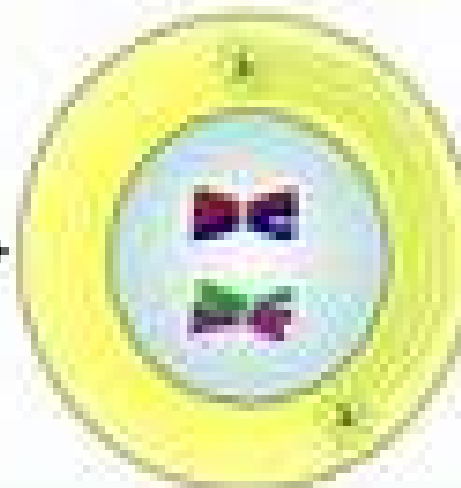
Zygotene. 2



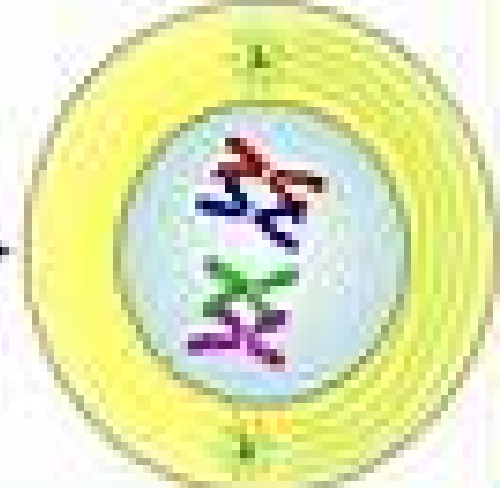
Pachytene. 3



4. Diplotene



5. Diakinesis



Metaphase

- The **spindle fibres** are well developed
- The **chromosomes move towards the equator** and finally they orient themselves on the **equator**.
- Each chromosome **do not separate in meiosis**

Anaphase I

- Each homologous chromosome with its two chromatids.
- The sister **chromatids** are connected by a centromere.
- This stage of the chromosome is called a **diad**.

Telophase I

- The haploid number of chromosomes after reaching their respective poles, become **uncoiled and elongated**.
- The nuclear membrane and the **nucleolus reappear** and thus two daughter nuclei are formed.

Cytokinesis I

- Cytokinesis occurs and two haploid cells are formed.
- These daughter cells pass through a short resting phase or interphase.

Homotypic Division or Second Meiotic Division

- Prophase II
- The chromosomes appear distinct with two chromatids.
- Each centriole divides into two, resulting in the formation of two centrioles.
- Then each moves to opposite poles

They produce asters.

Spindle fibres are formed between the centrioles.

Metaphase II

- **Chromosomes** get arranged on the **equator**.
- The two chromatids of each chromosome are separated by the division of the centromere.
- The **spindle fibres** are attached to the **centromeres**.

Anaphase II

- The separated chromatids become **daughter chromosomes** and move to opposite **poles** due to the contraction of the spindle fibres.

Telophase II

- daughter chromosomes uncoil.
- The nuclear membrane surrounds each group of chromosomes.
- The nucleolus reappears.

Cytokinesis II

- Cytokinesis occurs after nuclear division and two cells are formed from each haploid daughter cell, resulting in the formation of four cells with haploid number of chromosomes.
- The cells undergo further change to develop into gametes.

Significance of Meiosis

- Gametes are produced by meiosis
- A constant number of chromosomes is maintained .
- Owing to crossing over, the hereditary factors from male and female parents get mixed.
- This causes the genetical variations among the species.
- Variations are the raw materials for evolution.
- If there is no meiosis, the chromosome number is doubled or quadrupled.
- Law of segregation of Mendel operates in meiosis.
- Law of independent assortment of Mendel operates in meiosis