MEIOSIS

INTRODUCTION

- The term meiosis was coined by Farmer in 1905.It is the kind of cell division that produces the sex cells or the gametes. It is also called reduction division because the chromosome number is reduced to haploid (n) from diploid (2n).
- Meiosis produces four daughter cells from a parent cell.
- Meiosis consists of two divisions. They are:
- **HETEROTYPIC DIVISION OR FIRST MEIOTIC DIVISION**
- **HOMOTYPIC DIVISION OR SECOND MEIOTIC DIVISION**

A. HETEROTYPIC DIVISION

- It divides the diploid cell into two haploid cells.
- The daughter cells resulting from this division are different from the parent cell in the chromosome number (Heterotypic).
- This consists of 5 stages: They are,

A. Prophase I
B. Metaphase I
C. Anaphase I
D. Telophase I
E. Cytokinesis I

A. PROPHASE I

Prophase takes a longer duration and is sub divided into **five** stages. They are:

- Leptotene
- Zygotene,
- Pachytene
- Diplotene
- Diakinesis.

LEPTOTENE:

- The chromosomes become uncoiled and assume long thread like structures and take up a specific orientation inside the nucleus. They form a **bouquet stage**.

ZYGOTENE

- Zygotene **(Zygon-adjoining):** Two homologous chromosomes approach each other and begin to pair.
- Pairing of homologous chromosomes is called as **synapsis**.

PACHYTENE

- **Pachytene (Pachus-thick):** The chromosomes are visible as long paired twisted threads.

- The pairs so formed are called **bivalents**.
- Each bivalent now contains four chromatids (**tetrad stage**).
- Homologous chromosomes of each pair begin to separate.
- They do not completely separate, but remain attached together at one or more points by X-shaped arrangements known as **chiasmata**.
- The chromatids break at these points and the broken segments may be interchanged (crossing over). As a result, the **genetic recombination** takes place.

DIPLOTENE

- Each individual chromosome of each bivalent begins to split longitudinally into two similar chromatids.
- The homologous chromosomes repel each other and separate.
- Chiasmata begin to move along the length of the chromosome from the centromere towards the end resulting in **terminalization**.

DIAKINESIS

- The paired chromosomes are shortened and thickened. The nuclear membrane and nucleolus begin to disappear.
- Spindle fibres make their appearance.

B. METAPHASE I

- The chromosomes move towards the equator and finally they orient themselves on the equator.
- The two chromatids of each chromosome do not separate. The centromere does not divide.

C. ANAPHASE I

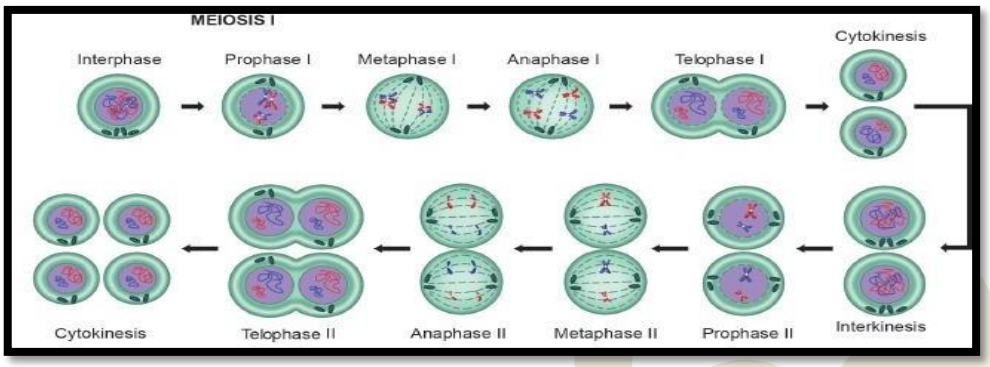
- Each homologous chromosome with its two chromatids and undivided centromere move towards the opposite poles of the cell.
- This stage of the chromosome is called **Diad**.

D. TELOPHASE I

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

E. CYTOKINESIS

- The cytoplasmic division occurs and two haploid cells are formed.



B. HOMOTYPIC DIVISION

In this division, the two haploid cells formed during first meiotic division divide into four haploid cells. The daughter cells are similar to parent cell in the chromosome number (Homotypic). It consists of **five** stages.

- Prophase – II
- Metaphase – II
- Anaphase – II
- Telophase – II
- Cytokinesis – II

PROPHASE II

- The centriole divides into two, ***each one moves to opposite poles into two, each one moves to opposite poles.***
- Asters and spindle fibres.
- Nuclear membrane and nucleolus disappear.

METAPHASE II

- The chromosomes *get arranged on the equator.*
- Two chromatids are separated.

ANAPHASE II

- The separated chromatids become daughter **appear** chromosomes and move to opposite poles

TELOPHASE II

- The daughter chromosomes are centered.
- The nuclear membrane and the nucleolus appear.

CYTOKINESIS II

- Two cells are formed from each haploid daughter cell, resulting in the formation of four cells with haploid number of chromosomes.

SIGNIFICANCE OF MEIOSIS

The constant number of chromosomes in a given species is maintained by meiotic division.

Mitosis	Meiosis
Occurs in somatic cells.	Occurs in reproductive cells.
Involved in growth and occurs continuously throughout life.	Involved in gamete formation only during the reproductively active age.
Consists of single division.	Consists of two divisions.
Two diploid daughter cells are formed.	Four haploid daughter cells are formed.
The chromosome number in the daughter cell is similar to the parent cell (2n).	The chromosome number in the daughter cell is just half (n) of the parent cell.
Identical daughter cells are formed.	Daughter cells are not similar to the parent cell and are randomly assorted.

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