By
Dr. Prabhavati
20.7.2020.

DII Hons/Sub. Zoology.
Paper - III
Gr - A

Page - 1
Lecture - 8

MEIOSIS

Meiotic cell div$_n$ occurs in germ cells of all living organisms.

The meiotic cell division first described by Van Beneden in 1883.

During meiosis the genetic material of a diploid germ cell undergoes two nuclear divisions & resulting in to four haploid daughter cells. Each daughter cell has one half of the No. of Chromosomes as the parent cell.

There are two successive nuclear divisions in meiosis as compared to the one division found in mitosis.

The two stages of meiosis are

Meiosis I

Meiosis II.

Meiosis I is also called reductional division.

Meiosis II also called as Equational division.

Before a dividing cell enters meiosis it undergoes a period of growth called interphase

Meiosis

- Interphase
- Meiosis I
  - Prophase I
    - Leptotene
    - Zygotene
    - Pachytene
    - Diplotene
    - Diakinesis
  - Metaphase I
  - Anaphase I
  - Telophase I
  - Cytokinesis

2 daughter cells with haploid set (N)

- Meiosis II
  - Prophase
  - Metaphase
  - Anaphase
  - Telophase
  - Cytokinesis

4 daughter cells

INTERPHASE

Just prior to the entry of cell into meiosis is known as premeiotic interphase.
During its S Phase of Pre meiotic interphase, chromosome replication takes place.

MEIOSIS I

Meiosis I Separate homologus chromosomes and Produce 2 cells with haploid chromosome number (N) for that reason it is known as reductional division.
Meiosis I consists of 4 stages
1) Prophase I
2) Metaphase I
3) Anaphase I &
4) Telophase I.

Prophase I

It is the longest in duration compared to prophase in mitosis.
It takes about 85 - 95% of the total time for meiosis and also much more complex.
The Prophase I devided in 5 stages (LeZaPaDiDia).

SUNDAY 14

Leptotene
Zygotene
Pachytene
Diplotene &
Diakinesis.

NOTES

Leptotene — The first stage of meiosis is called leptotene or leptonema.
All the chromosomes begin to condense, so they become visible as fine threads.

There is a marked increase in nuclear vol.
A process of homology search which is essential to the initial pairing of homologues begins during leptotene.

Zygotene

It is also known as zygonema.
This stage begins with the initiation of pairing between homologous chromosomes & it ends with complete pairing.
The process of pairing (at end to end) between homologous chromosomes is known as Synapsis (homologous dyads)
The Synaptinemal complex is formed during. These zygotene stage.
At the completion of zygotene, the paired homologous chromosomes take the form of Bivalents.
The No. of bivalents in each sps. is equal to the haploid No.

Pachytene

This stage is also known as Pachynema.
The process of synapsis is complete.
The 2 homologous of each bivalent appear to be attached with each other at one or more points, these attachments are called Chiasmata.
Crossing over is a precise breakage & swapping and reunion between 2 non-sister chromatids.
NOTE: Crossovers make new gene combination & which are an important source of genetic variations in populations.

DIPLOTENE.

APRIL TUESDAY 16 2019 105-259 • Wk 16

DNA recombination is complete.
The chromatids continue to shorten and thicken & 4 sister chromatids form tetrad
The synaptinemal complex begins to break down.

Diplotene also called diplonema.
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 chromosomes become shorter & thicker due to condensation.
Nucleolus & 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 fibres from one pole of the cell attach to one chromosome and spindle fibres from the opposite pole attach to the homologous chromosomes.

ANAPHASE 1
chromosomes move to the opposite poles.
The microtubules and the kinetochore fibres interact which cause the movement.
A difference between mitosis & meiosis is that sister chromatids remained joined after metaphase in Meiosis 1 whereas in mitosis they separate.

During Anaphase I original chromosomes Separati, so reduction in the No. of chromo. from 2N to N No. yet the sister chromatids remain together.

TELOPHASE I

The homologus chromosome complete their migrat to the 2 poles because shortening of spindle The nuclear envelop organized around two groups of chromosomes.
The nucleolus also reappears.

CYTOKINESIS

Cytokinesis involves the formation of Cleavage furrow resulting in the pocketing of the cells into 2 cells.
At the end of Telophase I & cytokinesis, two daughter cells are produced, each with one half of the No. of chromosomes (haploid set of replicated chromosomes) of the original parent cell.

INTEKINESIS

Interkinesis (Interphase II) is similar to interphase.

MEIOSIS II

Meiosis II is the second part of meiotic process. The meiosis II consists
Prophase II — Each dyad is composed of a pair of sister chromatids attached by a common centromere.
Metaphase II. — centromeres are positioned at the equatorial plane.

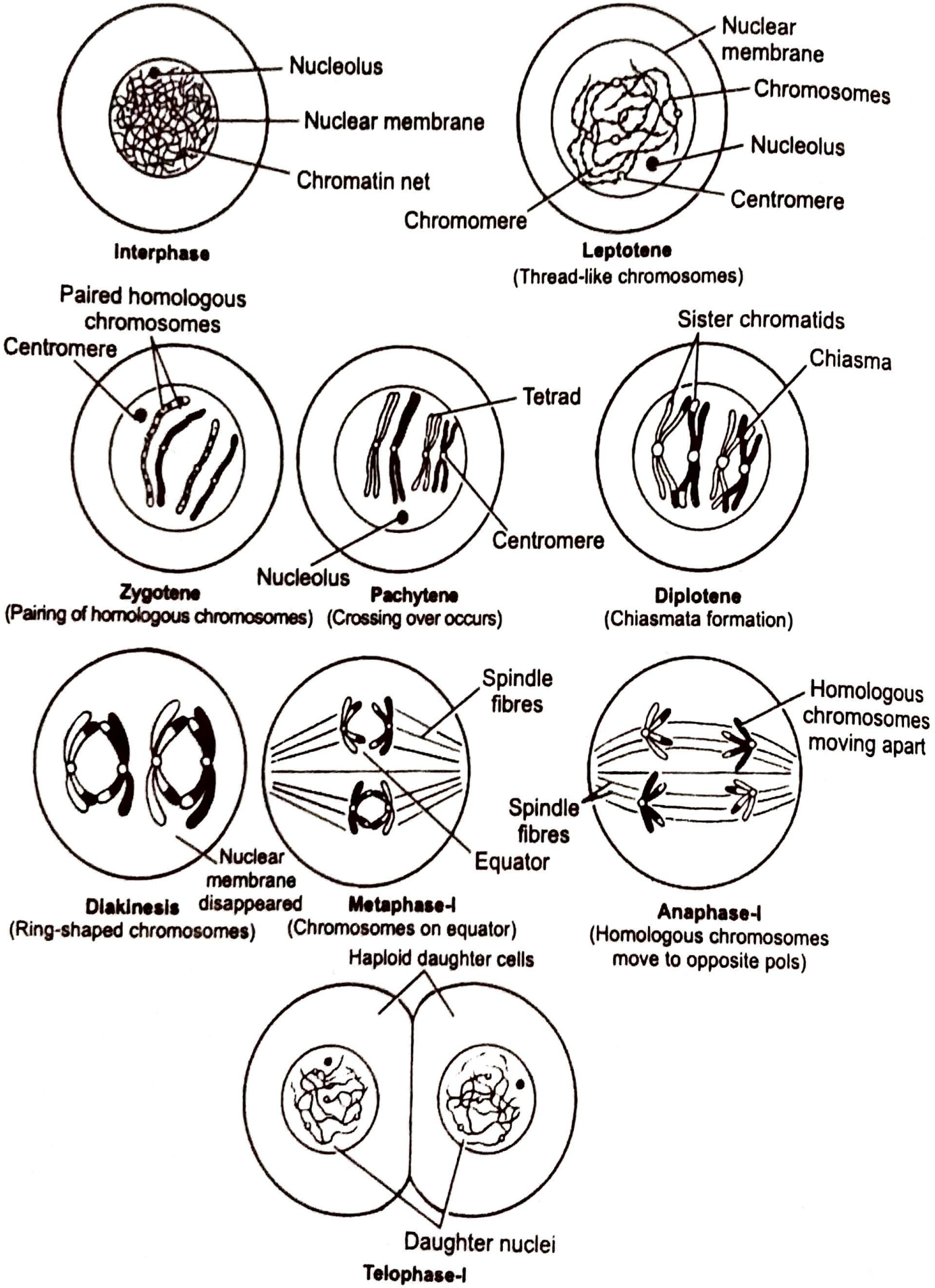

Fig. 23.23 Diagrammatic representation of different stages in the first meiotic division.

Anaphase II — Centromere divide and the sister chromatids of each dyad are pulled to opposite poles.

Telophase II - One No. of each cell pair of homologous chromosome present in each pole. Each chromosome is referred as monad. (a combination of maternal & paternal genetic information).

Nuclei reform around chromosomes at the poles.

Following cytokinesis & finally 4 haploid gametes result from a single meiotic event.

—X—