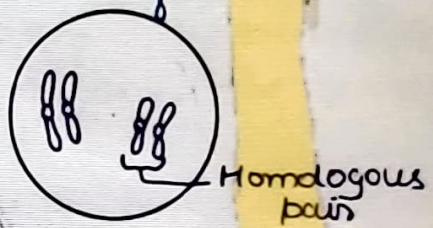
Cell cycle and cell division

Cell cycle :- Cell cycle is a series of events that takes place in a cell as it grows and divides.

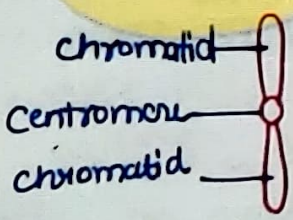
Some Important terms Related to cell Division

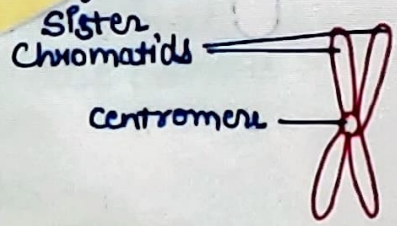
- Diploid → It means having two sets of chromosomes. (2n)
- Haploid → It refers to having only one set of chromosomes (n)
- Homologous chromosome →

It refers to a pair of chromosome in a diploid cell that are exactly similar in shape and size and have the centromere at same Location.



- Centromere :- It is a constricted region of chromosome The two chromatids of chromosome are attached at the centromere.





- Chromatid – One of the two identical parts of a chromosone after its duplication.

All the cells go through basic cell cycle.

Cell Cycle
- Interphase
- Karyokinesis
- Cytokinesis

INTERPHASE

- Very active phase.
- DNA Duplication occurs
- Preparatory phase

Interphase → G_1 phase, S phase, G_2 phase

G_1 → First Growth phase
- Cell grows in size
- RNA, proteins and enzymes are synthesised.

At this stage one of the two paths is taken up by the cell. Some cell go to resting phase and other continue to divide.

S phase → Synthetic phase
- DNA Synthesis
- Chromosomes are duplicated

G_2 phase - (Gap 2)
Second growth phase
- RNA and protein synthesis continues
- Centriole replicates in animal cell. plant cell don't have centriole

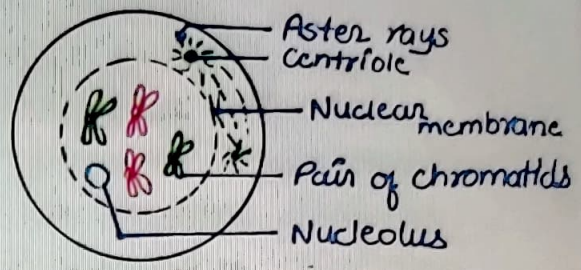
KARYOKINESIS OR MITOTIC PHASE

Division of nuclear material is called Karyokinesis.

Karyokinesis → Prophase, Metaphase, Anaphase, Telophase

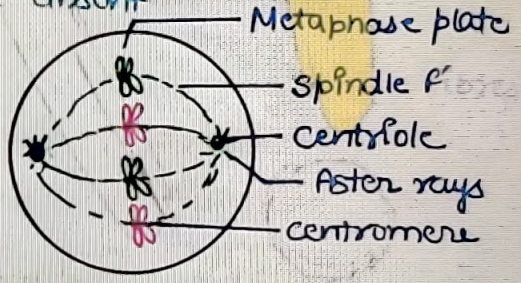
PROPHASE

- Longest phase of division
- Chromosome shorten by thickening
- Nuclear membrane tends to disintegrate.
- Nucleolus starts disappearing
- Aster rays radiate from centrioles.



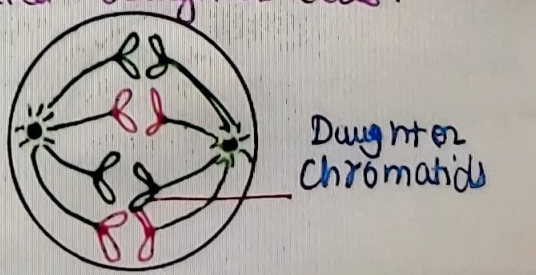
Metaphase

- Formation of spindle fibre
- Chromosomes line up at the centre forming equatorial or metaphase plate
- Chromosomes are attached to spindle fibres at the centromere region.
- Nuclear membrane & Nucleolus are absent



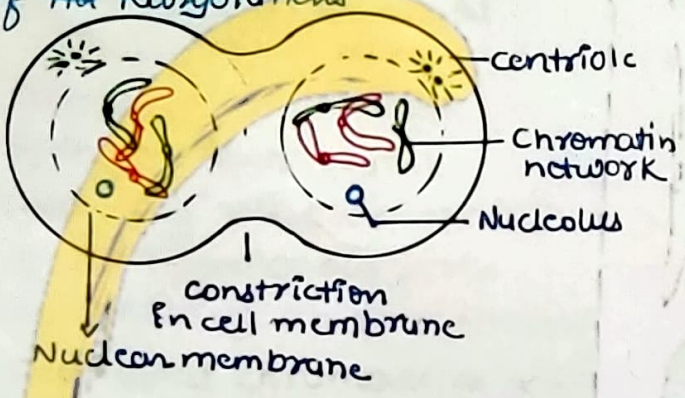
Anaphase

- Very rapid stage
- Centromere splits into two
- Two chromatids of a chromosome separate
- Separated chromatids are now called daughter cells.



TELOPHASE

- Chromatids now called as chromosomes reach the poles of the cell.
- Chromosomes uncoil, lengthen and form chromatin network again.
- Spindle fibre disappear
- A constriction may appear
- Nuclear membrane reappears and two nuclei are formed.
- Leads to cytokinesis
- Telophase marks the completion of ~~the~~ Karyokinesis



CYTOKINESIS

- Division of cytoplasm
- In animals – By furrow formation
- In plants – By cell plate formation

SIGNIFICANCE OF MITOSIS

- The cell contain same number of chromosome as parent.
- There is no variation in genetic information.
- Leads to increase in number of cells.
- Uncontrolled mitotic division may give rise to tumours and cancerous growth in the body

MEIOSIS

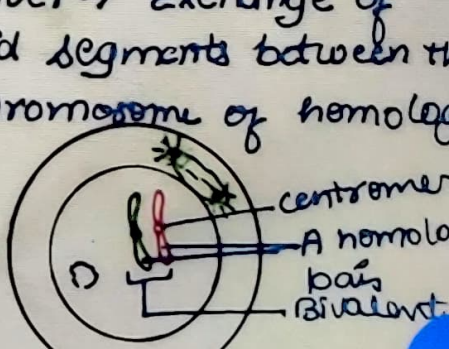
- It occurs in male and female reproductive or germ cell.
- A diploid cell undergoes two successive divisions to give rise to four haploid cells.
- The cells so formed are called the gametes
- Meiosis is also called as reductional division.
- It involves single duplication of chromosome followed by two successive divisions

i) Meiosis I ii) Meiosis II

- Meiosis I
  - Prophase I
  - Metaphase I
  - Anaphase I
  - Telophase I
- Meiosis II
  - Prophase II
  - Metaphase II
  - Anaphase II
  - Telophase II

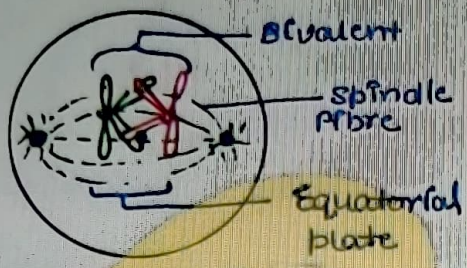
Prophase I

- The longest phase in meiosis
- Homologous chromosomes come close together to form a pair called a bivalent.
- This pairing of chromosomes is known as synapsis
- The pairing is followed by crossing over in homologous pa
- Crossing over → Exchange of chromatid segments between th two chromosome of homolog pair



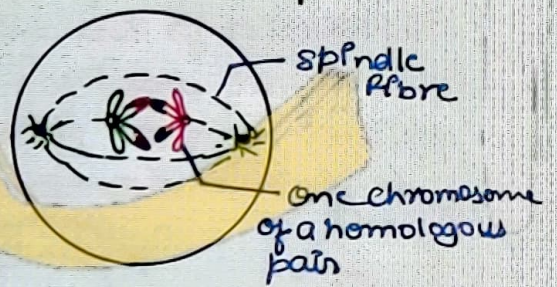
Metaphase I

- Bivalents get arranged at the equatorial plate of the spindle
- Bivalents are attached to the spindle fibres by their centromeres.
- Centromeres of chromosome points towards the poles and arms of the chromosome are directed inwards



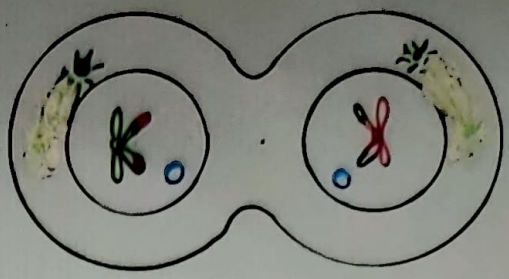
Anaphase I

- Spindle fibres shrink, separating the chromosomes of a homologous pair
- No splitting up of centromere
- Separated chromosomes move towards opposite poles



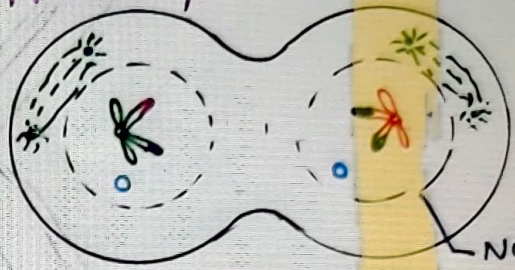
Telophase I

- Each pole poseses half the number of chromosomes
- Due to crossing over, the chromosomes at poles are genetically different from the parent chromosome.
- Spindle fibres disappear
- Nuclear membrane and nucleolus reappear



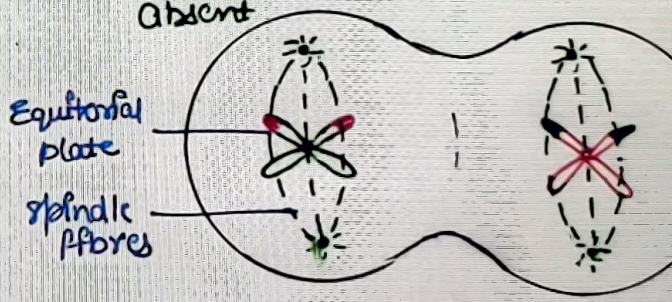
Prophase II -

- Nuclear membrane and nucleolus disappear
- Condensation and shortenin of chromatin material int chromosomes.
- Centriole start moving towa opposite poles.



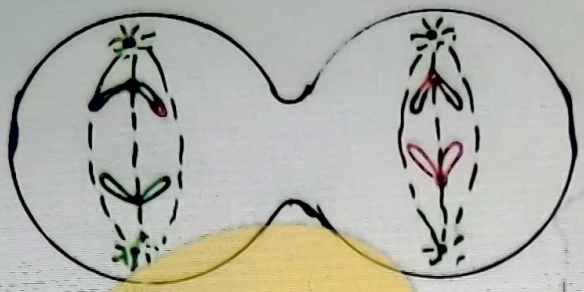
Metaphase II

- Centrioles move to opposite
- Chromosomes get aligned a the equatorial plate.
- Spindle fibre are attached the centromeres of chrom
- Nuclear membrane and nuc absent



Anaphase II

- Each centromere splits into two, separating the chromatids of a chromosome.
- spindle fibres shrink, pulling the chromatids
- Chromatids move apart.
- Separated chromatids are now called as chromosomes.



Telophase II

- chromatids, now called chromosome uncoil, get elongated and form a chromatin network
- Nuclear membrane and nucleolus reappear
- spindle fibres disappear
- At the end of telophase II 4 nuclei are formed, each containing haploid number of chromosome