

Karyokinesis and division of cytoplasm is called cytokinesis.

The cell division is of two types. 1) Mitosis and 2) Meiosis

**MITOSIS:** The term mitosis was coined by Flemming in 1882. Mitosis occurs in somatic organs like root tip, stem tip and leaf base etc. Hence it is also known as somatic cell division. The daughter cells are similar to the mother cell in shape, size and chromosome complement. Since the chromosome number is same in the daughter cells as compared to that of mother cell, this is also known as homotypic or equational division. Mitotic cell cycle includes the following stages: Interphase: This is the period between two successive divisions. Cells in interphase are characterized by deeply stained nucleus that shows a definite number of nucleoli. The chromosomes are not individually distinguishable but appear as extremely thin coiled threads forming a faintly staining network. The cell is quite active metabolically during interphase.

**Mitosis consist of four stage, viz.,**

(a) Prophase, (b) Metaphase, (c) Anaphase and (d) Telophase

a) **Prophase:** This is the longest phase in mitosis. The nucleus takes a dark colour with nuclear specific stains and also with acetocarmine / orcein. The size of the nucleus is comparatively big and the chromosomes that are thin thread and uncoiled in the initial stages slowly thicken and shorten by a specific process of coiling called relational coiling. The two chromatids of each chromosome held at centromere are visible under light microscope. The nuclear membrane and nucleolus disintegrates at the end of prophase.

b) **Metaphase:** After the disintegration of nuclear membrane in prophase, the spindle fibres are formed and the centromere of each chromosome is arranged on the equatorial plate. The chromosomes remain attached to spindle fibres at the centromere. This type of orientation of centromeres on the equator is known as auto-orientation. The chromosomes at this stage are shortest and thickest. Hence, chromosomes are clearly visible in metaphase. The chromatids of a chromosome are held together at the point of centromeres and the relational coils are at its minimum.

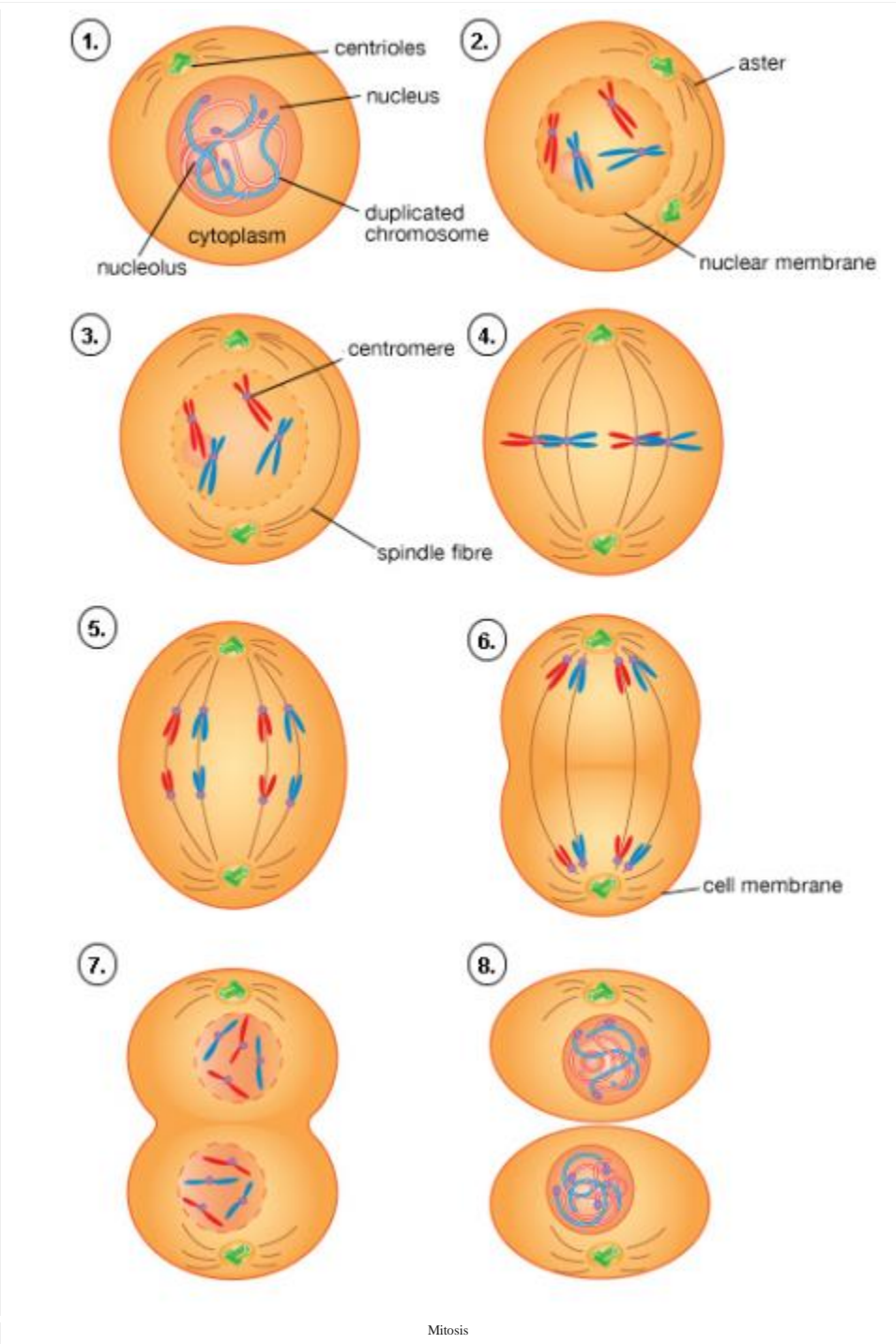
c) **Anaphase:** The centromere of each chromosome separates first and the sister chromatids of each chromosome moves towards opposite poles. Depending on the position of the centromeres (metacentric, acrocentric and telocentric), the chromosomes show `V`, `L` and `I` shapes respectively as the anaphase progresses. The chromosome number is constant but the quantity of each chromosome is reduced to half.

d) **Telophase:** spindle fibres disintegrate. Chromosomes lose their identity and become a mass of chromatin. The nucleus along with nucleoli will be re-organized at each pole. The division of nucleus is known as Karyokinesis. Karyokinesis is followed by cytokinesis. Cytokinesis: It is the division of cytoplasm that usually occurs between late anaphase and end of telophase. In plants,

cytokinesis takes place through the formation of cell plate, which begins in the centre of the cell and moves towards the periphery in both sides dividing the cytoplasm into two daughter cells. In animal cells, cytokinesis occurs by furrowing of plasmalemma in the equatorial region.

**Significance of Mitosis:** Mitosis plays an important role in the life of living organisms in various ways as given below:

1. Mitosis is responsible for development of a zygote into adult organism after the fusion of male and female gametes.
2. Mitosis is essential for normal growth and development of living organisms. It gives a definite shape to a specific organism.
3. In plants, mitosis leads to formation of new organs like roots, leaves, stems and branches. It also helps in repairing of damaged parts.
4. In animals, mitosis acts as a repair mechanism wherein old, dead and decayed cells are replaced with new ones, such as gut epithelium and blood cells
6. Mitosis is useful in maintaining the genetic purity because it does not allow segregation and recombination to occur. Hence daughter cells are genetically identical to parental ones. This concept forms the basis in asexual propagation of vegetatively propagated crops like sugarcane, banana, sweet potato, potato, etc. as mitosis leads to production of identical progeny in such crops.



2: Early Prophase

3: Late Prophase

4: Metaphase

5: Early Anaphase

6: Late Anaphase

7: Telophase

8. Daughter cell Identical