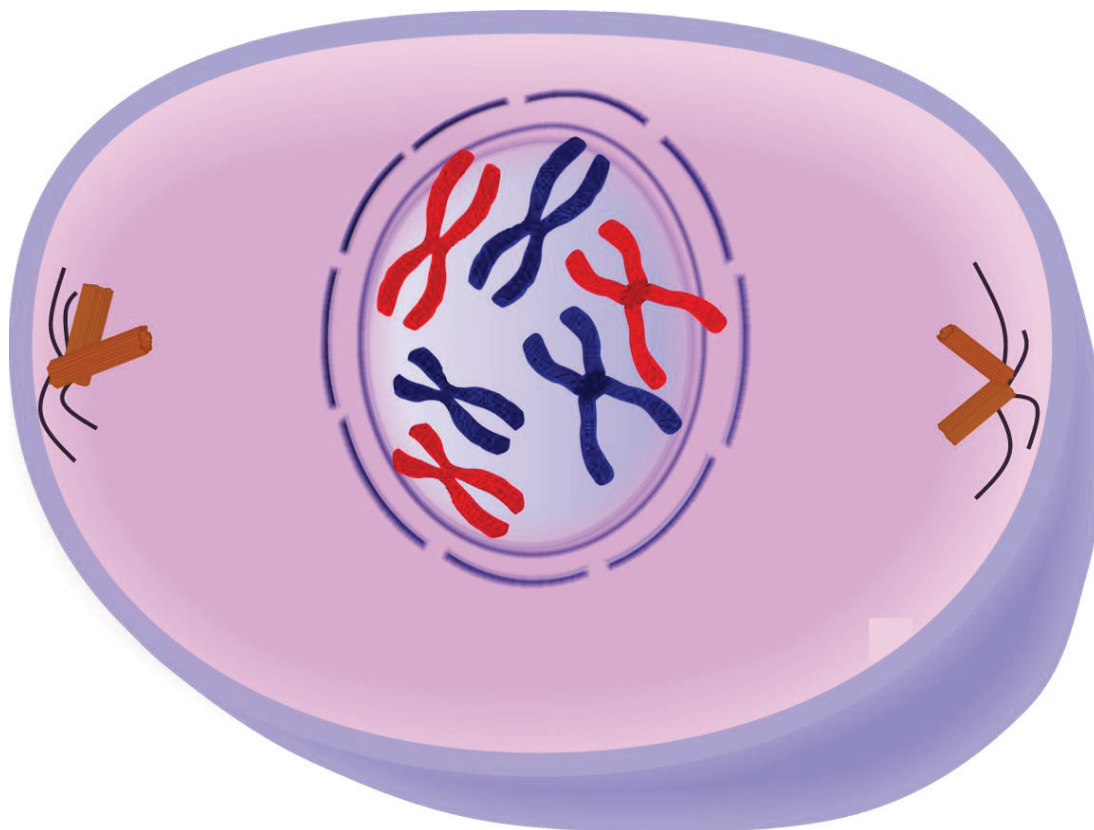


CELL CYCLE AND CELL DIVISION



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Cell cycle

The sequence of events by which a cell duplicates its genome, synthesizes the other constituents of cells and eventually divides into two daughter cells is called cell cycle.

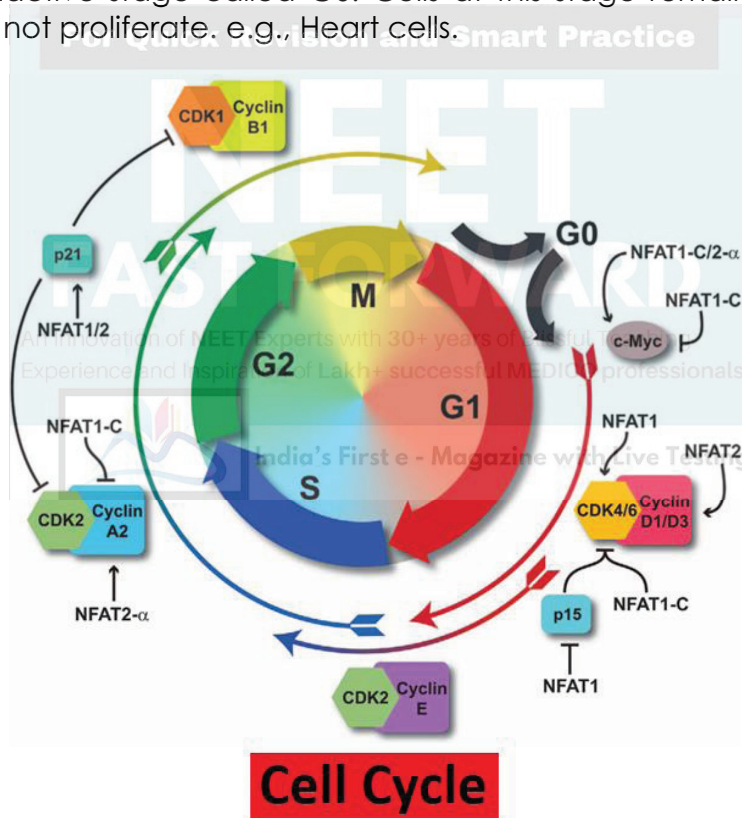
G₁ Phase: Cell metabolically active and grows continuously but does not replicate DNA

S Phase: DNA synthesis occurs, DNA content increases from 2C to 4C, but the number of chromosomes remains same i.e., 2n.

G₂ Phase: Proteins are synthesized in preparation for mitosis while cell b growth continues.

M Phase (Mitosis Phase): Starts with nuclear division, corresponding to separation of daughter chromosomes (karyokinesis) and usually ends with division of cytoplasm, (cytokinesis).

Quiescent stage (G₀): In adult animals cells that do not divide and exit G₁ phase to enter an inactive stage called G₀. Cells at this stage remain metabolically active but do not proliferate. e.g., Heart cells.



Difference between Mitosis and meiosis

Mitosis	Meiosis
Takes place in the somatic cells.	Takes place in reproductive cells.
It is a single division which produces two cells.	It is a double division which produces four cells.
Haploid and diploid both kind of cells may undergo mitosis.	Only diploid cells undergo in meiosis cell division.
Crossing over absent.	Crossing over takes place.
Pairing of chromosome does not occur.	Pairing of homologous chromosome occurs.

Stages of Mitosis

Since the number of chromosomes in the parent and progeny cells is the same, it is called as equational division.

Mitosis is divided into four sub stages:

Prophase:

- Replicated chromosomes, each consisting of 2 chromatids, condense and become visible.
- Microtubules are assembled into mitotic spindle.
- Nucleolus and nuclear envelope disappear.
- Centriole moves to opposite poles.

Metaphase:

- Spindle fibers attached to kinetochores (small disc-shaped structures at the surface of centromere) of chromosomes.
- Chromosomes line up at the equator of the spindle to form metaphase plate.

Anaphase:

- Centromeres split and chromatids separate.
- Chromatids move to opposite poles due to shortening of spindle fibers.

Telophase:

- Chromosomes cluster at opposite poles.
- Nuclear envelope assembles around chromosomes clusters'.
- Nucleolus, Golgi Complex, E.R. reforms.

Cytokinesis

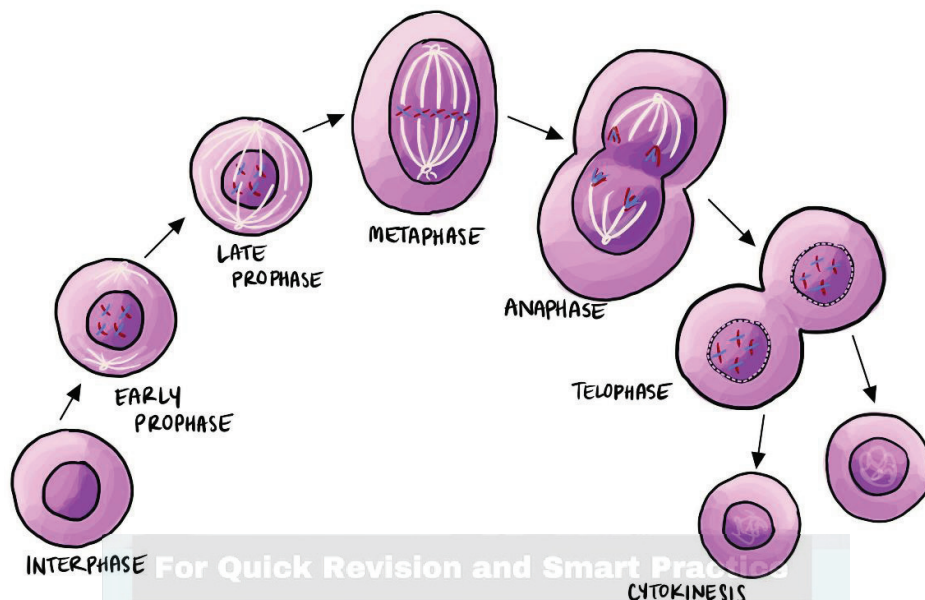
Is the division of protoplast of a cell into two daughter cells after karyokinesis (nuclear division).

Animal Cytokinesis: Appearance of furrow in plasma membrane which deepens and joins in the center, dividing cell cytoplasm into two.

Plant cytokinesis: Formation of new cell wall begins with the formation of a

simple precursor cell plate which represents the middle lamella between the walls of two adjacent cells.

Syncytium: When karyokinesis is not followed by cytokinesis, a multinucleated condition arises. This is called syncytium.



Significance of Mitosis:

- Growth-addition of cells.
- Maintenance of surface/ volume ratio. Maintain Nucleo –cytoplasmic ratio.
- Maintenance of chromosomes number.
- Regeneration.
- Reproduction in unicellular organisms, lower plants and some insects.
- Repair and wound healing.
- Vegetative reproduction in plants takes place by mitosis.

Meiosis

- Specialized kind of cell division that reduces the chromosomes number by half. hence it is called reductional division.
- Occurs during gametogenesis in plants and animals.
- Involves two sequential cycles of nuclear and cell division called Meiosis I and Meiosis II.
- It results in 4 haploid daughter cells.
- Interphase occurs prior to meiosis which is similar to interphase of mitosis except the S phase is prolonged.

Meiosis I

Prophase I: Subdivided into 5 phases.

Leptotene:

- Chromosomes make their appearance as single stranded structures.



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