



Cell-Cycle

G<sub>1</sub> Phase: Gap-I or First Growth phase / Post Mitotic phase /

Pre-synthetic phase:

1. Nucleus grows up to some extent.
2. Intense formation of biomolecules, biochemicals, and <sup>e.g. nucleotides, amino acids, RNA's, protein, ATP etc.</sup> sub-cellular structures e.g. mitochondria, golgibodies, plastids, ~~and~~ endoplasmic reticulum, ribosomes,
3. In late G<sub>1</sub> - some unknown signal molecule (Mitogen) are thought to be formed switching the cell into S-phase.

## S-phase: Synthetic Phase:

1. Replication of DNA molecules doubling its amount.  $2n \rightarrow 4n$   
in diploids & in haploids  $\rightarrow 2n$ .
2. Number of chromosomes remain same as in newly formed daughter cells
3.  $\rightarrow$  Each each chromosome is now dyad form (having two chromatids) from initial monad (having single strand chromatid)
4. Histone proteins are formed from their precursors.
5. Nucleosomes, the basics to formation of chromatin threads are formed.
6. Sub-units of kinetochore assemble.
7. Non-histone proteins and other metabolites are formed.

In short :- Chromosomes replicate along with some other molecules and substances

8. Once the S-phase begins, the cell must undergo Mitosis
9. Replication of each chromosome by synthesis of a new DNA-molecule on the template of existing DNA.
10. Kinetochore is a complex of proteins assembles on each chromatid in the region of centromere.
11. It is also known as Invisible stage of Metaphase (M-phase)

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G<sub>2</sub>-phase / Gap-II / Second Growth phase / Post-Synthetic/

Pre-Mitotic Phase

1. Nucleus grow in size.
2. Increase in size of cell also.
3. Intensive formation of biomolecules, biochemicals,
4. Biochemicals <sup>RNA, proteins</sup> for spindles and other structures related to cell division are formed.
5. Mitochondria, plastids, centrioles divide
6. Energy store increases.

G<sub>0</sub>-Phase: 1. The <sup>daughter</sup> cells which do not divide are said to be in G<sub>0</sub> phase.

2. These cells do not proceed beyond G<sub>1</sub> phase
  3. They undergo into differentiation for specification.
  4. Some of them may grow and divide depending upon triggering of factors in different conditions and environment (e.g. healing of wound).
  5. Some never divide and get their full differentiation.
- Finally they die out for (e.g. Nerve cells, R.B.C., W.B.C, and skeletal muscle cells).

## Significance : of Mitosis :

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1. Growth and development of multicellular organisms :  
From a single cell Zygote they are formed through repeated mitosis.
2. Cell size ~~Maintain~~ size of cell : Increase in cell size induces mitosis and keep S.A / Volume ratio normal.
3. Regeneration : A part or fragment of a body can regenerate the whole body (Plant especially and in certain animals like beech <sup>cut</sup> & worms)
4. Replacement : Death & decaying of cells is a regular practice. The new layers (Bark, lining of gut, covering of external surface, blood cells) have to be formed through new cell via <sup>mitotic</sup> cell division.
5. Asexual Reproduction : Vegetative and asexual reproduction.
6. Maintain somatic ~~var~~ variation : As it takes place in vegetative (somatic) cells. Hence a character established in them can be maintained in all of its daughter cells.
7. Maintain Genetic Constitution : Similar Genetic constitution is found in all of the cells of an organism (both quantitative and qualitative) as the constitution and distribution of chromosomes are same.
8. Relationship / Affinity :- It is same in almost all organisms. It proves that all were linked, linked or related.
9. Healing wounds : Around the area of injury cells divide mitotically and heal it.
10. Maintain N/C or C/N Ratio : An optimum one is required for the normal metabolism of a cell.