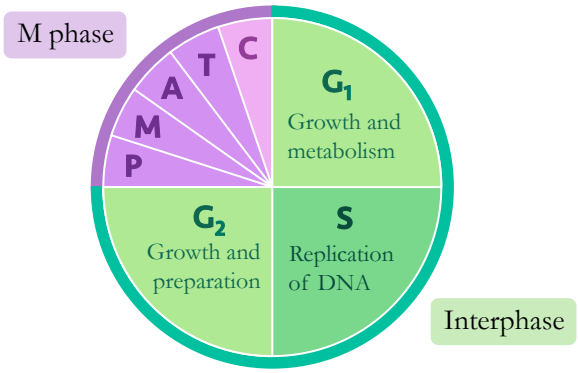
TOPIC 1.6: CELL DIVISION

Cell Cycle



The cell cycle is an ordered set of events that culminates in cell division

Interphase

An active phase of the cell cycle where many metabolic reactions occur

- Consists of G_1, S and G_2 stages

M phase

The period of a cell cycle in which the cell and contents divide

- Consists of mitosis (P, M, A, T) and cytokinesis

Some cells may also enter a non-proliferative quiescent phase (G_0)

Interphase

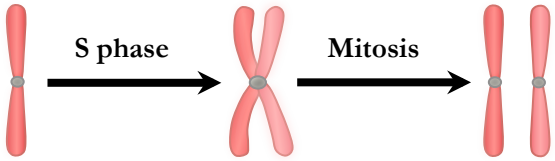
Normal metabolism cannot occur during M phase, so key events must occur during interphase to prepare for division:

- **D**NA replication (during S phase)
- **O**rganelle duplication
- **C**ell growth
- **T**ranscription / translation
- **O**btaining nutrients
- **R**espiration (cellular)

Supercoiling

During mitosis, chromatin condenses via supercoiling to become tightly packed chromosomes

- Due to replication (S phase), chromosomes consist of identical sister chromatids (joined at a centromere)



Mitosis

Mitosis is the division of a diploid nucleus into two genetically identical diploid nuclei

This process of cell cloning is needed for many important processes:

- **T**issue repair
- **O**rganism growth
- **A**sexual reproduction
- **D**evelopment of embryos

Cytokinesis

Cytokinesis is the process of cytoplasm division, whereby a cell splits in two

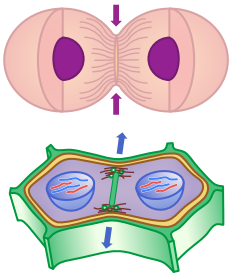
- It occurs concurrently with telophase and differs in plants and animals

Animals:

- Microtubules form a concentric ring and contract towards the centre (centripetal)

Plants:

- Vesicles form at the cell centre and fuse outwards to form a cell plate (centrifugal)



Mitotic Index

The mitotic index is a measure of the proliferative status of a cell population (i.e. number of dividing cells)

The mitotic index will be elevated during growth and repair processes and acts as a prognostic tool for cancer

$$\textbf{Mitotic Index} = \frac{\text{Cells in mitosis*}}{\text{Total number of cells}}$$

*Mitotic cells have no nucleus and have visible chromosomes

Mitosis Micrographs