SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai

DEPARTMENT OF PHYSICIAN ASSISTANT

COURSE NAME : PHYSIOLOGY

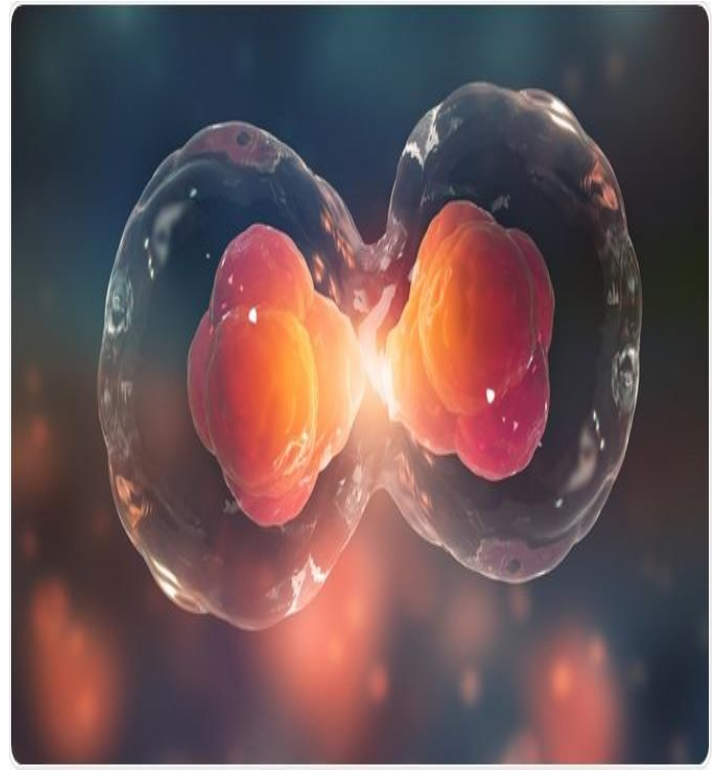
UNIT : INTRODUCTION TO PHYSIOLOGY

TOPICS : CELL

FACULTY NAME : Ms. SINEKA M

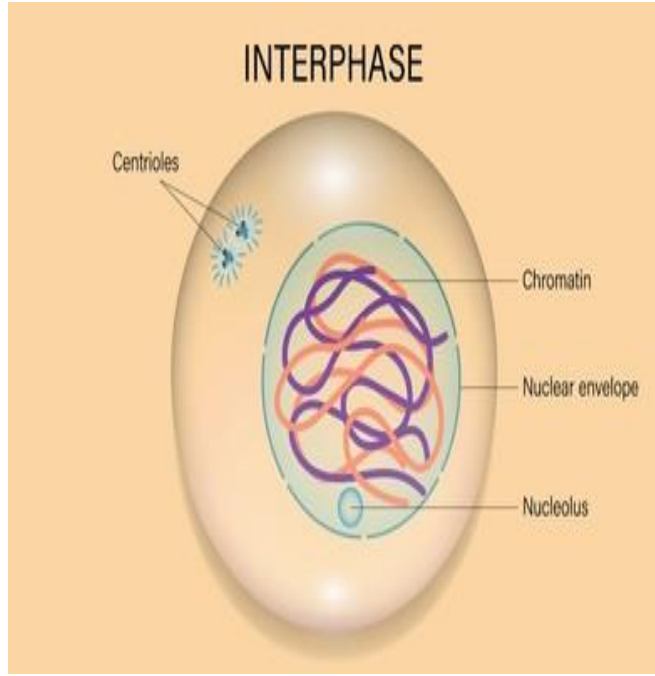
INTRODUCTION (Define)

- **Cell division** is the process in which one cell, called the parent cell, divides to form two new cells, referred to as daughter cells.
- The **cell cycle** is a repeating series of events that include growth, DNA synthesis, and cell division.
- The cell cycle is composed of two major stages: **Interphase and the mitotic (M) phase.**

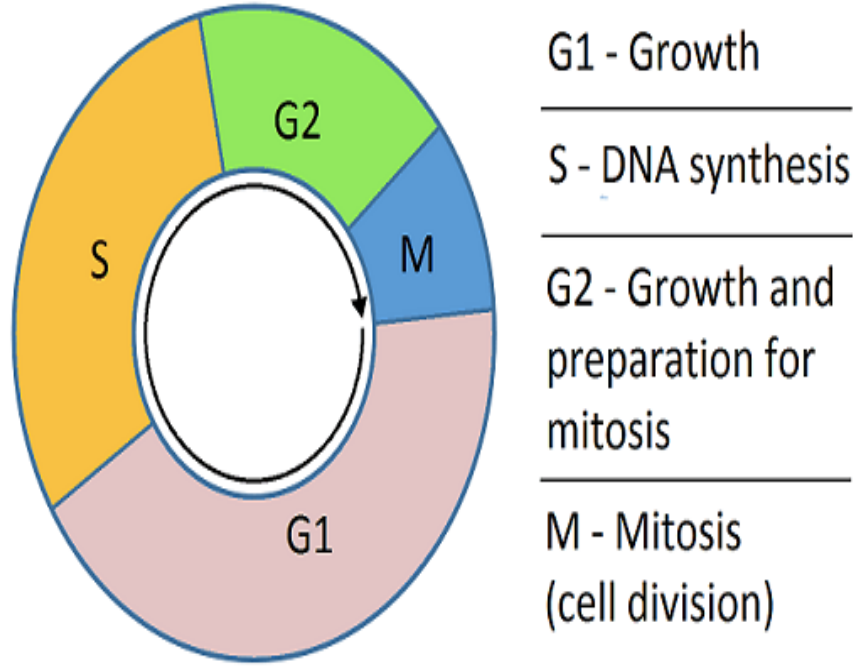


INTERPHASE

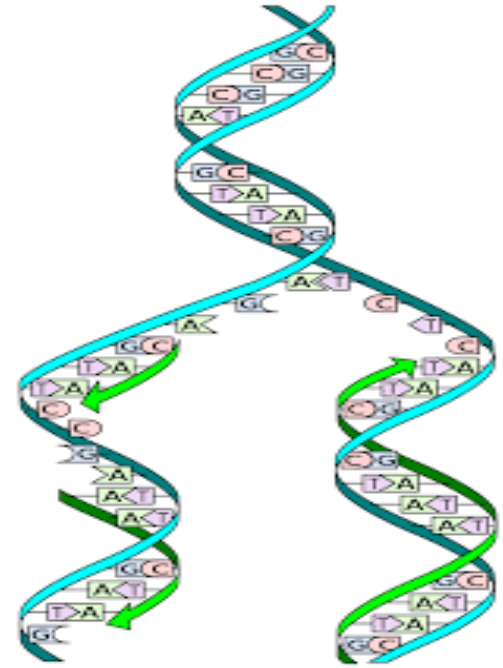
- Interphase is the longest part of the cell cycle, where the **cell grows** and makes a copy of its DNA.
- It is a period of intense metabolic activity and preparation for division and is divided into three substages: **G1 phase** (First Gap), **S phase** (Synthesis), **G2 phase** (Second Gap).



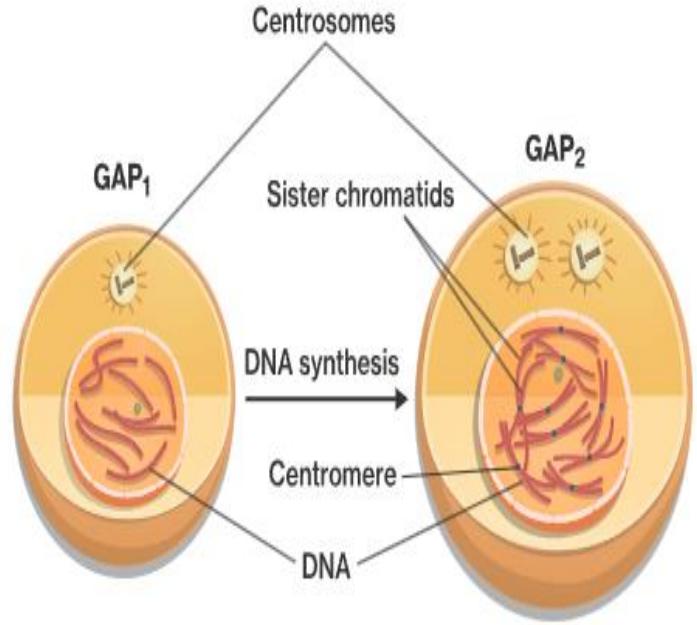
- **G1 phase (First Gap):** The **cell grows** physically larger, duplicates its organelles (such as mitochondria and ribosomes).
- And synthesizes proteins and molecular building blocks it will need in later steps.



- **S phase (Synthesis):** The cell synthesizes a complete, **identical copy of the DNA** in its nucleus.
- Each chromosome is replicated to produce two identical sister chromatids attached at the centromere.
- The centrosome is also duplicated during this phase.

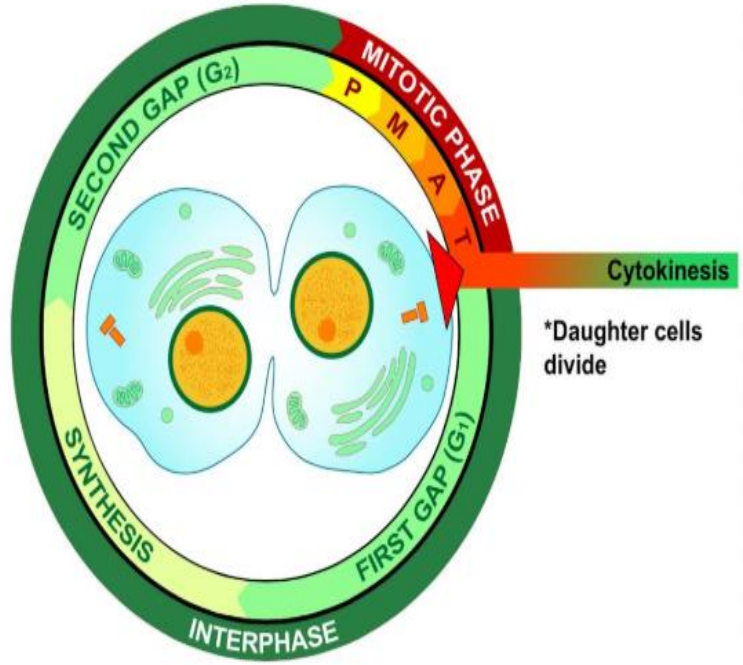


- **G2 phase (Second Gap):** The cell grows more, produces additional proteins and enzymes required for cell division and reorganizes its contents in preparation for mitosis.
- A final checkpoint ensures the **DNA has been replicated** accurately and is not damaged before entering the M phase.



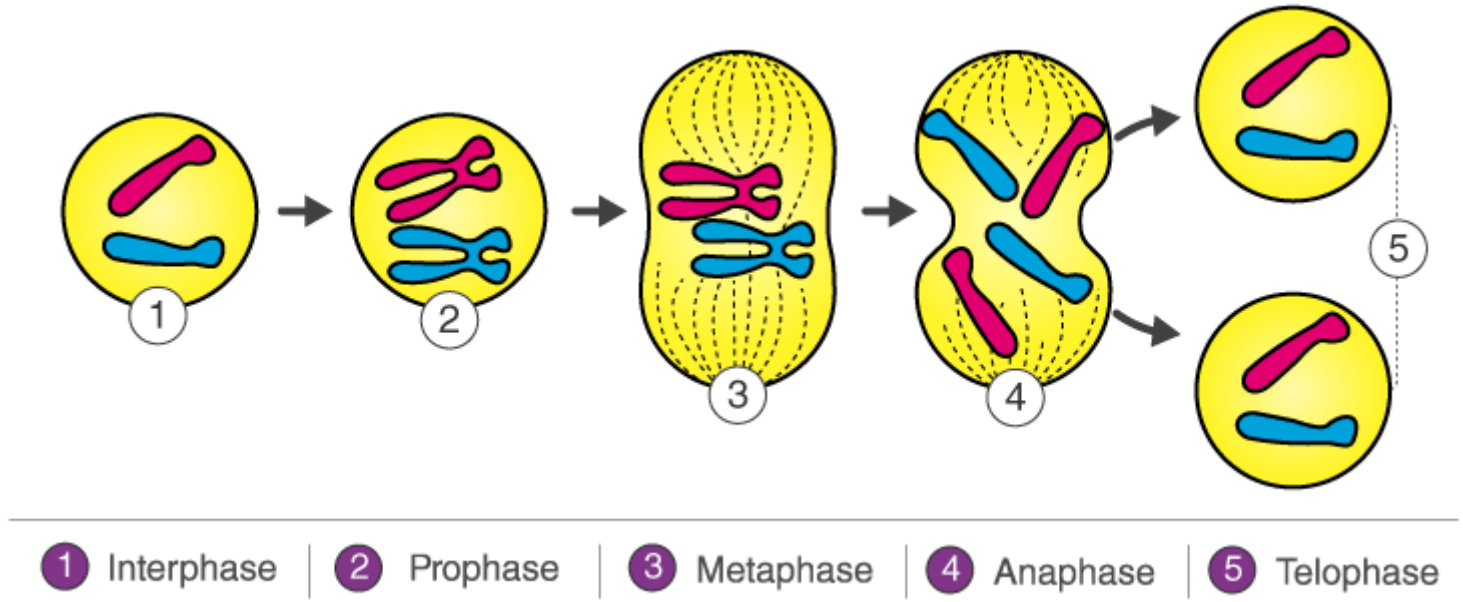
MITOTIC (M) PHASE

- The M phase is when the cell divides its copied DNA and cytoplasm to **form two new cells.**
- It consists of two tightly coupled processes: Mitosis (Nuclear Division) and Cytokinesis (Cytoplasmic Division)
- **Mitosis (Nuclear Division):** The nuclear DNA is condensed into visible chromosomes and separated into two identical nuclei.

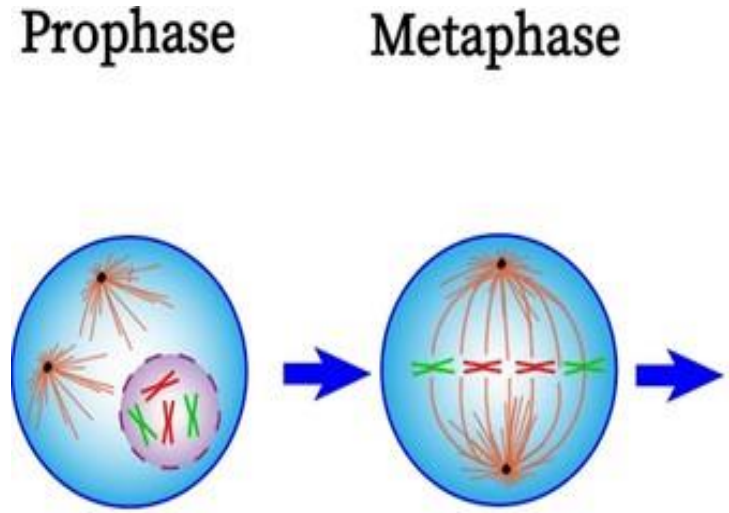


This process is divided into four main stages:

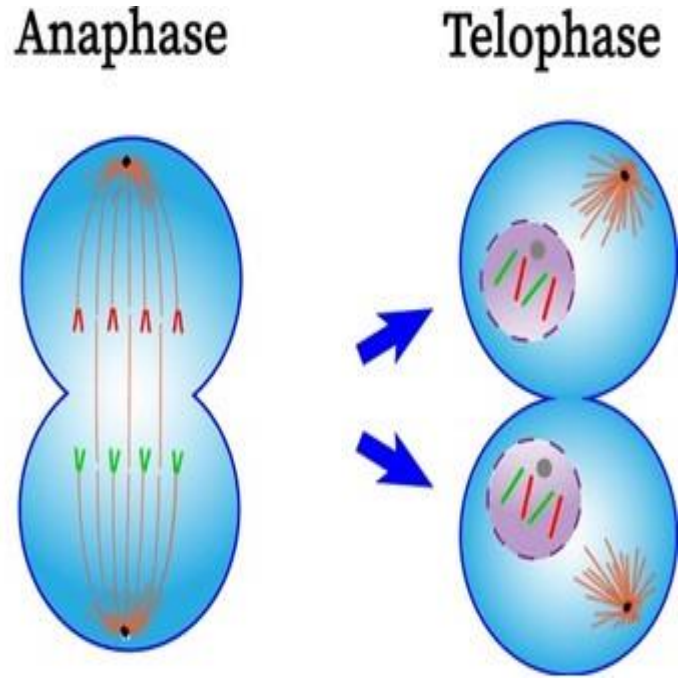
- Prophase
- Metaphase
- Anaphase
- Telophase



- **Prophase:** Chromosomes condense and become visible; the nuclear envelope breaks down; the mitotic spindle begins to form.
- **Metaphase:** Chromosomes align along the center of the cell (the metaphase plate).
- **Anaphase:** Sister chromatids separate and are pulled to opposite ends (poles) of the cell.

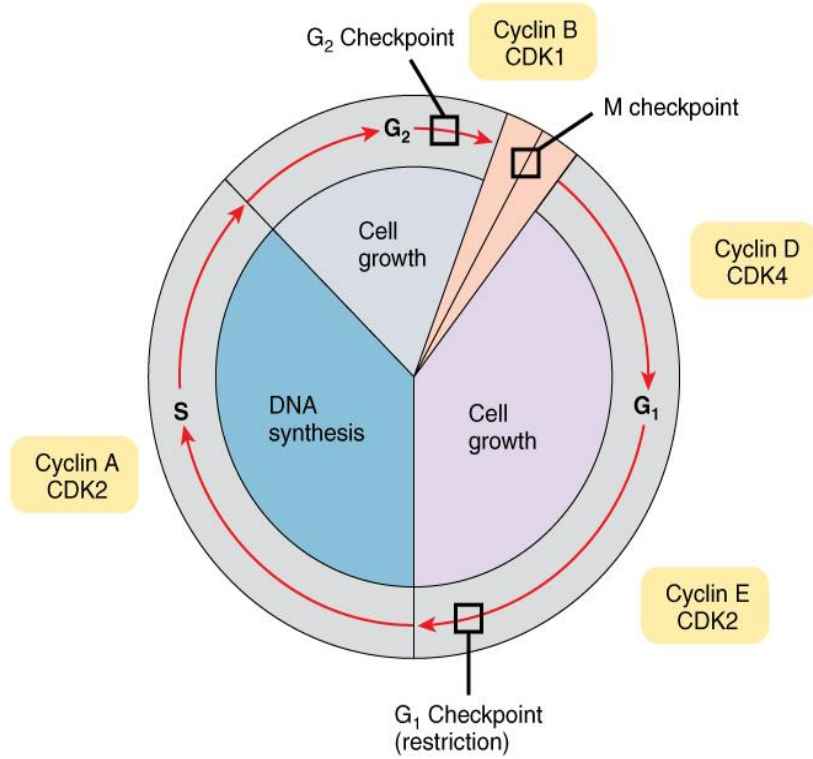


- **Telophase:** Two new nuclear envelopes form around the two sets of chromosomes, which begin to decondense.
- **Cytokinesis (Cytoplasmic Division):** The cell's cytoplasm divides, forming two separate daughter cells.

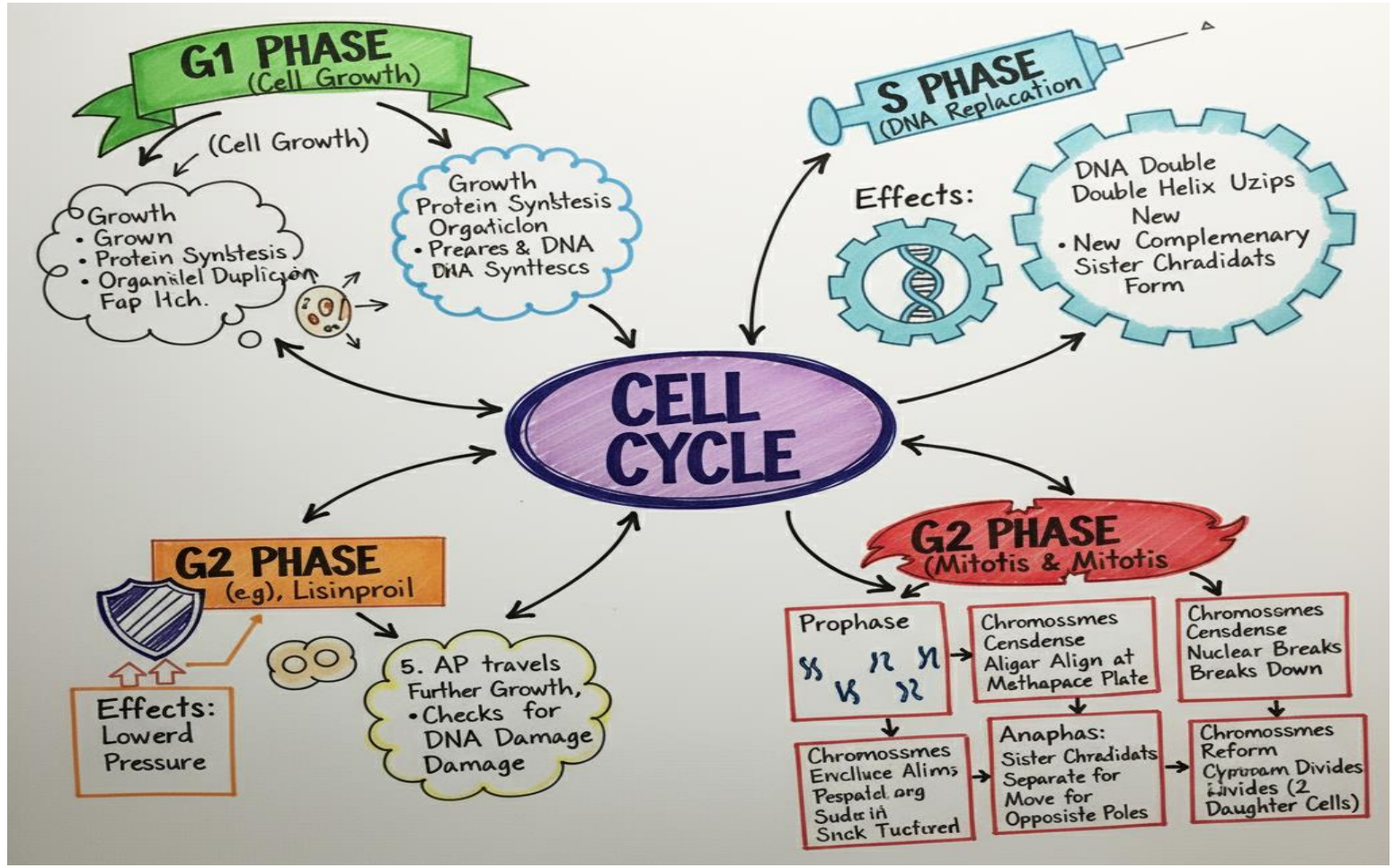


REGULATION AND CHECKPOINTS

- The cell cycle is tightly regulated by a control system with **checkpoints** that monitor progression and ensure all conditions are met before proceeding to the next phase.
- Key regulatory molecules include **cyclins** and **cyclin-dependent kinases (Cdks)**, whose fluctuating levels and activity drive the cell through the cycle transitions.



SUMMARY


G1 PHASE
(Cell Growth)
(Cell Growth)
Growth
• Grown
• Protein Synstesis
• Organilel Duplicon
Fap Hch.
Growth
Protein Synstesis
Orgaticlon
• Preares & DNA
DNA Synttescs
S PHASE
(DNA Replacation
Effects:
DNA Double
Double Helix Uzips
New
• New Complemenary
Sister Chradidats
Form
CELL
CYCLE
G2 PHASE
(e.g), Lisinproil
Effects:
Lowerd
Pressure
5. AP travels
Further Growth,
• Checks for
DNA Damage
Damage
G2 PHASE
(Mitotis & Mitotis
Prophase
Chromossmes
Censdense
Aligar Align at
Methapace Plate
Chromossmes
Censdense
Nuclear Breaks
Breaks Down
Chromossmes
Anaphas:
Sister Chradidats
Separate for
Move for
Opposiste Poles
Chromossmes
Reform
Divides (2
Daughter Cells)

References

- https://www.kenhub.com/en/library/anatomy/cellular-organelles
- https://www.britannica.com/science/cell-biology
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