SNS COLLEGE OF ALLIED HEALTH SCIENCE

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

DEPARTMENT OF OPERATION THEATRE AND ANESTHESIA TECHNOLOGY

COURSE NAME: 1131 – BASIC SCIENCES - PHYSIOLOGY

UNIT: 1 – THE CELL AND THE BLOOD

TOPIC: CELL CYCLE

SUBTOPIC: INTRODUCTION TO CELL CYCLE AND MITOSIS

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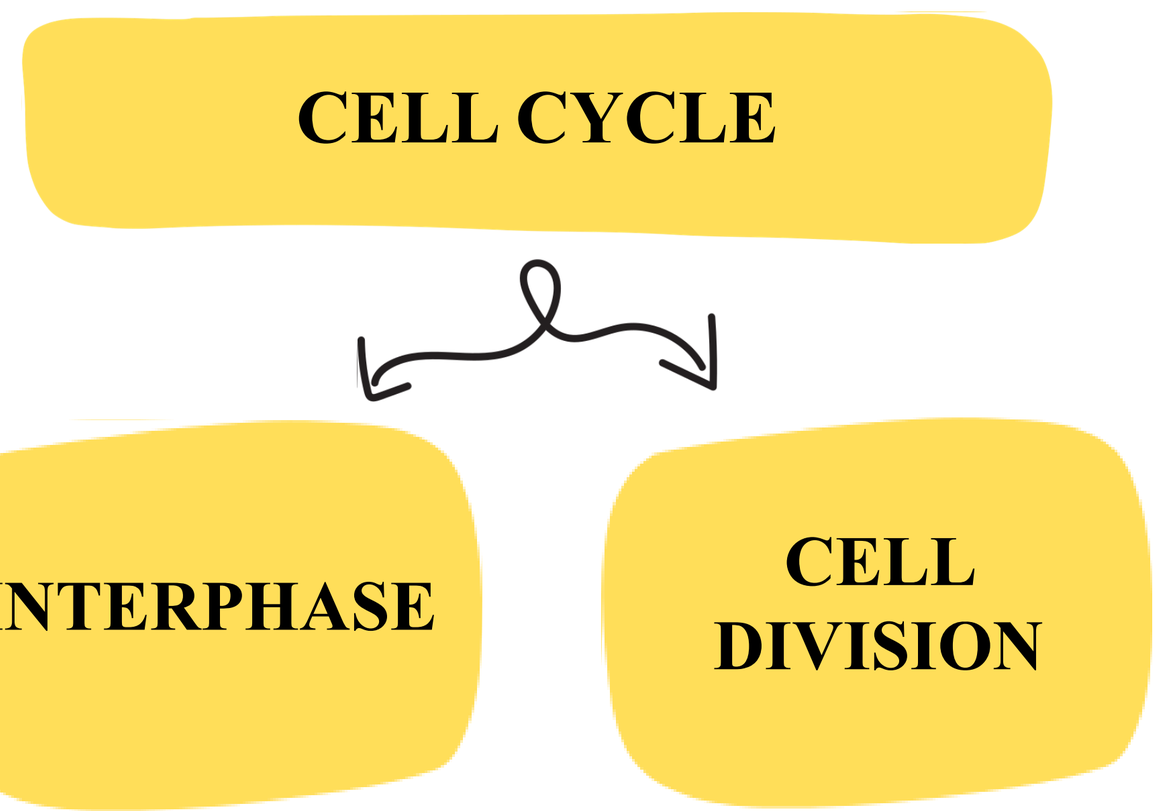
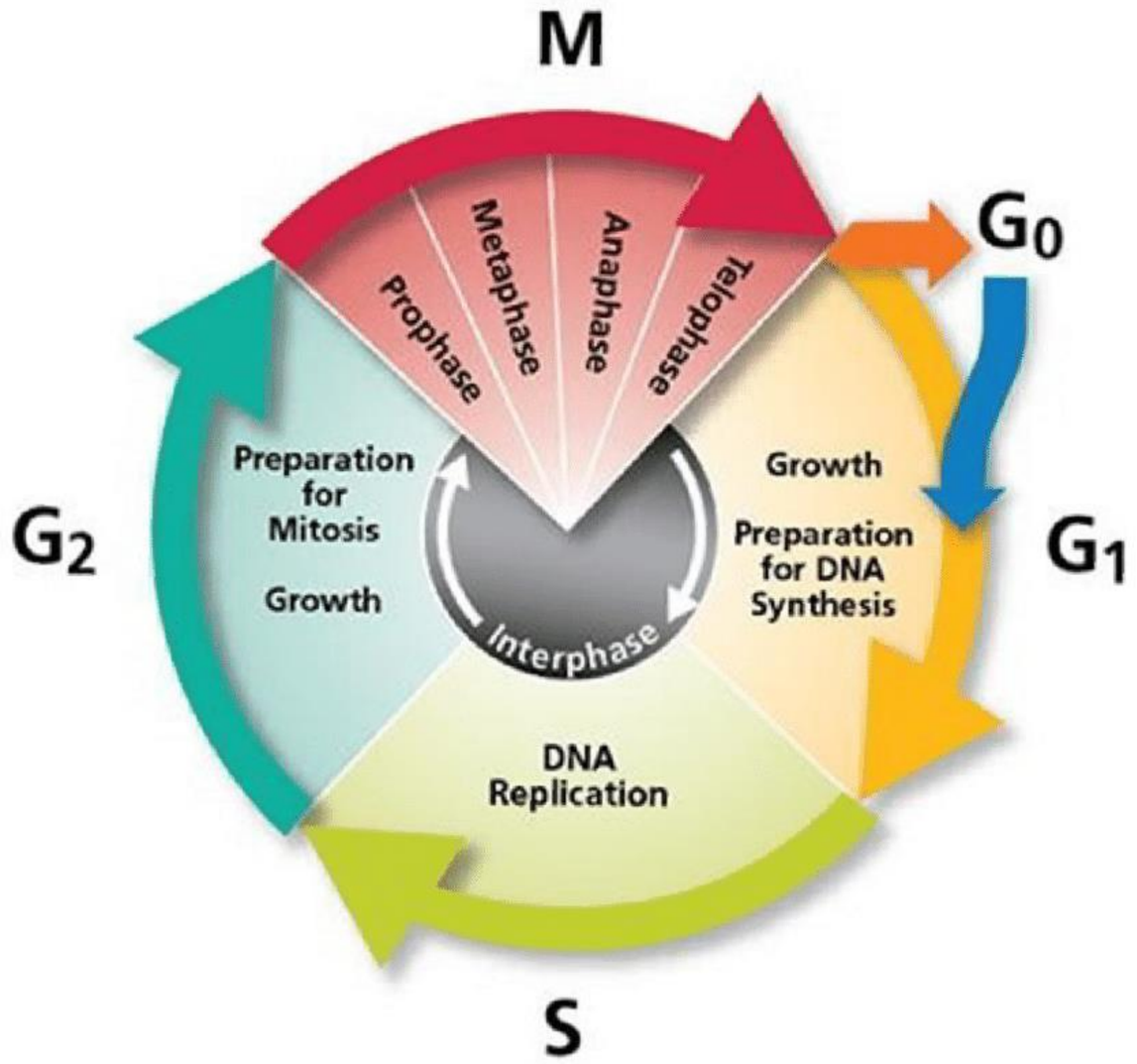
CELL CYCLE

- It includes series of activities through which a cell passes from time of birth until it reproduces
- Cell cycle contains 2 Phases

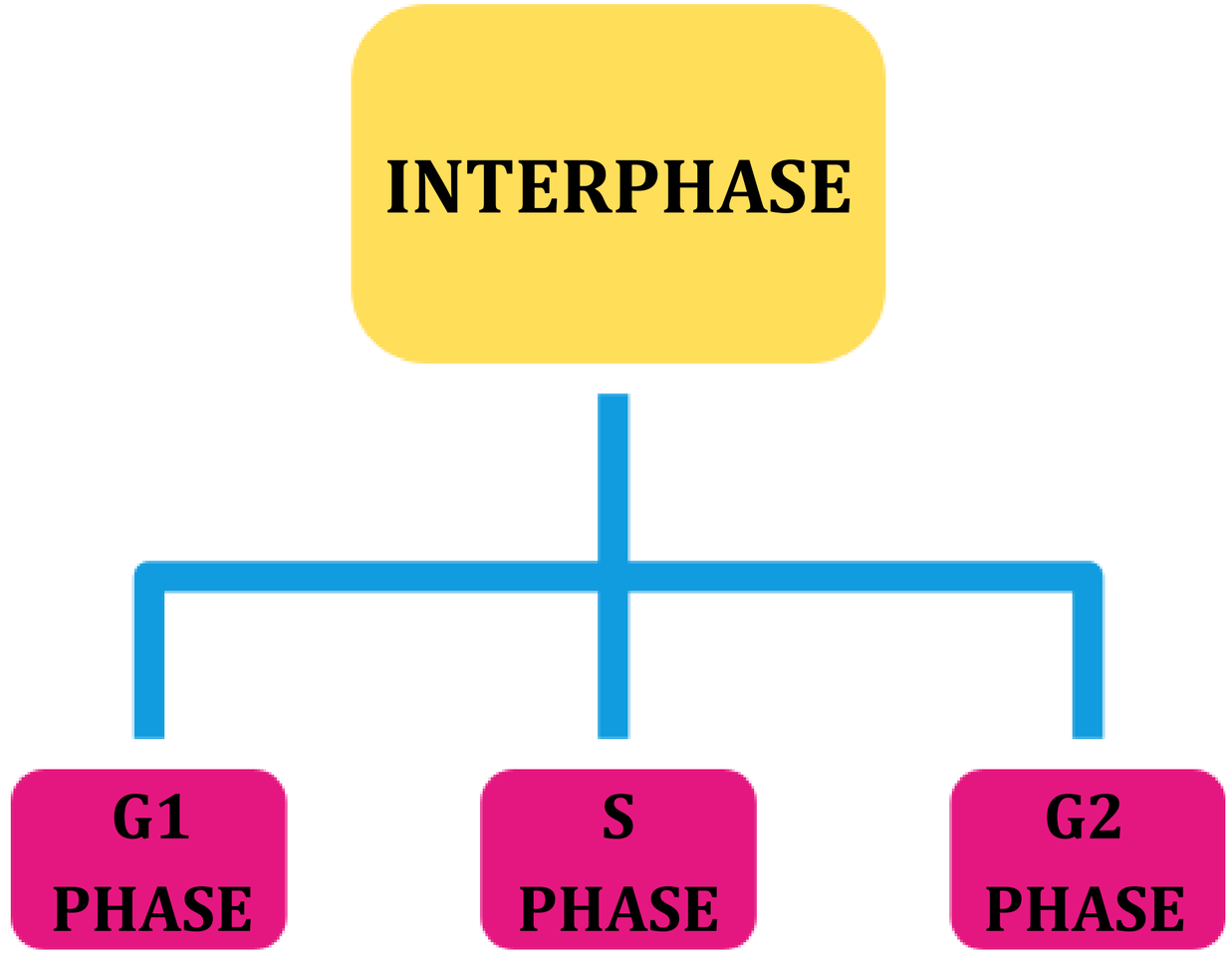


CELL CYCLE


M
Prophase
Metaphase
Anaphase
Telophase
G0
Preparation for Mitosis
Growth
G2
Growth
Preparation for DNA Synthesis
G1
Interphase
DNA Replication
S

INTERPHASE

- It is the phase of cell between 2 divisions
- In this phase the new born cell will grow and reach reproductive stage
- It has 3 distinct phases



INTERPHASE

G1 PHASE

- 1st Growth Phase
- Cell is engaged in growth, metabolism, production of substance required for division

S PHASE

- Synthesis Phase
- Replication of chromosomes takes place

G2 PHASE

- 2nd Growth Phase
- Development of cell takes place

CELL DIVISION

- The process in which cell will reproduce itself
- It has 2 phases

1. Nuclear Division (Karyokinesis)
2. Cytoplasmic Division (Cytokinesis)

} Takes place simultaneously

- Nuclear division is of 2 types - Mitosis , Meiosis

MITOSIS

DEFINITION

- Type of nuclear division seen in somatic cell
- Parent cell will divide into 2 daughter cells which contain same number of chromosomes present in parent cell

FUNCTION

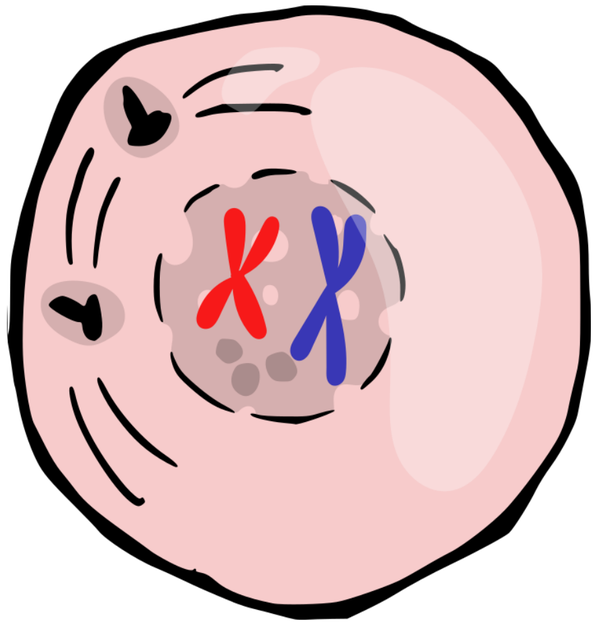
- It will help in replacement of dead cells or injured cells in order to add new cell for growth of the body

NUCLEAR DIVISION

- Prophase
- Metaphase
- Anaphase
- Telophase

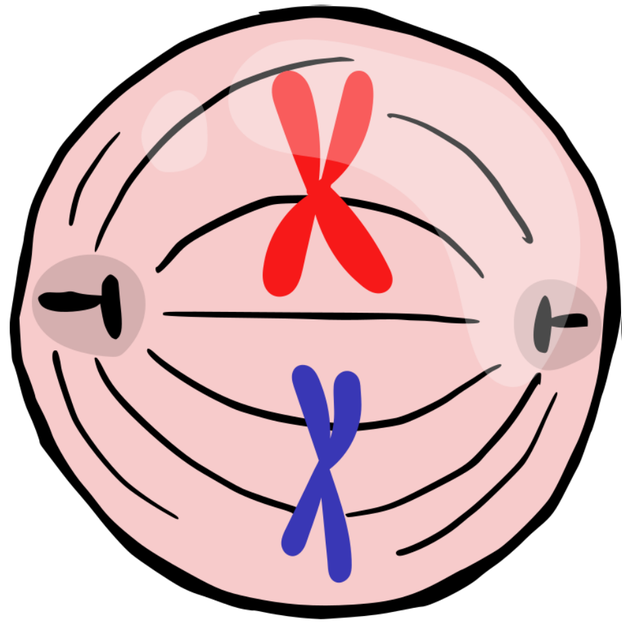
PROPHASE

- 1st phase of nuclear division
- Chromatids become more visible within the nucleus
- Nucleolus is prominent in early Prophase but later disappears
- Nuclear membrane breaks down releasing chromosome
- Centrioles separate and move towards opposite poles of the cell
- Centrioles give rise to microtubules --> form “Spindle” (Central) and others radiate to form “Astral rays”



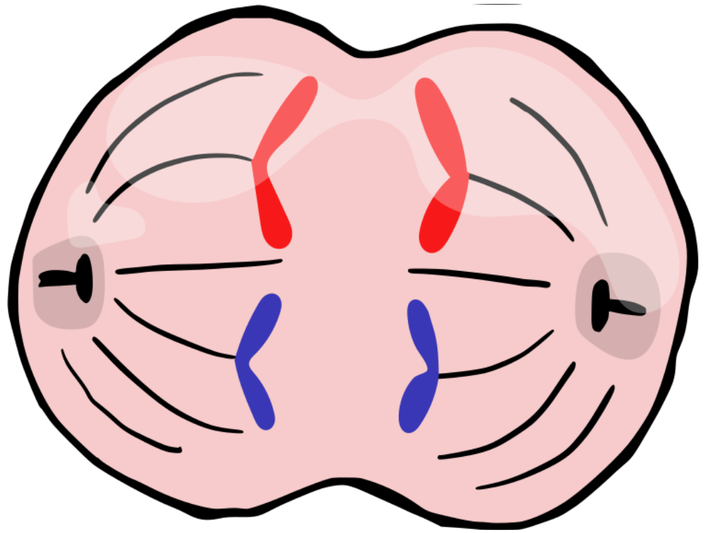
METAPHASE

- 2nd phase of nuclear division
- Relatively short duration
- Chromosomes are sharply defined
- Chromosomes move towards equator
- Centromeres of chromosome are attached to the spindle fiber



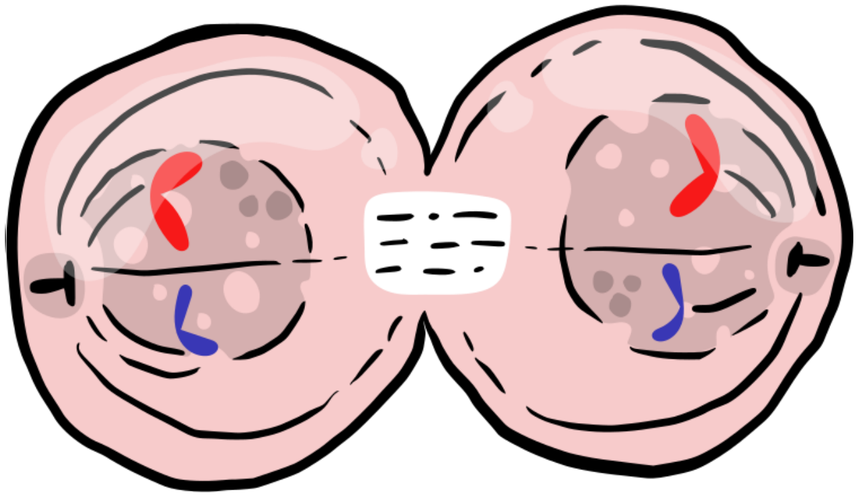
ANAPHASE

- 3rd phase of nuclear division
- Active and shortest stage
- Centromere of each chromosome, containing pair of chromatids splits longitudinally
- Original chromosome now splits into 2 new chromosomes
- Separated chromosomes move towards each pole of the cell
- Separated chromosomes shows different shape, based on the position of centromere



TELOPHASE

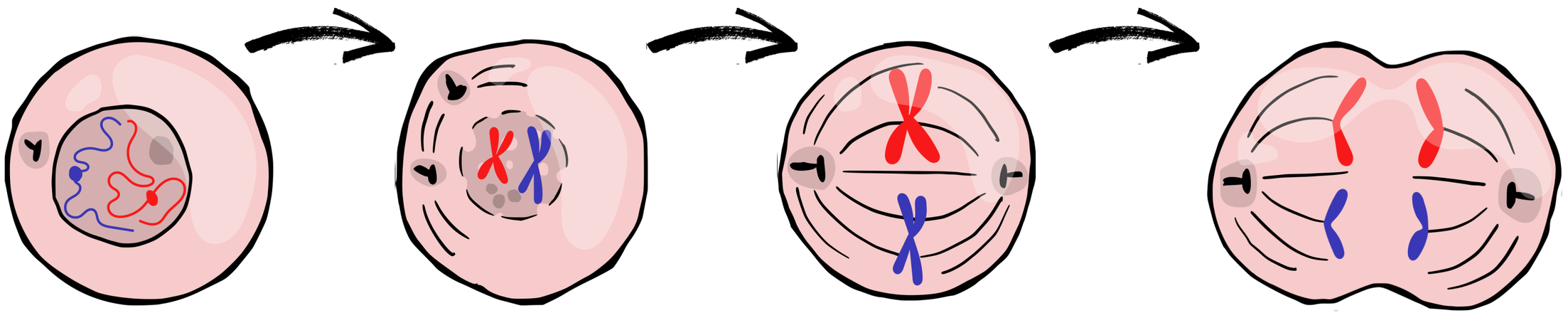
- Stage of reconstruction giving rise to 2 daughter cells
- Chromosomes become grouped at each pole of cell having
- Nuclear membrane and nucleoli reappear
- Spindle and aster disappear



CYTOPLASMIC DIVISION

- The division of cytoplasm and organelles of parent cell is called as CYTOKINESIS
- It will begin in late anaphase or in early telophase
- Division of cytoplasm will start by the formation of cleavage furrows
- It gradually deepens until the opposite ends make contact
- After that the parent cell splits into 2 daughter cells with same number of chromosomes as parent cell

MITOSIS



IN-CLASS ASSESSMENT

QUESTION 1:

Which phase of the cell cycle involves DNA replication?

a) G2 phase

b) G1 phase

c) M phase

d) S phase

IN-CLASS ASSESSMENT

QUESTION 2:

Mitosis occurs in which type of cells and results in how many daughter cells?

a) Reproductive cells; 4 haploid cells

b) Somatic cells; 2 diploid cells with identical chromosomes

c) Gametes; 2 haploid cells

d) Somatic cells; 4 diploid cells

IN-CLASS ASSESSMENT

QUESTION 3:

In which phase of mitosis do chromosomes align at the equatorial plate?

a) Anaphase

b) Prophase

c) Telophase

d) Metaphase

IN-CLASS ASSESSMENT

QUESTION 4:

What structure forms during Prophase to help separate chromosomes?

a) Cleavage furrow

b) Nuclear membrane

c) Spindle fibers from centrioles

d) Chiasmata

IN-CLASS ASSESSMENT

QUESTION 5:

Cytokinesis typically begins during which stage of mitosis?

a) Early Prophase

b) Late Anaphase or early Telophase

c) Metaphase

d) Interphase

IN-CLASS ASSESSMENT

ANSWERS:

1. d
2. b
3. d
4. c
5. b

SUMMARY

- The cell cycle comprises Interphase (G1—growth and metabolism, S—DNA synthesis/replication, G2—further growth and preparation) and Cell Division (nuclear—karyokinesis; cytoplasmic—cytokinesis).
- Mitosis, a type of nuclear division in somatic cells, produces two genetically identical diploid daughter cells through Prophase (chromosomes condense, spindle forms, nuclear membrane breaks), Metaphase (chromosomes align at equator), Anaphase (centromeres split, chromatids separate to poles), and Telophase (nuclear membranes reform, chromosomes decondense).
- Cytokinesis divides the cytoplasm via cleavage furrow, supporting growth, repair, and replacement of cells.

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THANK YOU