

SCIENCE (Reviewer by Therese Mendoza, 7-2)

I. Cell Cycle

MITOSIS → *Somatic/Body cells - for growth/repair*

1) Interphase

- Longest stage/phase of the cycle
- Where the cell grows and prepares for cell division

> G1 (Gap 1) → Cell organelles increase in no. & they produce carbohydrates, proteins, lipids

> S-Phase (Synthesis Phase) → DNA replication

= Daughter Cells must have the same exact DNA as the parent cells, hence why parent cells replicate their DNA

= If the DNA doesn't replicate accurately it would cause the daughter cells to either have missing or extra genetic material and this could lead to disease

Ex. Cancer - Cells divide too much

> G2 (Gap 2) → Cell gets ready for cell division & other cell organelles further divide and increase in number = if organelles did not increase then daughter cells would have missing organelles.

2) M-Phase (Miotic Phase)

- Where cell division happens
- A cell splits into two daughter cells (clones of the parents)
- And the cycle repeats for each daughter cell

A. Prophase

- Chromosomes condense and become visible
- Spindle fibers form
- Nuclear envelope dissolves

B. Metaphase

- Chromosomes align at the cell's equatorial plate called the metaphase phase
- Spindle fibers attach to the centromeres (Middle of the chromosomes)

C. Anaphase

- Chromatids are pulled apart by the spindle fibers

D. Telophase

- Reconstruction of Nuclear envelope
- Nucleus starts to reform

→ CYTOKINESIS

- The final divide
- Cytoplasm divides as the cell membrane pinches inward (cleavage furrow), eventually separating the cell into 2 daughter cells

MEIOSIS

- Gametes (Sperm/Egg cells)
- Sperm/Egg cells = 23 chromosomes
- Meiosis allows genetic diversity = everyone is different

> STAGES

1) Prophase I

- Chromosomes condense
- Nuclear envelope breaks down
- Homologous chromosomes pair up
- Crossing over occurs (exchange of DNA)

2) Metaphase I

- Chromosomes align at the center forming a metaphase plate

3) Anaphase I

- Chromosomes are pulled apart by spindle fibers

4) Telophase I

- 2 new nuclei form around each set of chromosomes

> CYTOKINESIS

1) Prophase II

- Chromosomes condense
- Nuclear envelope breaks down

2) Metaphase II

- Align at the center
- Microtubules attach to the centromere of the chromosomes

3) Anaphase II

- Chromosomes separate
- Pulled by spindle fibers

4) Telophase II

- Cleavage furrow
- Reconstruction of nuclei

> CYTOKINESIS

II. Reproduction

- Ability to produce offspring sexually/asexually
- Ensures continuation of species

A. Sexual Reproduction - Humans, Multicellular organisms

- Involves 2 parents
- Union of Gametes
- Genetic Diversity

B. Asexual Reproduction - Unicellular organisms

- One parent (self produce)
- Offspring is a CLONE of the parent = no genetic diversity

ASEXUAL

- Binary Fission → parent cell splits into two identical cells.
 - > Common in bacteria, amoeba, protists.
 - > Fast process, allows rapid population growth.
- Budding → a small part of the parent grows into a new individual.
 - > Example: Hydra, yeast.
 - > Bud may remain attached or detach to live independently.
- Spore Formation → parent produces spores that develop into new organisms.
 - > Example: Fungi, algae, mosses.
 - > Spores are resistant to harsh conditions, allowing survival.
- Vegetative Propagation → new plants grow from specific parts of the parent plant.
 - Cuttings → stem, leaf, or root cut and planted → develops into a new plant.
 - Example: Rose cuttings.
 - Tubers → underground storage stems grow into new plants.
 - Example: Potato, yam.
 - Runners (Stolons) → horizontal stems grow along soil, nodes develop into new plants.
 - Example: Strawberry, spider plant.

SEXUAL

- Pollination → transfer of *pollen* (male gamete) to *stigma* (female part) of flowers.
 - > Can be self-pollination or cross-pollination.
 - > Leads to fertilization → seed formation.
- Internal Fertilization → sperm fertilizes egg inside female.
 - > Common in mammals, reptiles, birds.
 - > Protects gametes from drying out.
- External Fertilization → sperm fertilizes egg outside female body.
 - > Common in fish, amphibians.
 - > Usually happens in water to keep gametes moist.
 - > Produces large numbers of gametes to increase chances of survival.