Topic: Functions of the Cell III

Subtopics:

1. **Growth – Mitosis, Enlargement, Differentiation**
2. **Hormonal Control of Growth**
3. **Irritability and Response to Stimuli**

Class: SS1

Term: First Term

Duration: 40 Minutes

Lesson Objectives:

By the end of this lesson, students should be able to:

1. Explain the process of **growth in living cells**, including **mitosis, enlargement, and differentiation**.
2. Describe how **hormones control growth** in plants and animals.
3. Define **irritability** and explain how living things **respond to their environment**.

Introduction (5 minutes):

One of the basic characteristics of life is **growth**.
Growth allows living things to:

- Increase in size
- Replace worn-out cells
- Repair injuries
- Develop from simple forms to complex organisms

Living organisms also respond to their environment through **irritability**.

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1. Growth in Living Organisms

Definition of Growth:

Growth is the **permanent increase in size, volume, and complexity** of an organism or its parts.

Growth involves:

- **Cell division** (producing more cells)
- **Cell enlargement** (cells increasing in size)
- **Cell differentiation** (cells becoming specialized for different functions)

A. Mitosis – Cell Division

Definition:

Mitosis is the **process of cell division** where a single cell divides into **two identical daughter cells**, each with the same number of chromosomes as the parent cell.

Stages of Mitosis:

Stage	What Happens
Prophase	Chromosomes become visible, nuclear membrane disappears
Metaphase	Chromosomes line up in the middle of the cell
Anaphase	Chromosomes split and move to opposite sides
Telophase	New nuclear membranes form around each set of chromosomes
Cytokinesis	The cell fully divides into two new cells

Importance of Mitosis:

- **Growth** (produces new cells)
- **Repair** of damaged tissues
- **Replacement** of worn-out cells
- **Asexual reproduction** in some organisms

B. Cell Enlargement:

- After mitosis, the new cells **grow bigger** by taking in water and nutrients.
- This makes the organism **increase in size**.

C. Cell Differentiation:

Definition:

Differentiation is the process by which **unspecialized cells become specialized** to perform specific functions.

Examples:

Specialized Cell	**Function**
Muscle cells	Movement
Nerve cells	Carry messages
Red blood cells	Carry oxygen
Root hair cells (plants)	Absorb water and minerals

Summary of Growth Process:

1. **Mitosis** → Produces new cells
2. **Enlargement** → Cells grow in size
3. **Differentiation** → Cells become specialized

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2. Hormonal Control of Growth

What are Hormones?

Hormones are **chemical messengers** produced by special glands.
They control **growth, development, and other processes** in the body.

A. Growth Hormones in Animals:

Hormone	Source	Function
Growth Hormone (GH)	Pituitary gland	Controls general body growth
Thyroxine	Thyroid gland	Regulates metabolism and supports growth
Testosterone	Testes	Develops male body features
Oestrogen	Ovaries	Develops female body features

B. Growth Hormones in Plants:

Plant Hormone	Function
Auxins	Control cell elongation, root growth, and phototropism (bending toward light)
Gibberellins	Promote stem growth and seed germination
Cytokinins	Help in cell division
Abscisic acid	Slows down growth during stress (e.g., drought)
Ethylene	Controls fruit ripening

Importance of Hormonal Control:

- Ensures **balanced growth** in animals and plants
- Controls **development stages** (e.g., puberty, seed germination)
- Regulates **responses to the environment** (e.g., bending towards light)

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3. Irritability and Environmental Response

Definition of Irritability:

Irritability is the **ability of living organisms to detect and respond to changes (stimuli) in their environment**.

What is a Stimulus?

A **stimulus** is any **change in the environment** that causes a reaction in a living thing.

Examples of Stimuli	Examples of Responses
Light	Plant bends toward light
Sound	Animals move toward or away from sound
Touch	Mimosa leaves fold up when touched
Temperature	Humans sweat in heat

Importance of Irritability:

- Helps organisms **adapt to their environment**
- Protects organisms from **harmful situations**
- Helps find **food and mates**
- Essential for **survival**

Irritability in Plants:

Plants respond slowly but still show irritability.
This is called **tropism** (growth in response to a stimulus).

Type of Tropism	Response
Phototropism	Plant bends toward light
Geotropism	Roots grow downward in response to gravity
Thigmotropism	Tendrils wrap around support when touched

Irritability in Animals:

Animals respond quickly to stimuli using:

- **Sense organs** (eyes, ears, nose, tongue, skin)

- **Nervous system** (brain, nerves)
- **Muscles** (for movement)

Conclusion:

Cells perform **growth, hormonal control, and environmental response** to maintain life.
Growth involves **cell division, enlargement, and specialization**.
Hormones **regulate growth and development**, while **irritability** allows organisms to **respond to their environment** for survival.