

## **An Introduction to Biological Sciences**

### **What is Biology?**

### **Biology is:**

- **A natural science that studies the natural world.**
- **The organized study of living things and their interactions with the environment.**
- **A continuous process seeking to discover facts about the natural world.**

### **Where does the term Biology come from?**

- **Bios- means life**
- **-ology means the study of**
- **Hence the term Biology**



### **Branches of Biology include:**

- **Biotechnology: The use of Biology to solve everyday problems.**
- **Botany: The study of plants.**
- **Zoology: The study of animals.**
- **Anatomy: The study of the structures that make up living things.**

### **Branches of Biology include:**

- **Physiology: The study of the functions of the structures that make up living things.**
- **Genetics: The study of heredity of living things.**
- **Microbiology: The study of microscopic living things.**

### **Branches of Biology include:**

- **Taxonomy: The study of classification of living things.**
- **Ecology: The study of relationships between living things and environments.**

## Specialization

- The studying and working in one specific branch of a field. (for us the field is biology)
- The suffix -ist means/explains the person who practices in a certain field.

## Names of some Biological Specialists:

- Biotechnologist
- Botanist
- Zoologist
- Anatomist
- Physiologist
- Geneticist
- Microbiologist
- Taxonomist
- Ecologist



## Where do Biologists work?

- Everywhere
- Laboratories
- Field
- Industry



## Biology, Technology, and Society:

- **Medicine:** x-ray machines, drugs/vaccines, artificial skin and other organs.
- **Agriculture:** super-plants and more productive animals
- **Industry:** bacteria that break down waste and sewage @ treatment plants.

## Tools of the Biologist:

- **Computers:** Aid in data collection and analysis
- **Microscope:** instrument that makes things appear larger than they are.
  - **Simple-** magnify 10X
  - **Compound-** has 2 or more lenses
    - **Ocular lens:** in eyepiece
    - **Objective lens:** in nosepiece
    - **Resolution becomes poor beyond 1000x** (Resolution is a measure of how clear an object appears.)

## Microscopes Cont.:

- **Electron Microscopes-**
  - can magnify up to 300 000x
  - use electrons to form images of very tiny objects
  - Resolution is 200 000x better than the human eye

## Electron Microscopes:

- **2 kinds:**
  - **Transmission Electron Microscope**
    - TEM
    - Can not be used to observe living tissue
    - passes electrons through the object being studied
    - can magnify up to 200 000x

## Electron Microscopes:

- **2 kinds continued:**
  - **Scanning Electron Microscope**
    - SEM
    - Can be used to observe living tissue
    - reflects electrons from the surface of the object being studied
    - produces 3-D black and white images

## Themes of Biology

- Cellular life based upon genetic code
- Energy
- Homeostasis
- Unity with Diversity
- Systems and interactions
- Evolution
- Nature of Science



## Cellular basis and Genetic code

- Living organisms are made up of basic structures called cells.
- Living things are based on a universal genetic code.
  - DNA
    - The information coded in your DNA is similar to organisms that lived 3.5 billion years ago.

## Energy

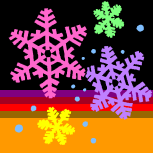
- The ability to do work.
- The ability to make things move.
- It powers life processes to enable maintenance of homeostasis, growth, reproduction, movement and other life processes.



## Energy

- It flows through individual organisms, communities of organisms, and ecosystems.
- It determines how organisms interact with each other and their environment.





## Homeostasis

- **Regulating and maintaining internal environment.**
- **Example: Perspire/Shiver**

## Unity within Diversity

- **Life is unified even though ecosystems are made up of many different species.**



## Systems and interactions

- **Each system is dependant on the others, none work independently.**
- **They interact to perform the functions of life.**

## Evolution



- **The gradual change in the characteristics of species over time.**
  - Each major group of organisms has evolved its own collection of structures that have evolved in ways that make particular functions possible.
  - Organisms use structures that have evolved into different forms as species have adapted to life in different environments.

## The Nature of Science

- **Scientific facts can be determined by making careful observations of present phenomena by building on previous knowledge, and modifying ideas.**

## Characteristics of living things:

- **In order to be considered alive, all of the characteristics of life must be met.**
- **Anything possessing all the characteristics of life are called organisms.**

## Characteristics of Living Things:

- Organization
- Reproduction
- Growth and Development
- Adjust to the Environment
- Obtain and use materials and energy
- Homeostasis
- Evolve



## Organization

- Living organisms are made up of cells and are based on a universal genetic code.
- The organisms must have an orderly structure (unicellular or multicellular)
- Unicellular- a single celled organism
- Multicellular- 2 or more celled organism



## Reproduction

- The production of offspring
- essential for the continuation of an organism's species



## Change

- Growth- results in an increase in the amount of living material and the formation of new structures.
- Development- all of the changes that take place during the life of an organism.



## Adjust to the surroundings

- Homeostasis- The regulation of an organism's internal environment to maintain conditions suitable for life.



## Adjust to the surroundings

- Adaptation: Any structure, behavior, or intentional process that enables an organism to respond to stimuli and survive better in an environment.



## Adjust to the surroundings

- **Environment-**
  - everything that surrounds a living thing
  - includes air, water, weather, temperature, internal environment



## Adjust to the surroundings

- **Stimulus-** any condition in the environment that requires an organism to adjust.
- **Response-** a reaction to a stimulus.



## Obtain and Use Energy

- **Life requires matter that serves as nutrients to build body structures, and energy that fuels life's processes.**

## Homeostasis

- **Living things maintain a relatively stable internal environment, even when external conditions change dramatically.**
- **All living organisms expend energy to keep conditions inside their cells within certain limits.**

## Evolve

- **Over generations, groups of organisms evolve, or change over time.**