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

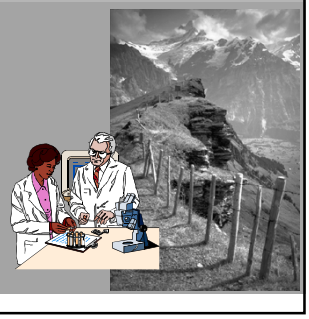
- The studying and working in one specific branch of a field. (for us the field is biology)
- The suffix -ist means/explains the person who practices in a certain field.

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:

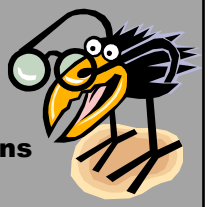
- 2 kinds:
  - Transmission Electron Microscope
    - TEM
    - Can not be used to observe living tissue
    - passes electrons through the object being studied
    - can magnify up to 200 000x

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

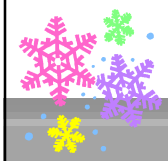
- Living organisms are made up of basic structures called cells.
- Living things are based on a universal genetic code.
  - DNA
    - The information coded in your DNA is similar to organisms that lived 3.5 billion years ago.

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.

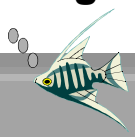
The Nature of Science

- 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 mare made up of cells and are based on a universal genetic code.
- The organisms must have an orderly structure (unicellular of 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.