

## **The Study of Life:**

**Biology – the study of all living things (organisms).**

## **6 Major Themes in Biology:**

- 1. cell structure & function**
- 2. stability & homeostasis**
- 3. reproduction & inheritance**
- 4. evolution**
- 5. interdependence of organisms**
- 6. matter, energy & organization**

### **1. Cell Structure & Function**

***Cell* – basic unit of life. All organisms are made of and develop from cells.**

***Unicellular* – organisms composed of 1 cell.**

***Multicellular* – organisms composed of more than one cell.**

***Differentiation* – cells become different from each other & take on various roles in the organism.**

### **2. Stability & Homeostasis**

***Homeostasis* - organisms maintain internal conditions, such as temperature, water content and even food intake, at very stable levels. This is found in all living things.**

### **3. Reproduction & Inheritance**

***Reproduction*** – the production of new offspring.

***Gene*** – short segment of DNA that contains the instructions for the development of a single trait of an organism.

**Types of Reproduction:**

- 1. *Sexual*** – the production of offspring from the combination of genetic material from two parent organisms.
- 2. *Asexual*** - the production of offspring that does not involve the union of gametes.

### **4. Evolution**

***Evolve*** - populations of organisms changing, over many generations.

***Evolution*** – all the changes that have formed life on Earth from its earliest beginnings to the diversity that characterizes it today. Explains how organisms alive today are related to organisms that are now extinct.

### **5. Interdependence of Organisms**

***Ecology*** – the study of interactions of organisms with one another and with their environment.

***Ecosystems***- all the biotic (living) and abiotic (nonliving) components of an environment.

## **6. Matter, Energy, & Organization**

***Photosynthesis*** – the conversion of light energy into chemical energy stored in organic compounds. Found in plants and some unicellular organisms.

***Autotrophs*** – organisms that obtain their energy by making their own food.

***Heterotrophs*** - organisms that must take in food to meet their energy needs.

### **Characteristics of Life**

***All organisms, no matter how different from each other they may be, share certain features characteristic of all living things.***

- 1. Cells*** - membrane bound structure that is the basic unit of life.
- 2. Organization*** – living things are highly organized at both the molecular & cellular levels.
- 3. Energy Use*** – all living things use energy in a process called *metabolism*, which is the sum of all of the chemical processes that occur in the organism.

**Organisms require energy to maintain their molecular & cellular organization as well as to grow and reproduce.**

4. ***Homeostasis*** - the stable internal conditions of a living thing. Cells work to keep their internal environment stable.
  
5. ***Growth*** – all living things grow.
  - A.) ***Cell division*** – the formation of two cells from an existing cell.
  - B.) ***Development*** – the process by which an adult organism arises.
  
6. ***Reproduction*** – all organisms produce new organisms.

## **The Scientific Method**

**Observation** – *deadly disease breaks out.*

**Asking a Question** – *What is the disease causing agent?*

**Collecting Data**

- 1.) **Observing** – *tissue samples under microscope.*

- 2.) **Measuring** – *number of people with symptoms, the number of days that elapsed from the time symptoms first appeared until a victim died, and the number of fatalities.*
- 3.) **Sampling** – *blood samples from diseased victims examined.*
- 4.) **Organizing Data** – *scientists organize data into tables, charts, maps, & graphs.*

**Hypothesis** – a statement that can be tested experimentally.

- 1.) **Forming a Hypothesis** - *virus discovered by the Centers for Disease Control (CDC) scientists caused hemorrhagic fever.*

2.) **Predicting** – *if the virus were the true disease causing agent, then introducing the virus into healthy tissue would cause cell death like that found in victims of the disease.*

**Experimenting** – the process of testing a hypothesis or prediction by gathering data under controlled conditions.

1.) **Conducting a Controlled Experiment** – *test tubes containing monkey kidney cells were divided into an experimental and control group. The experimental group had drops of blood from infected victims added to them. No blood was added to the control group.*

*The independent variable (variable being changed) was the addition of blood to the monkey kidney cells.*

*The dependent variable (variable being observed or measured in both experimental & control groups) was the health of the cells.*

*2.) Analyzing Data - eleven days after the virus-containing blood was mixed with monkey kidney cells, the cells in the experimental test tube were dead.*

## **Conclusion**

*1.) Modeling – scientists examine the case histories of people who have died from the disease to develop a model of where the virus originated and how it is transmitted among humans.*

- 2.) **Inferring** - *based on the observations the scientists made and the data collected and analyzed, they inferred that the virus was carried by a small, forest-dwelling animal.*
- 3.) **Forming a Theory** – a broad and comprehensive statement of what is believed to be true, supported by experimental evidence resulting from many tests of related hypotheses.