**Modeling in AP Biology**

Introduction...

Biology is a branch of science

* Scientists make observations, ask questions and experiment.
* Experimental methodology is important if your results are to be valid.
* Experiments lead to new questions that need to be tested.

**The Story so far....**

**Organisms are made of cells. Organisms have characteristics that they pass down to their offspring but, some of the offspring are different than their parents. These differences allow some individuals to reproduce more successfully than others which in turn allows the population to remain adapted to their environment over time. This has led to a wide variety of organisms on the planet that can be classified according to their similarities. Plants and animals are two groups that have developed over time and have a variety of adaptations and lifestyles. Plants and animals interact with one another, other groups of organisms, and the environment to produce highly complex systems of living and non-living components called ecosystems.**

Living things are made of cells.

* Cells are made of atoms and molecules.
* Some molecules are particularly important to living systems.
* Chemical reactions in cells are often conducted by enzyme pathways.
* Cells have specialized structures that control life processes.
* Cells must communicate with each other in order to maintain the life of the organism.
* Cells need energy to function.
  + Some cells are capable of harnessing the suns energy
  + All cells must be able to harness chemical energy to maintain life functions.
* Cells require a stable internal environment for maximum efficiency of operation and continuity of life.

Organisms have characteristics that they pass down to their offspring but some of the offspring are different than their parents.

* New cells are made as mature cells divide.
* Multicellular organisms must reduce genetic information for sexual reproduction.
* Sexual reproduction produces variation.
* The probability of inheriting a particular characteristic can be predicted with accuracy.
* DNA is the genetic material and contains the code by which proteins are produced.
* The development of technology has allowed us to learn more about the structure of genomes and to manipulate particular aspects to our advantage.
* All cells have a complete genome but do not express the same genes at all stages of development.
* Genetic expression must be regulated.
* Genetic traits may vary from generation to generation as some individuals are more reproductively successful than others.

Variation of environmental factors influence reproductive fitness causing populations to maintain adaptiveness from generation to generation.

* Variation within a population is the key to surviving change.
* Evolutionary relatedness can be predicted by similarities and represented in phylogenies.
* Isolation leads to speciation.

Earth supports a wide diversity of organisms. These organisms are grouped according to similarities and differences with other organisms.

* There are 3 domains and 5 kingdoms of life on earth. These are further subdivided into phyla, classes, orders, families, genus and species.
* The major divisions are based on cell type, cell structure and lifestyle.

Plants are a kingdom of organisms with a variety of adaptations and lifestyles.

* All plant bodies have certain things in common but success on land has specific requirements.
* Plants obtain nutrients and water from the environment and transport these things through their bodies using specialized structures.
* Plants undergo different stages of development during their lifetime. Hormones control the plant life cycle.
* Flowering plants sexually reproduce as sperm and eggs join to make seeds. Seeds germinate and grow into adult plants.
* Plants have great importance as producers. Plant products have great economic importance. Plants are an essential part of an ecosystem if animals are to survive.

Animals are a kingdom of organisms with a variety of adaptations of lifestyles.

* As animal groups become more complex, body types and tissue layers change. As complexity increases, animals develop more efficient ways of maintaining a stable internal environment.
* Animals use hormones and nervous systems to communicate within and between individuals.
* Locomotive function in animals is solved in a variety of different ways. In many phyla it involves specialized contractile tissues coupled with rigid, jointed tissue.
* As animals increase in size, gas exchange becomes more complex. Increased surface area between tissues and a transport fluid is used to solve this problem. Effective movement of the transport tissue is accomplished by pumps.
* Nutrients must be ingested, digested and absorbed in order to be made available to the cells and tissues. Larger, more complex animals have specialized structures and chemical processes to accomplish this task. A transport tissue is needed to get the nutrients to the cells and tissues.
* Metabolism produces wastes which must be excreted. Excretory organs help maintain balance of ions and water in the body.
* Animals exhibit behaviors as survival mechanisms. These behaviors are in response to internal or external stimuli. Animals exhibit these behaviors as they interact with their environment.

Organisms interact with one another and the environment to produce a highly complex system of living and non-living components.

* The earth’s physical environments vary according to climate patterns and soil profile.
* The living and non-living components of an ecosystem influence and cause changes in one another.
* Energy moves through ecosystems from organism to organism in a food web. In most every ecosystem the energy ultimately comes from the sun. There is always a loss of energy as it flows from one trophic level to another.
* Matter flows through ecosystems through organisms and the food web and also through geochemical processes. Unlike energy, which needs a constant input from the sun, matter is recycled through the system.
* Ecosystems change over time but advance toward the most stable type of ecosystem for the climate and soil profile.
* Population growth is influenced by many factors, both abiotic and biotic.
* Species interactions can be positive, negative or neutral but are always dynamic.
* The addition or deletion of species affects changes in the system. At times, these changes can be severe enough to collapse the system.
* Human activity influences the environment both locally and globally.
* Sustainable use of resources allows for economic development and maintenance of environmental and human health.