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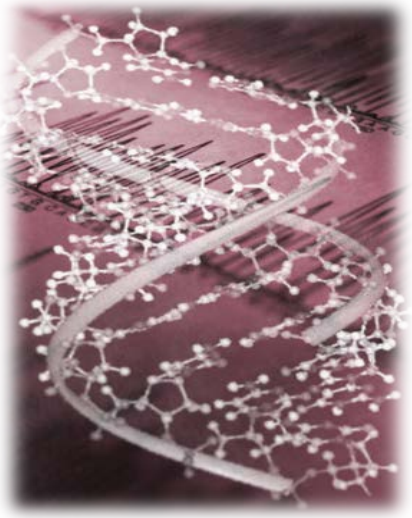
Course Overview

This course emphasizes the concepts, principles, and theories that enable people to understand the living environment. Students will study life science concepts such as the structure, function, and processes of cells, the genetic and molecular bases of inheritance, biological evolution of various species, and the diversity and interdependence of life. Students will also be able to explain the flow of energy and the cycling of matter through biological and ecological systems in this course. Embedded throughout this study are the basic science processes of inquiry, modeling investigations, and the nature of science. Students will learn to trace the historical development of scientific theories, ideas, and ethical guidelines in science. This course will also address the interdependence of science and technology, and the study of emerging issues to become scientifically literate citizens.

For each unit, the student will read the content that is presented, look at each illustration, watch all video clips, and follow all external web links. Answer the questions for each unit as completely as possible. The student may be required to do independent research and to find information on their own. Other resources may be used to enhance the material that is presented in order to answer the questions.

Try to keep a reasonable pace with each of the units. Some units may require lengthy preparation while others are shorter in length. It would be beneficial not to leave any questions blank. If you have any questions, please ask the VLA instructor for guidance.

BIOLOGY AREAS AND HISTORY



What is Biology?

Welcome to biology! The goal of science is to help us understanding the natural world and improve people's lives. Biology is a branch of science which involves the study of life. All of the processes associated with living organisms are the subject matter of biology. Biology is the study of all aspects of living things including their structure, classification, function, and interactions. As a student in this course, you will strive to understand the natural phenomena associated with plants and animals by asking why and how the natural world functions as it does. Why do living organisms interact with each other and their environment in particular ways? What are their evolutionary and genetic relationships? How are biological processes carried out in organs, tissues, and cells? In order to answer these broad questions, biologists must answer many specific ones: How does the liver of an animal break down fat? How does a green plant convert water and carbon dioxide into sugar? When do platypuses lay their eggs? Where do mosquitoes go in the winter? Some questions require years of scientific research before they can be answered satisfactorily. Continually asking questions and conducting studies leads toward a better understanding of all organisms and the environment.

We know from the previous paragraph that a biologist asks specific questions. Obviously, the next question will be …. What is a biologist? A biologist, quite simply, studies living things and their relationship to their environment. There are many types of biologists such as: marine biologists, aquatic biologists, forensic biologists, and environmental biologists, just to name a few. What do biologists really do? They ask questions such as what, why, and how. Asking questions is the basis of scientific thought which also requires skepticism. Skepticism is a doubting attitude that questions the truth of some idea or event. Biologists study problems and how they might be solved, how living organisms are organized in groups, the process of reproduction, growth and change, adaptations, interactions with the environment, genetics, and evolution.

Historical Perspectives in Biology

Next, we will take a look at some famous historical biologists and their contributions to the field of biology.

Many modern discoveries are based upon the work completed somewhere in the history of biology. Often a small change in an existing thought or an accidental occurrence can lead to new findings.

Great scientific progress was made in the 19th century. This progress resulted from the application of what was already known, plus new discoveries of a basic nature. The following is a very brief list of some of the most important discoveries in biology.

	**Robert Hooke** July 28, 1635 - March 3, 1703	• In 1665, Hooke, an English scientist, used a simple microscope (magnification of 30 times) to look at a thin slice of cork. • He saw many "little boxes" in the cork slice. • The boxes reminded Hooke of the small rooms (cells) that monks lived in, so he called these little boxes "cells". QuickTime **Robert Hooke**
	**Antoni van Leeuwenhoek** October 24, 1632 - August 26, 1723	• In 1675, Leeuwenhoek, a Dutch scientist, used a more powerful microscope (magnification of 300 times), to discover many living creatures in pond water. • The small organisms he saw under a microscope he named animalcules or "tiny animals". • Leeuwenhoek is nicknamed the "Father of Microbiology" because he was the first to see unicellular organisms. QuickTime **Antoni van Leeuwenhoek**
	**Carl Linnaeus** May 23, 1707 - January 10, 1778	• In the 1750's, Linnaeus, a Swedish biologist, developed a classification system for all living things (organisms). • Linnaeus' classification system, based on Binomial Nomenclature, was necessary because it provided a simple method of consistently classifying organisms based on similar structures. QuickTime **Even More Enlightenment Science**

	**Louis Pasteur** December 27, 1822- September 28, 1895	• Pasteur was a 19th century French scientist. • In 1862, Pasteur disproved the idea of "Spontaneous Generation", which is the idea of living organisms developing from non-living items. A popular belief before the 19th century. • In 1864, Pasteur created the process known as "Pasteurization" which is the process of heating and cooling a liquid to kill many of the microorganisms within the liquid. • In 1879, Pasteur proved that microorganisms cause various diseases and created some of the first vaccines by extending the work of Edward Jenner's (1796) small pox vaccine. QuickTime **Science and Bacteria**
	**Charles Darwin** February 12, 1809 - April 19, 1882	• Darwin was a 19th century British naturalist. • In 1859, Darwin created a theory of evolution which science has adopted. • Darwin developed his theory while making observations on his journey to the Galapagos Islands aboard the ship named HMS Beagle. • Darwin's theory of evolution is known as "Natural Selection". • Darwin wrote a book explaining his theory of Natural Selection titled Origin of Species in 1859. QuickTime **Charles Darwin's Theory of Evolution**
	**Gregor Johann Mendel** July 20, 1822 – January 6 , 1884	• Mendel was a 19th century Austrian monk. • Mendel's responsibility living in the monastery was that of a gardener. • Working with pea plants, Mendel began studying and predicting the passing of traits from parent pea plants to offspring pea plants. • Mendel's work led to the development of genetics QuickTime **Gregor Mendels Research on Pea Plants**
	**James Watson,** April 6, 1928 Current age: 86 **Francis Crick,** June 8, 1916 July 28, 2004	• In 1953, James Watson, American biologist, and Francis Crick, British biologist, worked together to discover the structure and function of DNA, after examining the progressive DNA work of many earlier scientists. • Watson and Crick's model of DNA explained how DNA stored and passed hereditary information.

Biological Areas of Study

Next, we will look at some of the major areas/studies of biology which focus on a specific biological topic.

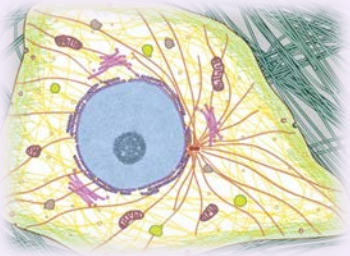
BOTANY	
 Botanist Luther Burbank in his Garden	**Botany** deals with the study of plants, including their structure, properties, and biochemical processes. Botany also includes plant classification, the study of plant diseases and of interactions with the environment.
ZOOLOGY	
	**Zoology** is the study of animals and animal life in general. It includes the inquiry into individual animals, animal populations, and the relationships of animals to each other, to plants, and to the nonliving environment.
ANATOMY AND PHYSIOLOGY	
	**Anatomy** is the study of structure or how organisms are organized on the cellular, tissue, organ, system, or organism levels. Physiology is the study of function or how organisms perform functions on the cellular, tissue, organ, system, or organism level.
EMBRYOLOGY	

Embryology is the study of the formation and development of an embryo and fetus. Studying embryology allows for detailed comparisons of different animals to provide arguments for evolutionary relationships among different species.

MARINE BIOLOGY

Marine Biology is the study of animals and plants that live in the sea. It also relates to air-borne and terrestrial organisms that depend directly upon bodies of salt water for food and necessities of life.

CYTOLOGY



Cytology is the study of cells, both in structure and function, as the fundamental units of living things.

Interactive Plant Cell

After you do the Cell Activity you can download the cell diagram to label each part of the cell.

Printable Cell diagram

MICROBIOLOGY

Microbiology is the study of microorganisms, or microbes, a diverse group of minute, simple life forms that include bacteria, archaea, algae, protozoa, fungi, and viruses. Microbiology is concerned with the structure, function, and classification of these organisms.

ECOLOGY

	**Ecology** is the study of the relations and interactions between organisms and their environment both living and nonliving.

Now answer questions 1 through 20.