

**01: The Science of Biology**

Key Biology Terms	Basic Theory of Biology
<ul style="list-style-type: none"> <li>• <b>Binomial nomenclature:</b> A classification method using the genus and species names to name a living organism in Latin, invented by Linnaeus.</li> <li>• <b>Cell:</b> The building unit for all living organisms that is capable of performing basic metabolism functions.</li> <li>• <b>Autotroph:</b> Organisms that synthesize their own nutrients.</li> <li>• <b>Heterotroph:</b> Organisms that depend on preformed organic molecules from the environment (or another organism) as a source of nutrients/energy</li> <li>• <b>Evolution:</b> Living organisms have descended with modifications from species that lived before them</li> <li>• <b>Gene:</b> Functional pieces of DNA that carry genetic information</li> <li>• <b>Homeostasis:</b> All living organisms have the ability to maintain a relatively constant internal environment including water, salt, glucose and pH.</li> <li>• <b>Hypothesis:</b> Attempt to explain why behavior occurs.</li> <li>• <b>Theory:</b> Explanation of why behavior occurs that is supported by evidence.</li> <li>• <b>Species:</b> The smallest group of living organisms that can mate and produce viable, fertile offsprings.</li> <li>• <b>Kingdom:</b> The largest group of living organisms that share certain characteristics. There are only five kingdoms for all living organisms: Monera, Protista, Fungi, Plantae and Animalia.</li> </ul>	<p><b>Cell Theory</b></p> <ul style="list-style-type: none"> <li>• Developed by three German Scientists: Schleiden, Schwann and Virchow</li> <li>• Cell is the building unit of all living organisms.</li> <li>• All cells come from pre-existing cells</li> <li>• All metabolism occur in cells of the body—cells are functional unit for all living things</li> </ul> <p><b>Theory of Evolution</b></p> <ul style="list-style-type: none"> <li>• All living organisms have descended with modifications from species that lived before them</li> <li>• Natural selection is the driving force for evolution             <ul style="list-style-type: none"> <li>◦ All living organisms struggle for existence</li> <li>◦ All organisms can adapt to their environment</li> <li>◦ Better adapted individuals or species survive and poorly adapted ones become extinct—survival of the fittest.</li> </ul> </li> </ul> <p><b>Gene Theory</b></p> <ul style="list-style-type: none"> <li>• Mainly contributed by Watson and Crick</li> <li>• All genetic information is stored in DNA – genes</li> <li>• Genes control most, if not every, aspects of an organism</li> <li>• The DNA language can be transcribed into RNA language and then translated into protein language for its final function</li> </ul>
<p align="center"><b>What is a Life</b></p>	
<p>Characteristic of a life:</p> <ul style="list-style-type: none"> <li>• <b>Organization:</b> living things are well organized</li> <li>• <b>Energy use:</b> living things need energy to support</li> <li>• <b>Reproduction:</b> living things should be able to reproduce themselves</li> <li>• <b>Growth:</b> living things grow and develop.</li> <li>• <b>Response to stimuli:</b> living things can respond to internal or external stimuli</li> <li>• <b>Homeostasis:</b> living things can maintain a relatively stable internal environment—self-regulation</li> </ul>	<p><b>Homeostasis</b></p> <ul style="list-style-type: none"> <li>• All living organisms have the ability to maintain a relatively constant internal environment             <ul style="list-style-type: none"> <li>◦ Water and salt level</li> <li>◦ Blood glucose level</li> <li>◦ Body fluid pH</li> </ul> </li> <li>• Purpose: to ensure proper function of the body</li> <li>• When it fails, a person can be sick or die</li> </ul>
<p align="center"><b>Branches of Biology</b></p>	<p align="center"><b>Classification of Living Things</b></p>
<ul style="list-style-type: none"> <li>• <b>Anatomy:</b> Study the structure and organization of lives</li> <li>• <b>Biochemistry:</b> Study the chemical basis of life</li> <li>• <b>Biology:</b> The study of life</li> <li>• <b>Botany:</b> Study of the plants.</li> <li>• <b>Cell Biology:</b> Study of cell structure, cell cycle, cell function etc.</li> <li>• <b>Development Biology:</b> Study how an individual organism grow and develop</li> <li>• <b>Ecology:</b> Study a group of organisms interacting with each other and with their environment</li> <li>• <b>Evolution:</b> Study how organisms acquire and inherit traits from their ancestors</li> <li>• <b>Genetics:</b> Study of the inheritance at various levels (molecular, cellular, individual, population, etc).</li> <li>• <b>Histology:</b> Study of the thin sections of tissues under a microscope</li> <li>• <b>Marine Biology:</b> Study of the living things in the ocean</li> <li>• <b>Microbiology:</b> Study microorganisms including virus, bacteria and some simply fungi</li> <li>• <b>Molecular Biology:</b> Study of how bio-molecules interact with each other, particularly the molecules involved in transmission and translation of genetic information.</li> <li>• <b>Physiology:</b> Study of the mechanical, physical, and biochemical functions of living organisms</li> <li>• <b>Population genetics:</b> Study of gene variations and ratios among populations.</li> <li>• <b>Taxonomy:</b> Study of classification of all living things</li> <li>• <b>Zoology:</b> Study of animals.</li> </ul>	<p>All living things are classified into 5 kingdoms:</p> <ul style="list-style-type: none"> <li>• <b>Monera:</b> single-celled, prokaryotic, photosynthesis or chemosynthesis</li> <li>• <b>Protista:</b> single-celled or multi-celled; photosynthesis or absorbing nutrition from environment, eukaryotic, usually lives in water, autotroph or heterotroph</li> <li>• <b>Fungi:</b> single-celled or multi-celled; photosynthesis or absorbing nutrition from environment, eukaryotic, heterotroph</li> <li>• <b>Plantae:</b> multi-celled; photosynthesis, autotroph</li> <li>• <b>Animalia:</b> multi-celled; heterotroph, capable of moving around</li> </ul>
	<p align="center"><b>Scientific Processes</b></p>
	<p>Although there is not one “scientific method,” there are aspects that are common to scientific investigations:</p>
	<p><b>Forming a hypothesis:</b></p> <ul style="list-style-type: none"> <li>• Observations</li> <li>• Questioning</li> <li>• Hypothesis formation</li> </ul>
	<p><b>Testing a hypothesis:</b></p> <ul style="list-style-type: none"> <li>• Experimentation</li> <li>• Trend recognition</li> </ul>
	<p><b>Evaluating a hypothesis:</b></p> <ul style="list-style-type: none"> <li>• Conclusion formation</li> <li>• Communication and validation of results</li> <li>• Model formation</li> <li>• Re-testing</li> </ul>