**Study Guide for General Biology I**

**Chapter 1**

***Make Flash Cards:***  It is highly recommended to make flash cards of all vocabulary terms in the chapter and in the lecture notes (PowerPoints).

***Use the following expected student learning outcomes as a guide for studying this chapter…***

**CHAPTER 1: THE SCIENCE OF BIOLOGY**

1.1 The Science of Life

* Recall the definition of biology.
* Describe the seven characteristics of living systems.
* Define homeostasis.
* List and describe the levels of the hierarchical organization of living systems, in order.
* Define "emergent Properties" as it relates to biology.

1.2 The Nature of Science

* Distinguish between inductive and deductive reasoning.
* Define hypothesis, experiment, and variable.
* Explain, in order, the steps of the scientific method known as observation, question, hypothesis, prediction, experiment, and conclusion.
* Distinguish between a hypothesis and a prediction.
* Explain the application of scientific thinking for the design of an investigation (see Figure 1.4).
* Distinguish between the "control" and "test" parts of a scientific investigation.
* Describe how scientists can use reductionism and models to understand biological systems.
* Explain how the general public's use of word "theory" differs from the use of "theory" in science.

1.3 An Example of Scientific Inquiry: Darwin and Evolution

* Recall the century in which Charles Darwin lived and wrote "*On the Origin of Species by Means of Natural Selection*"
* Define evolution and natural selection.
* Explain how natural selection is the mechanism for evolution.
* Explain the role of reproductive fitness in natural selection.
* Distinguish between arithmetic and geometric progression.
* Describe how the ideas of Thomas Malthus led Darwin to conceive of the process of “selection”.
* Explain why natural selection can be described as “survival of the fittest”.
* Distinguish between artificial selection and natural selection, giving an example of each.
* Define adaptation, and explain how it is demonstrated by the beaks of Darwin finches.
* Recall the age of the Earth.
* Explain how the fossil record supports Darwin’s ideas.
* Recall how long life has existed on Earth.
* Distinguish between homologous and analogous, and give examples of each.
* Recall that molecular evidence reveals the evolutionary relationships among living things.
* Define phylogenetic tree.
* Recognize and interpret a simple phylogenetic tree (see Figure 1.10).
* Explain why evolution can be described as a process of “editing” rather than a process of “creation”.

1.4 Unifying Themes of Biology

* Recall the cell theory.
* Define genome, gene, deoxyribonucleic acid, and nucleotides.
* Recall the function of DNA.
* Recall the size of the human genome.
* Recall that function is dependent on structure, and give biological examples of this concept.
* List the three domains of life.
* Recall that all living things belong to one (and only one) domain.
* Distinguish between prokaryotes and eukaryotes, and place them in their respective domains.
* List the four kingdoms of the domain Eukarya and briefly describe the characteristics of each.
* Recall that living systems exist in a nonequilibrium state and that they must have a constant supply of energy to maintain themselves.

**In addition to the above objectives, also do the following:**

* Accomplish the “Learning Outcomes” in this chapter and be able to do the “Learning Outcomes Review” items.
* Read and look at the information in any “Scientific Thinking” figures for this chapter and be able to use the information to illustrate the classic steps and process of a scientific investigation.
* Know the material in the Chapter Review.
* Do the “Understand” and “Apply” questions in the chapter Review Questions and know *why* the correct answer is the right choice (and *why* the incorrect answers are the wrong choices). Be able to answer similar questions based on any of the above specific learning objectives.