

Preface

Another name for the *Student Study Guide* for Campbell/Reece, *Biology*, Eighth Edition, could be "A Student Structuring Guide." This guide is designed to help you structure and organize your developing knowledge of biology and create your own personal understanding of the topics covered in the text. Take a few minutes to learn about some strategies of successful students as well as some strategies for using this study guide.

Strategies of Successful Students

What does it take to be a successful student? How can you learn more efficiently and earn better grades? And how can you enjoy your biology course more?

Every successful student tackles learning in his or her own unique way. But there are commonalities that can be shared and results from educational research that can inform you as you develop your own approach. Here is a short list of suggestions that may help.

Make it interesting. Biology is fascinating and so much easier to learn when you love it. Try to bring a sense of wonder to your classes and your studying. Appreciate how much has been discovered and how much we have yet to learn about the living world.

Focus in lecture. What does it mean to focus? Obviously sleeping, text messaging, and daydreaming are out. But so is taking down every word your professor says without thinking. If a lecture outline is provided, take notes on it and/or in a notebook. Many students find that taking notes on only one side of a page allows them to rework, elaborate, or at least make legible what they wrote down in class on the facing page. Doing this shortly after class helps to review the material while it is fresh and develop an organized set of notes that will help in studying for exams.

Make reading active. Research has shown that simply rereading material does not improve test scores, but interacting with the reading assignment does. How do you interact with the printed word? Ask yourself questions and look for answers. Reword every concept heading as a question before you start reading. Make questions out of subheadings. If you are trying to answer a question, you

are looking for meaning. Your brain is not just decoding words, it is working toward understanding those words.

Use your resources. What does your course provide—review sessions, office hours, tutors, study groups? Science is a social endeavor; interact with people as well as the material. Use the written resources provided by your course and the Campbell/Reece textbook: Web sites, practice exams, and tutorials. When possible, prepare for exams by practicing with questions from previous exams. Each professor has his/her own approach to writing questions. One way to improve your grade is to study how your professor asks questions.

Learn from your mistakes. Carefully review your exams—certainly the questions you missed, but even those you got right. If possible, go over the exam with an instructor. Learn both *what* you missed and *why* you missed it so you will know *how* to choose the correct answers next exam. Work on improving your test-taking skills. (See the following section on tips for taking objective tests.)

Try something new. If what you are doing isn't working, don't just keep trying to do it harder. Experiment with new strategies. Are you a visual learner? Try drawing pictures and diagrams. If you are an auditory learner, tape your lectures or make study tapes and listen to them as you commute or exercise. Do you need to interact physically with ideas? Build models, move about as you study, and be active in your learning.

Strategies for Using this Student Study Guide

This Student Study Guide certainly is not a replacement for your textbook or biology class. However, it should help support and even streamline your learning process. Some students read the assigned text chapters before lecture and then the study guide chapters after class to reinforce and review. Others reverse that order, skimming the study guide chapter before lecture and then carefully dissecting the text after listening to the professor's presentation. This study guide is especially helpful in preparation for tests. With the text open beside it so

you can refer to the essential textbook diagrams, read the relevant study guide chapters for a quick review.

Biology is a visual science, and this *Student Study Guide* includes many diagrams taken from *Biology*, Eighth Edition, to help you see the relationships among the parts of structures and processes. Interactive Questions, which are interspersed throughout each chapter's narrative, are designed to help you develop an active learning approach to your study of biology. The numerous multiple choice questions in each chapter will help you test your growing understanding of biological facts and concepts. The Word Roots section helps you learn the large new vocabulary that is a necessary part of a biology course.

The seven divisions of each study guide chapter are as follows:

- The listing of the **Key Concepts** from the text keeps you focused on the major themes of the chapter.
- The **Framework** identifies the overall picture; it provides a conceptual framework into which the chapter information fits.
- The **Chapter Review** is a condensation of each textbook chapter, with a brief summary for each concept heading within the chapter. All text bold terms are also shown in boldface in this section. Interspersed in this summary are **Interactive Questions** that help you stop and synthesize the material just covered.
- The **Word Roots** section presents the derivation of key biological prefixes, suffixes, and word roots. Examples of terms from the chapter are then defined. Breaking a complicated term down to identifiable components will help you to recognize and learn many new biological terms.
- The **Structure Your Knowledge** section directs you to organize and relate the main concepts of the chapter. It helps you to piece together the key ideas into a bigger picture.
- In the **Test Your Knowledge** section, you are provided with objective questions to test your understanding. The multiple choice questions ask you to choose the best answer. Some answers may be partly correct; almost all choices have been written to test your ability to discriminate among alternatives or to point out common misconceptions.
- Suggested answers to the Interactive Questions, the Structure Your Knowledge section, and the Test Your Knowledge questions are provided in the **Answer Section** at the end of the book.

Using Concept Maps. What are the *concept maps* that appear throughout this study guide? A concept map is a diagram that shows how ideas are organized and

related. The *structure* of a concept map is a hierarchically organized cluster of concepts, enclosed in boxes and connected with labeled lines, which explicitly show the relationships among the concepts. The *function* of a concept map is to help you structure your understanding of a topic and create meaning. The *value* of a concept map is in the thinking and organizing required to create a map.

Developing a concept map for a group of concepts requires you to evaluate the relative importance of the concepts (Which are most inclusive and important? Which are less important and subordinate to other concepts?), arrange the concepts in meaningful clusters, and draw and label the connections between them.

This book uses concept maps in several ways. A map of a chapter may be presented in the Framework section to show the organization of the key concepts in that chapter. An Interactive Question may provide a skeleton concept map, with some concepts provided and boxes for you to complete. This technique is intended to help you become more familiar with concept maps and to illustrate one possible approach to organizing the concepts of a particular section.

You will also be asked to develop your own concept maps on certain subsets of ideas. In these cases, the Answer Section will present a suggested concept map. A concept map is an individual picture of your understanding at the time you make the map. As your understanding of an area develops, your map will evolve—sometimes becoming more complex and interrelated, sometimes becoming simplified and streamlined. Do not look to the Answer Section for the “right” concept map. After you have organized your own thoughts, look at the answer map to make sure you have included the key concepts (although you may have added more), to check that the connections you have made are reasonable, and perhaps to see another way to organize the information.

Tips for Taking Multiple Choice Tests. Interact with each question. Read the stem of the question carefully, underlining or using a highlighter to identify the key concept. Read each answer slowly. Cross out the ones you know are wrong. Circle the key idea that you think identifies the correct answer. Now read the question and the answer you chose together, making sure your choice really does answer what is asked. If you aren't sure about a question, try rereading the question and each choice individually. Don't do all of your thinking in your head. Write in the margins and blank spaces of your test. Draw yourself diagrams and pictures. Write down what you do know, and it may jog your memory. If you still are not sure, mark the question to come back to later. As you work through related questions, you may find

information that helps you figure out that question. And remember, there is no substitute for good preparation, proper rest and nutrition, and a positive attitude.

Biology is a fascinating, broad, and exciting subject. Campbell/Reece, *Biology*, Eighth Edition is filled with terminology and facts organized in a manner that will help you build a conceptual framework of the major themes of modern biology. This *Student Study Guide* is

intended to help you learn and recall information and, most importantly, encourage and guide you as you develop your own understanding of and appreciation for biology.

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THE STUDY GUIDE

- 1.1 Themes help connect the concepts of biology.
- 1.2 The Core Theme: Evolution accounts for the unity and diversity of life.
- 1.3 Scientists use two main forms of inquiry in their study of biology.

CHAPTER OBJECTIVES

This chapter outlines the broad scope of biology, describes themes that unify the study of life, and introduces the scientific method. Biology is the study of life. A course in biology is neither a self-study course nor a class that is taken for credit. Biology is a collection of facts and concepts structured within their own organizing principles. Recognizing the common themes woven through will help you to structure your knowledge of biology, making and challenging your own.

CHAPTER OBJECTIVES

Biology is the scientific study of life, with evolution, the process of change that has shaped life from its origin on Earth to today's diversity, as an organizing principle. The properties and processes of life include highly ordered structure, emergent properties, response to the environment, regulation, energy processing, growth and development, and reproduction.

- 1.1 Themes help connect the concepts of biology.

Evolution, the Overarching Theme: Biology is the study of the unity and diversity of life, and the diversity

of life and the process of evolution are related through the study of biology.

The study of biology is organized at each level in the hierarchy of life. The study of life is organized in the hierarchy of life.

CHAPTER OBJECTIVES

Write a brief description of each of the levels of biological organization.

1. biosphere
2. ecosystem
3. community
4. population
5. individual
6. organ and organ system
7. tissue
8. cell
9. organelle
10. molecule

Describe the properties and processes of life.

Identifying emerging properties at each level of biological organization used in the hierarchy of life. Properties of the next level. These emergent properties result from the interaction of components and interactions of parts.

Biology is the study of life, with evolution, the process of change that has shaped life from its origin on Earth to today's diversity, as an organizing principle.