

## **a-g BIOLOGY A & B**

### **COURSE TITLE/ TRANSCRIPT CODE**

a-g Biology A 6E1002

a-g Biology B 6E1009

### **COURSE DESCRIPTION**

This biology course is designed to give students an introduction into scientific methodology and practice, ecology, cells, heredity, evolution, microbes, plants, animals, and humans. Students will learn about the complex biological interactions between organisms and current scientific developments in biological science.

Students will be provided with the foundational knowledge to pursue more advanced studies in this growing field. This survey course provides students with an overview of biological concepts that are reinforced with regularly scheduled laboratory activities and investigations. Students will demonstrate their critical thinking ability by answering analytical questions.

**PREREQUISITES:** Completion of Algebra 1 with a grade of "C" or better.

**REQUIRED TEXTBOOK:** HOLT BIOLOGY, California Edition; 2008; Holt, Rinehart and Winston

**SUPPLEMENTAL INSTRUCTIONAL MATERIALS:** BIOLOGY LAB KIT by Quality Science Labs is required for all students.

### **COURSE PURPOSE**

Students will:

1. Students will understand the fundamentals of life at the cellular level.
2. Students will know the mechanisms which lead to genetic variation in a population.
3. Students will understand how complex abiotic and/or biotic factors affect the organisms within a population.
4. Students will understand with the mechanisms of change that determine survival in a changing environment.
5. Students will examine the increasing complexity and interaction of major body systems in simple and complex animals to better understand the underlying theme of change.
6. Students will know the methods of organization biologists use to give order to organisms.
7. Students will be able to apply the scientific method in laboratory investigations.
8. Students will be able to appropriately use tools and technology in laboratory investigations.
9. Students will learn some of the modern applications of biology.
10. Students will be presented with analytical questions that will require them to use higher-order thinking skills.

### **COURSE OUTLINE**

The course will cover the following topics and CA Content Standards for Biology/ Life Science (CCSB/L):

Chapter 1 (Biology and You) - The purpose of this chapter is to present the nature of scientific thought and scientific methods. SI measurement and lab safety are presented in the context of the tools and techniques that scientists use in scientific research. The chapter closes with a discussion of the basic properties of life.

CCSB/L: IE1b, IE1c, IE1f, IE1g, IE1k

Chapter 2 (Applications of Biology) - This chapter describes how research connects biology to our everyday lives. This chapter illustrates how knowledge helps us better understand ourselves and the world around us.

CCSB/L: IE1d, IE1k, IE1l

Chapter 3 (Chemistry of Life) - This chapter introduces the basic chemistry students need to understand biochemical systems.

CCSB/L: 1b, 1h, IE1d, IE1g, IE1j, IE1k

Chapter 4 (Ecosystems) - The purpose of this chapter is to explain the interactions between organism and their environment in an ecosystem.

CCSB/L: 6a, 6b, 6d, 6e, 6f, IE1a, IE1d, IE1i, IE1k

Chapter 5 (Populations and Communities) - The purpose of this chapter is to explain the concepts of biological communities, populations, of different species living together.

CCSB/L: 6b, 6c, IE1d, IE1e, IE1l, IE1 k, IE1k

Chapter 6 (The Environment) - The purpose of this chapter is to explain how human activities affect the quality of Earth's environment -- specifically how chemical pollution, loss of natural resources, and human population growth affect the environment.

CCSB/L: 6b, IE1d, IE1j, IE1k

Chapter 7 (Cell Structure) - This chapter describes the relationship between the structure and function at the cellular and sub-cellular levels of an organism.

CCSB/L: 1a, 1c, 1e, 1f, 1g, 1i, 1j, 4d, IE1k

Chapter 8 (Cells and Their Environment) - In this chapter, students will be able to describe the structure of a cell membrane and its role in homeostasis.

CCSB/L: 1a, 1i, IE1k

Chapter 9 (Photosynthesis and Cellular Respiration) - The objective of this chapter is to examine how energy is made available to cells to power metabolism. Students will learn how energy is captured and stored during photosynthesis in autotrophs, and how that energy becomes usable to both autotrophs and heterotrophs through cellular respiration.

CCSB/L: 1f, 1g, 1i, 6d, IE1d, IE1k, IE1k

Chapter 10 (Cell Growth and Division) - This chapter describes the significance and process of cell

division. In addition, students will learn about the biology of cancer cells.

CCSB/L: IE1d, IE1k

Chapter 11 (Meiosis and Sexual Reproduction) - The chapter explains the different types of reproduction. In addition, the stages of meiosis and multicellular life cycles are described.

CCSB/L: 2a, 2b, 2c, 2d, 2e, 2f, 3a, IE1d, IE1g, IE1k

Chapter 12 (Mendel and Heredity) - The purpose of this chapter is to explain how genetic traits are passed from one generation to another. Students will learn how the genetic variation that results from various combinations of parental genes is the basis for natural selection.

CCSB/L: 2c, 2g, 3a, 3b, 3c, IE1j, IE1k

Chapter 13 (DNA, RNA, and Proteins) - This chapter explains the universal nature of DNA and its importance to life on Earth. Students will learn how the nature of the DNA molecule makes it possible for it to replicate itself, and more importantly, it has the code needed to direct the assembly of amino acids into polypeptides.

CCSB/L: 1d, 4a, 4b, 4e, 4f, 5a, 5b, IE1d, IE1k

Chapter 14 (Genes in Action) - This chapter explains gene mutation and gene expression.

CCSB/L: 1d, 4c, 4d, 4e, 4f, IE1a, IE1d, IE1j, IE1k, IE1l

Chapter 15 (Gene Technologies) - This chapter explains genetic engineering and some of its products.

CCSB/L: 3d, 4e, 4f, 5c, 5d, 5e, IE1a, IE1d, IE1k, IE1l

Chapter 16 (Evolutionary Theory) - In this chapter, students will be introduced to scientific ideas about evolution and natural selections. Students will develop an understanding of the basic elements of evolutionary theory and will evaluate supporting evidence from fossils, molecules, anatomy, and embryonic development.

CCSB/L: 6g, 7c, 8a, 8b, 8c, 8e, 8f, IE1e, IE1k, IE1n

Chapter 17 (Population Genetics and Speciation) - This chapter explains genetic variation and change in great detail. Students will learn that populations are subject to many forces and undergo constant genetic change and that species that exist at any time are the net result of both speciation and extinction.

CCSB/L: 6g, 7a, 7b, 7c, 7d, 7e, 7f, 8c, 8d, IE1d, IE1k

Chapter 18 (Classification) - The purpose of this chapter is to explain how living organisms are classified and to identify the traits biologists use to classify them. Students will learn how scientists have developed classification schemes to organize their knowledge of life's diversity and to represent inferences about the evolutionary relationships among organisms.

CCSB/L: 8f, IE1a, IE1d, IE1k

Chapter 19 (History of Life on Earth) - The purpose of this chapter is to explore how life may have begun and how scientists estimate the age of the Earth.

CCSB/L: 8e, 8g, IE1d, IE1j, IE1i, IE1k

Chapter 20 (Bacteria and Viruses) - The objective of this chapter is to explain the characteristics and processes of bacteria and viruses. Students will also learn how bacteria and viruses are beneficial to humans and how they cause disease.

CCSB/L: 1d, 10d, IE1d, IE1k

Chapter 21 (Protists) - Students will learn about the amazingly diverse members of the Kingdom Protista. They will study the characteristics and reproductive strategies of these organisms that are unique to this Kingdom.

CCSB/L: IE1k, IE1m

Chapter 22 (Fungi) - In this chapter, students will be able to describe how kingdom Fungi is characterized and how fungi obtain nutrients and reproduce.

CCSB/L: 2a, 2b, 6e, IE1d, IE1k

Chapter 23 (Plant Diversity and Life Cycles) - The purpose of this chapter is to describe the importance and diversity of plants. The characteristics, reproduction, and life cycles of seedless plants and seed plants are discussed.

CCSB/L: 1f, 2a, 2b, 2d, 6g, IE1d, IE1k

Chapter 24 (Seed Plant Structure and Growth) - This chapter is designed to help students understand that plants are composed of structures that adapt to help them survive in their environments.

CCSB/L: IE1d, IE1k

Chapter 25 (Plant Processes) - The purpose of this chapter is to explain plant processes in the growth and development of plants.

IE1d, IE1k, Ie1l

Chapter 26 (Introduction to Animals) - In this chapter, students will be presented the structural, developmental, and reproductive strategies that all animals share. Variations in these animal characteristics are described within the major animal groups.

CCSB/L: 1c, 6f, 9a, 9b, 9c, 9d, IE1d, IE1k

Chapter 27 (Simple Invertebrates) - The purpose of this chapter is to introduce students to invertebrate animals.

6g, 8f, IE1d, IE1k, IE1m

Chapter 28 (Mollusks and Annelids) - The purpose of this chapter is to introduce students to the similarities and differences among the three major classes of mollusks and to discuss the physical characteristics and adaptations of annelids.

CCSB/L: 6g, 8f, IE1d, IE1k

Chapter 29 (Arthropods and Echinoderms) - The purpose of this chapter is to describe characteristics of arthropods and echinoderms and provide information helpful in understanding their place in ecosystems and their impact on humans.

CCSB/L: 2d, 6g, 8f, IE1d, IE1k

Chapter 30 (Fishes and Amphibians) - This chapter describes the characteristics of fishes and amphibians and the ways in which these vertebrates are uniquely adapted to their environments.

CCSB/L: 2d, 6g, 9a, IE1d, IE1k, IE1l

Chapter 31 (Reptiles and Birds) - This chapter provides an overview of the characteristics of reptiles and birds.

2d, 6g, 9a, IE1d, IE1k

Chapter 32 (Mammals) - In this chapter, students will recognize the diversity of mammalian anatomy and physiology, which enables mammals to occupy a tremendous variety of habitats. The chapter also discusses the evolution of primates.

CCSB/L: 6g, 9a, IE1d, IE1k

Chapter 33 (Animal Behavior) - This chapter explains the factors that influence an animal's behavior.

IE1a, IE1k

Chapter 34 (Skeletal, Muscular, and Integumentary System) - This chapter explains the organization of the body and introduces three body systems, and the function of those systems.

CCSB/L: 9a, 9h, 10a, IE1d, IE1k, IE1l

Chapter 35 (Circulatory and Respiratory Systems) - The purpose of this chapter is to explain the structure and function of blood, blood vessels, the heart, and the pathways of blood through the body. The process of breathing and gas exchange are also discussed.

CCSB/L: 9a, IE1d, IE1k

Chapter 36 (Digestive and Excretory Systems) - The purpose of this chapter is to explain how the body digests and uses nutrients and how metabolic wastes are eliminated.

9a, 9f, 9g, IE1g, IE1k

Chapter 37 (The Body's Defenses) - The purpose of this chapter is to explore the way the body protects itself against disease. Students will also learn that the immune systems sometimes fail, often with serious consequences.

CCSB/L: 10a, 10b, 10c, 10d, 10e, 10f, IE1d, IE1g, IE1k, IE1m

Chapter 38 (Nervous System) - This chapter will explain how the nervous system allows the human body to respond to stimuli.

CCSB/L: 9b, 9c, 9d, 9e, IE1j, IE1k

Chapter 39 (The Endocrine System) - The purpose of this chapter is to explain the functions of the endocrine system.

9b, 9c, 9d, 9e, IE1k

Chapter 40 (Reproduction and Development) - The purpose of this chapter is to explain human reproduction and development. Male and female reproductive systems are discussed and the development of an embryo and fetus.

CCSB/L: 2d, 2e, IE1k

Chapter 41 (Forensic Science) - The purpose of this chapter is to introduce students to the field of forensic science.

5b, 9i, IE1d, IE1k, IE1l

### **LABORATORY ACTIVITIES -**

Biology Laboratory Activities are to include, but not be limited to, the following:

**Microscope: Structure and Care** - Students will learn the structure, workings, care and use of a microscope. They will become more familiar with the capabilities of a microscope.

**Microscope Magnification** - Students will calculate the magnification of the microscope under low and high powers. Also, they will gain additional familiarity with the capabilities of a microscope.

**Preparing a Slide Using a Wet Mount** - Students will learn to make a wet mount slide and practice focusing on specimens under the microscope.

**Microscope Drawings** - Students will practice focusing the microscope and create scientific drawings, with particular attention to details and scale.

**Cell Lab: Prepare and View a Plant Cell** - Student will view organelles in living plant cells and learn how to prepare and view a stained slide.

**Cell Lab: Prepare and View parts of a Plant Cell** - Students will prepare a "slice" type slide and a stained slide. Additionally, students will view the cell wall of a cork cell and starch cell.

**Cell Lab: Prepare and View Animal Cells and Compare them to Plant Cells** - Students will prepare and view a stained slide, identify and compare the structures of plant and animal cells, and identify how the structural differences aid in the function of each cell.

**Cell Lab: Student will view chloroplasts in a living plant cell and observe the process of cytoplasmic streaming in a living plant cell.**

**Cell Lab: A Selectively Permeable Membrane** - Students will observe the diffusion of materials through a selectively permeable membrane.

Mitosis Lab - Students will identify the different stages of mitosis and recognize the differences in mitosis in a plant and animal cell.

Bacteria Lab: Part 1 Forms of Bacteria - Students will locate bacteria cells on a slide and examine bacteria in its possible shapes and groupings.

Protista Lab - Students will become acquainted with the different phylum of Protista. Also, students will observe and draw the distinctive characteristics of each phyla.

Fungus Lab: Prepare and View Squash Fungus - Students will view the structures of mold and learn how to prepare and view a wet mount slide.

Fungus Lab: Prepare and View Mushroom Structures - Students will view and draw the external structures of mushrooms and learn how to prepare and view a slice/tease preparation slide.

Fungus Lab: Prepare and View Yeast - Students will culture yeast, prepare a smear type of slide, and view the yeast under the microscope.

Plant Lab: Monocot & Dicot Root, Leaf & Stem - Students will observe the differences and similarities between monocot and dicot plants. In addition, they will view root, stem, leaf, and seed tissues of monocot and dicot plants and record their observations in drawings.

Plant Lab: The Parts of a Flower - Students will practice dissection techniques by finding and identifying parts of a flower. Students will find and identify the females and male flower structures.

Plant Lab: Internal Structures of Monocots and Dicots - Students will view the internal structures of the leaves, roots, and stems of monocots and dicots. Also, students will observe the differences between the internal structures of monocots and dicots.

Plant Lab: Plant Leaves - Students will collect and categorize leaves according to venation, shape, and margins (edge). Upon completion of this lab, students will be able to quickly recognize different leaf categories.

Dissection: Worm - Students will observe a life specimen and become acquainted with the external anatomy of the worm. Students will locate the structures, organs, and systems of the worm. Lastly, student will assess the function of structures from observing the actual anatomy of the organism.

Dissection: Crayfish - Students will observe and analyze a live crayfish specimen. Students will locate the structures, organs, and systems of the crayfish. Lastly, student will assess the function of structures from observing the actual anatomy of the organism.

Dissection: Grasshopper - Students will become acquainted with the internal and external anatomy of the

grasshopper. Students will locate the structures, organs, and systems of a grasshopper. Lastly, student will assess the function of structures from observing the actual anatomy of the organism.

Dissection: Fish - Students will become acquainted with the internal and external anatomy of the fish. Students will locate the structures, organs, and systems of a yellow perch fish. Lastly, student will assess the function of structures from observing the actual anatomy of the organism.

Dissection: Frog - Students will become acquainted with the internal and external anatomy of a frog. Students will locate the structures, organs, and systems of a frog and they will assess the function of structures from observing the actual anatomy of the organism.

Dissection: Cow Eye - Students will become acquainted with the internal and external anatomy of a cow eye. Students will locate the structures, organs, and systems of a cow eye and they will assess the function of structures from observing the actual anatomy of the eye.

Dissection: Fetal Pig - Students will become acquainted with the internal and external anatomy of a fetal pig. Students will locate the structures, organs, and systems of the fetal pig and they will assess the function of structures from observing the actual anatomy of the organism.

## **KEY ASSIGNMENTS**

Textbook Assignments (60% of Final Grade)

For each chapter, students will answer "Review" questions listed at the end of each Chapter Section. Students will also answer questions listed at the end of the Chapter "Review" - specifically the questions listed under the following subtitles: Using Key Terms, Understanding Key Ideas, Explaining Key Ideas, Using Science Graphics, and Critical Thinking. (Sample questions from Chapter 1 Review have been included).

Using Key Term

- For each of the following pair of terms, explain how the meanings of the terms differ

1. hypothesis and theory
2. homeostasis and metabolism
3. reproduction and heredity

Understanding Key Ideas

- Which of the following observations is qualitative, described in words rather than numbers?

- a. surveying the size of the goose population
- b. observing the nocturnal behavior of coyote populations
- c. recording the date when goose migration begins every year
- d. counting the number of goose nests that are robbed of eggs in an area.

Explaining Key Ideas

- Infer why scientists try to limit the number of independent variables in an experiment.

Using Science Graphics

- The provided diagram shows a breakdown of the types of municipal solid waste, by weight, generated in the United States. Use the chart and your knowledge of science to answer the following questions:

...

3. Which of these waste could be turned into compost?

- a. glass
- b. plastics
- c. yard wastes
- d. metal containing iron

Critical Thinking.

1. The law of conservation of matter states that matter cannot be created or destroyed. How does this universal law relate to biology?
2. The development of science and technology is closely linked. Explain how the invention of the microscope led to the development of the sterile technique. List at least one other technology that most likely resulted from the invention of the microscope.

Laboratory Investigations (20% of Final Grade)

Student will be required to complete a CP 2-hour lab class activity once every two weeks. Student will apply the scientific method. Data collected may be represented in tables, graphs and student illustrations. The results from these lab activities will be incorporated in lab reports with concept analysis questions.

Exams (20% of Final Grade)

End-of-chapter exams will be administered at the conclusion of each textbook chapter.

Mid-term and final examinations will be administered each semester.

### **INSTRUCTIONAL METHODS AND/OR STRATEGIES**

Instructional methods/ strategies include, but are not limited to, the following:

Laboratory activities

Inquiry based discussion

Power point presentation

Video presentations

Student directed personal study

Demonstrations

Tutorials

Multimedia presentations

Lecture

Guided practice

Regular access to Subject Matter Expert (SME)

### **ASSESSMENT METHODS AND/OR TOOLS**

Methods by which student progress is assessed will be through a variety and/or combination of methods.

The methods available include but are not limited to the following:

Review of student work by Education Specialist (credentialed teacher) and Subject Matter Expert (SME).

Annual portfolios

Observation by Parent Facilitator, Education Specialist, and Subject Matter Expert (SME)

Student demonstrations

Student grades

Student work samples  
Discussion  
Written examination  
Research projects  
Laboratory write ups  
Demonstration write ups  
Tests  
Quizzes  
Participation