Your competence will be assessed as you complete the objective assessment (BTC1). This course of study may take up to 18 weeks to complete.

Introduction

This course of study is aligned to the BTC1 objective assessment. The same study materials are utilized in the BTT1 performance assessment. If you have previously completed the BTT1 assessment, then you should have already completed the required study activities found in this course of study. You may wish to review the assignments here, but you are not required to repeat these activities. If you have not yet completed the BTT1 assessment, then please proceed through this course of study in full.

Overview
Life Science covers a vast amount of material. The four main topics include cellular biology, evolution, organisms, and ecology. The topics are chunked into a manageable set of activities to complete. Be sure to check your understanding after each topic. This practice will help you build on your knowledge.

Outcomes and Evaluation
There are 4 competencies covered by this course of study; they are listed in the "Competencies for Life Science (BTC1)" page.You will complete the following assessments as you work through the course of study.

Pre-Assessment
You will complete the following pre-assessment:

- PBTC

Objective Assessment
You will complete the following objective assessment:

- BTC1

For specific information about this assessment, select this course under the "Course Details" section of your "Degree Plan."

Teaching Dispositions Statement
Please review the **Statement of Teaching Dispositions**.

Preparing for Success

The information in this section is provided to help you become ready to complete this course of study. As you proceed, you will need to be organized in your studies, competent in the indicated areas, and ready to pass the final assessments.

Your Learning Resources

Enroll in or order the learning resources for this course as early as possible so as to give them time to arrive and give you enough time to become familiar with them.

Enroll in Learning Resources

You will need to enroll in or subscribe to additional learning resources as a part of this course of study.

You may already have enrolled in these resources for other courses. Please check the "Learning Resources" tab and verify that you have access to the following learning resources. If you do not currently have access, please enroll or renew your enrollment at this time.

Note: For instructions on how to enroll or subscribe through the "Learning Resources" tab, please see the "Acquiring Your Learning Resources" page.

Life Science (Mastering Biology)
This web-based resource includes animations, quizzes, tutorials, and access to the following etext:

- Reece, J. B., Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., Jackson, R. B. (2011). *Campbell BIOLOGY* (9th ed.). San Francisco: Benjamin Cummings. ISBN-13: 978-0-321-55823-7

Note: The activities that use this resource list an expected time frame in parentheses. This is merely a guideline. The time frame listed is the minimum time needed to read through the material once. It is more important for you to understand the material than to meet the time frame.

AMNH Seminar (Optional)
These online seminars offered by the American Museum of Natural History (AMNH) use multimedia and discussions to connect teachers and future teachers from around the world to cutting-edge research, classroom resources, and each other. Participating in the seminars develops your understanding of the content, models an appropriate teaching technique, and exposes you to an array of resources that can be used in your classroom or to help with lesson planning. While this is an optional learning resource, you are strongly encouraged to take advantage of this opportunity.

These seminars, which are typically around $450, are covered as part of your WGU tuition. There are three seminars related to these assessments:

- "Genetics, Genomics, Genethics"
- "Evolution"
- "Diversity of Fishes"

Each six-week seminar requires about 8 hours per week of your time. The seminars have definite start and stop times, so, review the AMNH Calendar to determine when the course is offered, and consult your mentor to coordinate this seminar into your schedule.

Discuss the AMNH-WGU FAQ with your mentor to better understand how to successfully use the AMNH course as a WGU learning resource.

Other Learning Resources

You will need to obtain the following learning resources for this course of study.

Science Methods LabPaq

The LabPaq self-contained laboratory kit includes a lab manual along with the science equipment, specimens, supplies, and chemicals necessary to complete college laboratory experiments at home. The experiments reinforce science content and teach laboratory techniques.

Note: If you have already ordered this learning resource for another course, do not order it again. This resource is only available to students in a program with a version of 200810 or newer. These programs include a required one-time lab fee payment.

This resource is ordered by submitting the LabPaq Liability Release Form. Follow the directions at the top of the form to receive this resource. Fax, mail, or, preferably, attach this form to an e-mail and send to learning@wgu.edu. They will process your lab order and your materials will ship within five to seven business days. Please check your package as soon as it arrives. If there are any missing or damaged items, you will need to notify the Learning Resources Department right away. Two weeks after shipment, Hands-On Labs will be unable to make exchanges or supply replacements for items.

Additional Preparation

There are many different learning tools available to you within your course of study in addition to the learning resources discussed above. Some or all of them may be very useful to you as your progress through this course of study. Take the time to familiarize yourself with them and determine how best to fit them into your learning process.

The following activities and information will help you as you work through this course of study.

Message Boards, Learning Communities, Study Notes, FAQs

Message boards, learning communities, study notes, and FAQs are available in every course of study.

Use the "Additional Learning Tools" page to review these tools.

Course Mentor Assistance

Course mentors are available to help you. Their job is to aid understanding in areas where you need to improve and to guide you to learning resources. Request their help as needed when preparing for assessments.

Course mentors cannot provide reviews of entire assessments. If you fail assessment attempts, review the provided feedback first, then ask the course mentor specific questions about what you can do to meet the competency standard. Request course mentor assistance as necessary

in preparing for second attempts at objective assessments or performance task revisions. Mentors cannot guarantee you pass as they do not evaluate assessments; however, they can provide the assistance and advice necessary to help you succeed.

Other Preparations

Graphing Calculator

The assessments associated with this course of study do not require a calculator; however, calculators are permissible on all science assessments and will help you as you navigate through this course of study. Acquire a graphing calculator and familiarize yourself with how to use it. Refer to the Science Calculator Guidelines for details regarding acceptable calculators.

The Chemistry of Life

You can think of biology as an application of chemistry. You should understand how atoms are arranged to make up the molecules found in living matter. The physical shape of a biological molecule is an important aspect of its function.

Macromolecules

Atoms of C, H, and O can be bonded to create a slippery lipid, or bonded a different way to create sweet sugar. How atoms are bonded together determines a molecule's characteristics. When you have completed this topic, you will be able to describe the structure and function of the four main classes of large biological molecules as well as the structure and location of DNA.

Properties of All Living Things

Review the following figure at the beginning of chapter 1:

- Figure 1.3 ("Some properties of life")

In your notebook, write down properties of living things.

Learning About Polymers

Complete the following MasteringBiology activity associated with chapter 5 ("The Structure and Function of Large Biological Molecules") of the *Campbell Biology* textbook:

- Learning about Polymers (15 minutes)

Large Biomolecules

Copy the Large Biological Molecules chart into your notebook, referring to chapter 5 ("The Structure and Function of Large Biological Molecules") of the *Campbell Biology* textbook as needed. As described in the textbook, the physical shape of a molecule is related to its function. Compare your chart with the chart on page 90 of your *Campbell Biology* textbook to check your work.

In your notebook, draw the three basic parts of a nucleotide subunit and check your drawing with the following section of the *Campbell Biology* textbook

- section 5.5 ("Nucleic acids store, transmit, and help express hereditary information")

The Importance of Protein Structure

Review the following figure on pages 82-83. In your notebook, explain the four levels of protein structure.

- Figure 5.20 "Exploring Levels of Protein Structure"

Figure 5.21 shows the effects of a single amino acids substitution causing sickle-cell disease.

Cell Structure

Biology is the study of life, and all living organisms are made of cells. In this topic you will learn about the structure of cells and the many activities that occur in and around cells, allowing life to exist.

Living organisms are made up of cells. Prokaryotic cells are simple cells that do not have a nucleus. Bacteria are one-celled organisms that are prokaryotic. Eukaryotic cells are more complex and have membrane-bound organelles, which each serve a specific function. Plant and animal cells are eukaryotic. Viruses, on the other hand, are not made of cells and are not considered living organisms.

Cellular Processes

Work through the activities below to understand the various types of cells and the processes that occur in cells. Consider the various cell type's similarities and differences as you go through the activities.

Cell Biology

Complete the following MasteringBiology activities associated with chapter 6 ("A Tour of the Cell") of the *Campbell Biology* textbook:

- Prokaryotic Cells (10 minutes)
- Introduction to Eukaryotic Cells (10 minutes)
- Eukaryotic Cells (30 minutes)

Checking Your Understanding

Copy the Comparing Types of Cells Venn diagrams, one depicting the similarities and differences between prokaryotic and eukaryotic cells, and the other comparing plant and animal cells. Fill in the diagrams, referring to chapter 6 ("A Tour of the Cell") of the *Campbell Biology* textbook as needed.

Copy the Cell Components chart in your notebook, referring to chapter 6 ("A Tour of the Cell") of the *Campbell Biology* textbook as needed.
Use the chart on page 123 of your *Campbell Biology* textbook to check your work afterwards.

How Viruses are not cells

Complete the following MasteringBiology activity associated with chapter 19 (Viruses) of the *Campbell Biology* textbook to better understand the activities of a general virus:

- Learning About Viruses (10 minutes)

In your notebook, list the differences between bacteria cells (prokaryotes) and viruses. What are viruses composed of, and why are they not considered living? Use sections 19.1 and 19.2 of the *Campbell Biology* textbook as reference if needed.

Cell Transport

Complete the following MasteringBiology activities associated with chapter 7 (Membrane Structure and Function) of the *Campbell Biology* textbook and answer the questions within the each activity:

- The Plasma Membrane Structure (12 minutes)
- Passive Transport (25 minutes)
- Other Transport Mechanisms (12 minutes)

In your science notebook, answer the following questions:

- What is the difference between endocytosis and exocytosis?
- What are the differences between passive and active transport?
- How do cells use their transport mechanisms to maintain homeostasis and exchange nutrients and waste with their environments?

Cellular Respiration and Photosynthesis

Many biochemical reactions occur inside cells. Enzymes allow these reactions to occur at rates fast enough to sustain life. After working through this section, you should be able to describe the flow of energy through the processes of aerobic and anaerobic respiration and photosynthesis.

Cellular Biochemical Reactions

Many reactions occur in the mitochondria in the process of making ATP. Remember, prokaryotes do not have mitochondria, so these cells make ATP in the cytoplasm. When you have completed this topic, you will be able to describe the flow of energy through photosynthesis and respiration, as well as the role enzymes play during these reactions.

Enzymes

Complete the following MasteringBiology activities associated with chapter 8 ("An Introduction to Metabolism") of the *Campbell Biology* textbook:

- Chemical Reactions and ATP (10 minutes)
- Enzymes (13 minutes)

Your goal is to understand how enzymes speed up reactions and how they are used to regulate metabolism. In organisms, the exergonic reaction of ATP to ADP + P is paired with an endergonic reaction. In your notebook, make a series of drawings that show the basic action of enzymes as you work through this information.

In your science notebook, answer the following questions:

- How do enzymes speed up metabolic reactions?
- What is activation energy?

Cellular Respiration

Complete the following MasteringBiology activity associated with chapter 9 ("Cellular Respiration and Fermentation") of the *Campbell Biology* textbook:

- Cellular Respiration (15 minutes)

Your goal is to understand the main steps of harvesting usable energy from glucose and where these steps occur in the cell. In your notebook, describe the reactants and products of glycolysis, the citric acid cycle, and oxidative phosphorylation. Which of these require oxygen? Where do these reactions occur in the cell?

In your science notebook, answer the following questions:

- How are most ATP molecules produced in cellular respiration?
- What is the purpose of glycolysis and the citric acid cycle?

Fermentation

Complete the following MasteringBiology activity associated with chapter 9 ("Cellular Respiration and Fermentation") of the *Campbell Biology* textbook:

- Fermentation (5 minutes)

Your goal is to describe this anaerobic process of producing ATP. During anaerobic glycolysis, sugar is broken down into pyruvate molecules within the cytoplasm. Yeast cells can anaerobically convert pyruvate into ethanol and carbon dioxide to produce more ATP. When your muscle cells need ATP when no oxygen is present, they can convert pyruvate into lactic acid to make more ATP. Explain to a peer the flow of energy through anaerobic respiration.

In your science notebook, answer the following questions:

- What are the products of fermentation in muscle cells?
- What is oxidized and what is reduced in fermentation?

Review of Glucose Metabolism

Complete the following MasteringBiology activity associated with chapter 9 ("Cellular Respiration and Fermentation") of the *Campbell Biology* textbook:

- Review of Glucose Metabolism (6 minutes)

Photosynthesis

Complete the following MasteringBiology activity associated with chapter 10 ("Photosynthesis") of the *Campbell Biology* textbook:

- Photosynthesis (21 minutes)

In your notebook, write down an overview of the two stages of photosynthesis. Plant cells are involved in the process of cellular respiration, as well as photosynthesis. In your notebook, draw a large plant cell with both mitochondria and chloroplasts. Illustrate the stages of cellular respiration and photosynthesis as they would occur in this plant cell.

Genetics

During an organism's life cycle, more cells need to be made. Most cells in an organism are considered somatic cells, which are involved with the daily activities of living. During an organism's life, these somatic cells divide during the process of mitosis. For reproduction purposes, the organism's sex cells divide during the process of meiosis to create haploid gametes.

Mitosis and Meiosis

Throughout your life, your body needs to make more cells. As you grow taller, you need more bone cells. When your skin is broken, you need more skin cells to repair the damage. Cells are always in some stage of the cell cycle, which includes the process of making more somatic cells.

When you have completed this topic, you will be able to describe how new somatic cells and haploid gametes are generated.

The Cell Cycle

Complete the following MasteringBiology activity associated with chapter 12 ("The Cell Cycle") of the *Campbell Biology* textbook:

- The Cell Cycle (17 minutes)

In your notebook, describe the main phases of the cell cycle, including a description of the main phases of mitosis. Draw a labeled picture for each phase of mitosis.

Page 236 within chapter 12 of the *Campbell Biology* textbook describes binary fission, which is the asexual reproduction of a prokaryote. In your notebook, describe the main phases of binary fission and how prokaryotic cell division differs from eukaryotic cell division.

Meiosis

Complete the following MasteringBiology activity associated with chapter 13 ("Meiosis and Sexual Life Cycles") of the *Campbell Biology* textbook:

- Meiosis (30 minutes)

Be sure to understand the genetic significance of haploid and diploid cells. A karyotype illustrates that sexually reproducing organisms have two complete sets of chromosomes. One set was given by the father, and one set was given by the mother. Each set is a genetic mixture of the previous generations, due to crossing over. Sexually reproducing organisms have the

benefit of distributing the gene pool within the population.

In your notebook, explain how genes are replicated and randomly sorted during meiosis.

What are the phases of meiosis? What are the differences between asexual and sexual reproduction? What are the differences between mitosis and meiosis? How is information passed on to the next generation?

The Role of Chromosomes

DNA holds the code for making the various proteins needed for cellular function. When the DNA molecule is condensed, tightly wrapped around histones, it is referred to as a chromosome.

Laws of Inheritance

When you have completed this topic, you will be able to state the laws of inheritance and predict the probable outcomes of a genetic cross.

Mendelian Inheritance

Complete the following MasteringBiology activity associated with chapter 14 ("Mendel and the Gene Idea") of the *Campbell Biology* textbook:

- Mendelian Inheritance (30 minutes)

In your notebook, state Mendel’s laws of inheritance. Your goal is to predict the probable outcome of phenotypes in a genetic cross knowing the genotypes of the parents. Write notes in your lab notebook as needed. What is incomplete dominance?

Phenotype and Genotype Lab

Complete the following lab in the Science Methods SM-1 LabPaq:

- experiment 8 ("Phenotype and Genotype")

After completing the lab, send your lab report to the course mentor to receive feedback.

The Chromosomal Basis of Inheritance

Complete the following MasteringBiology activity associated with chapter 15 ("The Chromosomal Basis of Inheritance") of the *Campbell Biology* textbook:

- The Chromosomal Basis of Inheritance (25 minutes)

Chromosomes, Genes, Heredity

When you have completed this topic, you will be able to explain the relationship between chromosomes, genes, and heredity, as well as DNA replication

DNA Structure and Replication

Complete the following MasteringBiology activity associated with chapter 16 ("The Molecular Basis of Inheritance") of the *Campbell Biology* textbook:

- DNA Structure and Replication (15 minutes)

In your notebook, draw a storyboard showing the steps in DNA replication and the structure of DNA.

Figure 16.22 on pages 320-321 show the DNA structure under an electron microscope. You can see the tightly wound structure of the chromosome. In your notebook, draw pictures of the general structure of chromosomes and genes as they would be seen under an electron microscope

Consider the following questions:

- What are the differences between DNA and RNA?
- What role does complementary base pairing play in DNA replication?
- What does it mean that the two DNA strands in a double helix are antiparallel?

Protein Synthesis

Complete the following MasteringBiology activity associated with chapter 17 ("From Gene to Protein") of the *Campbell Biology* textbook:

- Protein Synthesis (20 minutes)

Know the general structure and function of RNA, protein, chromosomes, and genes. Draw a series of pictures to show the steps involved in making a protein.

The Effects of Mutations

Complete the following MasteringBiology activity associated with chapter 17 ("From Gene to Protein") of the *Campbell Biology* textbook:

- The Effects of Mutations (25 minutes)

What is a point mutation? Define *silent mutations, missense mutations, nonsense mutations* and *frameshift mutations* and explain what type of small scale mutation could cause each of these types of mutations.

Gene Expression

Complete the following MasteringBiology activity associated with chapter 18 ("Regulation of Gene Expression") of the *Campbell Biology* textbook:

- Gene Expression (10 minutes)

Cells specialize for different functions and therefore have different patterns of gene expression. Remember, all somatic cells have a complete set of chromosomes, which contains the code for all cellular functions-but what genes should be turned on or off in each cell? In general, most cells in a multicellular organism contain the same genetic information; in other words, they have the same nucleotide sequence of DNA. Therefore, cellular differentiation (the formation of

different types of cells) is not due to differences in the genetic information in different cells. Instead, it results from differences in how the genetic information is expressed. Differential gene expression is the expression of different sets of genes in cells that contain the same genetic information.

Write in your notebook how gene expression affects the formation of different cells with varied functions.

Gene Traits

Explore the following resources to learn more about genetic traits and their application to technology.

PCR Technology

Refer to the following chapter in the *Campbell Biology* textbook:

- chapter 20 ("Biotechnology")

In your notebook, write down the steps and benefits of PCR technology.

Inherited Characteristics

Explore the following resources to learn more about inherited characteristics.

Multiple Alleles

Watch the following video to help you understand how multiple alleles determine a person's blood type:

- Multiple Alleles and Blood Type

The following additional resources will help with your understanding:

- "Genes and Blood Type"
- section 14.3 of *Campbell Biology* textbook ("Inheritance patterns are often more complex than predicted by simple Mendelian genetics")

In your notebook, write notes on how blood type is determined with multiple alleles.

Sickle Cell disease

Use the following resources to help with your understanding:

- section 14.4 of *Campbell textbook*

The Importance of Protein Structure

Review the following figure on pages 82-83 to appreciate the four levels of protein structure:

- Figure 5.20 "Exploring Levels of Protein Structure"

Figure 5.21 shows the effects of "A single amino acid substitution in a protein causes sickle-cell

disease."

The Mechanics of Evolution

As the environment changes, the population might also change. Populations evolve, not individuals. Evolution refers to changes at the DNA level, and once an organism is born, its DNA is already determined.

Changes Over Time

The genetic makeup of a population can change. When you have completed this topic, you will be able to describe the evidence that shows life has changed over time and the role of natural selection in these changes.

Genomes and Their Evolution

The genetic material of an organism constitutes its genome. Comparing the genome of various species provides insight into the evolutionary changes that have taken place.

Read the following sections of the *Campbell Biology* textbook:

- section 21.5 ("Duplication, rearrangement, and mutation of DNA contribute to genome evolution")
- section 21.6 ("Comparing genome sequences provides clues to evolution and development.")

What is the mechanism that causes the genetic make-up of a population to change? How could chromosomal rearrangements lead to the emergence of new species? What type of information can be obtained by comparing the genomes of closely related species?

Descent with Modification

Complete the following MasteringBiology activities associated with chapter 22 ("Descent with Modification: A Darwinian View of Life") of the *Campbell Biology* textbook:

- Artificial and Natural Selection (25 minutes)
- Evidence for Evolution (20 minutes)

In your notebook, summarize the different types of evidence supporting evolution. The theory of evolution provides an explanation of the evidence, which continues to be validated as more evidence is presented. Practice explaining to a friend the concept of natural selection.

Evolution of Populations

Mutations play a role in the evolution of populations. When you have completed this topic, you will be able to explain how the traits within a population help its survival.

Mechanisms of Evolution

Complete the following MasteringBiology activities associated with chapter 23 ("The Evolution of Populations") of the *Campbell Biology* textbook:

- Mechanisms of Evolution (20 minutes)

- Sexual Reproduction adds to Genetic Variety Within the Population (15 minutes)

In your notebook, address the following:

- What are the main sources of variation in a population?
- Why is it beneficial for a population to have genetic variety within its members?
- How are mutations beneficial in evolution and the survival of the population?
- What is the relationship between adaptations and survival?
- Describe how gene flow, genetic drift, and natural selection all can influence evolution.

The Origin of Species

As populations change, a new species might emerge. The topic of speciation has various definitions within the scientific community. This section covers the basics of this topic. The AMNH seminar on evolution investigates the concept of speciation more in depth.

Speciation

Populations can change over time in different ways. The change could be within the whole population, could just affect a subgroup of the population, or could refer to the entire population being replaced by a new population. When you have completed this topic, you will be able to compare different ways populations can change over time, and you will also be able to state when different forms of life first appeared on Earth.

Species Evolution

Complete the following MasteringBiology activities associated with chapter 24 ("The Origin of Species") of the *Campbell Biology* textbook:

- Species Evolution (25 minutes)

In your notebook, draw a diagram that explains how reproductive or geographic isolation can affect speciation. Define speciation, microevolution, and macroevolution. Compare them to one another. Explain how natural selection affects speciation, as well as extinction.

Examine the following figure along with its explanation within chapter 24 ("The Origin of Species") of the *Campbell Biology* textbook:

- Figure 24.17 ("Two models for the tempo of speciation")

In your notebook, compare gradualism and punctuated equilibrium.

The History of Life

In this topic, you will look at the bigger picture of how populations have changed. Complete the activities below to better understand when the different forms of life first appeared on Earth.

History of Life on Earth

Complete the following MasteringBiology activity associated with chapter 25 ("The History of Life on Earth") of the *Campbell Biology* textbook:

- History of Life on Earth (25 minutes)

Write notes in your notebook related to how life might have begun in the water during the early stages of Earth's atmosphere. Create a timeline depicting when different life forms first appeared on Earth.

Describe an example from the fossil record that shows how life has changed over time. How might life have begun on Earth? When were dinosaurs in great abundance?

Human Evolution

Complete the following MasteringBiology activity associated with Chapter 34 ("The Origin and Evolution of Vertebrates") of the *Campbell Biology* textbook:

- Human Evolution (10 minutes)

Write notes in your lab notebook related to the evolution of humans, and list some of the characteristics of humans that evolved over time.

What characteristics distinguish hominins from other apes?

Classifying Life

While studying life on Earth, scientists have used various methods for grouping organisms. The methods used for classifying life have changed over time as more information is learned about living organisms. The human body is organized into organ systems, and each serves a different role to sustain life.

Taxonomy

Scientists have classified living organisms into groups based on their characteristics. When you have completed this topic, you will be able to discuss ways of classifying organisms.

Classification

Complete the following MasteringBiology activity associated with chapter 26 ("Phylogeny and the Tree of Life") of the *Campbell Biology* textbook:

- Classification (25 minutes)

What is phylogeny? What is the purpose of taxonomy?

In your notebook, write down the Linnaen classification system, referring to Figure 26.3 ("Linnean classification") as needed. Create your own pneumonic system to remember the order of terms.

Protists

Protists are more diverse than all other eukaryotes and are no longer classified in a single kingdom. Most are unicellular. Protists include photoautotrophs, heterotrophs, and mixotrophs, and are characterized by a wide diversity of life cycles.

Complete the following MasteringBiology activity associated with chapter 28 ("Protists") of the *Campbell Biology* textbook:

- Protists (20 minutes)

In your lab notebook, describe the characteristics of protists and name some examples.

Nonvascular Plants

Complete the following MasteringBiology activity associated with chapter 29 ("Plant Diversity I: How Plants Colonized Land") of the *Campbell Biology* textbook:

- Nonvascular Plants (15 minutes)

In your lab notebook, describe the characteristics of nonvascular plants and name some examples.

Plant Groups

Land plants evolved from green algae. Seeds and pollen grains are key adaptations for life on land.

Using Figure 30.2 as your guide, complete the Plant Groups chart in your notebook. You should understand how land plants are classified.

Fungi

Fungi are heterotrophs that feed by absorption. Most fungi grow as thin, multicellular filaments called hyphae. Fungi produce spores through sexual or asexual life cycles.

Complete the following MasteringBiology activity associated with chapter 31 ("Fungi") of the *Campbell Biology* textbook:

- Fungi (15 minutes)

In your lab notebook, describe the characteristics of fungi and name some examples.

Animal Body Plans

Animals are multicellular, heterotrophic eukaryotes with tissues that develop from embryonic layers. They can be characterized by "body plans."

Complete the following MasteringBiology activity associated with chapter 32 ("An Overview of Animal Diveristy") of the *Campbell Biology* textbook:

- Animal Body Plans (20 minutes)

In your lab notebook, describe the characteristics of animals and name some examples.

Animals and Plants

Animals and plants have a variety of structures for meeting the needs of the organism. The morphology of organisms has been used by scientists to classify organisms. With the ability to study an organism's DNA, this form of grouping organisms has been questioned. During this subject, you will examine the morphology of plants and animals.

Structure and Function in Plants

Plant structures also address the functions of support, nutrition, reproduction and development through life cycles, and gas exchange. Plant cells have cell walls to help with support. All plants must have a mechanism for providing all cells with nutrients, as well as a means for exchanging oxygen and carbon dioxide. In order to survive, plants must have a mechanism for producing offspring, as well as strategies for offspring to reach adulthood. In this section, you will investigate the structures plants have to perform these various functions.

The Diverse Structures of Plants

Complete the following MasteringBiology activity associated with chapter 36 ("Resource Acquisition and Transport in Vascular Plants") of the *Campbell Biology* textbook:

- Transport in Vascular Plants (15 minutes)

Complete the following MasteringBiology activity associated with chapter 38 ("Angiosperm Reproduction and Biotechnology") of the *Campbell Biology* textbook:

- Plant Reproduction (15 minutes)

In your notebook, describe the diversity of structures plants have to perform functions related to support, nutrition, reproduction, and development through life cycles, and gas exchange.

What keeps a tree standing tall without bones? What are the key adaptations that allowed plants to live on land?

Structure and Function in Animals

Animal structures address the functions of support, nutrition, reproduction, and development through life cycles, and gas exchange. Some invertebrate animals have exoskeletons for support (such as lobsters) while others use the properties of water to support their bodies (such as squid). Vertebrate animals have skeletons for support. All animals must have a mechanism for providing all cells with nutrients, as well as a means for exchanging oxygen and carbon dioxide. In order to survive, animals must have a mechanism for producing offspring, as well as strategies for offspring to reach adulthood. In this section, you are investigating the structures animals have to perform these various functions.

Invertebrate Structures

Chapter 33 of the *Campbell Biology* textbook describes the structures of invertebrate animals. For each section in this chapter, describe the diversity of structures that the invertebrates have to perform functions related to support, nutrition, reproduction, and development through life cycles, and gas exchange.

For example, section 33.1 describes the Porifera phylum. In your notebook, take notes on how

this phylum performs functions related to support, nutrition, reproduction and development through life cycles, and gas exchange.

Vertebrate Structures

Read the following section of the *Campbell Biology* textbook:

- section 40.1 ("Animal Form and Function are correlated at all levels of organization")

Based on the information you read in section 40.1, describe the following in your notebook:

- the hierarchical organization of body plans (cell, tissue, organ, organ system), giving examples of each
- the organ systems in mammals, listing their main components and main functions (using Table 40.1 to check your work)

Complete the following MasteringBiology activity associated with chapter 40 ("Basic Principles of Animal Form and Function"), 41 ("Animal Nutrition"), and 42 ("Circulation and Gas Exchange") of the *Campbell Biology* textbook:

- An Introduction to the Human Body (20 minutes)

Complete the following MasteringBiology activity associated with chapter 45 ("Hormones and the Endocrine System") of the *Campbell Biology* textbook:

- Hormones (15 minutes)

Complete the following MasteringBiology activity associated with chapter 50 ("Sensory and Motor Mechanisms") of the *Campbell Biology* textbook:

- Muscles, Bones and Nerves work together (15 minutes)

Stimulus and Response in Plants and Animals

To increase their survival, plants and animals have mechanisms to respond to their environment. After completing this topic, you will be able to explain behaviors that are a result of an organism responding to its environment, and how humans maintain homeostasis.

Plant Responses

Complete the following MasteringBiology activities associated with chapter 39 ("Plant Responses to Internal and External Signals") of the *Campbell Biology* textbook:

- Plant Responses (15 minutes)

In your notebook, describe different ways plants respond to stimulus in their environment.

Animal Responses

Complete the following MasteringBiology activities associated with chapter 40 ("Basic Principles

of Animal Form and Function") of the *Campbell Biology* textbook:

- Homeostasis (15 minutes)

Complete the following MasteringBiology activities associated with chapter 45 ("Hormones and the Endocrine System") of the *Campbell Biology* textbook:

- Regulating Blood Sugar (15 minutes)

In your notebook, describe different ways animals respond to stimulus in their environment.

Staying Healthy

Organisms have methods for staying healthy. The immune system works to keep the human body healthy. Some microorganisms serve a beneficial role in maintaining health, while others can cause disease.

Disease and the Immune System

Your body's immune system functions to combat diseases. When you have completed this topic, you will be able to describe mechanisms organisms use to combat disease, as well as the role microorganisms and viruses play in causing disease and/or maintaining health.

The Immune System

Complete the following MasteringBiology activity associated with chapter 43 ("The Immune System") of the *Campbell Biology* textbook:

- The Immune System (25 minutes)

To better understand the function of the lymphatic system, read the following section of the *Campbell Biology* textbook:

- section 43.1 ("In innate immunity, recognition and response rely on traits common to groups of pathogens")

In your notebook, describe the defenses your body has to stay healthy. Why do antibiotics not work for viral infections?

The Causes of Disease

Read the following sections of the *Campbell Biology* textbook:

- section 27.6 ("Prokaryotes have both harmful and beneficial impacts on humans")
- section 19.3 ("Viruses, viroids, and prions are formidable pathogens in animals and plants")

Based on the information you read, describe the following in your notebook:

- how bacteria cause illness in their host

- how bacteria are helpful
- how viruses cause illness in their host

Microbes Lab

Complete the following lab in the Science Methods LabPaq:

- experiment 6 (“Microbes Everywhere”)

After completing the lab, send your lab report to the course mentor to receive feedback.

Spread of Contagion Lab

Complete the following lab in the Science Methods LabPaq:

- experiment 7 ("Spread of Contagion")

After completing the lab, send your lab report to the course mentor to receive feedback.

Introduction to Ecology

Ecology is the study of interactions between organisms and the environment. When an earthworm digs through the soil, it is interacting with its environment. When a lily pad is floating on a pond’s surface, it is interacting with the environment. Ecology is the study of such interactions.

Organisms and Their Environment

When you have completed this topic, you will be able to explain the relationships within different biomes and the variations, tolerances, and adaptations of species within the biomes.

Introduction to Ecology

Read the following section in *Campbell Biology:*

- section 52.1 ("Earth's climate varies by latitude and season and is changing rapidly".)

Write notes in your lab notebook to distinguish the six levels of organization:

- organism
- population
- community
- ecosystem
- biome
- biosphere
- Write descriptions of the terms ecology, biotic, and abiotic. Abiotic factors/climate determines the types of organisms that can live in an area.

The Biosphere

Complete the following MasteringBiology activity associated with chapter 52 ("An Introduction to Ecology and the Biosphere") of the *Campbell Biology* textbook:

- The Biosphere (30 minutes)

Using chapter 52 as reference, describe in your notebook the different terrestrial and aquatic biomes. For example, section 52.3 details the aquatic biomes and how the various zones attract certain types of organisms. In the abyssal zone there is not much light, but there are hydrothermal vents that support a diverse ecosystem.

Populations and Communities

A community includes many populations interacting with each other. In the previous subject, the larger biome concept was investigated. For example, the desert biome is defined by its conditions, such as the climate and its soil, as well as its inhabitants. Earth's biomes are disjointed, since there are different examples spread around the globe. Ecosystems are subsections of biomes, which also include the abiotic and biotic factors of the environment. Ecosystems are focused to a particular area, such as the Sonoran Desert in southern Arizona. There are several communities of living organisms within an ecosystem. The populations within a particular community interact with each other at some level.

Population Ecology

An organism can be very well adapted to a particular environment, yet its survival is still dependant on the resources available. When you have completed this topic, you will be able to explain how the size of a population is limited by its environmental resources, and by the rates of birth, immigration, emigration and death.

Changes in Population size

Complete the following MasteringBiology activity associated with chapter 53 ("Population Ecology") of the *Campbell Biology* textbook:

- Population Ecology (30 minutes)

In your notebook, answer the following:

- Explain the concept of carrying capacity and how it depends on the availability of resources.
- Where is exponential growth by a plant population more likely-in an area where a forest was destroyed by fire, or in a mature, undisturbed forest? Why?
- Why does population size fluctuates?
- How are humans different from other species in their ability to alter the carrying capacity of their environment?

Community Ecology

There are many dynamics at work within a community. Matter is exchanged between its members while competing for resources. Organisms within a community serve a function, allowing the community to exist. When you have completed this topic, you will be able to explain impact of interactions within a community. The structure and dynamics of a community also depend on the feeding relationships between organisms-the trophic structure of the community. The transfer of food energy up the trophic levels is referred to as a food chain. Examples of food chains can be seen in Figure 54.13

Community Interactions

Complete the following MasteringBiology activity associated with chapter 54 ("Community Ecology") of the *Campbell Biology* textbook:

- Community Ecology (30 minutes)

Complete the Comunity Interactions chart in your notebook

In your notebook, answer the following:

- Describe the flow of energy through ecosystems
- Describe how organisms depend on each other to meet basic needs
- Provide examples of how organisms might depend on each other for shelter, food, or protection
- Why are food chains usually short?
- How do interspecific competition, predation, and mutualism differ in their effects on the interacting populations of two species?
- What outcome is expected when two species with identical niches compete for a resource, and why?
- Describe the various forms of competition between organisms and how these affect population size.
- Describe how organisms may serve certain functions (ecological niches).

Energy Flow Through Ecosystems

The biotic and abiotic components of the environment constantly interact. The oxygen in the atmosphere is considered abiotic, but after you breathe it in, the oxygen is then considered biotic as the atoms are reconfigured inside you. There is interdependence between all components of an environment.

Drawing pictures often helps with the learning process. As you work through this subject, check your understanding by creating your own drawings to show the interdependence with the environment.

Ecosystems

Food is more than just a source of energy. It also includes elements needed for the organism to make new molecules. Nitrogen, for example, is needed for the body to make more proteins. When you have completed this topic, you will be able to explain how matter is transferred over time through food webs and back to the environment. You will also be able to explain how elements are circulated within an ecosystem and how humans impact ecosystems, both positively and negatively

Energy and Nutrient Transfer

Complete the following MasteringBiology activities associated with chapter 55 ("Ecosystems and Restoration Ecology") of the *Campbell Biology* textbook:

- Energy Flow (25 minutes)
- Nutrient Cycles (35 minutes)

A food web illustrates the flow of energy within an ecosystem, but only about 10% of the energy from one organism transfers to the next trophic level. Much of the energy is used for respiration and growth or lost to the environment in the form of heat.

In your notebook, describe the flow of energy through ecosystems.

Explain to a peer how carbon, nitrogen, phosphorous, sulfur, and trace elements such as iron are cycled between living (biosphere) and non-living (atmosphere, hydrosphere, lithosphere) parts of an ecosystem, and globally. In your notebook, explain the role that decomposers play in recycling carbon, nitrogen, and phosphorous and how matter and energy are transferred back to the environment over time.

Figure 55.14 explores water and nutrient cycling. For each of the four biogeochemical cycles detailed in the figure, draw a simple diagram in your notebook that shows one possible path for an atom of that chemical form from abiotic to biotic resevoirs and back.

If decomposers usually grow faster and decompose material more quickly in warmer ecosystems, why is decomposition in hot deserts so slow?

Biodiversity

Biodiversity refers to the variety of living organisms. Healthy ecosystems have a variety of living organisms that interact. For example, a predator should have several animals available as its prey so that more opportunities are available for food. A variety of herbivores should be available to manage the plant species. When you have completed this topic, you will be able to explain how organisms depend on each other to meet basic needs.

Human Impact

Complete the following MasteringBiology activities associated with chapter 56 ("Conservation Biology and Global Change") of the *Campbell Biology* textbook:

- Biodiversity (25 minutes)
- Human Impact on Biodiversity (25 minutes)

In your notebook, make a chart comparing the positive and negative effects of human activities on ecosystems, including land use policies and water quality.

Scientists around the world record their observations of species. By analyzing these observations, conclusions can be made regarding the fluctuations in biodiversity over time. In your notebook, explain how biodiversity is altered by changes in habitats and what the benefits of biodiversity are.

Final Steps

Congratulations on completing the activities in this course of study! This section will guide you

through the assessment process.

Assessment Information

The activities in this course of study have prepared you to complete the BTC1 objective assessment. If you have not already completed the assessment, you will do so now.

Accessing Pre-Assessments

Complete the following pre-assessment:

- PBTC

For directions on how to receive access to pre-assessments, see the "Accessing Pre-Assessments" page.

Accessing Objective Assessments

Complete the following objective assessment:

- BTC1

For directions on how to receive access to objective assessments, see the "Accessing Objective Assessments" page.

Feedback

WGU values your input! If you have comments, concerns, or suggestions for improvement of this course, please submit your feedback using the following form:

- Course Feedback

ADA Requirements

Please review the University ADA Policy.