Biology with Labs

Edgenuity, Inc ()

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Pending

Submission Feedback

APPROVED

Basic Course Information

School(s) Offering This Course:

School Name	Course Learning Environment	Transcript Code(s)	
Edgenuity, Inc ()	Online	Abbreviation	Course Code

Title:	Biology with Labs
Transcript abbreviations:	
Length of course:	Full Year
Subject area:	Laboratory Science (D) / Biology / Life Sciences
UC honors designation?	No
Non-honors equivalent course:	{{ getNonHonorsEquivalentDisplayValue() }}
Non-honors exemption details:	
Prerequisites:	Algebra I (or co-requisite) (Required) Physical Science (Recommended) None
Co-requisites:	None

Integrated (Academics / CTE)?	No
Does your course include lab activities in your course description?	Yes
Grade levels:	9th, 10th
Course learning environment:	Online

Online course self assessment

A. Content (13)

B. Instructional Design (11)

C. Student Assessment (7)

D. Technology (11)

E. Course Evaluation and Support (10)

Course Description

Course overview:

This Course Overview is not available on the A-G Course Management Portal. For more information about this course, you need to contact the institution that authored this course.

> This compelling full-year course engages students in the study of life and living organisms and examines biology and biochemistry in the real world. It encompasses traditional concepts in biology and encourages exploration of new discoveries in this field of science. The components include biochemistry, cell biology, cell processes, heredity and reproduction, the evolution of life, taxonomy, human body systems, and ecology.

Course content:

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Introduction to Life

This course includes a variety of laboratory activities. These include wet labs that account for at least 20% of the course and additional virtual labs that can be used for extended practice. Wet labs are completed in a lab setting and are teacher-supervised, hands-on activities. Students are required to conduct the labs according to the lab procedures provided in the Student Guide and the Teacher Guide for the labs, to analyze outcomes, and to formally write about their findings and possible improvements. Lab materials for the wet lab must be provided by the school. The lab descriptions are provided in the assignment summary descriptions for each unit. All labs require students to participate in inquiry, observation, analysis and write-up. Labs begin with a question and formation of a hypothesis, students conduct systematic observations about the lab and design experiments or data collection strategies, then they analyze the data and lab results through several assignments that help them draw conclusions, and complete an extensive formal lab report to report their findings and conclusions. Student lab reports must demonstrate strong scientific reasoning and writing. In these reports students state the purpose of the experiment, questions posed before the experiment, their hypothesis, and independent, dependent, and controlled variables. They list their materials used and the procedure. They collect and organize data into tables, charts, graphs, etc., checking for accuracy. They interpret their data and graphs, determine whether the data supported or refuted their hypothesis. They describe sources of error and possible ways to improve or further their investigation, ensuring that they write without bias. They also further develop their ideas, designs, and solutions through discussion with other students in Collaboration Corner, the online discussion forum.

Each unit in this rigorous laboratory science course contains lessons that include a warm-up activity to review background knowledge and introduce new scientific concepts that will be discussed, direct instruction, assignments, and a summary. Integrated laboratory activities and projects provide students with the opportunity to demonstrate knowledge of scientific concepts and habits of mind important for university-level studies. Scientific texts are also incorporated throughout the course, providing opportunities for development of writing and literacy skills. In addition, students experience multiple opportunities to apply a variety of scientific inquiry skills, including those outlined in the Laboratory science subject area “d” requirements found in the UCOP A-G subject requirements. Please note that specific examples of how this course provides ample opportunity for student participation in all phases of the scientific process and develop scientific habits of mind by participating in all eight practices of science identified in the Next Generation Science Standards are outlined below the unit description of this unit.

In addition to student collaboration in hands on laboratory experiments, students regularly engage in higher-order thinking and discuss scientific ideas with other students in a threaded discussion format. The discussion, which is open only to students in each class, is monitored by the teacher, who can ask questions of the group or of individual students. This provides students the opportunity to communicate with each other in order to share understanding, insight, and ideas.

Throughout the course, the student's Course Map, provided through the learning management system, serves as a dynamic and interactive scope and sequence for all course assignments. The Course Map includes course objectives and student learning outcomes, content scope and sequence, and a comprehensive outline of assignments. Students can also access an online digital notebook, or eNotes. They have a full menu of text formatting tools and can return to their notes or print them at any time for review. Additionally, the unique direct instruction video presentations embedded in every lesson throughout the course feature highly qualified, certified instructors presenting instructional content via recorded video. Instructors guide students through concepts and skills with clear and engaging audio and visual supports that include white board demonstrations, bulleted key points, highlighted vocabulary, diagrams and photography. The video tool allows students to pause, go back, and repeat instruction as-needed. They stop at intervals throughout instruction to complete interactive tasks, self-assessing their learning progress and keeping students engaged.

Unit Description:

Students begin this unit by studying the characteristics of living organisms, and the different levels of organization within an organism. Students compare and contrast living and nonliving objects. Students then examine how two different scientists could use different experimental designs and have the same outcome. Next, students compare the structures and functions of macromolecules: carbohydrates, lipids, proteins and nucleic acids. Students then engage in lessons for each specific macromolecule. Students begin with carbohydrates, differentiating between the roles of monosaccharides, disaccharides, and polysaccharides in living organisms. Finally, students conclude the unit by participating in a lab component which explores the presence of nutrients in food.

Assignment Summary:

See hands-on lab activity below

Scientific Process and Practices of Science Samples:

Note: The following examples are from the whole course to provide a comprehensive overview.

Specific examples of how this course provides ample opportunity for student participation in all phases of the scientific process and develop scientific habits of mind by participating in all eight practices of science identified in the Next Generation Science Standards are outlined below:

<u>Practice 1: Asking questions (for science) and defining problems (for engineering):</u>

Lesson: Genetic Code

Within the lesson Genetic Code, students complete a project in which they ask scientific questions to enhance their understanding of the role of DNA and chromosomes in the expression of heritable traits. In order to answer these questions, students conduct scientific research and compose a written document that includes their questions and answers based on the evidence found.

Lab: Exercise and Homeostasis

Within the Lab: Exercise and Homeostasis lesson, students ask the following scientific question: How does heart rate change during and after an exercise is performed for two different periods of time? They then plan a scientific investigation to test this question, including developing appropriate hypotheses, selecting appropriate scientific tools and techniques, analyzing types of data to collect, and correcting for possible sources of error.

Lesson: Human Impact on the Environment

Within the lesson Human Impact on the Environment, students complete a project in which they conduct a simulation to evaluate human impact on coral reef ecosystems. They then utilize the results and additional scientific evidence to create written proposals and evaluations of possible real-world solutions to reduce the negative effects of human activity on this ecosystem and its biodiversity.

Lab: Interdependence of Organisms

Within the Lab: Interdependence of Organisms lesson, students ask the following question: How can the presence of one species benefit another in the same ecosystem? They then conduct an experiment in which two groups of lima bean plants are grown, one in soil with worms and one in soil without, to examine how the presence of the worms impacts the health of the plants.

Practice 2: Developing and using models:

Lesson: Light Dependent Reactions in Photosynthesis

Within the lesson Light Dependent Reactions in Photosynthesis, students examine the role of photosynthesis in providing energy to plants, focusing on the role of the light dependent reactions in the process. Students differentiate between ADP and ATP, and describe the role of ATP in plants. Students also identify the structures in which the light dependent reactions of photosynthesis take place, as well as evaluate the steps involved in these reactions, specifically in electron transport and chemiosmosis. Upon completion of the lesson, students analyze various models of the light dependent reactions in order to label a diagram with the products and reactants of photosynthesis, make appropriate corrections to a model of the conversion of solar energy into ATP and NADPH in the thylakoid membranes, and determine the effects of disabling the electron transport system in light-dependent reactions on photosynthesis.

Lesson: The Cycles of Matter

Within the lesson The Cycles of Matter, students complete a project in which they develop a scientific model that illustrates the role of photosynthesis and cellular respiration in the carbon cycle. The model also examines how carbon cycles between the Earth's four spheres. In addition, students develop a detailed written description of the content contained in the model.

Lab: Using a Dichotomous Key

Within the Lab: Using a Dichotomous Key lesson, students use a dichotomous key to analyze the characteristics of ten different fish specimens and apply the information from the key to identify each specimen. Characteristics analyzed within the key include body shape, presence or absence of specific fins, jaw size and shape, number of gills, presence of certain appendages, and tail shape.

Practice 3: Planning and carrying out investigations:

Lab: Exercise and Homeostasis

Within the Lab: Exercise and Homeostasis lesson, students ask the following scientific question: How does heart rate change during and after an exercise is performed for two different periods of time? They then plan a scientific investigation to test this question, including developing appropriate hypotheses, selecting appropriate scientific tools and techniques, analyzing types of data to collect, and correcting for possible sources of error.

Lab: Identifying Nutrients

Within the Lab: Identifying Nutrients lesson, students conduct a scientific investigation in order to evaluate the macromolecules present in a mystery food sample. During this investigation, students utilize chemical indicators to identify the presence of macromolecules such as proteins, lipids, monosaccharides, and polysaccharides in various food samples, and analyze the data collected to identify the mystery food.

Lab: Diffusion Across a Semi-Permeable Membrane

Within the Lab: Diffusion Across a Semi-Permeable Membrane lesson, students explore how materials move across a semipermeable membrane. During this investigation, students use dialysis tubing to simulate the membrane around a cell, and attempt to diffuse both glucose and sugar across the "membrane."

Practice 4: Analyzing and interpreting data:

Lesson: Population Growth

Within the lesson Population Growth, students conduct a simulation to analyze how various factors, including climate, resources, and habitat size affect the carrying capacity of a specific ecosystem. They then conduct a secondary simulation to analyze the effects of additional factors on biodiversity and populations. Finally, students evaluate the data collected to formulate conclusions on how human activity affects biodiversity.

Lesson: Darwin's Theory

Within the lesson Darwin's Theory, students complete a project in which they analyze the effects of the environment on various traits. During the project, students apply concepts of statistics and probability in order to answer questions about how genetics and environmental factors such as amount of precipitation, temperature, water quality, and presence of invasive species affect the variation and distribution of expressed traits in a population.

Practice 5: Using mathematics and computational thinking:

Lesson: Darwin's Theory

Within the lesson Darwin's Theory, students complete a project in which they analyze the effects of the environment on various traits. During the project, students apply concepts of statistics and probability in order to answer questions about how genetics and environmental factors such as amount of precipitation, temperature, water quality, and presence of invasive species affect the variation and distribution of expressed traits in a population.

Lesson: Population Growth

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Lab: Mouse Genetics (One Trait)

Within the Lab: Mouse Genetics (One Trait) lesson, students explore the relationship between genotype and phenotype by conducting systematic observations of the inheritance of dominant and recessive alleles using Punnett squares. Upon completion of the investigation, students utilize concepts of statistics and probability to determine how traits may be distributed in specific genetic crosses, including calculation of percentages of offspring that are likely to exhibit a specific trait. In addition, students conduct an analysis of possible sources of error in the investigation, and propose methods for improving upon the overall experimental design.

Lab: Mouse Genetics (Two Traits)

Within the lesson, "Lab: Mouse Genetics (Two Traits)", students participate in a laboratory experiment to understand the effect of the inheritance of one trait on the inheritance of a second trait. Students collect data to see if it supports the hypothesis that if a mouse inherits a particular form of one trait, then the inheritance of the other trait will not be affected because alleles assort independently. Upon completion of the experiment, students analyze the collected data to predict the offspring of a specific pair of organisms, as well as calculate ratios of predicted offspring and convert ratios to predicted percentages. Students also compare predicted values to simulated values to evaluate the dominance of specific traits.

Practice 6: Constructing explanations (for science) and designing solutions (for engineering):

Lesson: The Digestive and Excretory Systems

Within the lesson The Digestive and Excretory Systems, students complete a project in which they conduct scientific research in order to construct an explanation of how macromolecules are used in the body, specifically how sugar molecules are used to form amino acids and other carbon-based molecules. Upon completion of the initial explanation, students conduct additional research regarding the impact of carbohydrate intake on glucose formation and energy production, then use the new information to make revisions to their explanation.

Lesson: Cellular Respiration

Within the lesson Cellular Respiration, students complete a project in which they examine how energy and matter move through the environment under aerobic and anaerobic conditions, and gather evidence regarding the processes involved. They construct an explanation of the processes, then conduct additional scientific research and revise the initial explanation based on new information.

Practice 7: Engaging in argument from evidence:

Lesson: Succession and Extinction

Within the lesson Succession and Extinction, students conduct scientific research to investigate the following claim: Changes in environmental conditions always result in new ecosystems and loss of biodiversity characterized by an increase in the number of some species, the evolution of new species, and the extinction of some species. They then formulate a written conclusion about the stability of ecosystems, how and what can affect the stability of ecosystems, and how changes in the environment may affect the types and number of living things in an ecosystem based on their research, as well as background knowledge from the lesson.

Lesson: Biogeographic Isolation

Within the lesson Biogeographic Isolation, students complete a project in which they research and analyze the speciation of Galapagos Island finches. Upon completing their research, students utilize and evaluate the research data collected to answer questions such as the following:

1. Which of the four factors that affect evolution apply to the finches that the Grants studied? Use evidence from your research to support your answer.
2. If the area had experienced a wet season two years after the drought instead of a dry season, what kind of evolution would you expect? Explain your answer.

Lesson: DNA Mutations

Within the lesson DNA Mutations, students complete a project in which they investigate and analyze claims about the causes of inherited genetic variation. They then utilize their own prior knowledge to make a personal claim regarding a cause of inherited genetic variation, and defend this claim using additional scientific evidence in a written research paper.

Practice 8: Obtaining, evaluating, and communicating information:

Lesson: Biogeographic Isolation

Within the lesson Biogeographic Isolation, students complete a project in which they research and analyze the speciation of Galapagos Island finches. Upon completing their research, students evaluate the research data collected to formulate written responses to questions such as the following:

1. Which of the four factors that affect evolution apply to the finches that the Grants studied? Use evidence from your research to support your answer.
2. If the area had experienced a wet season two years after the drought instead of a dry season, what kind of evolution would you expect? Explain your answer.

Lesson: Biological Evidence and the Fossil Record

Within the lesson Biological Evidence and the Fossil Record, students examine multiple lines of evidence related to common ancestry and evolution. They then compose a written explanation detailing several of the lines of evidence, including specific examples of how each supports the concept of common ancestry and evolution.

Lesson: Human Impact on the Environment

Within the lesson Human Impact on the Environment, students complete a project in which they conduct a simulation to evaluate human impact on coral reef ecosystems. They then utilize the results and additional scientific evidence to create written proposals and evaluations of possible real-world solutions to reduce the negative effects of human activity on this ecosystem and its biodiversity.

Lab Reports

Throughout the course, students participate in a variety of laboratory experiments and compose written lab reports discussing individual procedures and results. The lab reports include components such as the question posed to develop the experiment, the hypothesis formulated, all variables, a list of necessary materials, the steps involved in and any changes to the procedure, identification of experimental and control groups, organized data (i.e., in tables, graphs, etc.), data analysis, discussion of support or lack of support for the hypothesis, possible sources of error, and ways to improve or further the lab investigation.

🧪 Unit Lab Activities:

In the laboratory lesson, “Lab: Identifying Nutrients”, students participate in a virtual experiment and laboratory experiment which focus on how to identify and explore the presence of nutrients in food. Students discuss how to apply safe practices during a lab and field investigation and then they apply these practices to their experiments. During the lab, the students collect data which they use to try and support they hypothesis “if the mystery food is tofu, then it will react with the reagent that indicates the presence of a protein because tofu is primarily a protein. After the students complete the lab, they will use the data collected to compose a lab report.

After each lab, students write complete detailed lab reports that demonstrate strong scientific reasoning and writing. In these reports students state the purpose of the experiment, questions posed before the experiment, their hypothesis, and independent, dependent, and controlled variables. They list their materials used and the procedure. They collect and organize data into tables, charts, graphs, etc., checking for accuracy. They interpret their data and graphs, determine whether the data supported or refuted their hypothesis. The describe sources of error and possible ways to improve or further their investigation. And they also write without bias.

All extended writing is completed in the eWriting environment, which is designed to scaffold students through the writing process from pre-writing to the final draft. Students may also access the rubric and checklist. A research tab allows students to gather information about their topic when enabled.

Cellular Structure and Function

Students begin this unit by analyzing the basic structure of a cell, and compare and contrast prokaryotic and eukaryotic cells. Next students identify the organelles of a cell and describe the functions of each organelle. Students continue their studies on cell structure and function by explaining how cells maintain homeostasis and the importance of homeostasis to living organisms. Students also differentiate between diffusion, osmosis, passive transport, and active transport. Students apply what they've learned about diffusion as they participate in labs focused on diffusion across a semi-permeable membrane. Students complete the unit by comparing and contrasting the structures of animal and plant cells, as well as differentiating the difference between the cell membrane and the cell wall.

Assignment Summary: In the lesson, "The Function of Organelles", the students are provided with images of cells and are expected to identify where each organelle is located within the cell. After the student completes this part of the assignment the students then write a brief paragraph describing the function of each organelle.

Formative and Summative Assessments Practices

Evaluation strategies are tightly aligned with the instruction. Students are assessed through traditional comprehension questions, short and extended writing assignments, and their participation in online discussion.

- Formal Assessments: Students take formal assessments at the end of each lesson, unit, semester, and course. These assessments provide robust evidence that students have mastered content.
- Lab reports: Students write complete detailed lab reports that demonstrate strong scientific reasoning and writing. In these reports students state the purpose of the experiment, questions posed before the experiment, their hypothesis, and independent, dependent, and controlled variables. They list their materials used and the procedure. They collect and

organize data into tables, charts, graphs, etc., checking for accuracy. They interpret their data and graphs, determine whether the data supported or refuted their hypothesis. They describe sources of error and possible ways to improve or further their investigation. And they also write without bias.

- Students complete other embedded assignments that serve as formative assessments such as interactive activities to self-check understanding of concepts, responding to assignment questions, reading informational texts with assignments, and writing short responses or essays to demonstrate deep content understanding and mastery of scientific practices and skills.

🧪 Unit Lab Activities:

Assignment Summary: In the laboratory lesson, “Lab: Using a Compound Microscope”, the students watch a tutorial video which reinforces the techniques used when using a compound microscope, also specifically focusing on how the magnification effects the visibility of cell organelles under a microscope. Next, the students participate in a virtual experiment as well as a laboratory experiment which explore cell organelles using a compound microscope. Finally, the students reflect on the lab and write a lab report which either supports or does not support the original hypothesis of the lab, “if cells are viewed under higher magnification, then more cell organelles will be seen.”

Assignment Summary: In the laboratory lesson, “Lab: Diffusion Across a Semi-permeable Membrane”, the students watch a tutorial video which revisits key details from a previous lesson, such as the effect of molecule size on a molecule’s ability to diffuse across a membrane. Next, the students participate in a virtual experiment as well as a laboratory experiment which explore diffusion across a semipermeable membrane. Finally, the students reflect on the lab and write a lab report which demonstrates their ability to collect and organize data professionally.

Cellular Reproduction and Energy

In this unit, students describe the steps of mitosis and the importance of mitosis to living organisms. While studying mitosis, students also analyze how new technologies and experiments affect previous scientific explanations. After students finish studying mitosis, they shift to studying the steps and importance of meiosis. Students describe the roles of crossing over and independent assortment. Students then relate the processes of mitosis and meiosis to reproduction, as well as compare and contrast sexual and asexual reproduction. Next, students outline the steps of the light-dependent reactions in photosynthesis as well as, the steps of the light-independent reactions in photosynthesis. Students then compare and contrast the two

reactions of photosynthesis. Students complete this unit by describing how cellular respiration converts glucose to energy in the form of ATP. Students compare and contrast aerobic and anaerobic cellular respiration as well as explain the importance of cellular respiration to living organisms.

Assignment Summary: In the lesson, “Meiosis”, the students practice what they have learned about meiosis by recalling the steps of meiosis while answering comprehension check questions. Students then read an article from the National Center for Human Genome Research, regarding genetic recombination. Finally, students use this article as a resource to answer questions which explain the relationship between crossing over and gene location, and explain how independent assortment occurs in sex cells.

Assignment Summary: In the lesson, “Light Independent Reactions in Photosynthesis”, students practice what they have learned about the light-independent reactions of photosynthesis. Students analyze a diagram demonstrating parts of the Calvin cycle, and the students are required to identify which part of the cycle is missing from the diagram, as well as describe what occurs at this stage of the cycle. Students then complete the assignment by answering three short writing questions which ask the students to describe each stage of the Calvin cycle: carbon fixation stage, reduction stage, and regeneration stage.

Within reading assignments throughout the course, a text mark-up toolset helps students of all reading levels engage with grade-level text. Because students can access the tools they need for any activity, students can adapt the level of scaffolding for content that they find more challenging or less challenging. These tools include:

- Read-aloud: Students can hear any section of text read aloud.
- Translation: Students can have on-screen text translated into their home languages. Supported languages include Arabic, Armenian, Chinese, French, German, Haitian Creole, Hindi, Italian, Japanese, Korean, Filipino, Polish, Portuguese, Russian, Spanish, Thai, and Vietnamese.
- Word Look-up: Students can look up any word on the page. They can read the definitions themselves or hear the definitions read aloud.
- Highlighters: Students are encouraged to highlight on-screen text as they read. Highlighting tools allow students to highlight in up to four different colors. Once students are finished reading, they can collect all their highlighted text by color and insert it into their notes or into any other document.
- Digital Sticky Notes: Students use digital sticky notes to annotate text as they read. These notes allow students to capture thoughts, insights, and questions for later use.

🧪 Unit Lab Activities:

Labs appear throughout the course focusing on the major concepts presented in the course. Some units include additional labs while other units, such as this one, are shorter and do not contain any labs, but instead focus on activities such as extended reading to explore additional perspectives and real world application of concepts.

DNA and Protein Synthesis

This unit builds the foundation for the students understanding of the DA structure. First students study the experiments that led to the discovery of the genetic code. Students then describe the relationship between DNA, genes, and chromosome. Students analyze the role of DNA replication in transmitting genetic information, which they use as they explore genes and forensic DNA. Next, students analyze the similarities and differences between DNA and RNA. Students also study how the base pairing in DNA and RNA was discovered. Students then participate in a lab with describes the role of RNA in the creation of proteins, and demonstrates how base pairing builds proteins from RNA. Students further their understanding as they analyze common types of DNA mutations and the effects of mutations on the characteristics of living organisms. Students also analyze the effect of harmful environmental factors on DNA. Next, students describe common types of chromosomal mutations and the effects of these changes on the characteristics of living organisms. To complete the unit, students also analyze the effect of harmful environmental factors on chromosomes.

Assignment Summary: In the lesson, “Genetic Code”, the students visit websites which they use along with their understanding about genetic code, to answer short writing questions. The first article focuses primarily on understanding the relationship between DNA, chromosomes, and genes. The second article applies what they have studied regarding DNA and applies it to Forensic DNA, as students explain how DNA can be used to help solve crime.

Assignment Summary: In the lesson, “Protein Synthesis”, students practice what they have learned about protein synthesis by applying their understanding of transcription and translation to various tasks. First, students label the steps for protein synthesis in order. Next, students respond to short writing questions by explaining the process of transcription and explaining how amino acids are assembled during translation. The students complete the assignment by answering comprehension check questions.

Unit Lab Activities:

In the laboratory lesson, “Lab: Building Proteins from RNA”, students participate in a virtual experiment and laboratory experiment which explore the process of building proteins from the information carried by RNA. During the lab, the students test the prediction stating that, RNA determines the sequence of amino acids in proteins and polypeptides by a two-step process: transcription of DNA produces mRNA in the nucleus, and then translation of the mRNA to tRNA takes place at the ribosome in the cytoplasm. After students complete the experiments they compose a lab report using the data obtained in the experiments.

Genetics and Heredity

This unit builds the foundation for the students' understanding of genetics and its role in inheritance. Students begin this unit by studying the importance of Gregor Mendel to the field of genetics. Students then describe the role of nucleic acids in transmitting genetic information. Next, students analyze the laws of inheritance. Students describe how the principle of dominance applies to genes. Students also summarize the law of segregation, as well as practice applying the law of independent assortment. Students continue to apply what they have learned as they predict possible allele combinations of offspring based on genetics of the parent and use Punnett squares to create monohybrid and dihybrid crosses. Students use the laws of inheritance to demonstrate how dominant and recessive alleles are passed from parents to offspring, as they participate in virtual and laboratory experiments. Students then study the process of sex-linked inheritance and analyze a pedigree to determine sex-linked traits. Next, the students participate in a lab which demonstrates how alleles are passed independently of one another using the law of inheritance to describe how two separate traits are inherited in an organism. The students complete this unit by distinguishing between inherited and acquired traits.

Assignment Summary: In the lesson, "Probability of Inheritance", students apply what they have learned about allele combinations and the probability of a trait occurring in offspring by completing a variety of Punnett squares. Students practice both monohybrid and dihybrid crosses for the Punnett square.

Unit Lab Activities:

In the laboratory lesson, "Lab: Mouse Genetics (One Trait)", students examine how the genes of the parental mice affect the fur color of the offspring mice, by participating in a virtual experiment and a laboratory experiment. During the experiment the students collect data to see if the hypothesis "if either parent mouse passes a dominant allele, the offspring will have black fur," is supported. As the student completes the experiments, the student uses the data from the experiments to compose a lab report.

In the laboratory lesson, "Lab: Mouse Genetics (Two Traits)", students participate in virtual and laboratory experiments which helps the students understand the effect of the inheritance of one trait on the inheritance of a second trait. The students perform the lab, collecting data to see if it supports the hypothesis that if a mouse inherits a particular form of one trait, then the inheritance of the other trait will not be affected because alleles assort independently. After the students complete the experiments, they use the data they have collected to compose a lab report.

Natural Selection

This unit introduces the students to evolutionary theory and its importance within biology. Students begin by summarizing the historical development of the theory of evolution. Students then analyze Darwin's theory and the main points of natural selection. Next, students explain how natural selection is a mechanism for evolution, and students also participate in a lab to reiterate this point. After this, students identify examples of other mechanisms for evolution, such as genetic drift and gene flow. Students then explain how new or varied species originate via natural selection and students examine how directional, disruptive, and stabilizing selection affect biological diversity. Students analyze how new species are formed by reproductive and geographic isolation. Students then analyze the relationship between biogeographic isolation and the theory of evolution. Next, students examine scientific evidence that supports the theory of evolution. They assess the comparative anatomies among organisms and then describe how the fossil record shows common ancestry between organisms. Then students interpret evolutionary relationships among organisms on a cladogram and explain how understanding evolutionary history impacts classification of organisms. Finally, students complete the unit by focusing on Human evolution and discussing specific hominid fossils that were key to understanding the evolution of modern humans.

Assignment Summary: In the lesson, "Factors Affecting Genetic Variation", the students apply their understanding of how different factors affect gene pools and natural selection. The students complete T-charts which categorize statements about the different mechanisms which play roles in evolution. The student also answers short writing questions which focus on factors which increase and decrease genetic variation.

Assignment Summary: In the assignment portion of the lesson, "Evolutionary Relationships," students practice what they have learned about evolutionary relationships and their role in classification. They answer questions about classification systems and then use cladograms to answer additional questions. For example, students distinguish between traditional and modern classification. They identify the meaning of node, clade, and taxa. Students also read a cladogram to determine which derived characteristics is shared by amphibians and reptiles.

🧪 Unit Lab Activities:

In the laboratory lesson, "Lab: Natural Selection", the students participate in virtual and experimental labs which help them progress their understanding of natural selection as they answer the question, "what is the effect of the type of food available on the frequency of different types of bird beaks?" After the students have completed these experiments, the students then use the data they have collected to compose a lab report which reflects on whether or not the hypothesis stating that, "if the type of the food available changes, then the frequency of beak types will change, because birds with beaks more suited to the available food will be more successful over time," was supported.

Understanding Organisms

In this unit, students get more practice with classifying organisms. Students begin by explaining the purpose of biological taxonomy. Then students describe how organisms are classified, and reasons why systems of classification may change. Next, students describe the purpose for using a dichotomous key, as well as explain the process of identifying an organism using a dichotomous key. Students participate in a lab assignment which allows the students the ability to practice using a dichotomous key. The students then distinguish the six kingdoms of living organisms and summarizing the levels of biological classification. Students also compare characteristics of taxonomic groups. Next the students spend some time studying plants. Students summarize the origin and evolution of land plants. Students then identify the three types of plant tissue and relate the structures of major plant organs and tissues to their functions. Students also describe the interactions among plant systems that allow transport, reproduction, and response. Next, students focus on another kingdom, protists and fungi, characterizing the three common types of protists and distinguishing between the five phyla of fungi. Students conclude the unit focusing on bacteria and viruses. Students compare modes of bacterial reproduction and explain how bacteria infect other organisms. Students also describe how the structure of a virus contributes to its ability to cause infection, and students differentiate between the lytic and lyso genic cycles of viral reproduction.

Assignment Summary: In the lesson, “Protists and Fungi”, students recall information from the lesson to identify and compare the characteristics of protists and fungi. Students begin by completing a chart, identifying specific characteristics of protists. Then students respond to identification questions about fungi phyla. Finally, students use a Venn Diagram to compare and contrast protists and fungi.

Unit Lab Activities:

In the laboratory lesson, “Lab: Using a Dichotomous Key”, the students participate in bot a virtual and laboratory experiment where they explore how dichotomous keys are used to identify unknown organisms. After the students complete the experiments, they reflect on what they have learned, and then the students use the data they have collected to compose a lab report which reflects on the question, “How does a dichotomous key help you identify unknown specimens based on their traits?”

Body Systems: Part 1

This unit is the first of two parts, which introduces students to the systems and structures that make up the human body. Students first study the levels of organization in the body, and analyze how organ systems function together to maintain homeostasis. Then students study the skeletal system. Students differentiate between the axial and appendicular skeleton, as well as illustrate bone markings and joint types. As the students continue to build upon their understanding of the structure of the human body, they study the muscle structure and function. The students differentiate between the skeletal, smooth, and cardiac muscles by structure and function. Students also describe the physiological process of a muscle contraction. Next, students turn their attention to the central nervous system, as they examine the different parts of the brain and spinal cord, and their functions. Students then illustrate the major structures and functions of the peripheral nervous system. Students identify the roles of sensory neurons, interneurons, and motor neurons. Students complete this unit by participating in a lab which investigates how heart rate changes during and after exercise.

Assignment Summary: In the lesson, “The Nervous System”, students use their knowledge of the nervous system to answer questions identifying key components of the central nervous system.

Unit Lab Activities:

In the laboratory lesson, “Lab: Exercise and Homeostasis”, students plan an investigation to examine how heart rate changes during and after exercise. After the students complete the experiments, they will use the data they have collected to compose a lab report.

Body Systems: Part 2

This unit is the second of two parts, which explores the systems of the human body. Students begin by examining how the digestive and excretory systems work and completing a project related to macromolecules in the body. Students then explain the functions of the endocrine and exocrine systems, as well as analyzing the different structures of these systems. Students then describe the role of hormones in maintaining homeostasis. Next, students investigate the structures and functions of the male and female reproductive system. Students describe the egg and sperm formation as well as the process of human development from fertilization to birth. After the students complete their studies of the reproductive system, students then examine the different structures and functions of the lymphatic system. Next, students progress to studying the immune system, by identifying the components that contribute to immune response, as well as describing immune responses. Students complete this unit by analyzing human health and how diseases are

spread. Students examine how people's genetic makeup or environmental conditions can contribute to their susceptibility to diseases. Finally, students participate in an experiment which studies the effect of immunity on the rate at which a disease spreads.

Assignment Summary: The Digestive and Excretory Systems

Within the lesson The Digestive and Excretory Systems, students complete a project in which they conduct scientific research in order to construct an explanation of how macromolecules are used in the body, specifically how sugar molecules are used to form amino acids and other carbon-based molecules. Upon completion of the initial explanation, students conduct additional research regarding the impact of carbohydrate intake on glucose formation and energy production, then use the new information to make revisions to their explanation.

Unit Lab Activities:

Labs appear throughout the course focusing on the major concepts presented in the course. Some units include additional labs while other units, such as this one, are shorter and do not contain any labs, but instead focus on activities such as extended reading to explore additional perspectives and real world application of concepts.

Ecology

In this unit, students begin studying ecology and the cycles of matter. Students begin by exploring the organizational hierarchy of organisms, populations, communities, ecosystems and biomes. Students describe the five major types of interactions between organisms. Students then examine how symbiotic relationships can create dependency among species. Students apply this concept by participating in a lab which describes the interdependent relationship between two organisms. Students then demonstrate how an organism's habitat determines its niche, as well as comparing and contrasting positive and negative interactions between organisms and their environment. Students then analyze population and how birth rate, death rate, immigration, and emigration affect population size. Students describe the limiting factors that affect a population in a given environment and differentiate between density-dependent and density-independent factors. Next, students identify factors that affect population growth, as they compare and contrast exponential and logistic growth models. Students complete this unit by focusing on succession and extinction. Students explain the stages of succession in an ecosystem, and they identify factors that may disturb ecosystem stability. Students finish this unit by describing various ways communities are attempting to restore and protect ecosystems; students also provide examples of emerging efforts designed to successfully address environmental issues.

Assignment Summary: In the lesson, “Energy Flow in Ecosystems”, students use their understanding of energy flow in an ecosystem to describe the role of producers, consumers, and decomposers. Students also describe how energy flows through a food chain and food web. Students analyze a food web, and use the food web to describe two complete food chains and how energy flows in a food chain.

Assignment Summary: In the lesson, “Human Impact on the Environment”, students read an article about green building, which they use to highlight key ideas and answer questions throughout the assignment. The students answer one short writing question, explaining what green building means. Then students answer a series of comprehension check questions which demonstrate overall understanding of the term green building.

Assignment Summary: In the lesson, “Population Growth”, students practice what they have learned about population growth by identifying factors that affect population growth. Students also compare and contrast population growth models, as well as use a graph to analyze carrying capacity.

🧪 Unit Lab Activities:

In the laboratory lesson, “Lab: Interdependence of Organisms”, students participate in virtual and laboratory experiments which help them understand how the presence of one species benefits another in the same ecosystem. After the students complete the experiment, they will use the data obtained in the labs to compose a lab report which addresses whether or not the hypothesis, “if plants grow in soil containing worms, then the plant growth will be greater, because worms help decompose organic matter and distribute it through the soil in a form that plants can use,” is supported.

Course Materials

Multimedia

Title	Author	Director	Name of video series	Date	Website	Medium of Publication

Title	Author	Director	Name of video series	Date	Website	Medium of Publication
Edgenuity Course Map	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Online Interactive Resource
Edgenuity Instructional Videos	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Online Interactive Resource
Edgenuity eNotes	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Online Interactive Resource
Edgenuity eWriter Tool	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Online Interactive Resource
Edgenuity Student Support for Text-based Assignments: Literacy Scaffolds and Supports	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Online Interactive Resource
Calculator	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Online Interactive Resource
Edgenuity Collaboration Corner	Edgenuity Inc.	[empty]	[empty]	[empty]	[empty]	Online discussion forum

Other

Title	Authors	Date	Course material type	Website
Crossing-over: Genetic Recombination	National Center for Human Genome Research	[empty]	Informational Text	[empty]
Endosymbiotic Theory	Edgenuity Staff	2012	Informational Text	[empty]

Title	Authors	Date	Course material type	Website
Passive Transport - Taking the Easy Road	Andrew Rader	Andrew Rader Studios 1997-2015	Informational Text	[empty]
Active Transport - Energy to Transport	Andrew Rader	Andrew Rader Studios 1997-2015	Informational Text	[empty]
Mitosis - When Cells Split Apart	Andrew Rader	Andrew Rader Studios 1997-2015	Informational Text	[empty]
The Cell Cycle & Mitosis Tutorial	University of Arizona	2004	Informational Text	[empty]
What is Green Building?	Edgenuity Staff	2012	Informational Text	[empty]
Strongest Muscle	Library of Congress	[empty]	Informational Text	[empty]
Your Bones	[empty]	[empty]	Informational Text	[empty]
Bacteria Cell	Edgenuity Inc.	[empty]	Informational Text	[empty]
Geographic Isolation	Edgenuity Inc.	[empty]	Informational Text	[empty]
Natural Selection	University of California Museum of Paleontology	[empty]	Informational Text	[empty]
Sex Linked Genes	Edgenuity Inc.	[empty]	Informational Text	[empty]
FAQ about cystic fibrosis	Cystic Fibrosis Foundation	[empty]	Informational Text	[empty]
Protein Synthesis	[empty]	[empty]	Informational Text	[empty]
Discovering the Structure of DNA	Edgenuity Inc.	[empty]	Informational Text	[empty]

Title	Authors	Date	Course material type	Website
Understanding Gene Testing	National Health Museum	[empty]	Informational Text	[empty]

Supplemental Materials

Title	Content

No course materials have been added to this course.

Additional Information

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