Unit 01: Introduction to Biology

Content Area: **Science**
Course(s):
Time Period: **Marking Period 1**
Length: **3-4 Weeks**
Status: **Published**

Summary

Introduction:

The focus of the first unit of the Honors Biology course is to introduce core themes in biology that will be analyzed throughout the year. These themes include the unity and diversity of life, the relationship between structure and function, evolution as a key concept in biology, and the flow of genetic information and energy. Students will become familiar with the hierarchy of a biological organization, and how emergent properties specific to each level arise as life moves from a microscope to a macroscopic level. Students will evaluate how each level of a biological organization depends on another and how climate change impacts these interactions. Students will also be introduced to the methods of scientific inquiry which will be utilized in laboratory investigation and data analysis throughout the year.

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Standards

9.1.12.CFR	Civic Financial Responsibility
	Brainstorming can create new, innovative ideas.
9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
LA.RL.9-10.1	Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.4.2.CT	Critical Thinking and Problem-solving
	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
	Critical thinkers must first identify a problem then develop a plan to address it to effectively solve the problem.
9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).

9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
	Individuals should practice safe behaviors when using the Internet.
	Constructing explanations and designing solutions in 9–12 builds on K–8 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.
	Individuals from different cultures may have different points of view and experiences.
	Patterns
9.4.2.IML	Information and Media Literacy
	Digital tools can be used to display data in various ways.
	Information is shared or conveyed in a variety of formats and sources.
MA.A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning
	Collaboration can simplify the work an individual has to do and sometimes produce a better product.
MA.A-REI.B	Solve equations and inequalities in one variable
LA.W.9-10.2.E	Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.
LA.W.9-10.2.F	Provide a concluding paragraph or section that supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
MA.A-REI.D	Represent and solve equations and inequalities graphically
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LS1.A	Structure and Function
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
LS1.A	Structure and Function
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
	Planning and Carrying Out Investigations
	Planning and carrying out in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.
LS1.A	Structure and Function
	Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
	Systems and System Models
HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

	Energy and Matter
	Constructing Explanations and Designing Solutions
	Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Essential Questions/ Enduring Understanding

Essential Questions:

How have science and technology influenced each other throughout history?

How can scientific methodology be used to formulate a question, write a hypothesis, design an experimental procedure, collect and analyze data, and determine a conclusion?

How can qualitative and quantitative data be analyzed to find trends in results that can be used to support or reject an experimental hypothesis and using an understanding of scientific principles in order to justify a claim?

How can themes in biology and evolution be applied to each level of biological organization?

Enduring Understandings:

Life is organized into a hierarchy based on similar characteristics.

All living organisms share the same characteristics of life.

Scientific inquiry can be used to answer questions.

Scientific content information can be used to explain real world phenomena.

Objectives

Students will know Key Vocabulary: biology, science, technology, theory, law, hypothesis, observation, inference, qualitative data, quantitative data, independent variable, dependent variable, conclusion, organism,

evolution.

Students will know how science and technology are related, influence, and depend on each other.

Students will know the properties unique to each level of biological organization that emerge at each level of biological organization.

Students will know how to categorize things as living or non living based on the properties of life that all living organisms share.

Students will know the local and global biological causes and impacts of climate change on living organisms.

Students will know how scientific inquiry can be used to solve a problem.

Students will be skilled at making observations and inferences while conducting scientific inquiry.

Students will be skilled at generating hypotheses when presented with a question.

Students will be skilled at designing and implementing experimental procedures in order to answer questions.

Students will be skilled at manipulating experimental variables to test a hypothesis.

Students will be skilled at collecting and analyzing data to determine if there are trends in data.

Students will be skilled at justifying claims using evidence from data and reasoning from understanding of scientific principles.

Learning Plan

Unit Notes: Students will record detailed notes in a notebook that cover the learning goals of the unit.

Levels of Biological Organization Flow Chart: Students will create a flowchart that depicts each level of biological organization and shows how energy moves through an ecosystem and how nutrients are cycled within an ecosystem. Students will identify abiotic and biotic factors.

Science and Technology Current Event: Students will research a current event related to science and technology, which they will summarize and connect to their understanding of how science and technology are interdependent.

CER Lab- Claim, Evidence, Reasoning: Students will design a lab inquiry in order to answer the provided questions. Students will write a hypothesis and lab procedure. They will then conduct the lab procedure and gather data to analyze and come to a conclusion.

Scientific Method Case Study: Students will read a case study about two different species of snakes and be asked to identify the steps of the scientific method described in the study and the variables of the study.

Design an Experiment: Students will be provided with a research question that they will design a hypothetical experiment for. The experiment must include a reasonable hypothesis, a detailed procedure, correctly identified experimental variables, and a methodology for collecting qualitative data and quantitative data.

Assessment

Formative:

Do Now Questions about prior knowledge and upcoming course content

Exit Ticket Questions to summarize material learned

Whole Class Discussion Participation

Small Group Discussion Participation

Think-Pair-Share Participation

Individual Student Questions/Responses

Independent Assignments (Levels of Biological Organization Flow Chart, Design an Experiment, Scientific Method Case Study)

Labs (CER Lab)

Summative:

Formal Lab Report (CER Lab)

Unit Test

Quizzes (The Scientific Method)

Benchmark:

Honors Biology Midterm Exam

Alternative Assessments:

Guided Formal Lab Report

Unit Study Guide/Guided Test

Presentation on Homeostasis and Human Anatomy

Materials

Textbook: Biology Concepts and Connections (Pearson Education) by Campell, Reece, Taylor, Simon, Dickey (2009)

Unit Learning Outline

Technology: computers for student and teacher, SmartBoard projector

Teacher Slide Presentations

Whiteboard + Accessories

Guided Notes/Worksheets

Lab Report Outline and Rubric

Personal Protective Equipment: safety glasses, gloves

Lab Equipment: beakers, water, ice, water kettle, thermometers, sponge animal capsules, timers/stopwatches, stirring rods

Graphing paper, rulers, colored pencils/markers