AP Biology

I. Standards Guiding Instruction

2020 New Jersey Student Learning Standards for Science
https://www.nj.gov/education/standards/science/Docs/NJSLS-Science_9-12.pdf

Recommended Science Course Progression

It is highly recommended that students have taken at least one chemistry course and one biology course (with at least one of them being honors level) before enrolling in the advanced placement biology course

Gifted and Talent Accommodations and Modifications:

-Formative assessment in personal progress checks will be used allowing students achieving at a high level to deepen their skills and to prep for AP end-of-year test for biology
-Students will be encouraged to delve into topics they find interest in by doing further research and finding how different topics relate to their planned future course of study/career
-Flexible and strategic work groups to challenge students and to grow as a learner

Special Education, and At-Risk Accommodations and Modifications:

-Extended time on tests as needed
-Outline notes and graphic organizers will be made and offered to students on an as needed basis
-Key vocabulary, multiple meaning words, and figurative language will be thoroughly defined
-Meetings and review of course material with/between small cooperative learning groups

English Language Learners:

-Lesson on prefixes and suffixes towards the beginning of the year, central aspects to this lesson as well as a guide sheet will be available to students throughout the year

New Jersey Department of Education - State Instructional Mandates:

- The course itself is an elective science course, not required of all students to fulfill graduation requirements, however the course will fulfill the requirements for advanced placement certification and allow students to sit for the AP Biology end-of-year exam.

6 science Practice skills required in AP courses (As per AP Biology Course Exam and Description)

- Concept explanation-explain biological concepts, processes, and models presented in written format SP1

  a.) Describe biological concepts or processes
  b.) Explain biological concepts or processes

c.) Explain biological concepts, processes, or models in applied contexts

- Visual representation-analyze visual representations of biological concepts and processes SP2

  a.) Describe characteristics of a biological concept, process, or model represented visually
  b.) Explain relationships between different characteristics of biological concepts, processes, or models represented visually
  c.) Explain how biological concepts or processes represented visually relate to larger biological principles, concepts, processes, or theories
  d.) Represent relationships within biological models, including mathematical models, diagrams, and flow charts
- Questions and methods-determine scientific questions and methods SP3

  a.) Identify or pose a testable question based on an observation, data, or a model
  b.) State the null or alternative hypotheses, or predict the results of an experiment
  c.) Identifying experimental procedures are aligned to the question
  d.) Make observations, or collect data from representations of laboratory setups or results
- Representing and describing data-represent and describe data SP4

  a.) Construct a graph, plot, or chart
  b.) Describe a data from a table or graph including identifying specific data points, describing trends or patterns in data, describing relationships between variables
- Statistical tests and data analysis-perform statistical tests and mathematical calculations to analyze and interpret data SP5

  a.) Perform mathematical calculations
  b.) Use confidence intervals or error bars to determine whether a sample means are statistically different
  c.) Perform a chi-square hypothesis test
  d.) Use data to evaluate a hypothesis
- Argumentation-develop and justify scientific arguments using evidence SP6

  a.) Make a scientific claim
  b.) Support a claim with evidence from biological principles, concepts, processes, and/or data
  c.) Provide reasoning to justify a claim by connecting evidence to biological theories
  d.) Explain the relationship between experimental results and larger biological concepts, processes, or theories
  e.) Predict the causes or effect of a change in, disruption to, one or more components in a biological system

Primary & Secondary Source Analysis:

The primary source for the course will be **Biology for the AP course** by James Morris. The book is newly published and considered the ideas and experiences of teachers, college professors, and researchers that have all been in their profession for several decades. It has been designed to match pace and order of the standard AP curriculum given in the College Board Course and Exam Description (CED) guide module-by-module. In addition, each module features two to four learning goals that align with common national standards in education (Morris, 2022). Concept checks are assigned as a brief summative assessment to correspond with

each module to allow students to check their understanding of crucial concepts, and to prepare for the AP exam in Biology.

II. Pacing Guide

9/6/22-11/15/22	First Marking Period	Unit I: Chemistry of Life Unit II: Cell Structure and Function Unit III: Cellular Energetics
11/16/22-1/31/23	Second Marking Period	Unit IV: Cellular Energetics Unit V: Heredity
2/1/23-4/5/23	Third Marking Period	Unit VI: Gene Expression and Regulation Unit VII: Natural Selection and Adaptations
4/17/23-6/22/23	Fourth Marking Period	Unit VIII: Ecology Advanced Placement Biology Test Prep Careers in Biology/Future Developments Within the Field

New Jersey Science Course Curriculum Objectives

Though the course is not required to follow state objectives, these in addition to AP requirements are used as a guideline to form the course

HS. Structure and Function

HS. Structure and Function
Students who demonstrate understanding can: **HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.** [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.] **LHS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.** [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.] **HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.** [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

HS. Matter and Energy in Organisms and Ecosystems

HS.Matter and Energy in Organisms and Ecosystems

Students who demonstrate understanding can:

HS-LS1-5 use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [Assessment Boundary: Assessment does not include specific biochemical steps.]

HS-LS1-6 construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

HS-LS2-7 use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.] [Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]

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. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]

HS-LS2-4 use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.]

H2-LS2-5 develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]

HS. Interdependent Relationships in Ecosystems

HS.Interdependent Relationships in Ecosystems

Students who demonstrate understanding can:

HS-LS2-1 use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]

HS-LS2-2 use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]

HS-LS2-6 evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]

HS-LS2-7 design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.] **Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.** [Clarification

Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]

HS-LS4-6 create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* [Clarification Statement: Emphasis is on testing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

HS. Inheritance and Variation of Traits

HS.Inheritance and Variation of Traits
Students who demonstrate understanding can: **HS-LS1-4 use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.** [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.] **HS-LS3-1 ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.** [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.] **HS-LS3-2 make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.** [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.] **HS-LS3-3 apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.** [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.]

Science and Engineering Practices

- Practice 1: Asking Questions and Defining Problems
- Practice 2: Developing and Using Models
- Practice 3: Planning and Carrying Out Information
- Practice 4: Analyzing and Interpreting Data
- Practice 5: Using Mathematics and Computational Thinking
- Practice 6: Constructing Explanations and Designing Solutions
- Practice 7: Engaging in Argument from Evidence
- Practice 8: Obtaining, Evaluating, and Communicating Information

Cross Cutting Concepts

- Systems and System Models
- Energy and Matter
- Structure and Functions
- Stability and Change

Modifications/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace

- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary

- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-Direct

- Repeated Drill / Practice
- Shortened Assignments
- Teacher Notes
- Tutorials
- Use of Additional Reference Material
- Use of Audio Resources

High Preparation Differentiation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Menu Assignments
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation Differentiation

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Extend Skills
- Mini Workshops to Re-teach
- Open-ended Activities
- Think-Pair-Share by Interest
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Readiness
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts

- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Integration- Interdisciplinary Connections

See Appendix

Unit #:1
5 Modules
8-11% of AP Exam

Overview:

STAGE 1
Desired Results

Essential Questions…

A. Change over time and Natural Selection
- How have gene pools changed in response to environmental and adaptations?
- How does competition affect diversity and unity of living things?
- What extinction events have taken place in the past that affect the landscape of genetic diversity now?

B. Energetics
- What is the role of energy in making and breaking polymers?
- What are strategies to capture, use, and store energy in various living things?
- How do organisms respond to changes at the molecular, cellular, physiological, and behavioral level?

C. Information Storage and Transmission
- How do living systems transmit information to ensure their survival?
- How does noninheritable information transmission influence the behavior between cells, organisms, and populations?
- What are key signal markers in genetic processes such as DNA replication, transcription, and translation lead to genetic disorders?

D. Systems Interactions
- How would living systems function without the polarity of the water molecule?
- How are ecosystems affected by disturbances such as mining, farming, and volcanic eruptions?
- How are ecological systems affected by the interactions of organisms with varying biological systems?

Enduring Understanding…(What students will know)

- Atoms are the basic unit of matter
- Water is an essential molecule for living things
- The four macromolecules found in all living things are carbohydrates, lipids, nucleic acids, proteins
- Energy is never destroyed, only moves on to different levels
- Water has several unique properties that make it important not just to living things, but inorganic processes as well

Students will be able to...

- Define/describe essential concepts in their own words **Science practice 1 (a-c)**
- Analyze visual representations of biological concepts and processes **Science practice 2 (a-d)**
- Predict results to scientific questions based on given published studies and experimental designs **Science practice 3 (a-e)**
- Describe results from studies and labs using data tools such as histograms and line graphs **Science practice 4 (a-b)**
- Perform statistical tests and mathematical calculations to analyze and interpret data **Science practice 5 (a-d)**
- Develop and justify scientific arguments using evidence **Science practice 6 (a-e)**
- Apply their knowledge of biology concepts to understand real-world questions or scenarios **Science practice 1-6**
- Perform hands-on lab activities to supplement course content, develop lab practice skills, summarize main ideas, skills, and practices
- Present the evidence of their laboratory investigations

Students will know...

Unit #1
Key Concepts/Ideas: Chemistry of Life: Atomic Structure, Bonding, Chemical Reactions, Macromolecules, Water and Life, Properties of Water, pH scale, Amino Acids, Tertiary and Quarternary Structure
Possible Misunderstandings: Amount of information and combination of concepts from physical and life sciences tends to be problematic. However students at the time of taking this course will have taken at least one biology course and a chemistry course giving them sufficient background. Basic concepts from each will be reviewed in AP course to start.

Key Vocabulary/Terms: Chemistry, Macromolecules, Elements, Water

STAGE 2
Evidence of Learning

Formative Activities, Tasks, or Projects:

Unit #1 Chemistry of life

Lesson 1.1 objective
Explain how the properties of water that result from its polarity and hydrogen bonding affect its biological function.

Lesson 1.2 objective
Describe the composition of macromolecules required by living organisms

Lesson 1.3 objective
Describe the properties of the monomers and the types of bonds that connect the monomers in biological macromolecules.

Lesson 1.4 objective
Describe the properties of the monomers and the types of bonds that connect the monomers in biological macromolecules

Lesson 1.5 objective
Explain how a change in the subunits of a polymer may lead to changes in structure or function of the macromolecule

Lesson 1.6 objective
Describe the structual similarities and differences between DNA and RNA

Activities:
-Unit conversion and scientific notation activity
Students will utilize the metric system and convert common units such as grams, liters, meters, etc. The system is based on a system of multiples of 10. Understanding the metric system, and converting units is an essential function of future science courses.
-Graphing 101 Tutorial
Students will have a brief review of graphing skills, as well the expectations for graphs made for labs over the course of the year.

Minor Assessments:
-Element quiz
-Key molecules quiz

Labs:
-Measuring and units lab
SP4 SP5 SP6

-pH lab
The pH lab will consist of utilizing 2-3 methods of taking pH of multiple substances, ranging from highly acidic to baic. Students will use investigation skills as well record and present their evidence from the lab activities.
SP1 SP2 SP3 SP4 SP5

Major assessments/projects:

-Unit 1 Test

Summative Activities, Tasks, or Projects:

Summative Activities

Discussion questions and posts will be used throughout the course to reinforce content and to assess student growth

Do Now Questions SP1 SP2 SP3 SP4 SP5 SP6

STAGE 3
Learning Plan

Assessment Topics and Lesson Themes:
Guided notes, student-led discussions, unit specific labs and activities listed above, cooperative learning strategies, and individual assessment tools will be used as part of the learning plan to ensure the following sections of the unit are thoroughly covered

Unit #1: 5 Modules
Elements of life
Water and life
Carbohydrates and lipids
Proteins
Nucleic acids

Additional Materials

Digital Tools/Resources:

-AP Classroom
-AP Classroom module summary videos
-AP Daily
-Unit Guides
-Personal Progress Checks
-Ebapbio.com
-Khan Academy-AP Biology
-Quizlet-Note Cards

Unit #:2

7 Modules
Weight on exam 10-13%

Overview

STAGE 1
Desired Results

Essential Questions…

A. Change over time and Natural Selection
- How have gene pools changed in response to environmental and adaptations?
- How does competition affect diversity and unity of living things?
- What extinction events have taken place in the past that affect the landscape of genetic diversity now?

B. Energetics
- What is the role of energy in making and breaking polymers?
- What are strategies to capture, use, and store energy in various living things?
- How do organisms respond to changes at the molecular, cellular, physiological, and behavioral level?

C. Information Storage and Transmission
- How do living systems transmit information to ensure their survival?
- How does noninheritable information transmission influence the behavior between cells, organisms, and populations?
- What are key signal markers in genetic processes such as DNA replication, transcription, and translation lead to genetic disorders?

D. Systems Interactions
- How would living systems function without the polarity of the water molecule?
- How are ecosystems affected by disturbances such as mining, farming, and volcanic eruptions?
- How are ecological systems affected by the interactions of organisms with varying biological systems?

Enduring Understand…. (what students will know)

- Cell theory
- Prokaryotic and Eukaryotic cells are the basic units of life for living things
- The body maintains regular internal conditions through metabolic processes
- Eukaryotic cells consist of a membrane bound nucleus as well as several supporting organelles
- Eukaryotes tend to be complex organisms such as humans, other eukaryotes such as mice and fungi are ideal model species

- ❖ Eukaryotic cells consist of several organelles that play a key function of the regular operation of an organism
- ❖ Diffusion limits the size of prokaryotes
- ❖ Cell membranes are composed of two layers of lipids

Students will be able to...

- Define/describe essential concepts in their own words **Science practice 1 (a-c)**
- Analyze visual representations of biological concepts and processes **Science practice 2 (a-d)**
- Predict results to scientific questions based on given published studies and experimental designs **Science practice 3 (a-e)**
- Describe results from studies and labs using data tools such as histograms and line graphs **Science practice 4 (a-b)**
- Perform statistical tests and mathematical calculations to analyze and interpret data **Science practice 5 (a-d)**
- Develop and justify scientific arguments using evidence **Science practice 6 (a-e)**
- Apply their knowledge of biology concepts to understand real-world questions or scenarios **Science practice 1-6**
- Perform hands-on lab activities to supplement course content, develop lab practice skills, summarize main ideas, skills, and practices
- Present the evidence of their laboratory investigations

Unit #2

Key Concepts/Ideas: Cell Structure and Function
Possible Misunderstandings: Differences between prokaryotes and eukaryotes, parts of the plasma membranes
Key Vocabulary/Terms: Eukaryotes, Prokaryotes Osmosis, Nucleus, Microscope, Cell Membranes

STAGE 2
Evidence of Learning

Formative Activities, Tasks, or Projects

Unit #2 Cell structure and function

Lesson 2.1 objective
Describe the structure and/or function of subcellular components and organelles

Lesson 2.2 objective
Explain how subcellular components and organelles contribute to the function of the cell
Describe the structural features of a cell that allow organisms to capture, store, and use energy

Lesson 2.3 objective

Explain the effect of surface area-to-volume ratios on the exchange of materials between cells or organisms and the environment

Lesson 2.4 objective
Desribe the roles of each of the components of the cell membrane in maintaining the internal environment of the cell.
Describe the fluid mosaic model of cell membranes

Lesson 2.5 objective
Explain how the structure of biological membranes influences selective permeability
Describe the role of the cell wall in maintaining cell structure and function

Lesson 2.6 objective
Describe the mechanisms that organisms use to maintain solute and water balance
Describe the mechanisms that organisms use to transport large molecules across the plasma membrane

Lesson 2.7 objective
Explain how the structure of a molecule affects its ability to pass through the plasma membrane

Lesson 2.8 objective
Explain how concentration gradients affect the movement of molecules across membranes
Explain how osmoregulatory mechanisms contribute to the health and survival of organisms

Lesson 2.9 objective
Describe the processes that allow ions and other molecules to move across membranes
Lesson 2.10 objective
Describe the membrane bound structures of th eukaryotic cell
Explain how internal membranes and membrane bound organelles contribute to compartmentalization of eukaryotic cell functions

Lesson 2.11 objective
Describe similarities or differences of compartmentalization between prokaryotic and eukaryotic cells
Describe the relationship between the functions of endosymbiotic organelles and their free-living ancestral counterparts

Activities:
-Microscope labeling activity
Students will label parts of the microscope as well as explain the function of each part

-Cell part chart
Students will create a chart that labels the structure and function of prokaryotic and eukaryotic cells

Labs:
-Microscope lab
plant vs. animal cells
SP1 SP2 SP3 SP4

-Eukaryotic vs. Prokaryotic cells

SP5 SP6

Assessments/Projects:
Cell City project
Unit 2 Test

STAGE 3
Learning Plan

Unit #2: 7 Modules

Guided notes, student-led discussions, unit specific labs and activities listed above, cooperative learning strategies, and individual assessment tools will be used as part of the learning plan to ensure the following sections of the unit are thoroughly covered

An introduction to the cell
Subcellular compartments of eukaryotes
Cell and organism size
Cell membranes
Membrane transport
Water movement: Osmosis, tonicity, and osmoregulation
Origin of compartmentalization and the eukaryotic cell

Summative Activities

Discussion questions and posts will be used throughout the course to reinforce content and to assess student growth

Do Now Questions SP1 SP2 SP3 SP4 SP5 SP6

Additional Materials

Digital Tools/Resources:

-AP Classroom
-AP Classroom module summary videos
-AP Daily
-Unit Guides
-Personal Progress Checks
-Ebapbio.com
-World of 7 Billion
-Khan Academy-AP Biology
-Quizlet-Note Cards

Unit #:3
6 Modules
Weight on exam 12-16%

Overview

STAGE 1
Desired Results

Essential Questions…

A. Change over time and Natural Selection
- How have gene pools changed in response to environmental and adaptations?
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- What extinction events have taken place in the past that affect the landscape of genetic diversity now?

B. Energetics
- What is the role of energy in making and breaking polymers?
- What are strategies to capture, use, and store energy in various living things?
- How do organisms respond to changes at the molecular, cellular, physiological, and behavioral level?

C. Information Storage and Transmission
- How do living systems transmit information to ensure their survival?
- How does noninheritable information transmission influence the behavior between cells, organisms, and populations?
- What are key signal markers in genetic processes such as DNA replication, transcription, and translation lead to genetic disorders?

D. Systems Interactions
- How would living systems function without the polarity of the water molecule?
- How are ecosystems affected by disturbances such as mining, farming, and volcanic eruptions?
- How are ecological systems affected by the interactions of organisms with varying biological systems?

Enduring Understanding

- Students will know that ATP is the main energy source for the cell

- ❖ Student will know the first and second law of thermodynamics
- ❖ Students will know the difference between kinetic and potential energy
- ❖ Students will learn that chemical reactions are a means of transferring energy, either using it within a system or providing it
- ❖ Students will learn the makeup of the enzyme-substrate complex
- ❖ Students will learn that some enzymes act as catalyst for chemical reactions as well as biological processes
- ❖ Students will know the processes of photosynthesis I and II, as well as respiration

Students will be able to...

- Define/describe essential concepts in their own words **Science practice 1 (a-c)**
- Analyze visual representations of biological concepts and processes **Science practice 2 (a-d)**
- Predict results to scientific questions based on given published studies and experimental designs **Science practice 3 (a-e)**
- Describe results from studies and labs using data tools such as histograms and line graphs **Science practice 4 (a-b)**
- Perform statistical tests and mathematical calculations to analyze and interpret data **Science practice 5 (a-d)**
- Develop and justify scientific arguments using evidence **Science practice 6 (a-e)**
- Apply their knowledge of biology concepts to understand real-world questions or scenarios **Science practice 1-6**
- Perform hands-on lab activities to supplement course content, develop lab practice skills, summarize main ideas, skills, and practices
- Present the evidence of their laboratory investigations

Unit #3
Key Concepts/Ideas: Cellular Energetics
Possible Misunderstandings: Enzyme strucure, function and catalysis, cell respiration particularly the Krebs cycle
Key Vocabulary/Terms: Photosynthesis, Cellular Respirations, Energetics, Metabolism, Enzymes

STAGE 2
Evidence of Learning

Unit #3 Cellular Energetics

Lesson 3.1 objective
Describe the properties of enzymes

Lesson 3.2 objective
Explain how enzymes affect the rate of biological reactions
Explain how changes to the structure of an enzyme may affect its function

Lesson 3.3 objective
Explain how the cellular environment affects enzyme activity

Lesson 3.4 objective
Describe the role of energy in living organisms

Lesson 3.5 objective
Describe the photosynthetic processes that allow organisms to capture and store energy
Explain how cells capture energy from light and trasfer it to biological molecules for storage and use

Lesson 3.6 objective
Describe the processes that allow organisms to use energy stored in biological macromolecules

Lesson 3.7 objective
Explain the connection between variation in the number and types of molecules within cells to the ability of th organism to survive or reproduce in different environments

How these objectives will be reached

Activities:
-Food journal
-Photosynthesis review game
-Nutrition Information class chart
-Quiz on bio topics, student presentations

Labs:
-Evaluating muscle exhaustion/cell respiration
Students will measure the process of muscle exhaustion, and discuss the body proceeding to make lactic acid when available reserves run low. This will be done through volunteers for exercise activities, time-keeping, measuring and graphing results, as well as discussing their thoughts on their results
SP1 SP2 SP3 SP4 SP5 SP6

-Chromatography
Students will evaluate and note the various pigments within spinach, using chromatography paper and solvent as well as the metric system students will calculate the Rf factor.

SP1 SP2 SP3 SP4

Assessments/Projects:
-Poster project on Bio topics
-Sport matching project
-Unit 3 Test

STAGE 3

Learning Plan

Assessment Topics and Lesson Themes:

Guided notes, student-led discussions, unit specific labs and activities listed above, cooperative learning strategies, and individual assessment tools will be used as part of the learning plan to ensure the following sections of the unit are thoroughly covered.

Unit #3: 6 Modules

Cellular energy
Enzymes
Photosynthesis I: Overview
Photosnthesis II: Biochemistry
Cellular Respiration I and II
Metabolism and the environment

Summative Activities

Discussion questions and posts will be used throughout the course to reinforce content and to assess student growth

Do Now Questions SP1 SP2 SP3 SP4 SP5 SP6

Additional Materials

Digital Tools/Resources:

-AP Classroom
-AP Classroom module summary videos
-AP Daily
-Unit Guides
-Personal Progress Checks
-Ebapbio.com
-World of 7 Billion
-Khan Academy-AP Biology
-Quizlet-Note Cards

Unit #:4
6 Modules

Weight on exam 10-15%

Overview

STAGE 1
Desired Results

Essential Questions…

A. Change over time and Natural Selection
- How have gene pools changed in response to environmental and adaptations?
- How does competition affect diversity and unity of living things?
- What extinction events have taken place in the past that affect the landscape of genetic diversity now?

B. Energetics
- What is the role of energy in making and breaking polymers?
- What are strategies to capture, use, and store energy in various living things?
- How do organisms respond to changes at the molecular, cellular, physiological, and behavioral level?

C. Information Storage and Transmission
- How do living systems transmit information to ensure their survival?
- How does noninheritable information transmission influence the behavior between cells, organisms, and populations?
- What are key signal markers in genetic processes such as DNA replication, transcription, and translation lead to genetic disorders?

D. Systems Interactions
- How would living systems function without the polarity of the water molecule?
- How are ecosystems affected by disturbances such as mining, farming, and volcanic eruptions?
- How are ecological systems affected by the interactions of organisms with varying biological systems?

Enduring Understanding
- ❖ Students will understand the importance of cell signaling in maintain homeostasis throughout the human body
- ❖ Students will learn about temperature by a heating system

Students will be able to...

- Define/describe essential concepts in their own words **Science practice 1 (a-c)**
- Analyze visual representations of biological concepts and processes **Science practice 2 (a-d)**
- Predict results to scientific questions based on given published studies and experimental designs **Science practice 3 (a-e)**
- Describe results from studies and labs using data tools such as histograms and line graphs **Science practice 4 (a-b)**
- Perform statistical tests and mathematical calculations to analyze and interpret data **Science practice 5 (a-d)**
- Develop and justify scientific arguments using evidence **Science practice 6 (a-e)**
- Apply their knowledge of biology concepts to understand real-world questions or scenarios **Science practice 1-6**
- Perform hands-on lab activities to supplement course content, develop lab practice skills, summarize main ideas, skills, and practices
- Present the evidence of their laboratory investigations

Unit #4
Key Concepts/Ideas: Cell Communication and Cell Cycle
Possible Misunderstandings: Cell cycle start and stop as well as regulation of the cell cycle
Key Vocabulary/Terms: Cell communication, Cell cycle, Signal transduction

STAGE 2
Evidence of Learning

Unit #4 Cell Communication and Cell Cycle

Lesson 4.1 objective
Describe the ways that cells can communicate with one another
Explain how cells another over short and long distances

Lesson 4.2 objective
Explain how cells communicate with one another over short and long distances
Describe the components of a signal transduction pathway
Describe the role of components of a signal transduction pathway in producing a cellular response

Lesson 4.3 objective
Describe the role of the environment in eliciting a cellular response
Describe the different types of cellular responses elicited by a signal transduction pathway.

Lesson 4.4 objective
Explain how a change in the structure of any signaling molecule affects the activity of the signaling pathway

Lesson 4.5 objective
Describe positive and negative feedback mechanisms
Explain how negative feedback helps to maintain homeostasis

Lesson 4.6 objective

Describe the events that occur in the cell cycle
Explain how mitosis results in th etransmission of chromosomes from one generation to the next

Lesson 4.7 objective
Describe the role of checkpoints in regulating the cell cycle
Describe the effects of disruptions to the cell cycle on the cell or organism

Plan to implement objectives
Cell feedback activity: Medical situations

Labs:
-Gram staining bacteria+Culture plates
Students will do a gram staining lab, this will invlove identifying gram positive and gram negative bacteria, and a study that with several culture plates. All of this will be done to for students to build a formal lab report.
SP1 SP2 SP3 SP4 SP5 SP6

Assessments/Projects
Unit 4 Test
Formal lab report

STAGE 3
Learning Plan

Assessment Topics and Lesson Themes:

Guided notes, student-led discussions, unit specific labs and activities listed above, cooperative learning strategies, and individual assessment tools will be used as part of the learning plan to ensure the following sections of the unit are thoroughly covered

Unit #4: 6 Modules

Cell communication
Signal transduction
Changes in signal transduction pathways
Feedback in cell communication
Cell cycle
Regulation of the cell cycle

Summative Activities

Discussion questions and posts will be used throughout the course to reinforce content and to assess student growth

Do Now Questions SP1 SP2 SP3 SP4 SP5 SP6

Additional Materials

Digital Tools/Resources:

-AP Classroom
-AP Classroom module summary videos
-AP Daily
-Unit Guides
-Personal Progress Checks
-Ebapbio.com
-World of 7 Billion
-Khan Academy-AP Biology
-Quizlet-Note Cards

Unit #:5
5 Modules
Weight on exam 8-11%

Overview

STAGE 1
Desired Results

Essential Questions…

A. Change over time and Natural Selection
- How have gene pools changed in response to environmental and adaptations?
- How does competition affect diversity and unity of living things?
- What extinction events have taken place in the past that affect the landscape of genetic diversity now?

B. Energetics
- What is the role of energy in making and breaking polymers?
- What are strategies to capture, use, and store energy in various living things?
- How do organisms respond to changes at the molecular, cellular, physiological, and behavioral level?

C. Information Storage and Transmission

- How do living systems transmit information to ensure their survival?
- How does noninheritable information transmission influence the behavior between cells, organisms, and populations?
- What are key signal markers in genetic processes such as DNA replication, transcription, and translation lead to genetic disorders?

D. Systems Interactions
- How would living systems function without the polarity of the water molecule?
- How are ecosystems affected by disturbances such as mining, farming, and volcanic eruptions?
- How are ecological systems affected by the interactions of organisms with varying biological systems?

Enduring Understanding

- ❖ Students will understand the process of meiosis and its contribution to genetic diversity
- ❖ Students will know how mendelian genetics formed the basis for the entire subject of genetics as we know it now
- ❖ Students will expand on their knowledge of genetics by exploring non-mendelian genetics
- ❖ Students will learn the effect the environment can have on phenotypic representation of genes
- ❖ Mitosis is the process of dividing to make more somatic (body) cells
- ❖ Meiosis is the process of dividing to make the sex cells
- ❖ Mendelian genetics based off of three laws that Mendel proved using pea plants

Students will be able to...

- Define/describe essential concepts in their own words **Science practice 1 (a-c)**
- Analyze visual representations of biological concepts and processes **Science practice 2 (a-d)**
- Predict results to scientific questions based on given published studies and experimental designs **Science practice 3 (a-e)**
- Describe results from studies and labs using data tools such as histograms and line graphs **Science practice 4 (a-b)**
- Perform statistical tests and mathematical calculations to analyze and interpret data **Science practice 5 (a-d)**
- Develop and justify scientific arguments using evidence **Science practice 6 (a-e)**
- Apply their knowledge of biology concepts to understand real-world questions or scenarios **Science practice 1-6**
- Perform hands-on lab activities to supplement course content, develop lab practice skills, summarize main ideas, skills, and practices
- Present the evidence of their laboratory investigations

Unit #5
Key Concepts/Ideas: Heredity
Possible Misunderstandings: Non-mendelian genetics
Key Vocabulary/Terms: Meiosis and Mitosis, Mendelian genetics, probability, chromosomal inheritance, Genetic diversity

STAGE 2
Evidence of Learning

Unit #5 Heredity

Lesson 5.1 objectives
Explain how meiosis results in the transmission of chromosomes from one generation to the next
Describe similarities or differences between the phases and outcomes of mitosis and meiosis

Lesson 5.2 objectives
Explain how the processes of meiosis generates genetic diversity

Lesson 5.3 objectives
Explain how shared, conserved, fundamental processes and features support the concept of common ancestry for all organisms
Explain the inheritance of genes and traits as describe by Mendel's laws

Lesson 5.4 objectives
Explain deviations from Mendel's model of th einheritance of traits

Lesson 5.5 objectives
Explain how the same genotype can result in multiple phenotypes under different environmental conditions

Lesson 5.6 objectives
Explain how chromosomal inheritance generates genetic variation in sexual reproduction

How these objectives will be achieved

Activities:
Dihybrid cross activity
Punnett square quiz
Mitosis and meiosis chart
Probability exercise

Labs:
-Blood typing
Volunteer students who have already gone through approval process will work on blood typing, they will complete punnett squares relating to blood type and will discover the blood type of someone in their group.
SP2 SP3 SP4 SP5
-Karyotyping
Students will investigate and utilize karytype chart to match various karytope results to syndromes and genetic diseases
SP1 SP6
Make a baby lab
Students will investigate probability, and work with their lab groups to create their own baby using randomized traits.

SP2 SP3 SP4 SP5 SP6

Projects/Assessments
How to write a formal lab report
Unit 5 Test

STAGE 3
Learning Plan

Assessment Topics and Lesson Themes:

Guided notes, student-led discussions, unit specific labs and activities listed above, cooperative learning strategies, and individual assessment tools will be used as part of the learning plan to ensure the following sections of the unit are thoroughly covered

Unit #5 5 Modules
Meiosis and genetic diversity
Mendelian genetics
Non-mendelian genetics
Environmental effects on phenotypes
Chromosomal Inheritance

Summative Activities

Discussion questions and posts will be used throughout the course to reinforce content and to assess student growth

Do Now Questions SP1 SP2 SP3 SP4 SP5 SP6

Additional Materials

Digital Tools/Resources:

-AP Classroom
-AP Classroom module summary videos
-AP Daily
-Unit Guides
-Personal Progress Checks
-Ebapbio.com
-World of 7 Billion
-Khan Academy-AP Biology
-Quizlet-Note Cards

Unit #:6
9 Modules
Weight on exam 12-16%

Overview

STAGE 1
Desired Results

Essential Questions…

A. Change over time and Natural Selection
- How have gene pools changed in response to environmental and adaptations?
- How does competition affect diversity and unity of living things?
- What extinction events have taken place in the past that affect the landscape of genetic diversity now?

B. Energetics
- What is the role of energy in making and breaking polymers?
- What are strategies to capture, use, and store energy in various living things?
- How do organisms respond to changes at the molecular, cellular, physiological, and behavioral level?

C. Information Storage and Transmission
- How do living systems transmit information to ensure their survival?
- How does noninheritable information transmission influence the behavior between cells, organisms, and populations?
- What are key signal markers in genetic processes such as DNA replication, transcription, and translation lead to genetic disorders?

D. Systems Interactions
- How would living systems function without the polarity of the water molecule?
- How are ecosystems affected by disturbances such as mining, farming, and volcanic eruptions?
- How are ecological systems affected by the interactions of organisms with varying biological systems?

Enduring Understanding

- ❖ Students will understand the proteins and other macromolecules involved in gene expression and regulation.
- ❖ Students will know the structure and function of DNA as well as RNA
- ❖ Students will learn the central dogma of molecular biology
- ❖ Pairing of purines and pyrimidines follows a systematic pairing method
- ❖ Students will know the process of DNA replication

- ❖ Students will know the process of transcription
- ❖ DNA replication in prokaryotes and eukaryotes has subtle, but important differences
- ❖ Chromosomes are circular in prokaryotes

Students will be able to...

- Define/describe essential concepts in their own words **Science practice 1 (a-c)**
- Analyze visual representations of biological concepts and processes **Science practice 2 (a-d)**
- Predict results to scientific questions based on given published studies and experimental designs **Science practice 3 (a-e)**
- Describe results from studies and labs using data tools such as histograms and line graphs **Science practice 4 (a-b)**
- Perform statistical tests and mathematical calculations to analyze and interpret data **Science practice 5 (a-d)**
- Develop and justify scientific arguments using evidence **Science practice 6 (a-e)**
- Apply their knowledge of biology concepts to understand real-world questions or scenarios **Science practice 1-6**
- Perform hands-on lab activities to supplement course content, develop lab practice skills, summarize main ideas, skills, and practices
- Present the evidence of their laboratory investigations

Unit #6
Key Concepts/Ideas: Gene Expression and Regulation
Possible Misunderstandings: Replication, Transcription, and Translation
Key Vocabulary/Terms: DNA and RNA, DNA replication, Mutation, Biotechnology, Viruses, Translation and Transcription

STAGE 2
Evidence of Learning

Formative Activities, Tasks, or Projects:

Unit #6 Gene Expression and Regulation

Leson 6.1 objective
Describes the structures involved in passing hereditary information from one generation to the next
Describe the characteristics of DNA that allow it to be used as the hereditary material

Lesson 6.2 objective
Describe the mechanisms by which genetic information is copied for transmission between generations

Lesson 6.3 objective
Describe the mechanisms by which genetic information flows from DNA to RNA protein

Lesson 6.4 objective

Explain how the phenotype of an organism is determined by its genotype

Lesson 6.5 objective
Describe the types of interactions that regulate gene expression
Explain how the location of regulatory sequences relates to their function

Lesson 6.6 objective
Explain how the binding of transcription factors to promoter regions affects gene expression or the phenotype of the organism
Explain th econnection between regulation of gene expression and phenotypic differences in cells and organisms

Lesson 6.7 objective
Describe the various types of mutations

Lesson 6.8 objective
Explain the use of genetic engineering techniques in analyzing or manipulating DNA

How these objectives will be reached

Activities:
PCR and Gel Electorophoresis simulation activity

Projects/Assessments:
Bacterial and viral disease brochure
Biotechnology project
Unit 6 Test

Labs:

-DNA strawberry extraction
Students will complete a strawberry dna extraction lab, considering the type of organism it is (eukaryotic) have a discussion on what the nature of this DNA is circular or double helix? As well as other aspects of eukaryotic dna replication

SP1 SP2 SP3 SP4 SP5 SP6

STAGE 3
Learning Plan

Assessment Topics and Lesson Themes:

Guided notes, student-led discussions, unit specific labs and activities listed above, cooperative learning strategies, and individual assessment tools will be used as part of the learning plan to ensure the following sections of the unit are thoroughly covered

Unit #6 9 Modules

DNA and RNA structure and function
DNA replication
Transcription and RNA processing
Translation
Regulation of gene expression
Cell specialization and development
Mutations
Biotechnology
Viruses

Summative Activities

Discussion questions and posts will be used throughout the course to reinforce content and to assess student growth

Do Now Questions SP1 SP2 SP3 SP4 SP5 SP6

Additional Materials

Digital Tools/Resources:

-AP Classroom
-AP Classroom module summary videos
-AP Daily
-Unit Guides
-Personal Progress Checks
-Ebapbio.com
-World of 7 Billion
-Khan Academy-AP Biology
-Quizlet-Note Cards

Unit #:7
9 Modules
Weight on exam 13-20%

Overview

STAGE 1
Desired Results

Essential Questions…

A. Change over time and Natural Selection
- How have gene pools changed in response to environmental and adaptations?
- How does competition affect diversity and unity of living things?
- What extinction events have taken place in the past that affect the landscape of genetic diversity now?

B. Energetics
- What is the role of energy in making and breaking polymers?
- What are strategies to capture, use, and store energy in various living things?
- How do organisms respond to changes at the molecular, cellular, physiological, and behavioral level?

C. Information Storage and Transmission
- How do living systems transmit information to ensure their survival?
- How does noninheritable information transmission influence the behavior between cells, organisms, and populations?
- What are key signal markers in genetic processes such as DNA replication, transcription, and translation lead to genetic disorders?

D. Systems Interactions
- How would living systems function without the polarity of the water molecule?
- How are ecosystems affected by disturbances such as mining, farming, and volcanic eruptions?
- How are ecological systems affected by the interactions of organisms with varying biological systems?

Enduring Understanding
- ❖ Students will gain an understand of the importance of diversity within life forms
- ❖ Students will learn Darwin's proposal on how diversity in life came about
- ❖ Students will learn about the different major
  Extinction events that have taken place in the past

Students will be able to...

- Define/describe essential concepts in their own words **Science practice 1 (a-c)**
- Analyze visual representations of biological concepts and processes **Science practice 2 (a-d)**
- Predict results to scientific questions based on given published studies and experimental designs **Science practice 3 (a-e)**

- Describe results from studies and labs using data tools such as histograms and line graphs **Science practice 4 (a-b)**
- Perform statistical tests and mathematical calculations to analyze and interpret data **Science practice 5 (a-d)**
- Develop and justify scientific arguments using evidence **Science practice 6 (a-e)**
- Apply their knowledge of biology concepts to understand real-world questions or scenarios **Science practice 1-6**
- Perform hands-on lab activities to supplement course content, develop lab practice skills, summarize main ideas, skills, and practices
- Present the evidence of their laboratory investigations

Unit # 7
Key Concepts/Ideas: Change Over Time and Natural Selection
Possible Misunderstandings: Speciation and the various methods
Key Vocabulary/Terms: Natural selection, population genetics, phylogeny, speciation, extinction, variaton

STAGE 2
Evidence of Learning

Formative Activities, Tasks, or Projects:

Unit #7 Evolution, Natural Selection, and basics of anatomy and physiology

Lesson 7.1 objective
Describe the causes of natural selection
Explain how natural selection affects population

Lesson 7.2 objective
Describe the importance of phenotypic variation in a population

Lesson 7.3 objective
Explain how humans can affect diversity within a population
Explain the relationship between changes in the environment an changes within the population

Lesson 7.4 objective
Explain how random occurences affect the genetic makeup of a population
Describe the change in the genetic makeup of a population over time

Lesson 7.5 objective
Explain how morphological, biochemical, and geological organisms have changed over time

Lesson 7.6 objective
Explain how a phylogenetic tree or cladogram can be used to infer evolutionary relatedness

How these objectives will be achieved

Activities:

Family tree activity
Extinction investigation

Labs:
Two animal dissections (pig and sheep heart)
Students will do an evaluative dissection of two organisms with major organs similar to human organs.
SP1 SP2 SP3 SP5 SP6
Projects/Assessments:
Formal Lab report
Unit 7 Test

STAGE 3
Learning Plan

Assessment Topics and Lesson Themes:

Guided notes, student-led discussions, unit specific labs and activities listed above, cooperative learning strategies, and individual assessment tools will be used as part of the learning plan to ensure the following sections of the unit are thoroughly covered

Unit #7 9 Modules

Introduction to evolution and natural selection
Natural and artificial selection
Population genetics
Change over time
Phylogeny
Speciation
Extinction
Variation in populations
Origins of life on Earth

Summative Activities

Discussion questions and posts will be used throughout the course to reinforce content and to assess student growth

Do Now Questions SP1 SP2 SP3 SP4 SP5 SP6

Additional Materials

Digital Tools/Resources:

-AP Classroom
-AP Classroom module summary videos
-AP Daily
-Unit Guides
-Personal Progress Checks
-Ebapbio.com
-World of 7 Billion
-Khan Academy-AP Biology
-Quizlet-Note Cards

Unit #:8
7 Modules
Weight on exam 10-15%

Overview

STAGE 1
Desired Results

Essential Questions…

A. Change Over Time and Natural Selection
- How have gene pools changed in response to environmental and adaptations?
- How does competition affect diversity and unity of living things?
- What extinction events have taken place in the past that affect the landscape of genetic diversity now?

B. Energetics
- What is the role of energy in making and breaking polymers?
- What are strategies to capture, use, and store energy in various living things?
- How do organisms respond to changes at the molecular, cellular, physiological, and behavioral level?

C. Information Storage and Transmission
- How do living systems transmit information to ensure their survival?

- How does noninheritable information transmission influence the behavior between cells, organisms, and populations?
- What are key signal markers in genetic processes such as DNA replication, transcription, and translation lead to genetic disorders?

D. Systems Interactions

- How would living systems function without the polarity of the water molecule?
- How are ecosystems affected by disturbances such as mining, farming, and volcanic eruptions?
- How are ecological systems affected by the interactions of organisms with varying biological systems?

Enduring Understanding

- ❖ Students will focus their time on ecology discussing aspects of population ecology as well as common interaction types

Students will be able to...

- Define/describe essential concepts in their own words **Science practice 1 (a-c)**
- Analyze visual representations of biological concepts and processes **Science practice 2 (a-d)**
- Predict results to scientific questions based on given published studies and experimental designs **Science practice 3 (a-e)**
- Describe results from studies and labs using data tools such as histograms and line graphs **Science practice 4 (a-b)**
- Perform statistical tests and mathematical calculations to analyze and interpret data **Science practice 5 (a-d)**
- Develop and justify scientific arguments using evidence **Science practice 6 (a-e)**
- Apply their knowledge of biology concepts to understand real-world questions or scenarios **Science practice 1-6**
- Perform hands-on lab activities to supplement course content, develop lab practice skills, summarize main ideas, skills, and practices
- Present the evidence of their laboratory investigations

Unit #8
Key Concepts/Ideas: Ecology
Possible Misunderstandings: Energy flow through ecosystems and how the various levels of an ecosystem are connected through the energy passed on to the next
Key Vocabulary/Terms: Energy flow, Response to environment, Population ecology, Growth Rate, Biodiversity, Succession

STAGE 2
Evidence of Learning

Unit #8 Ecology

Lesson 8.1 objective

Explain how the behavioral or physiological response of an organism is related to changes in internal or external environment

Lesson 8.2 objective
Describe the strategies organisms use to acquire and use energy

Lesson 8.3 objective
Describe factors that influence dynamics of populations

Lesson 8.4 objective
Explain how the density of a population affects and is determined resource availability in the environment

Lesson 8.5 objective
Describe the structure of a community according to its species composition and diversity

Lesson 8.6 objective
Describe the relationship between ecosystem diversity and its resilience to changes in the environment
Explain the interaction between the environment or preexisting variations in populations

How these objectives will be reached

Activities:
Keystone species activity
Animal gestation chart
World of 7 billion wall chart
World of 7 billion where do you stand?
Energy flow in an ecosystem story
Create your own energy pyramid
Career day

Labs:
-Owl Pellet lab
Students will observe a specimen of what is known as owl pellet, they will dissect the specimen and match the bones as well as components of organisms the owl has come into contact with.

SP1 SP2 SP5 SP6

Projects/Assessments:
Coyote case study
Career Day Project
Unit 8 Test

STAGE 3
Learning Plan

Assessment Topics and Lesson Themes:

Guided notes, student-led discussions, unit specific labs and activities listed above, cooperative learning strategies, and individual assessment tools will be used as part of the learning plan to ensure the following sections of the unit are thoroughly covered

Unit #8 7 Modules

Responses to the environment
Energy flow through ecosystems
Population ecology
Effect of density of populations
Community ecology
Biodiversity
Disruptions to ecosystems

Summative Activities

Discussion questions and posts will be used throughout the course to reinforce content and to assess student growth

Do Now Questions SP1 SP2 SP3 SP4 SP5 SP6

Additional Materials

Digital Tools/Resources:

-AP Classroom
-AP Classroom module summary videos
-AP Daily
-Unit Guides
-Personal Progress Checks
-Ebapbio.com
-World of 7 Billion
-Khan Academy-AP Biology
-Quizlet-Note Cards

Horizontal Integration/Interdisciplinary Connections

See Appendix