Course Overview

Text Source(s): The CA Science Framework

NGSS BIOLOGY	**Big Ideas (Enduring Understanding)**	Who am I? The influence of the biosphere on and by humans.
	Topics of Study (story line)	Storyline: Biology is the story of how life began on Earth, leading to biodiversity, coexistence, and our need to assure the wise stewardship of our planet. Sequence: Instructional Strands 1. Ecosystem Interactions and Energy 2. History of Earth's Atmosphere: Photosynthesis and Cellular Respiration 3. Structure, Function, and Growth (from cell to organisms) 4. Inheritance of Traits 5. Evidence of Evolution 6. Ecosystem Stability and Response to Climate Change.
	Essential Questions by Instructional Strands (IS)	**Instructional Strand (IS) #1: Ecosystems Interactions and Energy** 1.1 What defines an ecosystem and what are its dynamics? 1.2 What factors affect the size of populations within an ecosystem? 1.3 How do ecosystem imbalances impact diversity? What are potential solutions? **IS #2: History of Earth's Atmosphere: Photosynthesis and Cellular Respiration** 2.1 How do living things acquire energy and matter for life? 2.2 How do organisms store energy? 2.3 How are photosynthesis and cellular respiration connected? 2.4 How do organisms use the raw materials they ingest from the environment? 2.5 How has the cycling of energy and matter changed over Earth's history? **IS #3: Structure, Function, and Growth (from cells to organisms)** 3.1 How does the structure of DNA affect how cells look and behave? 3.2 How is your body able to function when you are sick? 3.3 How do systems work in a multi-celled organism, and what happens when there is a change in the system? 3.4 How do organisms survive even when there are changes in their environment? **IS #4 Inheritance of Traits**

		4.1 How are characteristics of one generation passed to the next? 4.2 What allows traits to be transmitted from parents to offspring? 4.3 How does variation affect a population under selective pressure? 4.4 How do environmental factors influence your phenotype? **IS #5 Evidence of Evolution** 5.1 What key pieces of evidence support the idea of common ancestry? 5.2 Explain Darwin's Theory of Natural Selection and give examples. 5.3 How is the Hardy-Weinberg Theory used to evaluate if a population is evolving? 5.4 Explain how examples of Natural Selection lead to adaptations within a population. 5.5 Evaluate and explain how changes such as, The Bottleneck Effect, can result in changes within a population. **IS #6: Ecosystem Stability and The Response to Climate Change** 6.1 What factors cause changes in ecosystems that ultimately affect populations? 6.2 What are the changes that are happening in the climate and what effects are those changes having on life in our biosphere? 6.3 How are human activities impacting Earth's systems and how does that affect life on Earth? 6.4 What can humans do to mitigate their negative impact on the environment?		
	Evidence Statements	**NGSS Performance Expectations (Clarification Statements)**	**Essential Outcomes**	**Laboratory Exercises/Activities**
IS 1	HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	https://www.nextgenscience.org/dci-arrangement/hs-ls2-ecosystems-interactions-enhttps://www.nextgenscience.org/dci-arrangement/hs-ls2-ecosystems-interactions-energy-and-dynam	Students will learn how matter cycles and energy flows within an ecosystem by developing and using models.	Link to resources or ideas

	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. HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.	https://www.nextgenscience.org/dci-arrangement/hs-ls2-ecosystems-interactions-enhttps://www.nextgenscience.org/dci-arrangement/hs-ls2-ecosystems-interactions-energy-and-dynamicsic		

IS 2	HS-LS1-5 Use the model to illustrate how photosynthesis transforms light energy into stored chemical energy. 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. HS-LS1-7. 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. 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-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the	https://www.nextgenscience.org/dci-arrangement/hs-ls1-molecules-organisms-structures-and-processes https://www.nextgenscience.org/dci-arrangement/hs-ls2-ecosystems-interactions-energy-and-dynamics	Students will understand the role of photosynthesis and cellular respiration through models and chemical equations while analyzing and interpreting data about how the cycling of energy and matter has changed over Earth's history.	

	biosphere, atmosphere, hydrosphere, and geosphere. ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity			

IS 3	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. HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	https://www.nextgenscience.org/dci-arrangement/hs-ls1-molecules-organisms-structures-and-processes	Students will understand that DNA carries the instructions on what protein to make by creating a model that shows the steps required in the production of proteins. Students will be able to demonstrate that one parent cell will yield two identical daughter cells. Students will be able to create a model to explain how cell differentiation can maintain homeostasis. Students will be able to explain how the body maintains internal stability as the outside environment changes through positive and negative feedback systems. Students will be able to give evidence of how two interacting systems work together to maintain homeostasis.	

IS 4	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. 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. HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population 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 HS-LS4-2. Construct an explanation based on evidence that the process of	w.nextgenscience.org/dci-arrangement/hs-ls3-heredity-inheritance-and-variation-traitshttps://ww https://www.nextgenscience.org/dci-arrangement/hs-ls4-biological-evolution-unity-and-diversity	Students will ask questions regarding what changes in DNA result in changes in phenotypes. Students can apply a physical model of chromosomes to visualize and provide evidence for how variation happens. Analyze the quantity and proportion of possible outcomes and how it helps explain variation in humans. Construct an argument that environmental factors can affect phenotypes. Model changes and use probabilities to determine whether or not there is evidence of changes in populations over time. Students develop explanations about the specific mechanisms that enable parents to pass traits on to their offspring. They make claims about which processes give rise to variation in DNA codes and calculate the probability that offspring will inherit traits from their parents.	

	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. HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.			

IS 5	HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. 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. HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species	https://www.nextgenscience.org/dci-arrangement/hs-ls4-biological-evolution-unity-and-diversity https://www.nextgenscience.org/dci-arrangement/hs-ess1-earths-place-universe https://www.nextgenscience.org/dci-arrangement/hs-ets1-engineering-design https://www.nextgenscience.org/dci-arrangement/hs-ess3-earth-and-human-activity https://www.nextgenscience.org/dci-arrangement/hs-ess2-earths-systems	Students will evaluate mechanisms that drive the process of evolution within populations while analyzing key pieces of evidence that directly support the theory of natural selection.	

	over time, and (3) the extinction of other species. HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social,			

	cultural, and environmental impacts.			
IS 6	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. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* HS-ESS3-5. Analyze geoscience data and the	https://www.nextgenscience.org/dci-arrangement/hs-ls2-ecosystems-interactions-energy-and-dynamics https://www.nextgenscience.org/dci-arrangement/hs-ls4-biological-evolution-unity-and-diversity https://www.nextgenscience.org/dci-arrangement/hs-ess3-earth-and-human-activity https://www.nextgenscience.org/dci-arrangement/hs-ets1-engineering-design	Students will design solutions to mitigate the negative impacts that humans have on their environment by analyzing and modeling changes in the biosphere and the effects of those changes on biodiversity. *mic drop*	

	results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. [HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as			

	well as possible social, cultural, and environmental impacts. HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.			

IS 7: Health

Health - High School Scope and Sequence

Instr. Days	Curriculum Lesson	Lesson Details	Vocab	Instr. Strand
1	Getting Started (Intro.)	● Class norms ● Puberty ● Physical characteristics ● Gender Identity	male, female, masculine, feminine, androgynous, sexual orientation, gender role, gender non-conformity, gender identity, cigender, transgender, intersex, gonads, gender expansive, gender binary	7
2+	Reproductive Anatomy	● Body structure and function ● Endocrine (sex hormones) ● Menstrual cycle and Ovulation	ovaries, testes, testosterone, estrogen, progesterone, uterus, Fallopian tubes, vagina, penis, egg, sperm, epididymis, vas deferens, ovulation.	7

5	Lesson 4 & 5	• Family Planning • Decision making • Teen pregnancy and consequences • Consent, laws, options, and postponement	abstinence, barrier method, hormonal method, OTC, prescription, male/female condom, spermicidal foam or gel, birth control pill, emergency contraception (Plan B) safe surrender, cooling off period, prenatal care, abortion, adoption, options, consequences.	7
2	Lesson 4 & 9	• Contraception • Protection (Condoms)	abstinence, barrier method, hormonal method, OTC, prescription, male/female condom, spermicidal foam or gel, birth control pill, emergency contraception (Plan B), universal precautions, monogamy, abstinence, latex, polyurethane, oil based, water-based.	7
4	Lesson 7, 8, 11	• STI Overview • Intro to HIV/AIDS and testing sites	epidemic, pandemic, antibody, T-cell, immune system, incubation, window period, semen, vaginal fluids, anti-retroviral therapy, pre-exposure prophylaxis, post exposure prophylaxis, sexual contact, sexually transmitted, incubation period, symptoms, asymptomatic, confidential testing, HIV antibody test, window period.	7
2	Lesson 6	• Persons affected by HIV/AIDS • New treatments	myth, stereotype, PLWA(person living with AIDS), PWA(person with AIDS)	7
1	Lesson 12	• Goals for the future	goal, plan, choices, consequences, steps, progress	7

17	class periods			