

EASTERN LEBANON COUNTY SCHOOL DISTRICT
STUDENT LEARNING MAP

Course/Subject: Biology

Days: 10

Topic: Basic Principles, Methods, Tools

Grade Level: 9

Key Learning : 1) Biologists use the elements of inquiry to study and solve problems about the living and once living world. 2) Similarities and differences are used to categorize and name organisms. 3) Organisms share common characteristics of life. 4) Technology helps humans know and do science better.



Unit Essential Question

What are the basic biological principles and the methods and tools used by biologists to explain the natural world?

<p>Concept Scientific method</p>	<p>Concept Measurement/Equipment</p>	<p>Concept Characteristics of Life</p>
<p>Standards: 3.1.B.A9 S11.A.1.1.3 S11.A.2.1.1 S11.A.2.1.2 S11.A.2.1.3 S11.A.2.1.4</p>	<p>Standards: S11.A.2.2.2</p>	<p>Standards: 3.1.B.A1</p>
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<p>Lesson Essential Question How can the scientific method be applied to everyday problems?</p>	<p>Lesson Essential Question How is SI and various forms of microscopy used to enhance the study of biology?</p>	<p>Lesson Essential Question What are the characteristics of living or once living things?</p>
↓	↓	↓
<p>Vocabulary Hypothesis, Theory, Law, Scientific Method, Problem, Observation</p>	<p>Vocabulary SI prefixes, Electron microscope, Compound microscope, Digital enhanced microscope</p>	<p>Vocabulary Respiration, Energy, Response, Adaptation, Homeostasis, Movement, Heredity</p>

<p>Concept</p>	<p>Concept</p>	<p>Concept</p>
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STUDENT LEARNING MAP

<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
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<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>
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<u>Vocabulary</u>	<u>Vocabulary</u>	<u>Vocabulary</u>

Additional Information/Resources:

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STUDENT LEARNING MAP

Course/Subject: Biology
Topic: Organic Molecules

Days: 10
Grade Level: 9

Key Learning

Organic molecules are important to living organisms.



Unit Essential Question

What organic molecules are found in living organisms?

<p>Concept Atoms and Elements</p>	<p>Concept Organic Molecules</p>	<p>Concept Properties of Water</p>
<p>Standards: 3.1.B.A9 S11.C.1.1.1 S11.C.1.1.2 S11.C.1.1.3</p>	<p>Standards: 3.1.B.A8</p>	<p>Standards: 3.1.B.A8</p>
<p>Lesson Essential Question What is the composition of matter? What are the basic biological elements and why are they important to life? How and why do various elements combine?</p>	<p>Lesson Essential Question What are the four major organic molecules and how are there structures and functions similar and different? How is Carbon uniquely suited to form biological macromolecules? Explain how enzymes function in biologic reactions.</p>	<p>Lesson Essential Question What are the unique properties of water and how do these properties support life on Earth?</p>
<p>Vocabulary Atom, Element, Molecule, Compound, Physical change, Chemical change, Ionic bonding, Covalent bonding, Polar covalent bonding</p>	<p>Vocabulary Organic molecules, Carbohydrates, Lipids, Proteins, Nucleic acids, Monomer, Polymer, Reactant, Product, activation energy, enzyme,</p>	<p>Vocabulary Hydrogen bond, Adhesion Cohesion, Surface tension pH, acids, bases, buffers</p>

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<u>Concept</u>	<u>Concept</u>	<u>Concept</u>
<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
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<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>
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<u>Vocabulary</u>	<u>Vocabulary</u>	<u>Vocabulary</u>

<u>Additional Information/Resources:</u>

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Course/Subject: Biology
Topic: Ecology

Days: 10
Grade Level: 9

Key Learning

Understanding the basic ecological principles.



Unit Essential Question

What are the basic ecological principles?

Concept Energy Flow and trophic levels	Concept Biogeochemical cycles	Concept Role of climate
Standards: 4.1.4.A 4.1.7.A 4.1.10.A 4.1.7.C 4.4.6.A 4.5.3.D 4.1.3.A 4.1.4.B 4.2.10.A 4.1.4.C 4.4.5.C 4.4.3.C	Standards: 4.1.4.B 4.1.7.B 4.2.5.A 4.2.7.A 4.3.12.A 4.4.3.C 4.5.4.C 4.5.8.C 4.3.4.D 3.1.B.A2	Standards: 4.1.10.A 4.1.10.B 4.1.12.A 4.1.4.A 4.1.12.C 4.1.4.E 4.1.7.E 4.1.10.E 4.5.10.D 4.2.8.A 4.2.10.A 4.2.12.A 4.2.10.B 4.2.12.B 4.2.10.C 4.2.12.C 4.3.12.A 4.3.10.B 4.5.10.B 4.5.12.B 4.5.4.C 4.5.7.C
Lesson Essential Question What are the main trophic levels in an ecosystem?	Lesson Essential Question What are the four major biogeochemical cycles?	Lesson Essential Question How is climate important to the biotic and abiotic

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How does energy flow in an ecosystem?		factors that influence an ecosystem?
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Vocabulary Producer, Consumer Herbivore, Carnivore Detrivore, Autotroph Heterotroph	Vocabulary Water Cycle, Nitrogen cycle, Oxygen – carbon dioxide cycle, Phosphorus cycle, Legumes Productivity, Nitrogen fixation, Limiting nutrient	Vocabulary Biotic factors, Abiotic factors, Climate Weather, Greenhouse effect, Habitat, Niche Succession

Concept	Concept	Concept
Standards:	Standards:	Standards:
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Lesson Essential Question	Lesson Essential Question	Lesson Essential Question
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Vocabulary	Vocabulary	Vocabulary

Additional Information/Resources:

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STUDENT LEARNING MAP

Course/Subject: Biology
Topic: Ecology 2

Days: 5
Grade Level: 9

Key Learning

1. Limiting factors impact population dynamics and potential species extinction.
2. Ecosystems change in response to natural and human disturbances.












Unit Essential Question

How are populations and ecosystems affected by human and natural disturbances?

Concept Population Growth	Concept Environmental Issues: Types and Impact	Concept Conservation and Restoration
Standards: 4.1.4.A 4.1.10.A 4.1.12.A 4.1.7.E 4.1.10.E 4.1.4.E 4.2.10.C 4.5.3.D 4.5.5.D 4.5.6.D 4.5.10.D 4.2.10.A 4.2.7.A 4.2.8.A 4.2.10.B 4.4.6.A 4.4.6.B 4.4.3.C 4.4.5.C 4.5.7.B 4.5.7.C	Standards: 4.1.10.A 4.1.10.B 4.1.12.A 4.1.4.A 4.1.12.C 4.1.4.E 4.1.7.E 4.1.10.E 4.5.10.D 4.2.8.A 4.2.10.A 4.2.12.A 4.2.10.B 4.2.12.B 4.2.10.C 4.2.12.C 4.3.12.A 4.3.10.B 4.5.10.B 4.5.12.B 4.5.4.C 4.5.7.C	Standards: 4.1.10.A 4.1.10.B 4.1.12.A 4.1.4.A 4.1.12.C 4.1.4.E 4.1.7.E 4.1.10.E 4.5.10.D 4.2.8.A 4.2.10.A 4.2.12.A 4.2.10.B 4.2.12.B 4.2.10.C 4.2.12.C 4.3.12.A 4.3.10.B 4.5.10.B 4.5.12.B 4.5.4.C 4.5.7.C
Lesson Essential Question What are the patterns of population growth?	Lesson Essential Question How have humans affected the environment?	Lesson Essential Question What we do to help prevent further damage to and

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What factors affect population growth		restore the environment?
		
Vocabulary carrying capacity, exponential and logistic growth, density dependent and density independent factors, extinction	Vocabulary greenhouse effect, climate change, ozone depletion, pollution, extinction, biological magnification, non-native species	Vocabulary sustainability, waste management, eco-tourism, recycle, restoration, conservation, Environmental Protection Agency

Concept	Concept	Concept
Standards:	Standards:	Standards:
		
Lesson Essential Question	Lesson Essential Question	Lesson Essential Question
		
Vocabulary	Vocabulary	Vocabulary

Additional Information/Resources:

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Course/Subject: Biology
Topic: Cells and Cellular Interactions

Days: 7
Grade Level: 9

Key Learning

Cells are the basic unit of structure and function of living things.



Unit Essential Question

How does cell structure relate to function and the organization of living things?

<p>Concept Cell theory</p> <p>Standards: 3.1.B.A1 3.1.B.C2 4.1.3.A 4.1.4.A</p>	<p>Concept Cell structure</p> <p>Standards: 3.1.B.A1 3.1.B.A5 3.1.B.C2 4.1.4.A 3.1.B.A6 3.1.B.A2</p>	<p>Concept Cell boundaries</p> <p>Standards: 3.1.B.A5 3.1.B.A2 3.1.B.A4 3.1.B.A7 3.2.C.A1 3.2.B.B6</p>
<p style="text-align: center;">↓</p> <p>Lesson Essential Question What are the three components of the cell theory? What is a cell?</p>	<p style="text-align: center;">↓</p> <p>Lesson Essential Question What are the basic cell organelles? How is organelle structure related to function? What are the main organelles in a prokaryotic cell? What are the main organelles in a Eukaryotic cell?</p>	<p style="text-align: center;">↓</p> <p>Lesson Essential Question What factors affect osmosis and diffusion? Compare the processes of osmosis and diffusion.</p>
<p style="text-align: center;">↓</p> <p>Vocabulary Cell, Cell theory</p>	<p style="text-align: center;">↓</p> <p>Vocabulary Organelle, cytoplasm, nuclear envelope, chromosome, nucleolus,</p>	<p style="text-align: center;">↓</p> <p>Vocabulary Cell membrane, phospholipid bilayer, concentration gradient,</p>

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	Ribosome, endoplasmic reticulum, Golgi apparatus, lysosome, vacuole, mitochondria, chloroplast, cytoskeleton, centriole	equilibrium, osmosis, diffusion, hypertonic, hypotonic, isotonic, active transport, facilitated diffusion, endocytosis, exocytosis, Phagocytosis, pinocytosis
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Concept	Concept	Concept
Standards:	Standards:	Standards:
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Lesson Essential Question	Lesson Essential Question	Lesson Essential Question
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Vocabulary	Vocabulary	Vocabulary

Additional Information/Resources:

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STUDENT LEARNING MAP

Course/Subject: Biology
Topic: Homeostasis and Transport

Days: 7
Grade Level: 9

Key Learning

Through a variety of mechanisms, organisms maintain a biological balance between their internal and external environments.



Unit Essential Question

How do organisms maintain homeostasis?

Concept Plasma Membrane	Concept Passive Transport	Concept Active Transport
Standards: 3.1.B.A5 3.1.B.A2 3.1.B.A4 3.1.B.A7 3.2.C.A1 3.2.B.B6	Standards: 3.1.B.A5 3.1.B.A2 3.1.B.A7 3.2.C.A1 3.2.B.B6	Standards: 3.1.B.A5 3.1.B.A2 3.1.B.A7 3.2.C.A1 3.2.B.B6
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Lesson Essential Question How does the structure of the plasma membrane help selectively regulate what passes in and out of a cell?	Lesson Essential Question How do passive transport mechanisms move materials across a membrane and contribute to homeostasis?	Lesson Essential Question How do active transport mechanisms move materials across a membrane and contribute to homeostasis?
↓	↓	↓
Vocabulary Selectively permeable, permeable, impermeable, phospholipid bilayer, fluid mosaic model, hydrophilic, hydrophobic, embedded proteins	Vocabulary Passive transport, diffusion, dynamic equilibrium, osmosis, concentration gradient, facilitated diffusion, ion channel, tonicity, hypotonic, isotonic, hypertonic; osmotic pressure, homeostasis	Vocabulary Sodium potassium pump, active transport, endocytosis, exocytosis, pinocytosis, phagocytosis

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Concept Intracellular Transport	Concept Feedback Mechanisms and Homeostasis	Concept
Standards: 3.1.B.A5 3.1.B.A2	Standards: 3.1.B.A8 3.1.B.A5 4.5.4.D 4.2.4.C	Standards:
↓	↓	↓
Lesson Essential Question What roles to the ER and Golgi apparatus play in intracellular transport?	Lesson Essential Question How do multicellular organisms use feedback mechanisms to maintain homeostasis?	Lesson Essential Question
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Vocabulary Endoplasmic reticulum, Golgi apparatus, vesicles	Vocabulary Cell specialization, thermoregulation, water regulation, oxygen regulation, chemical regulation (pH/buffers, hormone, electrolyte)	Vocabulary

Additional Information/Resources:

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Course/Subject: Biology
Topic: Cellular Energetics

Days: 7
Grade Level: 9

Key Learning

Living things require energy to survive.



Unit Essential Question

How does a living thing gain and utilize energy?

<p>Concept Glycolysis and the Krebs cycle</p>	<p>Concept ETC and Fermentation</p>	<p>Concept Photosynthesis</p>
<p>Standards: 3.1.B.A2 3.1.B.A5 3.1.C.A1 4.1.10.C 3.1.C.A2</p>	<p>Standards: 3.1.B.A2 3.1.B.A5 3.1.C.A1 4.1.10.C 3.1.C.A2</p>	<p>Standards: 3.1.B.A2 3.1.B.A5 3.1.C.A1 4.1.10.C 3.1.B.A2 3.1.B.A5 3.1.C.A1 3.1.C.A2</p>
<p>Lesson Essential Question What are the major processes in glycolysis? Why is glycolysis necessary for life? What are the major processes in the Krebs Cycle?</p>	<p>Lesson Essential Question What are the major processes in the ETC? What are the major processes in lactic acid and alcoholic fermentation? Why is respiration necessary for life?</p>	<p>Lesson Essential Question What are the major processes of the light and dark reactions? Why is photosynthesis necessary for life? Compare photosynthesis and cellular respiration.</p>
<p>Vocabulary Glycolysis Cellular respiration NAD+</p>	<p>Vocabulary ETC Lactic acid Alcoholic fermentation</p>	<p>Vocabulary Pigment Chlorophyll Thylakoid</p>

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FAD+ ATP	Aerobic Anaerobic ATP synthase	Stroma Dark reactions Light reactions NADP+ Calvin cycle
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<u>Concept</u>	<u>Concept</u>	<u>Concept</u>
<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
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<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>
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<u>Vocabulary</u>	<u>Vocabulary</u>	<u>Vocabulary</u>

<u>Additional Information/Resources:</u>

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STUDENT LEARNING MAP

Course/Subject: Biology
Topic: Mitosis and Meiosis

Days: 7
Grade Level: 9

Key Learning

Why are the processes of mitosis and meiosis important to a cell?



Unit Essential Question

How do cells grow and reproduce?

Concept Why is mitosis important to cell growth?	Concept Why is meiosis referred to as a reduction division?	Concept How are meiosis and mitosis similar and different?
Standards: 3.1.B.A3 3.1.B.A4 3.1.B.A5 3.1.B.B2 3.1.B.B3 3.1.B.B5 3.1.B.C2 3.1.C.C2	Standards: 3.1.B.A4 3.1.B.A5 3.1.B.B2 3.1.B.B3 3.1.B.B5 3.1.B.C2 3.1.C.C2	Standards: 3.1.B.A4 3.1.B.A5 3.1.B.B2 3.1.B.B3 3.1.B.B5 3.1.B.C2 3.1.C.C2
↓	↓	↓
Lesson Essential Question What are the stages of mitosis?	Lesson Essential Question What are the stages of meiosis?	Lesson Essential Question Compare the importance of mitosis and meiosis?
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Vocabulary Interphase, Prophase, Metaphase, Anaphase, Telophase, Cytokinesis, Cell cycle, Spindle	Vocabulary Prophase II, Metaphase II, Anaphase II, Telophase II, Gametogenesis, Diploid, Haploid, Homologous, karyotyping	Vocabulary Crossing over, Gametes, Somatic cells

Concept	Concept	Concept
Standards:	Standards:	Standards:

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<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>
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<u>Vocabulary</u>	<u>Vocabulary</u>	<u>Vocabulary</u>

Additional Information/Resources:

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Course/Subject: Biology
Topic: Genetics

Days: 15
Grade Level: 9

Key Learning

1. DNA segments contain information for the production of proteins necessary for growth and function of cells. 2. Genetic engineering has transformed and continues to transform the fields of medicine, forensics, and agriculture.



Unit Essential Question

How do organisms use nucleic acids to make proteins? What factors affect gene expression?

Concept DNA: Past, Present and Future	Concept DNA Replication	Concept Transcription
Standards: 3.1.B.B3	Standards: 3.1.B.B3	Standards: 3.1.B.B3
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Lesson Essential Question What are the chemical components of DNA? What clues helped scientists solve the structure of DNA?	Lesson Essential Question How does a DNA molecule make a copy of itself?	Lesson Essential Question How does RNA differ from DNA? How does the cell make a protein?
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Vocabulary Deoxyribonucleic acid, nucleotides, nucleic acid, covalent bonds, nitrogenous bases, adenine, guanine, cytosine, thymine, base pairing, double helix, Rosalind Franklin, James Watson, Francis Crick, electrophoresis gel	Vocabulary Replication, DNA polymerase	Vocabulary Ribonucleic acid (RNA), messenger RNA, ribosomal RNA, transfer RNA, transcription, RNA polymerase

Concept Translation	Concept Mutations and Gene Expression	Concept Biotechnologies
Standards:	Standards:	Standards:

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3.3.B.B3	3.1.B.B3 3.1.B.C2	3.1.B.B4
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<u>Lesson Essential Question</u> What is the genetic code, and how is it read? What role does the ribosome play in assembling proteins?	<u>Lesson Essential Question</u> What are mutations? How do mutations affect gene expression?	<u>Lesson Essential Question</u> How has genetic engineering transformed the fields of medicine, forensics, and agriculture.?
↓	↓	↓
<u>Vocabulary</u> Ribosome, amino acid, polypeptides, genetic code, codon, anticodon, translation, gene expression	<u>Vocabulary</u> Mutations, point mutations, frameshift mutations, mutagens, polyploidy	<u>Vocabulary</u> Biotechnologies

Additional Information/Resources:

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Course/Subject: Biology
Topic: Genetics

Days: 10
Grade Level: 9

Key Learning

Patterns of inheritance can be used to predict genotypes and phenotypes of offspring.



Unit Essential Question

How can observed patterns of inheritance be used to predict genotypes and phenotypes of offspring?

Concept Mendelian Genetics	Concept Human Genetics	Concept Mutations
Standards: 3.1.B.B5	Standards: 3.1.B.B5	Standards: 3.1.B.B5 3.1.B.B6
↓	↓	↓
Lesson Essential Question Why is Mendel known as the father of genetics? How do genotypes influence phenotypes? How would you explain the various patterns of inheritance described by Mendel?	Lesson Essential Question What are common inheritance patterns found in humans? How can karyotypes and pedigrees be used in human genetics?	Lesson Essential Question What are some examples of common mutations that occur at the gene and chromosome level? How do mutations affect gene expression?
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Vocabulary Independent assortment, law of segregation, genotype, phenotype, allele, gene, heterozygous, homozygous, punnett square, probability, monohybrid cross, dihybrid cross, autosomal dominant, autosomal recessive, codominance, incomplete dominance	Vocabulary polygenic inheritance, multiple alleles, karyotypes, pedigrees	Vocabulary crossing-over, nondisjunction, duplication, translocation, deletion, insertion, inversion, frameshift mutation, point mutations, silent, nonsense, missense

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<u>Concept</u>	<u>Concept</u>	<u>Concept</u>
<u>Standards:</u>	<u>Standards:</u>	<u>Standards:</u>
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<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>	<u>Lesson Essential Question</u>
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<u>Vocabulary</u>	<u>Vocabulary</u>	<u>Vocabulary</u>

Additional Information/Resources:

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STUDENT LEARNING MAP

Course/Subject: Biology
Topic: Evolution

Days: 5
Grade Level: 9

Key Learning

Natural processes as described by the theory of evolution effect change in a population over time?






Unit Essential Question

How do natural processes as described by the theory of evolution effect change in a population over time?

Concept Darwin's Theory	Concept Evidence to Support Evolution	Concept Types of Natural Selection
Standards: 3.1.B.C3 3.1.B.C4	Standards: 3.1.B.C2 3.1.B.C3	Standards: 3.1.B.C1
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Lesson Essential Question How does Darwin's theory differ from other theories of evolution?	Lesson Essential Question How do the different types of evidence support the theory of evolution?	Lesson Essential Question How can populations change over time?
↓	↓	↓
Vocabulary Evolution, Natural Selection, Charles Darwin, Charles Lamarck	Vocabulary Fossil Record, Comparative Anatomy, Homologous Structures, Vestigial Structures, Artificial Selection	Vocabulary Microevolution, Macroevolution, Adaptation, Fitness, Disruptive Selection, Stabilizing Selection, Directional Selection

Concept Speciation	Concept	Concept
Standards: 3.1.B.C1	Standards:	Standards:
↓	↓	↓
Lesson Essential Question	Lesson Essential Question	Lesson Essential Question

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What are the factors that can lead to the formation of a new species? How can speciation happen?		
		
<u>Vocabulary</u> Speciation, Geographic Isolation, Reproductive Isolation, Genetic Drift, Bottleneck Effect, Founders Effect, Microevolution, Macroevolution, Gene Pool, Mutation, Divergent Evolution, Convergent Evolution	<u>Vocabulary</u>	<u>Vocabulary</u>

Additional Information/Resources:

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Course/Subject: Biology
Topic: Frog dissection

Days: 5
Grade Level: 9

Key Learning

Frog internal structures and functions are similar to humans









Unit Essential Question

Compare frog internal structure and function to humans

Concept Frog external and digestive features	Concept Frog reproductive and excretory features	Concept Frog heart and brain
Standards: 3.1.B.A8	Standards: 3.1.B.A8	Standards: 3.1.B.A8
↓	↓	↓
Lesson Essential Question How is structure related to function at the cellular level of biological organization?	Lesson Essential Question How do organisms maintain a biological balance between their internal and external environments?	Lesson Essential Question What are the advantages of multicellularity?
↓	↓	↓
Vocabulary Nares, chromatophore, tympanum, liver, gall bladder, cloaca, pancreas, bile duct, small intestine, large intestine, stomach, mesentary	Vocabulary Bladder, fat bodies, kidney, adrenal glands, ureter, oviduct, testes, ovary	Vocabulary Olfactory lobe, optic lobe, cerebrum, cerebellum, medulla oblongata, pineal gland, atrium, ventricle, septum

Concept	Concept	Concept
Standards:	Standards:	Standards:

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<u>Lesson Essential Question</u>			<u>Lesson Essential Question</u>			<u>Lesson Essential Question</u>		
								
<u>Vocabulary</u>			<u>Vocabulary</u>			<u>Vocabulary</u>		

Additional Information/Resources: