

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Science of Biology

Time Allotment: 11 days

Unit Sequence: 1

Major Concepts to be learned:

- Scientific Method
- Characteristics of Life
- Metric System

Expected Skills to be demonstrated:

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|---|--|
| <ul style="list-style-type: none">• Identify the parts of an experiment• Compare/Contrast correct vs incorrect experimental designs• Compare/Contrast living vs non-living• Analyze data to draw conclusions | <ul style="list-style-type: none">Design a controlled experimentMicroscopes parts and use of microscopesConvert units within the metric system |
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PA Standards/Anchors:

Eligible Content:

3.1.9-12.A
3.1.9-12.B
3.1.9-12.D
NGSS ETS2.B

Instructional Strategies:

Assessments:

Direct Instruction	Lab
Group Work	Demonstrations
Microscope Use	Worksheets/Reading Guides
Homework	Real-life video clips

Lab
Homework
Vocabulary
Chapter Review
Chapter Test

Grade level: 9th

Course Title: Biology 9

Topic/Concept: The Chemistry of Life

Time Allotment: 14 days

Unit Sequence: 2

Major Concepts to be learned:

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| <ul style="list-style-type: none">• Periodic Table• Water Properties• Macromolecules | <ul style="list-style-type: none">Chemical BondsAcids/BasesEnzymes |
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Expected Skills to be demonstrated:

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| <ul style="list-style-type: none">• Find patterns/trends in the periodic table• Identify electrons, valence electrons, oxidation numbers, atomic mass from the periodic table• Differentiate between covalent and ionic bonds• Predict covalent/ionic bonds given a set of elements• Draw structures of covalent bonds• Distinguish between different types of macromolecules• Show sensitivity of enzymes to pH/Temperature changes |
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PA Standards/Anchors:

Eligible Content:

3.1.9-12.F NGSS LS1.A	
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Instructional Strategies:

Assessments:

Direct Instruction Worksheets/Reading Guides Real-life Video clips	Demonstrations Homework	Homework Worksheets Quiz Chapter Review Vocabulary Chapter Test
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Grade level: 9th

Course Title: Biology 9

Topic/Concept: The Biosphere

Time Allotment: 10-11 days

Unit Sequence: 3

Major Concepts to be learned:

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| <ul style="list-style-type: none">• Biotic/Abiotic Factors• Food chains/webs• Ecological pyramids | <ul style="list-style-type: none">• Ecological Levels of Organization• Trophic levels• Nutrient cycles |
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Expected Skills to be demonstrated:

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| <ul style="list-style-type: none">• Identify biotic/abiotic factors• Predict how biotic/abiotic factors affect the environment• Identify the levels of organization• Understand the difference between energy flow and nutrient cycles• Show the connection of human activities to nutrient cycle• Understand the importance/impact of keystone species on an ecosystem |
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PA Standards/Anchors:

Eligible Content:

3.1.9-12.E	3.1.9-12.G	3.1.9-12.L	
3.1.9-12.H	3.1.9-12.I	3.1.9-12.M	
3.1.9-12.J	3.1.9-12.K	NGSS LS2.B	

Instructional Strategies:

Assessments:

Direct instruction	Homework	Alaska Food Chain case study Homework Vocabulary Chapter review Chapter test
Real-life Video clips	Group Work	
Scientific case study	Graphic organizers	
Graphs		

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Ecosystems and Communities

Time Allotment: 15-16 days

Unit Sequence: 4

Major Concepts to be learned:

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|--|---|
| <ul style="list-style-type: none">• Climate• Keystone species• Climax Communities• Aquatic Ecosystems | <ul style="list-style-type: none">• Community Interactions• Ecological succession• Biomes |
|--|---|

Expected Skills to be demonstrated:

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|---|
| <ul style="list-style-type: none">• Understand the main factors affecting an area's climate• Predict how climate change impacts organisms• Identify different types of community interactions and symbioses• Predict what happens when ecosystems are disturbed/left alone• Identify the role of keystone species on an ecosystem• Identify the factors that affect aquatic ecosystems |
|---|

PA Standards/Anchors:

Eligible Content:

3.1.9-12.H	3.1.9-12.I	3.1.9-12.J	
3.1.9-12.L	3.1.9-12.M	3.1.9-12.O	
NGSS LS2.A			

Instructional Strategies:

Assessments:

Direct instruction	Homework	Biome Project Homework Vocabulary Chapter Review Chapter Test
Real-life video clips	Scientific articles	
Biome research	Worksheets	

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Populations

Time Allotment: 6-7 days

Unit Sequence: 5

Major Concepts to be learned:

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| <ul style="list-style-type: none">• Factors affecting population growth• Limits to population growth• Invasive species | Growth curves
Human population growth |
|--|--|

Expected Skills to be demonstrated:

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| <ul style="list-style-type: none">• Identify factors affecting population growth rates• Identify stages of population growth from graphs• Explain how carrying capacity can change• Understand how predator/prey relationships affect population growth• Predict the effect of invasive species on populations• Identify factors affecting human population/growth• Explain the differences between developed/developing countries |
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PA Standards/Anchors:

Eligible Content:

3.1.9-12.M NGSS LS2.A	
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Instructional Strategies:

Assessments:

Direct Instruction Graphing Homework	Invasive species homework Vocabulary Chapter review Chapter test
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Grade level: 9th

Course Title: Biology 9

Topic/Concept: Humans in the Biosphere

Time Allotment: 7-8 days

Unit Sequence: 6

Major Concepts to be learned:

- Negative impacts of a growing human population on the environment
- Sustainability
- Renewable/non-renewable resources
- Types of environmental resources
- Biodiversity

Expected Skills to be demonstrated:

- Identify renewable/non-renewable resources
- Develop solutions to human-caused environmental issues

PA Standards/Anchors:

Eligible Content:

3.1.9-12.N
3.1.9-12.V
3.1.9-12.X
NGSS LS2.C

Instructional Strategies:

Assessments:

Direct Instruction
Environmental Research Project
Real-life video clips

Project

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Cell Structure and Function

Time Allotment: 11-12 days

Unit Sequence: 7

Major Concepts to be learned:

- Prokaryote vs Eukaryote
- Organelles
- Cellular Transport
- Homeostasis

Expected Skills to be demonstrated:

- Understand functions of organelles
- Understand how organelles work together to keep cell alive
- Label cell parts
- Identify similarities/differences between plant, animal and bacterial cells
- Conduct an experiment to show how a cell's environment affects homeostasis

PA Standards/Anchors:

Eligible Content:

3.1.9-12.B
3.1.9-12.C
NGSS LS1.A

Instructional Strategies:

Assessments:

Direct Instruction
Cells Alive interactive website
Demonstration – selective permeability
Compare/Contrast different cells chart
Experiment – homeostasis lab
Real-life video clips

Homework	Chart
Cells Alive packet	Lab
Vocabulary	Review
Test	

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Photosynthesis

Time Allotment: 6-7 days

Unit Sequence: 8

Major Concepts to be learned:

- Energy Conversion
- Photosynthesis process
- Heterotrophs vs Autotrophs

Expected Skills to be demonstrated:

- Understand the connection between photosynthesis and cellular respiratoin
- Connect photosynthesis to the Carbon cycle
- Understand how light color affects the rate of photosynthesis
- Understand how water affects the rate of photosynthesis

PA Standards/Anchors:

3.1.9-12.B	3.1.9-12.C	3.1.9-12.E
3.1.9-12.F	3.1.9-12.H	3.1.9-12.J
3.1.9-12.K	NGSS LS1.C	

Eligible Content:

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Instructional Strategies:

Direct instruction
Guided Notes
Homework
Worksheets
Virtual Lab

Assessments:

Homework
Virtual Lab
Vocabulary
Chapter Review
Chapter test

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Cellular Respiration

Time Allotment: 6 days

Unit Sequence: 9

Major Concepts to be learned:

- Cellular Respiration vs Photosynthesis
- Process of cellular respiration

Expected Skills to be demonstrated:

- Compare/contrast cellular respiration and photosynthesis
- Investigate the affect of exercise on CO2 production
- Understand how molecules are broke down and energy is released

PA Standards/Anchors:

Eligible Content:

3.1.9-12.B	3.1.9-12.F	3.1.9-12.G	
3.1.9-12.H	3.1.9-12.J	3.1.9-12.K	
NGSS LS1.C			

Instructional Strategies:

Assessments:

Direction instruction Worksheets Homework Exercise Lab	Homework Exercise Lab Vocabulary Chapter review Chapter test
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Grade level: 9th

Course Title: Biology 9

Topic/Concept: Cell Growth and Division

Time Allotment: 9 days

Unit Sequence: 10

Major Concepts to be learned:

- Reasons why cells divide
- Stages of cell division
- Controlling cell division
- Cell differentiation

Expected Skills to be demonstrated:

- Calculate surface area and volume ratios
- Understand the issues faced by larger cells
- Compare/Contrast types of reproduction
- Identify stages of the cell cycle
- Understand factors that affect the cell cycle
- Understand how different types of cells arise from the same set of instructions

PA Standards/Anchors:

Eligible Content:

3.1.9-12B
3.1.9-12.D
3.1.9-12.P
NGSS LS1.B

Instructional Strategies:

Assessments:

Direct instruction
Calculations
Worksheet
Homework
Observation – microscopes
Real-life Video Clips

Homework
Vocabulary
Chapter Review
Chapter Test

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Genetics

Time Allotment: 11-12 days

Unit Sequence:11

Major Concepts to be learned:

- Mendel's experiments
- One and Two factor crosses (Punnett squares)
- Other inheritance patterns
- Meiosis

Expected Skills to be demonstrated:

- Understand the importance of Mendel's work
- Predict the results of one factor crosses
- Predict the results of two factor crosses
- Predict the results of other inheritance patterns – incomplete dominance/codominance/multiple alleles
- Identify stages of Meiosis
- Compare/Contrast Mitosis vs Meiosis

PA Standards/Anchors:

Eligible Content:

3.1.9-12.A
3.1.9-12.P
3.1.9-12.Q
3.1.9-12.R
NGSS LS3.B

Instructional Strategies:

Assessments:

Direct Instruction
Homework
Practice worksheets
Group work

Homework
Vocabulary
Chapter Review
Chapter Test

Grade level: 9th

Course Title: Biology 9

Topic/Concept: DNA, RNA and Protein Synthesis

Time Allotment: 9 days

Unit Sequence: 12

Major Concepts to be learned:

- DNA Structure
- DNA Replication
- Types of RNA
- Protein synthesis
- Mutations

Expected Skills to be demonstrated:

- Build the structure of DNA
- Identify the parts of a DNA/RNA molecule
- Relate DNA Replication to Mitosis/Meiosis
- Identify types of RNA based on location/function
- Connect the parts of the cell to their function in protein synthesis
- Understand and visualize how mutations affect protein structure and function

PA Standards/Anchors:

Eligible Content:

3.1.9-12.A	3.1.9-12.B	3.1.9-12.P	
3.1.9-12.Q	NGSS LS3.A	NGSS LS3.B	

Instructional Strategies:

Assessments:

Direction instruction	Diagrams	Homework Vocabulary Chapter Review Chapter Test
Worksheets	Compare/Contrast mitosis vs meiosis	
Homework	Real-life video clips	
DNA Models	DNA extraction demonstration	

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Human Heredity

Time Allotment: 7 days

Unit Sequence: 13

Major Concepts to be learned:

- Karyotyping
- Human Traits
- Pedigrees
- Human Genetic disorders
- The human genome

Expected Skills to be demonstrated:

- Recognize sex/genetic disorders from karyotypes
- Predict the inheritance of sex-linked disorders
- Identify genotypes/phenotypes from pedigrees
- Understand why recessive disorders persist in populations and possible advantages to being carriers
- Relate nondisjunctions in humans to Meiosis
- Understand gel electrophoresis basics

PA Standards/Anchors:

Eligible Content:

3.1.9-12.A
3.1.9-12.P
3.1.9-12.Q
3.1.9-12.R
NGSS LS3.A

Instructional Strategies:

Assessments:

Direct instruction
Demonstrations – gel electrophoresis
BLAST search – genetic homology
Practice problems

Vocabulary
Chapter Review
Chapter Test

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Genetic Engineering

Time Allotment: 7-8 days

Unit Sequence: 14

Major Concepts to be learned:

- Selective Breeding
- Recombinant DNA
- Transgenic organisms
- Applications of genetic engineering

Expected Skills to be demonstrated:

- Compare/contrast selective breeding and genetic engineering
- Compare/contrast hybridization vs inbreeding
- Understand how DNA can be moved from organism to organism
- Compare/contrast cloning vs sexual reproduction
- Match DNA fingerprints

PA Standards/Anchors:

Eligible Content:

3.1.9-12.A
3.1.9-12.P
3.1.9-12.Q
NGSS LS3.B

Instructional Strategies:

Assessments:

Direct instruction
Reading guide
Real-life video clips

Vocabulary
Chapter review
Chapter test

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Theory of Evolution

Time Allotment: 8-9 days

Unit Sequence: 15

Major Concepts to be learned:

- Darwin's experiences that shaped his thinking
- Other influences on Darwin
- Natural selection
- Evidence for evolution

Expected Skills to be demonstrated:

- Understand how Darwin's experiences shaped his Theory
- Compare/Contrast a theory vs a hypothesis
- Apply evidence to support the theory of evolution
- Predict the survival/adaptability of species
- Discuss and evaluate experiments showing how humans are causing evolution

PA Standards/Anchors:

Eligible Content:

3.1.9-12.S	3.1.9-12.T	3.1.9-12.U	
3.1.9-12.W	3.1.9-12.X		
NGSS LS4.B			

Instructional Strategies:

Assessments:

Direct Instruction Real-life Video clips Reading Guides Peppered moth lab Research article – Anthropogenic evolution	Reading guide Vocabulary Chapter review Chapter test
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Grade level: 9th

Course Title: Biology 9

Topic/Concept: Evolution of Populations

Time Allotment: 11 days

Unit Sequence: 16

Major Concepts to be learned:

- Genetic variation
- Evolution of populations
- Genetic drift
- Genetic equilibrium
- Speciation
- Molecular evolution

Expected Skills to be demonstrated:

- Calculate allele, genotype and phenotype frequencies
- Predict genotype and phenotype frequencies given a population
- Test natural selection versus equilibrium
- Show how genetic drift alters populations
- Test and understand the importance of genetic diversity
- Infer evolutionary relationships based on genetic differences
- Show how new species are formed

PA Standards/Anchors:

Eligible Content:

3.1.9-12.Q	3.1.9-12.R	3.1.9-12.S	
3.1.9-12.U	3.1.9-12. W	3.1.9-12.X	
NGSS LS4.C			

Instructional Strategies:

Assessments:

Direct instruction Math probabilities Genetic Bottleneck activity – Black-footed Ferrets Reading guides Real-life video clips Lab - test genetic equilibrium “Goldfish lab” Homework	Homework Genetic Bottleneck activity Goldfish lab Vocabulary Chapter Review Chapter Test
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Grade level: 9th

Course Title: Biology 9

Topic/Concept: Classification

Time Allotment: 5-8 days (time permitting)

Unit Sequence: 17

Major Concepts to be learned:

- Naming and classification of organisms
- Cladograms
- Three Domains of life

Expected Skills to be demonstrated:

- Practice naming organisms
- Use dichotomous keys to identify organisms
- Demonstrate why using evolutionary relationships is better than using morphology to determine ancestry
- How to read and draw cladograms
- Identify similarities and differences among the Three Domains of Life

PA Standards/Anchors:

Eligible Content:

NGSS LS4.A

Instructional Strategies:

Assessments:

Grade level: 9th

Course Title: Biology 9

Topic/Concept: Review for Keystone Exams

Time Allotment: 3-5 days

Unit Sequence: 18

Major Concepts to be learned:

- Review various topics that were a weakness on the Firefly tests

Expected Skills to be demonstrated:

- Varies

PA Standards/Anchors:

Varies by year

Eligible Content:

Instructional Strategies:

Look over previous Keystone exam questions
Practice sample questions

Assessments: