

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Molecules of Life

Time Allotment: 7 days

Unit Sequence: 1

Major Concepts to be learned:

- Review Chemistry patterns/trends on periodic table
- Water properties
- Organic compounds
- Macromolecules of life

Expected Skills to be demonstrated:

- Apply patterns on periodic table to make chemical compounds
- Understand the importance of water properties to supporting life
- Name simple organic compound with/without skeletal structures
- Identify chemical formulas from skeletal structures
- Compare/contrast the 4 major macromolecules of life

PA Standards/Anchors:

Eligible Content:

3.1.9-12.A
3.1.9-12.F
3.1.9-12.G

Instructional Strategies:

Assessments:

Direct Instruction
Practice Problems
Video clips

Vocabulary
Chapter review
Chapter test

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: The Cell

Time Allotment: 11-14 days

Unit Sequence: 2

Major Concepts to be learned:

- Prokaryotic vs Eukaryotic
- Organelles
- Microscope Parts

Expected Skills to be demonstrated:

- Present information on a cell component
- Compare/contrast Prokaryotic vs Eukaryotic
- Use Microscopes properly
- Use oil immersion

PA Standards/Anchors:

Eligible Content:

3.1.9-12.B

Instructional Strategies:

Assessments:

Direct Instruction
Presentations
Worksheets
Microscope use
Video Clips

Vocabulary
Chapter review
Chapter test
Presentations
Bacteria observations

Grade level: 11-12

Course Title: Advanced Biology

**Topic/Concept: Membrane Structure
& Function**

Time Allotment: 6 days

Unit Sequence: 3

Major Concepts to be learned:

- Fluid Mosaic Model
- Types of membrane proteins
- Passive transport
- Active transport

Expected Skills to be demonstrated:

- Determine factors that affect a membrane's fluidity and permeability
- Distinguish between different types of membrane proteins
- Compare/Contrast passive vs. active transport

PA Standards/Anchors:

Eligible Content:

3.1.9-12.A
3.1.9-12.B 3.1.9-12.C

Instructional Strategies:

Assessments:

Direct Instruction
Demonstration
Video Clips

Vocabulary
Chapter review
Chapter test

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Cellular Respiration

Time Allotment: 6-7 days

Unit Sequence: 4

Major Concepts to be learned:

- Substrate level phosphorylation
- Oxidative phosphorylation
- Aerobic pathways
- Anaerobic pathways

Expected Skills to be demonstrated:

- Identify Substrate-level vs oxidative phosphorylation
- Compare/Contrast aerobic vs anaerobic pathways
- Understand how the exergonic flow of energy stored in food is used to make ATP
- Track carbon atoms in Glycolysis and the Citric Acid cycle

PA Standards/Anchors:

Eligible Content:

3.1.9-12.G
3.1.9-12.J
3.1.9-12.K

Instructional Strategies:

Assessments:

Direct Instruction
Lab

Vocabulary
Chapter review
Chapter test
Lab

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Photosynthesis

Time Allotment: 5 days

Unit Sequence: 5

Major Concepts to be learned:

- Light dependent reactions
- Calvin cycle
- Chloroplast structure

Expected Skills to be demonstrated:

- Identify/Label the parts of the chloroplast where reactions occur
- Identify colors of light that provide the most energy
- Compare/Contrast adaptations to harsh environments
- Track carbon atoms through the Calvin cycle
- Compare/Contrast photosynthesis vs cellular respiration

PA Standards/Anchors:

Eligible Content:

3.1.9-12.B	3.1.9-12.E	3.1.9-12.F	
3.1.9-12.G	3.1.9-12.K		

Instructional Strategies:

Assessments:

Direct Instruction Video Clips	Vocabulary Chapter review Chapter test
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Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: The Cell Cycle

Time Allotment: 9 days

Unit Sequence: 6

Major Concepts to be learned:

- Apoptosis
- Cell Division
- Cell Cycle Control Mechanisms
- Cancer

Expected Skills to be demonstrated:

- Identify reasons why cells undergo apoptosis
- Connect apoptosis to cancer
- Identify the stages of Mitosis from pictures
- Understand reasons why cells divide
- Identify mechanisms that prevent cells from dividing or allow cells to divide
- Research a type of cancer related to the cell cycle
- Connect cancer to genetics (genes)
- Observe mitotic stages under a microscope

PA Standards/Anchors:

Eligible Content:

3.1.9-12.A
3.1.9-12.C
3.1.9-12.D
3.1.9-12.P

Instructional Strategies:

Assessments:

Direct Instruction
Cancer gene research
Video Clips
Drawings
Worksheet
Microscopes

Vocabulary
Chapter review
Chapter test
Cancer gene research

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Meiosis

Time Allotment: 7 days

Unit Sequence: 7

Major Concepts to be learned:

- Stages of Meiosis
- Karyotyping
- Meiosis mistakes
- Mitosis vs Meiosis
- Independent Assortment

Expected Skills to be demonstrated:

- Compare/Contrast Mitosis and Meiosis
- Identify the stages of Meiosis from pictures
- Predict what happens during nondisjunctions
- Determine disorders from karyotypes
- Draw stages of meiosis
- Compare/contrast sexual vs asexual reproduction
- Understand how independent assortment and crossing over produce genetic diversity

PA Standards/Anchors:

Eligible Content:

3.1.9-12.D
3.1.9-12.Q
3.1.9-12.R

Instructional Strategies:

Assessments:

Direct Instruction
Video clips
Drawings
Worksheets
WebQuest - karyotypes

Vocabulary
Chapter review
Chapter test
WebQuest - karyotypes

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Mendel and Genes

Time Allotment: 15-18 days

Unit Sequence: 8

Major Concepts to be learned:

- Punnett Squares
- Mendel's experiments
- Genetic Disorders
- Inheritance patterns
- Independent Assortment

Expected Skills to be demonstrated:

- Understand Mendel's contributions to the field of genetics
- Predict the results of monohybrid and dihybrid crosses with Punnett Squares
- Use forked-line method (probabilities) to predict the results of dihybrid, trihybrid (and higher) crosses
- Predict the results of multiple-allele traits
- Predict the results of epistatic traits
- Read and interpret Pedigrees

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

Instructional Strategies:

Assessments:

Direct Instruction
Fruit Fly Genetics – breed live fruit flies
Pedigrees
Worksheets – practice problems
Video Clips

Quiz
Vocabulary
Chapter review
Chapter test
Fruit Fly Genetics

Grade level: 11-12

Course Title: Advanced Biology

**Topic/Concept: Chromosomal Basis
of Inheritance**

Time Allotment: 8 days

Unit Sequence: 9

Major Concepts to be learned:

- Linked traits (dependent assortment)
- Sex-linked traits
- Chromosomal disorders

Expected Skills to be demonstrated:

- Predict the results of linkage using recombination frequencies
- Compare/Contrast dependent and independent assortment
- Use pedigrees to determine genotypes/phenotypes of individuals
- Predict the results of sex-linked inheritance
- Connect chromosomal disorders to mistakes during meiosis

PA Standards/Anchors:

Eligible Content:

3.1.9-12.P
3.1.9-12.Q
3.1.9-12.R

Instructional Strategies:

Assessments:

Direct Instruction
Pedigrees
Worksheets

Vocabulary
Chapter review
Chapter test

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Molecular Basis of Inheritance

Time Allotment: 11 days

Unit Sequence: 10

Major Concepts to be learned:

- DNA Structure
- DNA Replication
- DNA Packaging

Expected Skills to be demonstrated:

- Explore early experiments that determined the structure of DNA
- Understand how the antiparallel structure of DNA causes issues during replication
- Predict leading/lagging strands based on the direction of replication
- Understand how DNA is organized and packaged in a cell
- Compare/Contrast Chromatin vs Chromosomes

PA Standards/Anchors:

Eligible Content:

3.1.9-12.P
3.1.9-12.Q

Instructional Strategies:

Assessments:

Direct Instruction
Lab – DNA extraction
Worksheets
Diagrams
Video Clips

Vocabulary
Chapter review
Chapter test

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Gene Expression

Time Allotment: 13-15 days

Unit Sequence: 11

Major Concepts to be learned:

- Transcription
- Translation
- Splicing
- Mutations

Expected Skills to be demonstrated:

- Research and present information on a genetic disease
- Understand the steps in transcription
- Compare and contrast the primary transcript to the 'mature' transcript
- Discuss the role of introns in RNA splicing
- Predict how mutations affect the polypeptide during translation
- Understand the role of mRNA, tRNA and rRNA in translation

PA Standards/Anchors:

Eligible Content:

3.1.9-12.A
3.1.9-12.P
3.1.9-12.Q

Instructional Strategies:

Assessments:

Direct Instruction
Research – genetic disease
Presentations
Worksheet – mutations
Video Clips

Vocabulary
Chapter review
Chapter test
Presentation – genetic disease

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Regulation of Gene Expression

Time Allotment: 5 days

Unit Sequence: 12

Major Concepts to be learned:

- Lac Operon regulation and expression
- Inducible vs repressible operons
- Hox genes

Expected Skills to be demonstrated:

- Compare/contrast inducible vs repressible operons
- Understand the role of the operator, inducer and repressor in gene regulation
- Understand how Hox genes regulate pattern formation

PA Standards/Anchors:

Eligible Content:

3.1.9-12.A
3.1.9-12.C
3.1.9-12.P

Instructional Strategies:

Assessments:

Direct Instruction
Video Clips

Vocabulary
Quiz

Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: DNA Tools and Biotechnology

Time Allotment: 22 days

Unit Sequence: 13

Major Concepts to be learned:

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|---|--|
| <ul style="list-style-type: none">• Gel Electrophoresis• Gene Cloning• Bacterial transformation• Genetic engineering | <ul style="list-style-type: none">• DNA sequencing• Polymerase Chain Reaction• Genome-wide association studies |
|---|--|

Expected Skills to be demonstrated:

- | | |
|---|---|
| <ul style="list-style-type: none">• Set up gel electrophoresis• Use micropipetters• Explain the process of PCR• Understand the role of antibiotics and inducers in gene expression• Understand how GMOs are used in every day life and their safety/risks | <ul style="list-style-type: none">• Interpret the results of gel electrophoresis• Explain DNA sequencing methods• Predict the results of bacterial transformations• Interpret the results of Genome-wide association studies• Understand Gene Therapy |
|---|---|

PA Standards/Anchors:

Eligible Content:

3.1.9-12.P 3.1.9-12.U 3.1.9-12.X	
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Instructional Strategies:

Assessments:

Direct Instruction Activity – PCR Lab – Gel Electrophoresis Lab – Bacterial transformation Video Clips Video – Secrets in Our DNA	Activity Quiz Labs Vocabulary Chapter review Chapter test
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Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Descent with Modification

Time Allotment: 7 days

Unit Sequence: 14

Major Concepts to be learned:

- Idea's that shaped Darwin
- Darwin's theory of evolution
- Evidence for evolution

Expected Skills to be demonstrated:

- Understand the scientists and experiences that influenced Darwin's theory of evolution
- Understand Darwin's theory of evolution
- Connect Darwin's theory to events happening today
- Identify evidence for evolution
- BLAST search to compare DNA homology

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		

Instructional Strategies:

Assessments:

Direct Instruction BLAST search	Vocabulary Chapter review Chapter test BLAST
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Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Evolution of Populations

Time Allotment: 10 days

Unit Sequence: 15

Major Concepts to be learned:

- Sources of genetic variation
- Hardy-Weinberg equilibrium
- Factors disrupting equilibrium

Expected Skills to be demonstrated:

- Identify the key sources of genetic variation
- Calculate allele, genotype and phenotype frequencies in a population
- Test to see if a population is evolving
- Identify key factors affecting Hardy-Weinberg equilibrium
- Use spreadsheets to calculate mean, median, mode, minimum, maximum, standard deviation, etc.

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		

Instructional Strategies:

Assessments:

Direct Instruction Worksheets Lab – bead ‘population’ Spreadsheet	Vocabulary Chapter review Chapter test Lab Spreadsheet
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Grade level: 11-12

Course Title: Advanced Biology

Topic/Concept: Bacteria and Archaea

Time Allotment: 5-8 days

Unit Sequence: 16

Major Concepts to be learned:

- Domain Bacteria
- Domain Archaea

Expected Skills to be demonstrated:

- Distinguish between the two domains of “bacteria”
- Use streak plates to isolate pure cultures of bacteria
- Perform Gram staining
- View bacteria under microscopes
- Make bacterial smears

PA Standards/Anchors:

Eligible Content:

3.1.9-12.S
3.1.9-12.U
3.1.9-12.W

Instructional Strategies:

Assessments:

Direct Instruction
Labs – cultures, smears, stains, microscopes

Vocabulary
Quiz
Lab