

Wilson Area School District Planned Course Guide

Title of Planned Course: Academic Biology

Subject Area: Science

Grade Level: 9

Course Description: This course includes the fundamentals of biology such as the characteristics of life, ecology, human impact, nature of cells, photosynthesis and cellular respiration, basic genetics, evolution, plants, and animals. Students will make connections between varying aspects of life, relationships between organisms, and our role in the biological world.

Time/Credit for this Course: One Full Academic Year / 1.0 Credit

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Wilson Area School District Planned Course Material

Course Title: Academic Biology

Textbook: Biology, Prentice Hall
Pearson Education, Inc.,
2010
<http://www.prenticehall.com/>

Teacher Resources:

- Ancillary Materials
- Study Island

Curriculum Map

August: Unit 1: Structure and Function

- Properties of Water

September: Unit 1: Structure and Function

- Structure and Function of Organic Compounds
- Chemical Reactions
- Free Energy Changes & Enzymes

October: Unit 1: Structure and Function

- Differentiation between Eukaryotic and Prokaryotic Cells
- Differentiation between Plant and Animal Cells
- Cell Organelle Functions

November: Unit 1: Structure and Function

- Cell Transport
- Cell Specialization and Organization

Unit 2: Organization for Matter and Energy Flow in Organisms

- Photosynthesis
- Structure and Importance of ATP
- Cellular Respiration

Unit 3: Growth and Development

- Cell Division
- Cell Cycle Regulation

December: Unit 3: Growth and Development

- Cell Division
- Cell Cycle Regulation

Unit 4: Inheritance of Traits

- DNA Structure and Function
- RNA Structure and Function
- Process of DNA Replication
- Protein Synthesis
- Gene Mutations

January: Unit 5: Variation of Traits

- Mendelian Inheritance
- Human Inheritance

February: Unit 5: Variation of Traits

- Mendelian Inheritance
- Human Inheritance

Unit 6: Evidence of Common Ancestry and Diversity

- Evidence of Evolution
- Classification

March: Unit 6: Evidence of Common Ancestry and Diversity

- Patterns of Macroevolution
- Human Evolution

Unit 7: Natural Selection and Adaptation

- Darwinian Evolution
- Speciation Mechanisms

Unit 8: Interdependent Relationships in Ecosystems

- Structure of Biosphere
- Species Interactions
- Biogeochemical Cycles

April: Unit 8: Interdependent Relationships in Ecosystems

- Process of Succession
- Identify the Characteristics of Biomes

Unit 9: Ecosystems Dynamics, Functioning, and Resilience

- Population Growth
- Limiting Factors
- Human Impacts on Biosphere

Unit 10: Social Interactions and Group Behavior

- Competition
- Symbiotic and Other Relationships Among Organisms

May: Keystone Preparation

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Life Science: Structure & Function

Related Chapters: Ch.2, Ch.7

Time frame: 26 Days

State Standards: 3.1.9-12.A, 3.1.9-12.B, 3.1.9-12C, 3.1.9-12.F, 3.2.9-12.D, 3.2.9-12.E, 3.1.6-8.A, 3.1.6-8.B, 3.1.6-8.C, 3.1.6-8.A-C

Essential content/objectives: At end of the unit, students will be able to:

- List and explain the properties of water
- Explain why water molecules are polar
- Differentiate between solutions and suspensions
- Explain the difference between acidic and basic solutions
- Describe the structure and function of each group of organic compounds
- Explain how chemical reactions affect chemical bonds in compounds
- Describe how energy changes affect how easily a chemical reaction will occur
- Explain why enzymes are important to living things
- Differentiate between eukaryotes and prokaryotes as well as plant and animal cells
- List and explain cell parts and functions
- Describe what happens during diffusion
- Differentiate between osmosis, facilitated diffusion and active transport
- Describe cell specialization
- Identify the organization levels in multicellular organisms

Core Activities: Students will complete/participate in the following:

- Chapter Worksheets
- CER: Properties of Water Lab
- Acid and Base Lab
- Energy Activity
- Review Game
- Chapter Worksheets
- Cell Drawings
- Cell Analogy Project
- Organelle Chart
- CER: What is a Cell? Lab
- Diffusion Demonstration
- CER: Elodea Osmosis Lab
- Egg Lab

Extensions:

- Study Island Practice Sets
- Build Molecular Models using model kits
- Create a Cell City
- Devise a Cell Crossword online

Remediation:

- Study Island Practice Sets
- Review Quizzes
- Review Worksheets
- Peer Tutoring
- Chapter Review Packet
- Cell Model
- Cell Song
- Cell Organelle Children's book
- Create Cell Review Games

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work
- Demonstrations
- Review Packet
- Review Game

Materials & Resources:

- Textbook
- PowerPoints
- Lab Materials
- Model Kits
- Supplemental Videos

Assessments:

- Quizzes
- Tests
- Homework
- Labs

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Organization for Matter and Energy Flow in Organisms

Related Chapters: Ch.8, Ch.9

Time Frame: 5 days

State Standards: 3.1.9-12.E, 3.1.9-12G, 3.1.6-8.F, 3.1.6-8.G

Essential content/objectives: At end of the unit, students will be able to:

- Explain where plants get the energy they need to produce food
- Describe the role of ATP in cellular activities
- State the overall equation for photosynthesis
- Describe the role of light and chlorophyll in photosynthesis
- Describe the structure and function of a chloroplast
- Identify input/output of the light dependent reactions and Calvin Cycle
- Describe what conditions affect the rate of photosynthesis
- Explain what cellular respiration is and what happens during glycolysis
- Differentiate between alcoholic and lactic acid fermentation
- Identify input/output of the Krebs Cycle and the Electron Transport Chain
- Compare photosynthesis and cellular respiration

Core Activities: Students will complete/participate in the following:

- CER: Effects of light on plant growth lab
- CER: Rate of photosynthesis disc assay
- Chapter Worksheets
- Concept Maps
- Pigment Chromatography Lab
- Rate of Photosynthesis Lab with yew sprig
- CER: Yeast Fermentation Bag Lab

Extensions:

- Study Island
- Peer Tutoring

Remediation:

- Study Island
- Review Quizzes
- Review Worksheets
- Peer Tutoring

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work

Materials & Resources:

- Textbook
- PowerPoints
- Lab Materials

Assessments:

- Quizzes
- Tests
- Homework
- Labs
- Projects

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Growth and Development

Related Chapters: Ch.10, Ch.11.4

Time Frame: 7 days

State Standards: 3.1.9-12.D, 3.1.9-12.Q, 3.1.6-8.N

Essential content/objectives: At end of the unit, students will be able to:

- Explain the problems growth causes for cells and how cell division helps prevent these problems
- Name and describe the main events of the cell cycle
- Describe what happens during the four stages of mitosis
- Describe how cancer cells are different from other cells
- Contrast the chromosome number of body cells and gametes
- Summarize the events of meiosis
- Contrast mitosis and meiosis

Core Activities: Students will complete/participate in the following:

- Chapter Worksheets
- CER: Which of the agar cubes would diffuse the fastest?
- Mitosis Lab using onion root tips and whitefish blastula slides
- Pipe Cleaner Activities to simulate mitosis or meiosis
- Bead Activity to simulate crossing over
- CER: Patient Diagnosis Karyotype Lab
- Cancer Powerpoint / Project
- Review Packet
- Review Game

Extensions:

- Study Island
- Peer Tutoring
- Cancer PowerPoint

Remediation:

- Study Island
- Review Quizzes
- Review Worksheets
- Peer Tutoring
- Practice with pipe cleaners or beads

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work

Materials & Resources:

- Textbook
- PowerPoints
- Lab Materials
- Cancer PowerPoint
- Pictures of cancerous cells

Assessments:

- Quizzes
- Tests
- Homework
- Labs
- Projects

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Inheritance of Traits

Related Chapters: Ch.12, Ch.13

Time Frame: 7 days

State Standards: 3.1.9-12.P, 3.1.9-12A, 3.1.9-12.Q, 3.1.6-8.M

Essential content/objectives: At end of the unit, students will be able to:

- Summarize the relationship between genes and DNA
- Describe the overall structure of a DNA molecule
- Relate the DNA molecule to chromosome structure
- Summarize the events of DNA replication
- Contrast and compare DNA and RNA
- Describe the three main types of RNA
- Describe transcription and the editing of RNA
- Summarize translation
- Explain the relationship between genes and proteins
- Contrast gene mutations and chromosomal mutations

Core Activities: Students will complete/participate in the following:

- Chapter Worksheets
- DNA extraction Lab from Cheek Cells
- DNA Replication paper folding activity
- Transcription/Translation video segment
- Hands on simulation of translation
- Watch DNA, Cracking the Code DVD
- Review Packets
- DNA Jeopardy Review Game

Extensions:

- Study Island
- Peer Tutoring
- Show the movie GATTACA
- Read and summarize recent DNA articles

Remediation:

- Study Island
- Review Quizzes
- Review Worksheets
- Peer Tutoring
- Building a DNA model

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work

Materials & Resources:

- Textbook, PowerPoints
- Lab Materials
- Human Genome Video (Beginning Segment)
- Cracking the Code DVD

Assessments:

- Quizzes
- Tests
- Homework
- Labs
- Projects

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Variation of Traits

Related Chapters: Ch.11, Ch.14

Time Frame: 16 days

State Standards: 3.1.9-12.Q, 3.1.9-12.R

Essential content/objectives: At end of the unit, students will be able to:

- Summarize Mendel's conclusion about inheritance
- Differentiate between genotypes and phenotypes
- Differentiate between dominant and recessive traits
- Explain Mendel's Law of Segregation and Law of Independent Assortment
- Explain the concept of alleles and chromosomal inheritance
- Complete monohybrid, dihybrid, codominant, incomplete dominant and sex – linked punnett squares
- Interpret a pedigree
- Give an example of a trait that has multiple alleles
- Describe examples of inheritance of human traits
- Explain how small changes in DNA can cause genetic disorders
- Be able to give examples of human genetic disorders and chromosomal disorders
- Describe sex linked disorders and why they are more common in males than females
- Explain the process of X chromosome inactivation
- Summarize nondisjunction and the problems it can cause

Core Activities: Students will complete/participate in the following:

- Chapter Worksheets
- Punnett Square Problems
- Design a species lab
- Coin Toss Lab

Extensions:

- Study Island
- Peer Tutoring
- Brave New Babies Article
- Design a Species Project
- Create a Pedigree

Remediation:

- Study Island
- Review Quizzes
- Review Worksheets
- Peer Tutoring

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work
- Peer Instruction to complete punnett squares

Materials & Resources:

- Textbook
- PowerPoints
- Lab Materials

Assessments:

- Quizzes
- Tests
- Homework
- Labs
- Projects

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Evidence of Common Ancestry and Diversity

Related Chapters: Ch.16.4, Ch.18, Ch.19, Ch.26

Time Frame: 5 days

State Standards: 3.1.9-12.S, 3.1.6-8.O, 3.1.6-8.P, 3.1.6-8.Q

Essential content/objectives: At end of the unit, students will be able to:

- Differentiate between vestigial, homologous and analogous structures.
- Interpret how fossils help document the descent of modern species from ancient ancestors.
- Analyze amino acid sequences as indicators of evolution.
- Explain how geographic distribution of species today relates to their evolutionary history.
- Explain how living things are organized for study
- Explain how evolutionary relationships are important in classification
- Explain how we can compare very dissimilar organisms
- Describe two patterns of macroevolution.
- List adaptations that enabled later hominine species to walk upright.

Core Activities: Students will complete/participate in the following:

- Chapter Worksheets
- Fact vs. Fiction Evolution Activity
- What Am I? Activity
- Dichotomous Key Lab
- Lucy & Human Origins Activity
- History of Whales Activity
- Vestigial Structure Animal Comparison Article

Extensions:

- Study Island, Peer Tutoring
- Woolly Mammoth Genome Article
- Practice using Dichotomous Keys

Remediation:

- Study Island
- Review Quizzes
- Review Worksheets
- Peer Tutoring
- Classification of Common Objects Activity
- Classifying Organisms Poster Activity

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work

Materials & Resources:

- Textbook
- PowerPoints
- Lab Materials

Assessments:

- Quizzes
- Tests
- Homework
- Labs
- Projects

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Natural Selection & Adaptation

Related Chapters: Ch.16, Ch. 17

Time Frame: 5 days

State Standards: 3.1.9-12.T - X, 3.1.6-8.R - T

Essential content/objectives: At end of the unit, students will be able to:

- Describe the pattern Darwin observed among organisms of the Galapagos Islands
- Identify how Lamarck thought species evolved
- Describe how natural variation is used in artificial selection
- Explain how natural selection is related to a species' fitness
- Identify evidence Darwin used to present his case for evolution
- State Darwin's theory of evolution by natural selection
- Differentiate speciation graphs and data

Core Activities: Students will complete/participate in the following:

- CER: Deer Mice Natural Selection Simulation
- CER: Galapagos Island Analysis
- Chapter Worksheets
- Jigsaw with current evolution articles
- Concept Map
- National Geographic Darwin Article
- Evolution Keyword Puzzle
- Evolution of the horse timeline
- Great Transformations Video
- Review Packet

Extensions:

- Study Island
- Peer Tutoring
- Peppered Moth Lab

Remediation:

- Study Island
- Review Quizzes
- Review Worksheets
- Peer Tutoring
- Teddy Graham Lab

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work

Materials & Resources:

- Textbook
- PowerPoints
- Lab Materials
- Great Transformations Video

Assessments:

- Quizzes
- Tests
- Homework
- Labs
- Projects

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Interdependent Relationships In Ecosystems

Related Chapters: Ch.3, Ch.4, Ch.5

Time Frame: 6 days

State Standards: 3.1.9-12.H, 3.1.9-12I, 3.1.9-12L, 3.1.6-8.J

Essential content/objectives: At end of the unit, students will be able to:

- Identify the levels of organization that ecologists study
- Trace the flow of energy through living systems
- Evaluate the efficiency of energy transfer among organisms in an ecosystem
- Describe how matter cycles through the living and nonliving parts of an ecosystem
- Describe how the availability of nutrients affects the productivity of an ecosystem
- Explain how biotic and abiotic factors influence an ecosystem
- Identify interactions that occur within communities
- Explain the process of succession
- Identify the characteristics of major land biomes
- Describe how ecosystems recover from a disturbance.
- Describe and compare the major land biomes.
- Identify the major categories of freshwater ecosystems.

Core Activities: Students will complete/participate in the following:

- Chapter Worksheets
- Practice Food Webs
- Activity to identify relationships between organisms
- CER: Predator/Prey Graphing activity

Extensions:

- Study Island
- Food Web Project
- Biome Project

Remediation:

- Study Island
- Review Quizzes
- Review Worksheets
- Peer Tutoring

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work

Materials & Resources:

- Textbook
- PowerPoints
- Strange Days on Planet Earth – Predators video

Assessments:

- Quizzes
- Tests
- Homework
- Labs
- Projects

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Ecosystems Dynamics, Functioning, and Resilience

Related Chapters: Ch.5, Ch.6

Time Frame: 6 days

State Standards: 3.1.9-12.M, 3.1.9-12.N

Essential content/objectives

- Describe exponential and logistic growth
- List the characteristics used to describe a population
- Identify the factors that affect population size
- Identify factors that limit population growth
- Identify factors that affect carrying capacity
- Identify the limiting factors that depend/don't depend on population density
- Describe human activities that can affect the biosphere.
- Describe the relationship between resource use and sustainable development.
- Describe how human activities impact soil, water, and air quality.

Core Activities: Students will complete/participate in the following:

- CER: Population Growth
- Chapter Worksheets
- Activity to identify relationships between organisms
- Predator/Prey Graphing activity

Extensions:

- Study Island
- Food Web Project
- Biome Project

Remediation:

- Study Island
- Review Quizzes
- Review Worksheets
- Peer Tutoring
- Chapter Review Packet

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work

Materials & Resources:

- Textbook
- PowerPoints
- Strange Days on Planet Earth – Predators video

Assessments:

- Quizzes
- Tests
- Homework
- Labs
- Projects

Curriculum Scope & Sequence

Planned Course: Academic Biology

Unit: Social Interactions and Group Behavior

Related Chapters: Ch.4

Time Frame: 5 days

State Standards: 3.1.9-12.O

Essential content/objectives

- Identify interactions that occur within communities
- Elaborate the role competition plays in shaping communities
- Describe the roles predation and herbivory play in shaping communities.
- Identify the three types of symbiotic relationships in nature.

Core Activities: Students will complete/participate in the following:

- Chapter Worksheets
- Practice Food Webs
- Activity to identify relationships between organisms
- CER: Predator/Prey Graphing activity

Extensions:

- Study Island
- Food Web Project

Remediation:

- Study Island
- Review Quizzes
- Review Worksheets
- Peer Tutoring
- Chapter Review Packet

Instructional Methods:

- Direct instruction using notes and key terms
- Cooperative Learning during labs
- Group Discussion
- Teacher modeling and visual aids
- Independent Student Work

Materials & Resources:

- Textbook
- PowerPoints
- Strange Days on Planet Earth – Predators video

Assessments:

- Quizzes
- Tests
- Homework
- Labs
- Projects