

## Grade 3 Science Curriculum

### **Major Topic: Comparing Plants and Animals**

**Goal 1.** Students will examine similarities and differences within and between plants and animals, including humans.

#### **Subtopic Performance Objectives:**

##### **1A. Behavior, Structure, and Function**

- a. Compare and contrast physical and living components of different biomes (regions characterized by their climate and plant life such tundra, tropical rain forest, desert, etc.) MLR-B (3-4) #3 (Emphasize how plants and animals have specialized structures and behaviors to live in these regions.)
- b. Group the same (plants and animals) in different ways using different characteristics. MLR-A (3-4) #1
- c. Explain how features used for grouping depend on the purpose of the grouping. BMK-5A (3-5) #2
- d. Design and describe a classification system for (plants or animals). MLR-A (3-4) #2
- e. Demonstrate an understanding that a cell is the basic unit of living organisms (plants and animals). MLR-C (3-4) #1

##### **1B. Adaptation and Change Over Time**

- a. Identify present day organisms that have not always existed, and past life forms that have become extinct. MLR-D (3-4) #1
- b. Show how fossils can be compared to one another and to living (plants and animals) according to their similarities and differences. BMK-5F (3-5) #2
- c. Describe how individuals (plants or animals) of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing. BMK-5F (3-5) #1
- d. Explain how adaptations, in response to change over time, may increase a species' chances of survival. MLR-D (3-4) #3
- e. Explain how for any particular environment, some kinds of plants and animals survive well, and some survive less well, and some cannot survive at all. BMK-5D (3-5) #1

##### **1C. Life Cycles and Heredity**

- a. Compare and contrast the life cycles of (different plants and animals). MLR-A (3-4) #4
- b. Describe ways in which (plants and animals, including humans) may be similar to and different from their parents and explore the possible reasons for this. MLR-D (3-4) #4
- c. Describe how some likenesses are inherited and some are learned. BMK-5B (3-5) #1

- d. Explain how in order for offspring to resemble their parents, there must be a reliable way to transfer information from one generation to the next. BMK-5B (3-5) #2

**Suggested Materials:**

- FOSS – Structures of Life
- STC – Life Cycles of Butterflies

**Assessments:**

- LAD – All in the Family
- LAD – Seeing Cells
- LAD – Critter Classification
- MAP – Looking Closely
- MAP – An Animal for the Future?

**Major Topic: Earth Materials and Changes They Undergo**

**Goal 2:** Students will understand there are different materials that make up the earth and these materials undergo change, sometimes in cycles.

**Subtopic Performance Objectives:**

**2A. Earth Materials**

- a. Describe how earth materials are solids (rock, soils, and ice), liquids (water and magma), and the gases of the atmosphere. NRC-D (K-4) 1A
- b. Recognize that various earth materials have different properties, which make them useful in different ways, for example, as building materials, growing plants we use, etc. NRC-D (K-4) 1A
- c. Describe differences among minerals, rocks, and soils. MLR-F (3-4) #3
- d. Describe why some rocks have fossils in them and how fossils form. MLR-D (3-4) #2

**2B. Changes**

- a. Describe how the surface of the earth changes (plate tectonics). MLR-F (3-4) #1; NRC-D (K-4) 2A
- b. Describe how some processes, like erosion and weathering, are very slow. NRC-D (K-4) 3A
- c. Describe how some processes that change the earth, like volcanic eruptions and earthquakes, happen very fast. NRC-D (K-4) 3A
- d. Demonstrate an understanding that many things about the earth occur in cycles that vary in length and frequency. MLR-F (3-4) #2
- e. Illustrate how water and other substances go through a cyclic process of change in the environment (e.g., water cycle, rocks eroding to form soil which eventually hardens to form rock). MLR-F (3-4) #4

**Suggested Materials:**

- FOSS – Earth Materials
- FOSS – Water

**Assessments:**

- LAD – Comparing Soils
- LAD – What is the Mystery Rock?

**Major Topic: Earth in the Solar System**

**Goal 3.** Students will understand the relationship between earth and its moon, the sun, and other planets.

**Subtopic Performance Objectives:****3A. Earth-Sun Connection**

- Illustrate the relative position of the sun and earth. MLR-G (3-4) #1
- Describe how the sun and earth have properties, locations, and movements that can be observed and described. NRC-D (K-4) 2A
- Trace the sources of earth's heat and light energy to the sun. MLR-G (3-4) #2
- Describe earth's rotation on its axis (and the effect on the day/night cycle) MLR-G (3-4) #3
- Describe earth's revolution around the sun. MLR-G (3-4) #3
- Describe how the sun appears to move across the sky in the same way every day but its path changes slowly over the seasons (i.e., investigate using shadows). NRC-D (K-4) 3C

**3B. Earth-Moon Connection**

- Explore the relationship between the earth and its moon (i.e., tides, monthly cycle of moon phases, moon's revolution around earth, moon held in orbit by earth's gravity, how we always see the same face of the moon, lunar eclipses). (Note: The verb is not "explain", explanations come in middle school. At this level it is descriptive and observational, not explanatory.) MLR-G (3-4) #4
- Compare how the moon moves across the sky on a daily basis much like the sun (i.e., investigate different locations of the moon in the night sky as well as when you can see a full moon in the morning sky). NRC-D (K-4) 3C
- Investigate and describe the role of scientists, astronauts, and engineers in space exploration. MLR-M (3-4) #2

**3C. Earth in the Solar System**

- Illustrate the relative positions of the sun, moon, and planets. MLR-G (3-4) #1
- Describe how objects in the sky have patterns of movement. NRC-D (K-4) 3C
- Describe how planets change their positions against the background of stars. BMK-4A (3-5) #3
- Describe how other planets also orbit the sun. BMK-4A (3-5) #4
- Describe how telescopes magnify the appearance of some distant objects in the sky, including the moon and the planets. BMK-4A (3-5) #2
- Describe how like all planets and stars, the earth is approximately spherical in shape. BMK-4A (3-5) #2

**Suggested Materials:**

- NASA LEARN at [www.nasalearn.org](http://www.nasalearn.org)
- GEMS – Earth, Moon, and Stars\*
- GEMS – Moons of Jupiter\*
- GEMS – Messages from Space\*
- \* pieces of these align with MLR addressed here

**Assessments:**

- MAP – Map for an Alien
- LAD – Earth’s Movements

## Grade 4 Science Curriculum

### **Major Topic: Microhabitats**

**Goal 1.** Students will understand characteristics of single-celled organisms and their role in an ecosystem.

#### **Subtopic Performance Objectives:**

##### **1A. Characteristics and Needs of Single-Celled Organisms**

- a. Demonstrate an understanding that a cell is the basic unit of living organisms. MLR-C (3-4) #1
- b. Describe how some living things consist of a single cell. BMK-5C (3-5) #1
- c. Describe how single-celled organisms exist. MLR-C (3-4) #2 (Like familiar organisms, they need food, water, and air; a way to dispose of waste, and an environment they can live in. BMK-5C (3-5) #1
- d. Explore how the use of a microscope allows one to see cells in a variety of organisms (single-celled organisms). MLR-C (3-4) #3
- e. Compare and contrast the life cycles, behavior, and structure of different organisms (compare single-celled organisms with familiar plants and animals) MLR-A (3-4) #4
- f. Explain how adaptations (specialized structures and behaviors of single-celled organisms), in response to change over time, may increase a (single-celled) species chances of survival. MLR-D (3-4) #3

##### **1B. Classifying Single-Celled Organisms**

- a. Group the same (single-celled pond organisms) in different ways using different characteristics. MLR-A (3-4) #1
- b. Describe how the features used for grouping depend on the purpose of the grouping. BMK-5A (3-5) #2
- c. Design and describe a classification system for (single-celled pond organisms). MLR-A (3-4) #2

##### **1C. Micro-organisms in the Environment**

- a. Describe the different (single-celled organisms) within a given habitat (pond) MLR-A (3-4) #3
- b. Describe a food web and the relationships within a given ecosystem (describe the role of single-celled organisms in a pond food web). MLR-B (3-4) #1
- c. Explain the difference between producers (single-celled algae that make their own food), consumers (single-celled organisms that eat other single-celled organisms as well as get eaten by other animals), and decomposers (bacteria and other single-celled organisms in the soil and water that break down dead material) and identify examples of each. MLR-B (3-4) #2
- d. Investigate the connection between major living (micro-life) and nonliving components (sunlight, temperature, air, water, etc.) of a local ecosystem (pond). MLR-B (3-4) #4

- e. Investigate how changes in an organism's environment are sometimes beneficial to it and sometimes harmful (e.g., algal blooms, salt runoff, increased temperature, etc.). BMK-5D (3-5) #4
- f. Explain how most microorganisms do not cause disease, and many are beneficial. BMK-5D (3-5) #5

**Suggested Materials:**

- MMSA Unit – Microhabitats (\*inquiry-based and designed to align with all of these objectives.
- STC – Micro-worlds

**Assessments:**

- Microhabitats – Letter from Leeuwenhoek
- LAD – Critter Classification
- LAD – Food for All

**Major Topic: Physical and Chemical Properties**

**Goal 2.** Students will understand that materials have physical properties and these properties can sometimes change without changing the material. Students will understand what happens to materials during a chemical change.

**Subtopic Performance Objectives:**

**2A. Physical Properties**

- a. Describe observable physical properties such as size, weight, color, texture, temperature, ability to float, etc. NRC-B (K-4) 1A
- b. Use tools such as rulers, balances, and thermometers to measure physical properties. NRC-B (K-4) 1A *Supplements Math Curriculum*
- c. Describe objects based on the properties of the materials from which they are made. NRC-B (K-4) 1B
- d. Use physical properties to separate or sort a mixture of materials. NRC-B (K-4) 1C
- e. Show how materials can exist in different states – solid, liquid, and gas. NRC-B (K-4) 1C
- f. Prove that air is a substance that takes up space and (has weight). BMK-4B (3-5) #4

**2B. Physical Change**

- a. Explain how matter changes in physical ways. MLR-E (3-4) #2
- b. Show how heating and cooling can cause changes in the properties of materials (e.g., soften, shrink or expand, change state, change color, etc.) BMK-4D (3-5) #1
- c. Show how some common materials, such as water, can be changed from one state to another by heating or cooling. NRC-B (K-4) 1D
- d. Investigate how many kinds of changes occur faster under hotter conditions. (e.g., evaporation, dissolving) BMK-4D (3-5) #1
- e. Prove that no matter how parts of an object are assembled, the weight of the whole object made is always the same as the sum of its parts; and when a thing is

broken into parts, the parts have the same total weight as the original thing.  
BMK-4D (3-5) #2

## 2C. Chemical Properties

- a. Describe how the physical properties of (materials) sometimes change when one (material) chemically combines with another. MLR-E (3-4) #1
- b. Recognize that “a new material is made by combining two or more materials, it has properties that are different from the original materials. For that reason, a lot of different materials can be made from a small number of basic kinds of materials.” BMK-4D (3-5) #4

## 2D. Chemical Change

- a. Explain how matter changes in chemical ways. MLR-E (3-4) #2
- b. Describe how some kinds of (chemical) changes occur faster under hotter conditions. BMK-4D (3-4) #1

## 2E. Energy and Chemical Change

- a. Identify different forms of energy (during chemical change such as heat and light). MLR-H (3-4) #1
- b. Explain ways different forms of energy can be produced. MLR-H (3-4) #2 (i.e., Heat can be produced during chemical change through burning or mixing two substances together.) NRC-B (K-4) 3B

### Suggested Materials:

- Insights – Changes of State
- Insights – The Mysterious Powder
- GEMS – Involving Dissolving
- BSCS Science TRACS – Investigating Changing Properties
- FOSS – Water

### Assessments:

- LAD – Physical and Chemical Changes
- MAP – Disappearing Life Saver

## Major Topic: Motion and Force

**Goal 3.** Students will understand the effects of forces on the motion of an object and apply their understanding using principles of technological design.

### Subtopic Performance Objectives:

#### 3A. Forces

- a. Describe the effects of different types of forces on motion (such as mechanical, gravitational, or friction). MLR-I (3-4) #1
- b. Describe how earth’s gravity pulls any object toward it without touching it. BMK-4G (3-4) #1

- c. Draw conclusions about how the amount of force affects the motion of massive and less massive objects. MLR-I (3-4) #2 (i.e., The greater the force is, the greater the change in motion will be. The more massive an object is, the less effect a given force will have. BMK-4F (3-5) #1
- d. Generate examples illustrating that when something is pushed or pulled, it exerts a reaction force. MLR-I (3-4) #3
- e. Identify mechanical force as a form of energy. MLR-H (3-4) #1

### **3B. Motion**

- a. Describe how changes in speed or direction of motion are caused by forces. BMK-4F (3-5) #1
- b. Explain that how fast things move differs greatly. Some things are so slow their journey takes a long time; others move too fast for people to even see them. BMK-4F (3-5) #2
- c. Describe the position of an object by locating it relative to another object or the background. NRC-B (K-4) 2A
- d. Trace and measure the changing position of an object over time to show motion. NRC-B (K-4) 2B

### **3C. Technological Design**

- a. Design and build an invention that uses your knowledge of force and motion to solve a motion-related design challenge (such as balloon-powered cars or rockets, parachutes, paper rockets, land sailers, etc.) MLR-J (3-4) #4

These principles of technological design (the technology part of the Science and Technology MLR's), which also include MLR's J1, J3, J5, K6, L1, L3, L4, L5, and L7) are described in the National Science Education Standards, Standard E on pp 137-138 and can be applied to a motion design problem (such as how to get a balloon powered rocket to travel the furthest distance along a string):

1. Identify a Simple Problem
2. Propose a Solution
3. Implement Proposed Solutions
4. Evaluate the Product or Design
5. Communicate the Problem, Design, and Solution

#### **Suggested Materials:**

- Science Source – LINX System
- NASA Rockets Curriculum Guide
- STC – Motion & Design

#### **Assessments:**

- LAD – Keep on Trucking

**MSAD #34**

**Science  
Curriculum  
5-8**

## 5 and 6 MLR Matrix

	Grade 5: Ecosystems	Grade 5: Magnetism & Electricity	Grade 5: Soils	Grade 6: Classification	Grade 6: Characteristics of Living Things	Grade 6: Ecology	Grade 6: Diversity of Life	Grade 6: Structure & Function	Grade 6: Reproduction & Heredity
A1				X					
A2				X					
A3					X				
B1					X	X			
B2	X								
B3	X								
B4						X			
B5						X			
C1								X	
C2								X	
C3								X	
C4								X	
C5								X	
D1							X		
D2									
D3							X		
D4									X
E1									
E2									
E3									
E4									
E5									
E6									
E7									
E8									
F1									
F2			X						
F3									
F4			X						
F5									
F6			X						
F7			X						
G1									
G2									
G3									
G4									
G5									
H1									
H2									
H3									
H4		X							
H5									
H6									
I1									
I2									
I3									
Other	M1,M4, M6,M8		M4						

## 7 and 8 MLR Matrix

	Grade 7 Structure of the Earth	Grade 7 Earth in the Universe	Grade 7 Weather	Grade 7 Earth's Resources	Grade 7 Earth Processes	Grade 7 Earth History	Grade 8 Particulate Nature of Matter	Grade 8 Classification & Properties of Matter	Grade 8 Force & Motion	Grade 8 Energy
A1										
A2										
A3										
B1			X							
B2										
B3										
B4										
B5										
C1										
C2										
C3										
C4										
C5										
D1						X				
D2						X				
D3										
D4										
E1								X	X	
E2							X			
E3								X		
E4								X		
E5							X			
E6								X		
E7								X		
E8								X		
F1	X									
F2										
F3						X				
F4	X		X							
F5	X									
F6				X						
F7	X									
G1	X									
G2	X									
G3	X									
G4	X									
G5	X									
H1										X
H2										X
H3										X
H4										X
H5										
H6							X			
I1									X	
I2									X	
I3										
Other	L4		L4,J1,J2	M6, M7						

## Grade 5 Science Curriculum

### **Major Topic: Ecosystems**

**Goal 1.** Students will understand the interconnections between organisms and their environment.

#### **Subtopic Performance Objectives:**

##### **1A. Populations and Their Needs**

- a. Define a population as consisting of all individuals of a species that occur together at a given place and time. NRC-C (5-8) 4A
- b. Describe an ecosystem as all populations living together and the physical factors with which they interact. NRC-C (5-8) 4A
- c. Explain how the finite resources (abiotic and biotic) in an ecosystem limit the types and populations of organisms within it. MLR-B (5-8) #2 (e.g., other organisms, food, soil, water, shelter)
- d. Show how other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem. NRC-C (5-8) 4D

##### **1B. Ecosystem Change**

- a. Describe how changes in an organism's habitat are sometimes beneficial to it and sometimes harmful. BMK-5D (3-5) #4
- b. Describe, given a particular ecosystem, the physical conditions that affect the growth and survival of organisms. BMK-5D (5-8) #1 (e.g., include what happens when these change)
- c. Describe succession and other ways ecosystems can change over time (e.g., forests, ponds) MLR-B (5-8) #3

##### **1C. Human Impact on an Ecosystem**

- a. Research and evaluate the environmental impacts of scientific and technological developments (on an ecosystem). MLR-M (5-8) #1
- b. Describe an individual's biological and other impacts on an (ecosystem), (e.g., pesticide use, improper disposal of motor oil or other wastes). MLR-M (5-8) #4
- c. Give examples of actions which may have expected or unexpected consequences that may be positive, negative, or both. MLR-M (5-8) #6 (e.g., introducing an invasive species)
- d. Recognize scientific and technological contributions of diverse people (on protecting ecosystems) MLR-M (5-8) #8 (e.g., Rachel Carson, Jacques Cousteau).

#### **Suggested Materials:**

- Quest – Bio-invasive Species
- Quest – Gulf of Maine
- FOSS – Environments
- STC – Ecosystems
- GEMS – Mapping Animal Movements

**Assessments:**

- MAP – Life in the Ecosystem

**Major Topic: Magnetism and Electricity**

**Goal 2.** Students will understand the nature of electricity and magnetism and the connection between them.

**Subtopic Performance Objectives:**

**2A. Electrical Energy**

- Identify electricity as a form of energy. MLR-H (3-4) #1
- Explain different ways electrical energy can be produced (e.g., through mechanical energy, burning fuel, solar cells, stored chemical energy in a battery, lightning, etc.) MLR-H (3-4) #2
- Investigate how electricity in circuits can produce light, heat, sound, and magnetic effects. NRC-B (K-4) #3C
- Show how electrical circuits require a complete loop through which an electrical current can pass. NRC-B (K-4) #3C

**2B. Forces**

- Describe how, without touching them, a magnet pulls on all things made of iron and either pushes or pulls on other magnets. BMK-4G (3-5) #2
- Show how, without touching them, material that has been electrically charged pulls on all other materials and may either push or pull other charged materials. BMK-4G (3-5) #2
- Describe how electric currents and magnets can exert a force on each other. BMK-4G (6-8) #3

**2C. Electromagnetic Energy**

- Describe how energy is a property of many substances and is associated with electricity and magnetism. NRC-B (5-8) 3A
- Describe the characteristics of static and current electricity. MLR-H (5-8) #4
- Explain how electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced. NRC-B (5-8) 3D

**Suggested Materials:**

- FOSS – Electricity and Magnetism
- TOPS – Electricity
- TOPS – Magnetism
- STC – Electric Circuits
- Insights - Circuits & Pathways
- STC – Magnets and Motors

**Assessments:**

## **Major Topic: Structure of the Earth – Soils**

**Goal #3** Students will understand that the solid structure of earth includes important types of soils, formed and used in different ways.

### **Subtopic Performance Objectives:**

#### **3A. Soil Characteristics**

- a. Show how soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria. NRC-D (5-8) 1E
- b. Investigate how the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, insects, rodents, and other organisms. BMK-4C (6-8) #6
- c. Show how soils are often found in layers, with each having a different chemical composition and texture. NRC-D (5-8) 1E
- d. Collect and analyze soil samples from various locations in the community. MLR-F (5-8) example
- e. Demonstrate factors affecting the flow of groundwater. MLR-F (5-8) #7 (e.g., particle size)

#### **3B. Soil Formation**

- a. Describe how soils are formed and why soils differ from place to place. MLR-F (5-8) #2
- b. Describe how rock is weathered to form soil. NRC-F (5-8) 1E
- c. Describe factors (affecting soil) that can cause short term and long term changes to the earth. MLR-F (5-8) #4 (e.g., erosion, weathering, depleting topsoil, droughts, etc.)

#### **3C. Soil Use**

- a. Describe the many products used by humans that are derived from materials in the earth's crust. MLR-F (5-8) #6 (e.g., top soil, clay, sand, gravel)
- b. Analyze how the finite resource (of soil) in an ecosystem limits the types of populations of organisms within it. MLR-B (5-8) #2
- c. Describe an individual's biological and other impacts on an environmental system. MLR-M (5-8) #4 (e.g., soil contamination).

#### **Suggested Materials:**

- NSTA – Soil Curriculum Guide
- Investigating Earth Systems – Soil
- STC – Land & Water
- EBS – Toxic Leak

#### **Assessments:**

- LAD – Soil Studies

**Grade 6  
Life Science Curriculum**

**Major Topic: Classification**

**Goal 1.** Students will understand the purpose of biological classification systems and how they are used.

**Subtopic Performance Objectives:**

**1A. Systems of Classification**

- a. Compare systems of classifying organisms including systems used by scientists. MLR-A (5-8) #1
- b. Describe the characteristics, which biologists consider when classifying organisms. Biologists consider details of internal and external structures to be more important than behavior or general appearance (e.g., vertebrates vs. invertebrates). BMK-5A (6-8) #3
- c. Recognize the difference between plants, which use sunlight to make their own food, and animals, which consume energy-rich foods. Recognize that some kinds of organisms, many of them microscopic, cannot be neatly classified as either plants or animals (i.e., Fungi, Monera, Protista). BMK-5A (6-8) #1
- d. Describe the system for assigning a scientific name to every living thing (i.e., Genus, species). MLR-A (5-8) #2
- e. Recognize for sexually reproducing organisms, a species comprises all organisms that can mate with one another to produce fertile offspring. BMK-5A (6-8) #4

**Suggested Materials:**

- STC Organisms - From Macro to Micro
- FOSS – Diversity of Life
- Micro-cosmos – Kingdom Quest

**Assessments:**

- Learning Effects – Classification

**Major Topic: Characteristics of Living Things**

**Goal 2.** Students will understand the characteristics that define living organisms.

**Subtopic Performance Objectives:**

**2A. Needs of Living Things**

- a. Describe the needs of living things. All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment. NRC-C (5-8) 3A
- b. Food provides molecules that serve as fuel and building material for all organisms. BMK-5E (6-8) #1
- c. Describe some structural and behavioral adaptations that allow organisms to survive (i.e., be able to meet their needs such as find food, reproduce, etc.) MLR-A (5-8) #3

## **2B. Life Processes**

- a. Within cells, many of the basic functions of organisms – such as extracting energy from food and getting rid of waste – are carried out, the way in which cells function is similar in all living organisms. BMK-5C (6-8) #3
- b. Describe in general terms the chemical processes of photosynthesis and respiration. MLR-B (5-8) #1

### **Suggested Materials:**

- FOSS – Diversity of Life
- STC Organisms – From Macro to Micro
- New Directions – Food, Growth, and Energy

### **Assessments:**

- Learning Effects – Seedlings
- NASA LEARN – Photosynthesis Puzzle

## **Major Topic: Ecology**

**Goal 3.** Students will understand how living things depend on one another and on nonliving aspects of the environment.

### **Subtopic Performance Objectives:**

#### **3A. Interdependency and Relationships**

- a. Generate examples of the variety of ways that organisms interact (e.g., competition, predator/prey, parasitism/mutualism). MLR-B (5-8) #4
- b. Describe the ways in which populations of organisms can be categorized by the function they serve in an ecosystem – producers, consumers, and decomposers. NRC-C (5-8) 4B
- c. Show how food webs identify the relationships among producers, consumers, and decomposers in an ecosystem. NRC-C (5-8) 4B
- d. Show the effects of competition (for resources such as food, space, water, air, and shelter). The number of organisms an ecosystem can support depends on the available resources, abiotic and biotic factors. NCR-C (5-8) 4D

#### **3B. Matter and Energy Flow Through an Ecosystem**

- a. Describe in general terms the chemical processes of photosynthesis and respiration. MLR-B (5-8) #1
- b. Describe how energy flows through an ecosystem. Energy entering the ecosystem as sunlight is transferred by producers into chemical energy through photosynthesis. The energy then passes from organism to organism in food webs. NRC-C (5-8) 4C
- c. Show how energy can change from one form to another in living things. Animals get their energy from oxidizing food, releasing some of its energy as heat. BMK-5E (6-8) #3

- d. Describe various mechanisms found in the natural world for transporting living and nonliving matter and the results of such movements (e.g., food webs, carbon dioxide/oxygen cycle, water cycle related to living things). MLR-B (5-8) #5
- e. Explain how over a long time, matter is transferred from one organism to another repeatedly and between organisms and their physical environment. As in all material systems, the total amount of matter remains constant, even though its form and location change. BMK-5E (6-8) #2

**Suggested Materials:**

- FOSS – Populations and Ecosystems
- Quest – Bio-invasion
- Bottle Biology
- New Directions – Lives of Plants

**Assessments:**

- LAD – Life in the Ecosystem

**Major Topic: Diversity of Life**

**Goal 4.** Students will understand the basis for all life and that all living things change over time.

**Subtopic Performance Objectives:**

**4A. Similarities and Differences Among Living Things**

- a. Describe how millions of species of animals, plants, and micro-organisms are alive today and; how, although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical processes, and the evidence of common ancestry. NRC-C (5-8) 5A
- b. Explain how biological evolution accounts for the diversity of species developed through gradual processes over many generations. NRC-C (5-8) 5B

**4B. Change Over Time (Biological Evolution)**

- a. Describe how fossil evidence can be used by scientists to trace the history of a species. MLR-D (5-8) #1
- b. Explain how extinction of species is common – most of the species that have lived on the earth no longer exists. NRC-C (5-8) 5C
- c. Explain how small differences between parents and offspring can accumulate (through artificial selection) and can result in successive generations of organisms being very different from their ancestors (e.g., breeds of dogs). BMK-5F (6-8) #1
- d. Explain why individual organisms with certain traits are more likely than others to survive and have offspring (natural selection). Changes in environmental conditions can affect the survival of individual organisms and entire species. BMK-5F (6-8) #2
- e. Provide examples of the concept of natural and artificial selection. MLR-D (5-8) #3

#### **4C. Adaptations**

- a. Describe how species acquire many of their unique characteristics through biological adaptation, which involves the selection of naturally occurring variations in a particular environment. NRC-C (5-8) 5B
- b. Give examples of structures, behaviors, or physiology that enhance the survival and reproductive success in a particular environment. NRC-C (5-8) 5B
- c. Explain how extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. NRC-C (5-8) 5C

##### **Suggested Materials:**

- EBS – Survive!
- Jason Project – Galapagos
- NRC – Evolution and the Nature of Science

##### **Assessments:**

- LAD – Horsing Around
- LAD – Changes in Plant Life

#### **Major Topic: Structure and Function**

**Goal 5.** Students will understand the hierarchal organization (cells, tissues, organs, organ systems, whole organisms, ecosystems) and relationship between structure and function in living organisms.

#### **Subtopic Performance Objectives:**

##### **5A. Cells**

- a. Explain that all organisms are composed of cells, the fundamental unit of life. Most organisms are single cells; other organisms, including humans, are multi-cellular. NRC-C (5-8) 1A
- b. Discover that the details of cells (both single celled and multi-celled organisms) are visible (usually) only through a microscope. BMK-5C (6-8) #1
- c. Explain that cells are continually dividing, making more cells for growth and repair. BMK-5C (6-8) #2
- d. Recognize that specialized cells, with distinct structures, perform specialized functions in multi-cellular organisms (e.g., nerve, blood, muscle cells). NRC-C (5-8) 1D
- e. Explain how it is within cells, that many of the basic functions of (organs and) organisms, such as extracting energy from food and getting rid of waste, are carried out. BMK-5C (6-8) #3
- f. Describe how cells require nutrients, which they use to provide energy for the work they do and to make the materials that a cell or organism needs. NRC-C (5-8) 1C
- g. Demonstrate how about two-thirds of the weight of cells is accounted for by water, which gives cells many of their properties. BMK-5C (6-8) #4
- h. Prepare and examine microscope slides of single celled and multi-celled organisms. MLR-C (5-8) #2

## **5B. Tissue and Organs**

- a. Describe how groups of specialized cells cooperate to form a tissue, such as a muscle. NRC-C (5-8) 1D
- b. Describe how different tissue are grouped together to form larger functional units, called organs. NRC-C (5-8) 1D
- c. Recognize that different body tissues and organs are made up of different kinds of cells. BMK-5C (6-8) #1
- d. Recognize that each type of tissue and organ has a distinct structure and set of functions that serve the organism as a whole. NRC-C (5-8) 1D
- e. Describe the structure and function of major organs in human systems. MLR-C (5-8) #3

## **5C. Organ Systems**

- a. Describe how the human organism has systems for digestion, respiration, reproduction, circulation, excretion, movement, control, coordination, and protection from disease. NRC-C (5-8) 1E
- b. Describe how body systems work together. MLR-C (5-8) #5
- c. Compare and contrast human organ systems with those of other species. MLR-C (5-8) #1

## **5D. Disease**

- a. Describe how disease is a breakdown in structures or functions of an organism. NRC-C (5-8) 1F
- b. Identify the causes and effects of disease, explain their transmission, and identify prevention strategies. MLR-C (5-8) #4

### **Suggested Materials:**

- Project 2061 - Cell Lesson
- STC – Human Body
- EBS – Outbreak!
- EBS – Gold Medal
- Insights – Human Body Systems

### **Assessments:**

- LAD – Microscopes in a Lab
- MAP – I Am A Cheeseburger

## **Major Topic: Reproduction and Heredity**

**Goal 6.** Students will understand the cycle of reproduction, growth, and development and the influence of heredity.

### **Subtopic Performance Objectives:**

#### **6A. Reproduction, Growth, and Development**

- a. Describe how reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. NRC-C (5-8) 2A
- b. Describe how some organisms reproduce sexually and some reproduce asexually. NRC-C (5-8) 2A
- c. Explain how in many species, including humans, females produce eggs and males produce sperm. Plants also produce sexually, the egg and sperm (pollen) are produced in the flowers of flowering plants. NRC-C (5-8) 2B
- d. Describe how an egg and sperm unite to begin development of a new individual (plant or animal). NRC-C (5-8) 2B

## **6B. Heredity**

- a. Compare how sexually and asexually reproducing species transfer genetic information to offspring. MLR-D (5-8) #4
- b. Explain why sexually produced offspring never are identical to either of their parents. NRC-C (5-8) 2B
- c. Explain how every organism requires a set of instructions for specifying its traits. Heredity is the passage of these instructions from one generation to another. NRC-C (5-8) 2C
- d. Describe how hereditary information is contained in genes, located in the chromosomes of each cell. Each gene carries a single unit of information. An inherited trait of an individual can be determined by one or by many genes, and a single gene can influence more than one trait. A human cell contains many thousands of different genes. NRC-C (5-8) 2D
- e. Describe how an organism's characteristics can be described in terms of a combination of traits. NRC-C (5-8) 2E
- f. Demonstrate how new varieties of cultivated plants and domestic animals have resulted from selective breeding (artificial selection) for particular traits. BMK-5B (6-8) #3
- g. Explain how some traits are the result of inheritance, while others result from interactions with the environment. NRC-C (5-8) 2E

### **Suggested Materials:**

- Wisconsin Fast Plants
- EBS – Survive!

### **Assessments:**

**Grade 7**  
**Earth Science Curriculum**

**Major Topic: Structure of the Earth**

**Goal 1.** Students will understand that the Earth is made up of different parts and materials.

**Subtopic Performance Objectives:**

**1A. Rocks and Minerals**

- a. Classify and identify rocks and minerals based on their physical and chemical properties, their composition, and the processes that formed them. MLR-F (5-8) #5
- b. Describe how the earth is mostly rock. BMK-4B (6-8) #1
- c. Demonstrate how some changes in the solid earth can be described as “the rock cycle”. NRC-D (5-8) 1D

**1B. Water and Atmosphere**

- a. Describe how three-fourths of the earth’s surface is covered by a relatively thin layer of water (some of it frozen) and the entire planet is surrounded by a relatively thin blanket of air. BMK-4B (6-8) #1
- b. Explain how water evaporates from the surface of the earth, rises and cools, condenses into rain or snow and falls again to the surface. BMK-4B (6-8) #5
- c. Illustrate how water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the ocean. BMK-4B (6-8) #5
- d. Demonstrate how water is a solvent. As it passes through the water cycle it dissolves minerals and gases and carries them to the oceans. NRC-D (5-8) 1G
- e. Demonstrate factors effecting the flow of groundwater. MLR-F (5-8) #7
- f. Describe how the atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. NRC-D (5-8) 1H
- g. Explain how the atmosphere has different properties at different elevations. NRC-D (5-8) 1H

**1C. Layers of the Earth**

- a. Describe how the solid earth is layered with a lithosphere; hot, convecting mantle; and dense, metallic core. NRC-D (5-8) 1A
- b. Make and use a three-dimensional model (to represent the layers of the earth). MLR-L (5-8) #4

**Suggested Materials:**

- FOSS – Landforms
- FOSS – Earth History
- GEMS – Stories in Stone
- Investigating Earth Systems – Rocks and Landforms
- Investigating Earth Systems – Oceans
- Investigating Earth Systems – Water as a Resource
- Rock Detectives
- NSTA – Dig In – Hands On Soil Investigations

**Assessments:**

- Learning Effects – *Best Rock*

**Major Topic: Earth in the Universe**

**Goal 2.** Students will understand relationships between the Earth and other bodies in the Solar System and beyond.

**Subtopic Performance Objectives:**

**2A. Stars**

- a. Compare past and present knowledge about characteristics of stars (e.g., composition, location, life cycles) and how people learned about them. MLR-G (5-8) #1
- b. Describe how the sun is a medium sized star located near the edge of a disk-shaped galaxy of stars, part of what can be seen as a glowing band of light that spans the sky on a very clear night. BMK-4A (6-8) #1
- c. Describe how the sun is the central and largest body in the solar system. NRC-D (5-8) 3A
- d. Describe the concept of galaxies, including size and number of stars. MLR-G (5-8) #2
- e. Describe how the sun is many of thousands of times closer to the earth than any other star. Light from the sun takes a few minutes to reach the earth, but light from the next nearest star takes a few years to arrive. The trip to that star would take the fastest rocket thousands of years. BMK-4A (6-8) #2

**2B. Sun-Earth-Moon System**

- a. Explain how gravity holds us to the earth's surface and explains the phenomena of the tides. NRC-D (5-8) 3C
- b. Describe how the sun is the major source of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. NRC-D (5-8) 3C
- c. Demonstrate how the earth's tilt on its axis results in the seasons. MLR-F (5-8) #1
- d. Make and use scale drawings or a three-dimensional model to (represent the Sun-Earth-Moon system). MLR-L (5-8) #4

**2C. Planets and Non-Planetary Objects**

- a. The earth is the third planet from the sun in a system that includes the moon, the sun, eight other planets and their moons, and smaller objects such as asteroids and comets. NRC-D (5-8) 3A
- b. Describe how the earth is orbited by one moon, many artificial satellites, and debris. BMK-4A (6-8) #3
- c. Show how the nine planets are of very different size, composition, and surface features move around the sun in nearly circular orbits. BMK-4A (6-8) #3

- d. Describe how some planets have a great variety of moons and even flat rings of rock and ice particles orbiting around them. Some of these planets and moons show evidence of geologic activity. BMK-4A (6-8) #3
- e. Describe scientists' exploration of space and the objects they have found (e.g., comets, asteroids, pulsars). MLR-G (5-8) #4

## **2D. Motion and Distance in the Universe**

- a. Compare and contrast distances and the time required to travel those distances on earth, in the solar system, in the galaxy, and between galaxies. MLR-G (5-8) #3
- b. Explain how some distant galaxies are so far away that their light takes several billion years to reach the earth. People on earth, therefore, see them as they were that long ago in the past. BMK-4A (6-8) #2
- c. Explain how gravity is the force that keeps planets in orbit around the sun and governs the rest of the motion in the solar system. NRC-D (5-8) 3C
- d. Describe the motions of moons, planets, stars, solar systems, and galaxies. MLR-G (5-8) #5
- e. Describe how most objects in the solar system are in regular and predictable motion. NRC-D (5-8) 3B
- f. Show how motions in the solar system explain phenomena such as the day, the year, phases of the moon, and eclipses. NRC-D (5-8) 3B

### **Suggested Materials:**

- FOSS – Planetary Science
- GEMS – Real Reasons for Seasons
- GEMS – Living With a Star
- GEMS – Moons of Jupiter
- MMSA – Sunspotters
- NASA LEARN – Earth, Moon, Mars Scale Model Lesson
- EBS – Asteroids

### **Assessments:**

- LEARN – Dark Moons
- LEARN – Who Turned Off the Lights
- LEARN – NASA Portrait Gallery of the Universe
- LEARN – Stellar Cycle
- LEARN – Navigator's Guide to the Milky Way
- LAD – Tis the Season
- LAD – The Stars Above
- LAD – Lost In Space
- MAP – Motion in the Heavens

## **Major Topic: Weather**

**Goal 3.** Students will understand the short and long term effects of weather and how to interpret weather information.

### **Subtopic Performance Objectives:**

#### **3A. Interpreting Weather Information**

- a. Make accurate (weather) observations using appropriate tools and units of measure. MLR-J (5-8) #1
- b. Collect and analyze (weather) data and draw conclusions fairly. MLR-J (5-8) #2
- c. Make and use (weather) maps to represent real objects, find locations, and describe relationships. MLR-L (5-8) #4

### **3B. Weather Effects**

- a. Describe some structural and behavioral adaptations that allow organisms to survive in a changing environment (i.e., changes in weather). MLR-A (5-8) #3
- b. Explain how clouds, formed by the condensation of water vapor, affect weather and climate. NRC-D (5-8) 1I
- c. Describe how global patterns of atmospheric movement influence local weather. NRC-D (5-8) 1J
- d. Describe how (weather processes) cause natural hazards-events that change or destroy human and wildlife habitats, damage property, and harm or kill humans. (i.e., floods, storms, tornadoes) NRC-F (5-8) 3A

### **3C. Weather and Climate**

- a. Describe factors that can cause short-term (weather) and long-term (climate) changes to the earth. MLR-F (5-8) #4
- b. Explain how oceans have a major effect on climate, because water in the oceans holds a large amount of heat. NRC-D (5-8) 1J
- c. Describe how even relatively small changes in atmospheric or ocean content can have widespread effects on climate if the change lasts long enough. BMK-4B (6-8) #6

#### **Suggested Materials:**

- EBS – Flood
- EBS – Tornado
- EBS – Hurricane
- Investigating Earth Systems – Climate and Weather

#### **Assessments:**

## **Major Topic: Earth's Resources**

**Goal 4.** Students will understand types and use of earth's energy and physical resources.

### **Subtopic Performance Objectives:**

#### **4A. Energy Resources**

- a. Categorize energy sources as renewable or non-renewable and compare how these sources are used by humans. MLR-H (5-8) #5
- b. Describe how different ways of obtaining, transforming, and distributing energy have different environmental consequences. BMK-8C (6-8) #2

#### **4B. Mineral and Water Resources**

- a. Describe how freshwater, limited in supply, is essential for life and for most industrial processes. BMK-4B (6-8) #8
- b. Describe the many products used by humans that are derived from materials in the earth's crust. MLR-F (5-8) #6
- c. Describe how some minerals are very rare and some exist in great quantities, but for practical purposes, the ability to recover them is just as important as their abundance. As minerals are depleted, obtaining them becomes more difficult. Recycling and the development of substitutes can reduce the rate of depletion but may also be costly. BMK-4B (6-8) #10

#### **4C. Human Impact on Earth's Resources**

- a. Describe how the benefits of earth's resources, such as fresh water, air, soil, and trees can be reduced by using them wastefully or by deliberately or inadvertently destroying them. The atmosphere and the oceans have a limited capacity to absorb wastes and recycle materials naturally. Cleaning up polluted air, water, or soil or restoring depleted soil, forests, or fishing grounds can be very difficult and costly. BMK-4B (6-8) #11
- b. Give examples of actions, which may have expected or unexpected consequences (on natural resources) that may be positive, negative or both. MLR-M (5-8) #6
- c. Explain the connections between industry, natural resources, population, and economic development. MLR-M (5-8) #7

#### **Suggested Materials:**

- EBS – Oil Spill
- Investigating Earth Systems – Materials and Minerals

#### **Assessments:**

### **Major Topic: Earth Processes**

**Goal 5.** Students will understand the short and long processes that affect the earth.

#### **Subtopic Performance Objectives:**

##### **5A. Volcanoes and Earthquakes**

- a. Describe how heat flow and movement of materials within the earth cause earthquakes and volcanic eruptions and create mountains and ocean basins. BMK-4C (6-8) #1
- b. Describe how lithospheric plates on the scales of continents and oceans constantly move at rates of centimeters per year in response to movements in the mantle and cause earthquakes and volcanic eruptions. NRC-D (5-8) 1B
- c. Describe how gas and dust from large volcanoes can change the atmosphere. BMK-4C (6-8) #1
- d. Describe how some changes in the earth's surface are abrupt (such as earthquakes and volcanic eruptions). BMK-4C (6-8) #2

##### **5B. Landforms**

- a. Describe how landforms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediment, while destructive forces include weathering and erosion. NRC-D (5-8) 1C
- b. Describe how the uplift and wearing down of mountains happens very slowly. BMK-4C (6-8) #2
- c. Describe how the earth's surface is shaped in part by the motion of water and wind over very long times, which act to level mountain ranges. BMK-4C (6-8) #2
- d. Describe how mountain building results from plate motions. NRC-D (5-8) 1B

**Suggested Materials:**

- EBS – Earthquake
- EBS – Volcano
- STC – Catastrophic Events
- Investigating Earth Systems – Dynamic Planet
- Investigating Earth Systems – Rocks and Landforms
- FOSS – Earth History
- GEMS – River Cutters
- NASA EarthKam

**Assessments:**

**Major Topic: Earth History**

**Goal 6.** Students will understand the changes to the Earth that have happened over time.

**Subtopic Performance Objectives:**

**6A. Fossil Record**

- a. Explain how scientists use fossils to prove that life forms, climate, environment, and geologic features in a certain location are not the same now as they were in the past. MLR-D (5-8) #2
- b. Explain how fossils can be used to trace the history of a species. MLR-D (5-8) #1

**6B. Geologic Changes**

- a. Describe how thousands of layers of sedimentary rock confirm the long history of the changing surface of the earth. BMK-4C (6-8) #5
- b. Describe how the earth processes we see today, including erosion, movement of lithospheric plates, and changes in atmospheric composition, are similar to those that occurred in the past. NRC-D (5-8) 2A
- c. Explain how earth history is also influenced by occasional catastrophes, such as the impact of an asteroid or comet. NRC-D (5-8) 2A
- d. Explain the evidence scientists use when they give the age of the earth. MLR-F (5-8) #3

**Suggested Materials:**

- FOSS – Earth History

- Microcosmos – Earth History Timeline
- EBS – Asteroid!
- Tom Snyder – Hidden in Rocks

**Assessments:**

## **Major Topic: Particulate Nature Matter**

**Goal 1.** Students will understand that matter has a definite structure determined by the arrangements and motion of its particles.

### **Subtopic Performance Objectives:**

#### **1A. Atoms and Molecules**

- a. Describe the evidence that all matter consists of particles called atoms that are smaller particles. MLR-E (5-8) #2
- b. Describe how atoms may stick together in well-defined molecules or may be packed together in large arrays. Different arrangements of atoms into groups compose all substances. BMK-4D (6-8) #1

#### **1B. States of Matter**

- a. Describe that atoms and molecules are perpetually in motion. BMK-4D (5-8) #3
- b. Describe how the motion of the particles of matter determines the state of that matter (e.g., solid, liquid, gas, plasma) and vice versa. MLR-E (5-8) #5
- c. Describe how energy put into or taken out of a system can cause changes in the motion of particles of matter. MLR-H (5-8) #6

#### **1C. Conservation of Matter**

- a. Demonstrate how the idea of atoms explains the conservation of matter: If the number of atoms stays the same no matter how they are rearranged, then their total mass stays the same. BMK-4D (6-8) #7 and MLR-E (5-8) #8

#### **Suggested Materials:**

- New Directions – Chemistry that Applies
- STC – Properties of Matter

#### **Assessments:**

## **Major Topic: Classification and Properties of Matter**

**Goal 2.** Students will understand that matter has physical and chemical properties and that properties determine the ways matter is classified.

### **Subtopic Performance Objectives:**

#### **2A. Elements, Compounds, and Mixtures**

- a. Describe how scientific ideas about elements were borrowed from Greek philosophers of 2,000 years earlier, who believed that everything was made from four basic substances: air, earth, fire, and water. It was the combination of these “elements” in different proportions that gave other substances their observable properties. BMK-4D (6-8) #5

- b. Explain the similarities and differences between elements, compounds, and mixtures. MLR-E (5-8) #7
- c. Explain how the relatively small number of naturally occurring elements can result in the large variety of substances (including living and nonliving) found in the world. MLR-E (5-8) #6

## **2B. Classifying Elements**

- a. Describe how substances are often placed in categories or groups if they react in similar ways (e.g., metals). NRC-B (5-8)
- b. Identify groups of elements that have similar properties, including highly reactive metals, highly reactive nonmetals, and some almost completely non-reactive gases. Some elements don't fit into any of the categories; among them are carbon and hydrogen, essential elements of living matter. BMK-4D (6-8) #6
- c. Use the Periodic Table to group elements based on the characteristics. MLR-E (5-8) #3

## **2C. Properties of Matter**

- a. Recognize that substances have characteristic properties, such as density, boiling point, solubility, all of which are independent of the amount of the sample. NRC-B (5-8) 1A
- b. Predict and test whether objects will float or sink based on a qualitative and quantitative understanding of the concepts of density. MLR-E (5-8) #1
- c. Describe how a mixture can be separated into the original substances using one or more of the characteristic properties. NRC-B (5-8) 1A

## **2D. Chemical Change and Interactions**

- a. Explain how substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. NRC-B (5-8) 1B
- b. Describe how a substance can combine with different substances in different ways, depending on the conditions and the properties of each substance. MLR-E (5-8) #4
- c. Describe how the temperature and acidity of a solution influence reaction rates. Many substances dissolve in water, which may greatly facilitate reactions between them. BMK-4D (6-8) #4
- d. Demonstrate that total mass is conserved in chemical reactions. NRC-B (5-8) 1B and MLR-E (5-8) #8
- e. Explain, using the idea of atoms, that no matter how substances within a closed system interact with one another, or how they combine or break apart, the total mass of the system remains the same. BMK-4D (6-8) #7

### **Suggested Materials:**

- New Directions – Chemistry That Applies
- STC – Properties of Matter
- FOSS – Chemical Interactions

### **Assessments:**

- MAP – Alien Periodic Table

- LAD – What’s the Matter

## **Major Topic: Force and Motion**

**Goal 5.** Students will understand how to describe, explain, and predict the effect of forces on the motion of objects.

### **Subtopic Performance Objectives:**

#### **5A. Describing Motion**

- Recognize the motion of an object can be described by its position, direction of motion, and speed. NRC-B (5-8) 2A
- Use mathematics to describe the motion of objects (e.g., speed, distance, time, acceleration). MLR-I (5-8) #2
- Measure the motion of an object and represent it on a graph. NRC-B (5-8) 2A
- Describe the motion of objects using knowledge of Newton’s Laws. MLR-I (5-8) #1
- Describe and quantify the ways machines can provide mechanical advantages in producing motion. MLR-I (5-8) #3

#### **5B. Changes in Motion**

- Show how if more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. NRC-B (5-8) 2C
- Show how unbalanced forces will cause changes in the speed or direction of an object’s motion or both. NRC-B (5-8) 2C
- Demonstrate how if an unbalanced force acts toward a single center, the object’s path may curve into an orbit around the center. BMK-4F (6-8) #3

#### **5C. Types of Forces**

- Describe how every object exerts gravitational force on every other object. The force depends on how much mass the objects have and how far apart they are. The force is hard to detect unless at least one of the objects has a lot of mass. BMK-4G (6-8) #1
- Describe how electric currents and magnets can exert a force on each other. BMK-4G (6-8) #3
- Describe how a force such as friction prevents an object from moving at a constant speed. NRC-B (5-8) #B
- Predict and test whether objects will float or sink based on a qualitative and quantitative understanding of the concepts of buoyancy (and fluid forces). MLR-E (5-8) #1

#### **Suggested Materials:**

- Events Based Science – Thrill Ride!
- STC – Energy, Machines, and Motion
- EBS – Flight
- FOSS – Force and Motion

**Assessments:**

- MAP Task – Crash Test
- LAD – Zipping Along

**Major Topic Focus: Energy**

**Goal 6.** Students will understand the concept of energy and its transformations.

**Subtopic Performance Objectives:**

**6A. Types of Energy**

- Explain that energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. NRC-B (5-8) 3A
- Describe different types of energy. Heat energy is in the disorderly motion of molecules; chemical energy is the arrangement of atoms; mechanical energy is in moving bodies or in elastically distorted shapes; gravitational energy is in the separation of mutually attracting masses. BMK-4E (6-8) #4
- Describe characteristics of static and currently electricity. MLR-H (5-8) #4

**6B. Energy Transfer**

- Describe how energy is transferred into or out of a system in most chemical and nuclear reactions. Heat, light, mechanical motion, or electricity might all be involved in such transfers. NRC-4B (5-8) 3E
- Describe how energy in the form of heat is almost always one of the products of an energy transformation. BMK-4E (6-8) #2
- Analyze the benefits and drawbacks of energy conversions (e.g., in electricity generation). MLR-H (5-8) #1
- Demonstrate that energy cannot be created or destroyed but only changed from one form to another. MLR-H (5-8) #2
- Describe how heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature. NRC-4B (5-8) 3B
- Compare and contrast the ways (heat) energy travels (e.g., conduction, convection, radiation). MLR-H (5-8) #3
- Compare and contrast the ways energy travels (by waves). MLR-H (5-8) #3

**6C. The Electromagnetic Spectrum**

- Describe how light from the sun is made up of a mixture of many different colors of light, even though to the eye the light looks almost white. BMK-4F (6-8) #1
- Explain how other things that give off or reflect light have a different mix of colors. BMK-4F (6-8) #1
- Explain how light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection). To see an object, light from that object, emitted by or scattered from it, must enter the eye. NRC-4B (5-8) 3C
- Explain how the sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation. NRC-4B (5-8) 3F

- e. Describe how human eyes respond to only a narrow range of wavelengths of electromagnetic radiation – visible light. Differences in wavelength within that range are perceived as differences in color. BMK-4F (6-8) #5

**Suggested Materials:**

- GEMS – Invisible Universe

**Assessments:**

- LAD – Energy Sources
- MAP – How Warm Can You Keep It?

**MSAD #34**

**Science  
Curriculum  
9-12**

**Belfast Area High School  
Maine Learning Results  
Goals and Objectives**

**CLASSIFYING LIFE FORMS**

**Goal A:**        **The learner will understand that there are similarities within the diversity of all living things.** Modern classification systems are based on comparisons of the structure, life cycles, and behavior of organisms.

- Objective 1.    The learner will explain the role of DNA in resolving questions of relationship and evolutionary change.
- Objective 2.    The learner will describe similarities and differences among organisms within each level of the taxonomic system for classifying organisms (kingdom through species).
- Objective 3.    The learner will analyze the basic characteristics of living things, including their need for food, water, and gases and the ability to reproduce.

**ECOLOGY**

**Goal B:**        **The learner will understand how living things depend on one another and on non-living aspects of the environment.** Balance in ecosystems is based on an intricate web of relationships among populations of living organisms and on non-living factors such as water and temperature. Changes in specific populations or conditions affect other parts of the ecosystem. Individual systems continually change in response to human and other factors.

- Objective 1.    The learner will illustrate the cycles of matter in the environment and explain their interrelationships.
- Objective 2.    The learner will compare the process of photosynthesis and respiration, and describe the factors that effect them.
- Objective 3.    The learner will analyze the factors that affect population size (e.g., reproductive and survival rates).
- Objective 4.    The learner will analyze the impact of human and other activities on the type and pace of change in ecosystems.  
Example: The learner will create a poster illustrating the cycles of water, oxygen, and carbon dioxide as they relate to photosynthesis and respiration.

**CELLS**

**Goal C:**        **The learner will understand that cells are the basic units of life.** The functions performed by organelles (specialized structures found in cells) within individual cells are also carried out by the organ system in multi-cellular organisms. This standard requires that students be conversant with magnifying devices, cell structure and function, body systems, and disease causes and the body's defense against them.

- Objective 1.    The learner will relate the parts of a cell to its function.
- Objective 2.    The learner will illustrate how cells replicate and transmit information, including the roles of DNA and RNA.
- Objective 3.    The learner will discuss the function of the important "molecules of life" – proteins (including enzymes and hormones), carbohydrates, lipids, and nucleic acids.
- Objective 4.    The learner will explain how the human body protects itself against disease and how the body might lose that ability.

- Objective 5. The learner will analyze and debate basic principles of genetic engineering: how it is done, its uses, and some ethical implications.  
Example: The learner will describe how the structure of a cell membrane is related to its function. The learner will create a model contrasting the processes of meiosis and mitosis.

## **CONTINUITY AND CHANGE**

**Goal D:** The learner will understand the basis for all life and that all living things change over time. Fossils show past life, extinct species, and environmental changes over time. Organisms change and new species may arise due to genetically coded adaptations.

- Objective 1. The learner will explain how mutations can be caused by gene mutation or chromosomal alteration and describe the possible results of such mutations on individuals or populations.
- Objective 2. The learner will describe why the offspring of sexually reproducing species have different survival rates than those of asexually reproducing species under a variety of conditions. The learner will describe the advantages and disadvantages of each.
- Objective 3. The learner will explain and document the importance of relatively short-term changes (e.g., one generation) on a species' survival.
- Objective 4. The learner will describe how genetic manipulation can cause unusually rapid change in species.
- Objective 5. The learner will analyze a theory scientists use to explain the origin of life.
- Objective 6. The learner will explain both the evidence used to develop the geologic time scale and why an awareness of geologic time is important to an understanding of the process of change in the universe as well as on earth.  
Example: The learner will describe how scientists use radioisotopes and other technologies to verify fossil changes over time.

## **STRUCTURE OF MATTER**

**Goal E:** The learner will understand the structure of matter and the changes it can undergo.

- Objective 1. The learner will trace the development of models of the atom to the present and describe how each model reflects the scientific understanding of their time.
- Objective 2. The learner will analyze how matter is affected by changes in temperature, pressure, and volume.
- Objective 3. The learner will describe an application of the Law of Conservation of Matter.
- Objective 4. The learner will describe how atoms are joined by chemical bonding.
- Objective 5. The learner will compare the physical and chemical characteristics of elements.
- Objective 6. The learner will describe nuclear reactions, including fusion, fission, and decay, their occurrences in nature, and how they can be used by humans.  
Example: The learner will explain how advances in science and technology have increased our knowledge of the structure of atoms. The learner will describe how physical properties of the ocean, such as salinity and temperature, affect its global circulation and localized motion.

## THE EARTH

**Goal F:** **The learner will gain knowledge about the earth and the processes that change it.** The earth's surface undergoes steady or sudden changes due to forces of wind, water, ice, volcanism, and shifting of tectonic plates.

- Objective 1. The learner will describe how air pressure, temperature, and moisture interact to cause changes in the weather.
- Objective 2. The learner will analyze potential effects of changes in the earth's oceans and atmosphere.
- Objective 3. The learner will describe the impact of plate movement and erosion on the rock cycle.
- Objective 4. The learner will describe ways that scientists measure long periods of time and determine the age of very old objects.
- Objective 5. The learner will demonstrate how rocks and minerals are used to determine geologic history.
- Objective 6. The learner will analyze the changes in continental position and the evidence that supports the concept of tectonic plates.  
Example: The learner will measure physical changes in the atmosphere to predict the weather. The learner will research the location of rock types and fossils in different parts of the world. The learner will conduct simulations to determine ways that global climate can be affected by large-scale circulation of the oceans and the atmosphere.

## THE UNIVERSE

**Goal G:** **The learner will gain knowledge about the universe and how humans have learned about it, and about the principles upon which it operates.** This includes understanding the result of the relative positions and movement of the earth, moon, sun, stars, planets, and galaxies. It also entails an understanding of how scientists gather data and formulate explanations for phenomena in space.

- Objective 1. The learner will describe how scientists gather data about the universe.
- Objective 2. The learner will research current explanations for phenomena such as black holes and quasars.
- Objective 3. The learner will explain how astronomers measure interstellar distances.  
Example: The learner will use a computer to analyze images of planetary bodies.

## ENERGY

**Goal H:** **The learner will understand concepts of energy.** Energy takes many forms that can exert forces and so work. The conversion of energy from one form to another offers useful applications and sometimes presents problems.

- Objective 1. The learner will describe the relationship between matter and energy and how matter releases energy through the processes of nuclear fission and fusion.
- Objective 2. The learner will compare and contrast how conductors, semiconductors, and superconductors work and describe their present and potential uses.
- Objective 3. The learner will demonstrate an understanding that energy can be found in chemical bonds and can be used when it is released from those bonds.

## MOTION

**Goal I:**      **The learner will understand the motion of objects and how forces can change that motion.**  
All objects are in motion, at least at an atomic/subatomic level. By understanding how forces (e.g., gravity, friction, and magnetism) act on objects, they can predict their effects on the motion of the object.

Objective 1.    The learner will describe how forces affect fluids (e.g., air and water).

Objective 2.    The learner will explain the relationship between temperature, heat, and molecular motion.

## INQUIRY AND PROBLEM SOLVING

**Goal J:**      **The learner will apply inquiry and problem solving approaches in science and technology.**  
Scientific inquiry, problem solving, and the technology method provide insight into and comprehension of the world around us. A variety of tools, including emerging technologies, assist the inquiry processes. Models are used to understand the world.

Objective 1.    The learner will make accurate observations using appropriate tools and units of measure.

Objective 2.    The learner will verify, evaluate, and use results in a purposeful way. This includes analyzing and interpreting data, making predictions based on observed patterns, testing solutions against the original problem conditions, and formulating additional questions.

Objective 3.    The learner will demonstrate the ability to use scientific inquiry and technological method with short term and long-term investigations, recognizing that there is more than one way to solve a problem. The learner will demonstrate knowledge of when to try different strategies.

## SCIENTIFIC REASONING

**Goal K:**      **The learner will learn to formulate and justify ideas and to make informed decisions.** This involves framing and supporting arguments, recognizing patterns and relationships, identifying bias and stereotypes, brainstorming alternative explanations and solutions, judging accuracy, analyzing situations, and revising studies to improve their validity.

Objective 1.    The learner will judge the accuracy of alternative explanations by identifying the evidence necessary to support them.

Objective 2.    The learner will explain why agreement among people does not make an argument valid.

Objective 3.    The learner will develop generalizations based on observations.

Objective 4.    The learner will determine when there is a need to revise studies in order to improve their validity through better sampling, controls or data analysis techniques.

Objective 5.    The learner will produce inductive and deductive arguments to support conjecture.

Objective 6.    The learner will analyze situations where more than one logical conclusion can be drawn.

## **COMMUNICATION**

- Goal L: The learner will communicate effectively in the application of science and technology.** Clear and accurate communication employs appropriate symbols and terminology, models, and a variety of media and presentation styles. Communication includes constructing knowledge through reflection, evaluation, refocusing, and critically analyzing information from a variety of sources. Individuals and collaborative groups must communicate effectively.
- Objective 1. The learner will analyze research or other literature for accuracy in the design and findings of experiments.
- Objective 2. The learner will use journals and self-assessment to describe and analyze scientific and technological experiences and to reflect on problem solving processes.
- Objective 3. The learner will make and use appropriate symbols, pictures, diagrams, scale drawings, and models to represent and simplify real-life situations and to solve problems.
- Objective 4. The learner will employ graphs, tables, and maps in making arguments and drawing conclusions.
- Objective 5. The learner will critique models, stating how they do and do not effectively represent the real phenomenon.
- Objective 6. The learner will evaluate the communication capabilities of new kinds of media (e.g., cameras with computer disks instead of film).
- Objective 7. The learner will use computers to organize data, generate models, and do research for problem solving.

## **IMPLICATIONS OF SCIENCE AND TECHNOLOGY**

- Goal M: The learner will understand the historical, social, economic, environmental, and ethical implications of science and technology.** Scientific and technological breakthroughs are influenced by prevailing beliefs and conditions that in turn are impacted by new ideas and inventions. By assessing the impacts of technological and activity on the environment, students will develop their own sense of global stewardship.
- Objective 1. The learner will examine the impact of political decisions on science and technology.
- Objective 2. The learner will demonstrate the importance of resource management, controlling environmental impacts and maintaining natural ecosystems.
- Objective 3. The learner will evaluate the ethical use or introduction of new scientific or technological developments.
- Objective 4. The learner will analyze the impacts of various scientific and technological developments.
- Objective 5. The learner will examine the historical relationships between prevailing cultural beliefs and breakthroughs in science and technology.
- Objective 6. The learner will research issues that illustrate the effects of technological imbalances and suggest some solutions.  
Examples: The learner will design a sustainable community. The learner will compare the costs, risks, and benefits to society of a scientific or technological development (e.g., nuclear fission, genetic engineering).

**BAHS**  
**Program**  
**of**  
**Studies**

**Belfast Area High School**  
**Program of Studies**  
**SCIENCE**

**ADVANCED EARTH SCIENCE 411**

**Cr 1**

**Grade 9**

**Pre: Strong reading, math and study skills, recommendation of 8<sup>th</sup> grade teacher.**

This course is for students who possess high reading levels, advanced math skills, and well developed study skills. This course presents earth science concepts and their relationship to the environment. Topics include map studies, astronomy, rocks and minerals, natural resource use, weathering and erosion, landforms, atmosphere and weather, oceanography and historic geology. A variety of laboratory activities enhance the areas of study. Library research and projects provide concept expansion.

**EARTH SCIENCE 413**

**Cr 1**

**Grade 9**

This course reinforces study skills for all students, including the college bound student. This course acquaints the student with the basic concepts of the development and changes related to the land, atmosphere, and oceans. Discussions will include practical applications and impacts on ecology and environment. A variety of laboratory activities and library research will encourage concept understanding.

**APPLIED SCIENCE 414**

**Cr 1**

**Grade 9**

**This course covers the Earth Science requirement.**

Applied Science is a one-year course designed for students who have difficulties learning in a typical earth science class. Students will use a variety of hands-on methods to deal with a variety of topics including: measuring, map reading, scientific processes, interpreting scientific symbols, graphing and tables, laboratory safety, weather, plate tectonic, erosion and weathering, the rock cycle, space exploration, ecology and the environment and the impact of science on society. The class is team-taught. (Limit of 16 students.)

**COLLEGE PREPARATORY BIOLOGY 421**

**Cr 1.5**

**Grade 10**

**Pre: Sophomore status or permission of department, (which requires passing a test on Earth Science topics related to Learning Results), Alg. I recommended.**

This is a rigorous course, designed for the highly motivated college bound student. The topics are: ecology, cells, cell energetics, genetics, evolutionary theory, and a survey of the Moneran, Protist, Fungi, Plant and Animal Kingdoms. Students are responsible for reading the text, study questions, lab reports, class activities, current events, quarter projects and everyday class work.

**BIOLOGY 423**

**Cr 1**

**Grade 10**

This course includes a more detailed study of biological processes than is provided in Intro to Biology and a closer look at representative members of the plant, animal and protist kingdoms. Lab work is incorporated into the class schedule on the average of twice a week. Reading and answering of related questions are assigned regularly. A notebook is required for lecture notes and the results of lab work. Frequent quizzes and unit tests are included in the grade.

**INTRO TO BIOLOGY 424**

**Cr 1**

**Grade 10**

Intro to Biology is a one-year course designed for students who have difficulties learning in a typical biology class. It emphasizes basic skills and individual learning. Students will use a variety of hands-on methods to deal with a variety of topics including: cells, heredity, ecology, plants and animals. The class is team-taught. (Limit of 16 students.)

**COMPARATIVE ANATOMY 428****Cr .5****Grade 10-12****Pre: Biology**

Anatomy is a one-semester lab-based course consisting of a series of dissections, starting with the simple vertebrates and culminating with the higher mammals. Students will be required to learn the gross anatomy of each specimen as well as the functions of the major organs.

**HUMAN ANATOMY AND PHYSIOLOGY 429****Cr .5****Grade 10-12****Pre: Biology**

Human Anatomy and Physiology is an elective course designed to enrich the educational opportunities for students in the field of science. The students in this course have various personal objectives, ranging from wishing to enter a premed program after high school to solely personal interest in the subject. The course is heterogeneous and allows for a great deal of individual learning. Another aspect of this course is that it is not a survey course, but rather a highly focused one that allows students the time, as well as the means, to explore a single area of biology.

**ADVANCED CHEMISTRY 431****Cr 1.5****Grade 11-12****Pre: An 85 average in College Prep Biology and Alg I or permission of the instructor and currently taking Alg II.**

A traditional college preparatory course, designed to give the student an understanding of the principles and concepts of chemistry by developing necessary background material and developing these concepts to greater depth. Major objectives of the course are an introduction to correct laboratory techniques, and development of a working chemical vocabulary – both mathematical and verbal. The course is structured to develop through the use of the laboratory, demonstrations and supportive lecture material, a background of laboratory skills and basic chemical principles. Students are required to maintain a notebook of class lecture materials, which along with the text, serve as a basis for the course. Laboratory reports are required where feasible.

**CHEMISTRY IN THE COMMUNITY 433****Cr 1****Grade 11-12**

Chem Com is a student centered, activity based, issues oriented chemistry course developed by the American Chemical Society. Chem Com is a nationally recognized curriculum. The course is designed to: help students realize the role that chemistry will play in their personal and professional lives; to use chemistry knowledge to think through and make informed decisions about issues involving science and technology; and to develop a lifelong awareness of the potential and limitations of science and technology. Chem Com is composed of eight units covering such topics as: supplying our water needs, conserving chemical resources, petroleum, understanding food, nuclear chemistry, air and climate, health and the chemical industry. Each of these units includes the major concepts, vocabulary, thinking skills and laboratory techniques necessary for competency in a beginning chemistry course.

**CORE CHEMISTRY 436****Cr .5****Grade 10-12**

A one semester, hands-on course designed to help students meet Learning Results objectives regarding the structure of matter. This course is designed for sophomores, juniors, and seniors who do not take a full year of chemistry, but would like to learn more about science or fulfill science and graduation requirements.

**ENVIRONMENTAL CHEMISTRY 438****Cr .5****Grade 10-12**

This is a one semester, hands-on course designed to help students meet Learning Results objectives for chemistry. Topics such as air and water pollution, acid rain, the Greenhouse Effect, depletion of the ozone layer, renewable and non-renewable energy sources, and burning of fossil fuels, will be examined from the standpoint of chemistry. The course is designed for sophomores, juniors, and seniors who choose not to take a full year of Chemistry, but who want to learn more about science. Field trips may be involved. Chemistry and Physics are required courses beginning with the Class of 2004. This course will be offered only during the fall semester and when taken in conjunction with Astronomy (Physics) 448 will satisfy the Chemistry/Physics

graduation requirement. However, please note that 4-year colleges and universities that require a full year of high school chemistry may not accept this course.

### **AP BIOLOGY 440**

**Cr 1.5**

**Grade12**

**Pre: College Prep Biology, Advanced Chemistry, proficiency in mathematics/selection process.**

The course includes topics in molecular, cellular, organismal and population biology. The Advanced Placement Exam may be taken at the end of the course, which may result in as many as 8 college credits being awarded to the successful student by the college he/she plans to attend. There is homework every night. The grading is based on tests, homework and projects. Limited to 16 students.

### **AP PHYSICS 444**

**Cr 1.5**

**Grade 11-12**

**Pre: An 85 or better in Advanced Chem. And Alg. II and students must be enrolled in Adv. Math or Calculus.**

AP Physics is a lab course that surveys a wide spectrum of topics in the study of energy and its changes. It is equivalent to one year of non-calculus college physics and can result in as many as eight college credits upon successful completion of AP Physics B test in May. Students learn to read, understand, and interpret physical information – verbal, mathematical, and graphical. Students use mathematical reasoning in physical situations and perform experiments and interpret the results of observations, including making assessments of experimental uncertainties. Major topics include kinematics, mechanics, thermodynamics, electricity and magnetism, optics, and modern physics.

### **PHSICS (Lab) 441**

**Cr 1.5**

**Grade 12**

**Pre: Must have successfully completed Alg. II and be enrolled in Adv. Math**

Lab Physics is designed to meet the needs of college bound seniors who will be taking post-secondary science. Physics is the study of matter and energy and their interactions. Students are introduced to fundamental concepts in the areas of mechanics, light, sound, heat, electricity, magnetism, and nuclear phenomena. This course combines classroom discussion with inquiry based laboratory activities. Student investigations emphasize accurate observations, collection of data, analysis of data, and safe manipulation of laboratory apparatus and materials. This is a math-oriented course with a strong emphasis on problem solving. Algebra, geometry, and trigonometry are used on a regular basis. Students with good math and science backgrounds will find this course challenging.

### **CONCEPTUAL PHYSICS 443**

**Cr 1**

**Grade 12**

Physics is designed to provide a solid background in physical principals. In this course, students will experience, through hands-on activities, how physics impacts their lives and their everyday environment. Student assessment will be based on lab reports, homework problems, learning logs, and projects. Although there are no prerequisites, algebra and geometry are used in this course.

### **CORE PHYSICS 437**

**Cr .5**

**Grade 10-12**

A one semester, hands-on course designed to help students meet learning results objectives regarding concepts of energy, motion, and forces. This course is designed for sophomores, juniors, and seniors who do not take a full year of physics, but would like to learn more about science of fulfill science and graduation requirements. This course is a required course beginning with the Class of 2004.

### **ASTRONOMY: The Physics of the Universe.**

**Cr .5**

**Grade 10-12**

This is a one-semester, hands-on course designed to help students meet Learning Results objectives for physics. Topics such as gravity, force and motion, acceleration, rocketry, light, electricity and magnetism, and telescopes will be examined from the standpoint of Physics. This course is designed for sophomores, juniors, and seniors who choose not take a full year of Physics, but who want to learn more about science. Field trips may be involved and, whenever possible will include viewing of the night sky. Physics and Chemistry are required courses beginning with the Class of 2004. This course will be offered only during the spring semester and

when taken in conjunction with Environmental Chemistry (438) will satisfy the Chemistry/Physics graduation requirement. However, please note that 4-year colleges and universities that require a full year of high school Physics may not accept this course.

**MARINE STUDIES 434**

**Cr .5**

**Grade 11-12**

**Pre: Biology or permission of instructor**

An interdisciplinary study into Belfast Harbor and Penobscot Bay. Subject areas will include: oceanography, marine biology, estuarine ecology, geology, mathematics, communication skills, and history. Students will undertake individual and class-wide research projects. Students will undertake individual and class-wide research projects. Students are required to participate in an all day field trip.

**FISH AND WILDLIFE MANAGEMENT I 445**

**Cr .5**

**Grade 9-12**

A spring semester course that deals with populations, communities, ecology, and management of fish and wildlife. Emphasis is on the interaction of species and the impact of environmental changes on populations. Evaluations will be based on labs, projects, tests, and journals. Students will read essays, articles, and small books. Classes will be held outdoors as much as possible. An all day field trip is required.

**FISH AND WILDLIFE MANAGEMENT II 449**

**Cr .5**

**Grade 10-12**

**Pre: Successful completion of Fish and Wildlife Management I and instructor permission.**

This course will be an extension of the Fish and Wildlife class. Students will be in the same class as Fish and Wildlife I. There will be extra research and projects on the subject matter covered in the class. In addition, students will choose a subject that highly interests them and do independent research through interviews, field research, and institutional visitations to complete a semester long research project.

**MAINE FIELD ECOLOGY 439**

**Cr .5**

**Grade 9-12**

This is a fall semester course that studies ecosystems of Maine through identifications and collections. Each student will be responsible for various collecting projects along with identifying individual organisms. These will vary from the aquatic life in a stream to trees in the mature north woods ecosystem. Evaluations will be based on projects, collections, labs, and tests. Classes will be outdoors as much as possible. The demands of the course involve: collecting outside of school, name memorization, note taking skills and the ability to complete independent projects on time. An all day field trip is required.