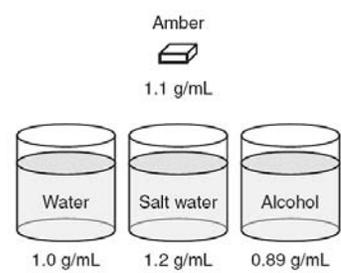


**Science Areas of Focus: Grade 8**  
**(Reflects knowledge and skill expectations for Grades 5-8)**

**Mission:** *Scientific literacy encompasses the understanding of key concepts and principles of science; familiarity with the natural world for both its diversity and unity; and use of scientific knowledge and scientific ways of thinking for individual and social purposes (American Association for the Advancement of Science).*

<b>Standard 5.1 Scientific Processes</b>									
All students will develop problem-solving, decision-making and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.									
<b>Big Idea:</b> Science is a way of thinking about and investigating the world in which we all live.									
<b>5.1.8 A. Habits of Mind</b>									
<b>Essential Questions</b>	<b>Enduring Understandings</b>								
<ul style="list-style-type: none"> <li>▪ What constitutes evidence?</li> <li>▪ When do you know you have enough and the right kind of evidence?</li> <li>▪ How can this result be best justified and explained to others?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Scientific inquiry involves asking scientifically-oriented questions, collecting evidence, forming explanations, connecting explanations to scientific knowledge and theory, and communicating and justifying explanations.</li> </ul>								
<b>Areas of Focus</b>	<b>Comments and Examples</b>								
1. <b>Evaluate the strengths and weaknesses of data, claims, and arguments.</b>	<p><b>As a skill standard, habits of mind are assessed in the context of standards 5.5 – 5.10, rather than as stand-alone items.</b></p> <p><b>Sample Test Item:</b>            Cheng wants to know which brand of paper towel absorbs more water, Brand X or Brand Y. He uses squares of each brand and measures how much water is absorbed from cups of water after 30 seconds of submersion. His data from the five trials are shown below. Describe and explain three ways that Cheng could improve his experimental design.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" style="text-align: center;">Water Absorption</th> </tr> <tr> <th style="text-align: center;">Paper Towel Brand</th> <th style="text-align: center;">Amount of Water (mL) Absorbed (5 trials)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Brand X</td> <td style="text-align: center;">30, 31, 32, 34, 34</td> </tr> <tr> <td style="text-align: center;">Brand Y</td> <td style="text-align: center;">40, 43, 44, 45, 45</td> </tr> </tbody> </table>	Water Absorption		Paper Towel Brand	Amount of Water (mL) Absorbed (5 trials)	Brand X	30, 31, 32, 34, 34	Brand Y	40, 43, 44, 45, 45
Water Absorption									
Paper Towel Brand		Amount of Water (mL) Absorbed (5 trials)							
Brand X		30, 31, 32, 34, 34							
Brand Y	40, 43, 44, 45, 45								
2. <b>Communicate experimental findings to others.</b>									
3. <b>Recognize that the results of scientific investigations are seldom exactly the same and that replication is often necessary.</b>									
4. Recognize that curiosity, skepticism, open-mindedness, and honesty are attributes of scientists.									
<b>5.1.8 B. Inquiry and Problem Solving</b>									
<b>Essential Questions</b>	<b>Enduring Understandings</b>								
<ul style="list-style-type: none"> <li>▪ What makes a question scientific?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Scientific inquiry involves asking scientifically-oriented questions, collecting evidence, forming explanations, connecting explanations to scientific knowledge and theory, and communicating and justifying explanations.</li> </ul>								
<b>Areas of Focus</b>	<b>Comments and Examples</b>								
1. <b>Identify questions and make predictions that can be addressed by conducting investigations.</b>	<p><b>Sample Test Items:</b></p> <ol style="list-style-type: none"> <li>1. Explain how you can determine the volume of a solid object, such as a small rock, using only water and either a measuring cup or a graduated cylinder.</li> </ol>								
2. <b>Design and conduct investigations incorporating the use of a control.</b>									

<p>3. <b>Collect, organize, and interpret the data that result from experiments.</b></p>	<p>Use the picture below to answer the question.</p> <div style="text-align: center;">  </div> <p>2. Predict what will most likely happen (sink or float) to the amber when it is placed in each liquid? Explain the reasons for your hypothesis.</p> <p>3. A student made this hypothesis.</p> <p><i>“If most plants did not carry out photosynthesis, then many organisms would die.”</i></p> <p>Which statement best supports his hypothesis?</p> <p>A. The environment has a limited water supply.</p> <p>B. The environment has a limited mineral supply.</p> <p>* C. The environment has a limited oxygen supply.</p> <p>D. The environment has a limited carbon dioxide supply.</p>
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**5.1.8 C. Safety**

<b>Essential Questions</b>	<b>Enduring Understandings</b>
<ul style="list-style-type: none"> <li>▪ What does Safety First demand of us in each setting?</li> <li>▪ What rules are general and what are situation-specific?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Safety first!</li> </ul>
<b>Areas of Focus</b>	<b>Comments and Examples</b>
<p>1. <b>Know when and how to use appropriate safety equipment with all classroom materials</b></p>	<p><b>Sample Test Item:</b>            Maria has one glass of pure water and one glass of salt water, which look exactly alike. Maria has decided to boil small samples of water on a hot plate to evaporate the water to identify which sample has salt dissolved in it. Identify the potential hazards of doing so and what Maria should do to keep safe.</p>
<p>1. <b>Understand and practice safety procedures for conducting science investigations.</b></p>	

**Standard 5.2 Science and Society**

All students will develop an understanding of how people of various cultures have contributed to the advancement of science and technology, and how major discoveries and events have advanced science and technology.

**Big Idea:** Science is a human endeavor. People from many cultures have contributed to the understanding of science.

**5.2.8 A. Cultural Contributions**

<b>Essential Questions</b>	<b>Enduring Understandings</b>
<ul style="list-style-type: none"> <li>▪ What do we mean in science when we say that we stand on the shoulders of giants?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Understanding the development of scientific ideas is essential for building scientific knowledge.</li> </ul>

Area of Focus	Comments and Examples
1. <b>Recognize that scientific theories: develop over time; depend on the contributions of many people; and reflect the social and political climate of their time.</b>	<p><b>Instructional Focus:</b> As students study science, they should be aware of the historical context that has impacted the development of various scientific theories and that the body of scientific knowledge is constantly changing. It is not expected that students memorize the specific contributions of individual scientists, but rather they will appreciate the context of their work and how it has impacted what we know about the world in which we live.</p> <p><b>Sample Test Item:</b> Charles Darwin's <i>On the Origin of Species</i> is often considered to be the foundation of biology as it offers a unifying logical explanation for the diversity of life. Provide a brief explanation as to why it took Darwin 23 years to publish his work after conceiving his revolutionary ideas.</p> <p><b>Inappropriate assessment item for this CPI:</b> Who wrote <i>On the Origin of Species</i>?</p>
2. Know that scientists are men and women of many cultures who often work together to solve scientific and technological problems.	
3. Describe how different people in different cultures have made and continue to make contributions to science and technology.	

### 5.2.8 B. Historical Perspectives

Essential Questions	Enduring Understanding:
<ul style="list-style-type: none"> <li>▪ How do science and technology influence each other?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Technology evolves at an ever accelerating pace based on the needs and wants of society, and is influenced by the cultural, political, and environmental values and constraints.</li> </ul>

Areas of Focus	Comments and Examples
1. <b>Describe the impact of major events and people in the history of science and technology, in conjunction with other world events.</b>	<p><b>Sample Test Items:</b></p> <p>1. In the mid-1800s, Louis Pasteur proved the germ theory of disease. The impact of his work saved millions of human lives. Which invention made Pasteur's work possible?</p> <p style="margin-left: 40px;">A. telescope</p> <p style="margin-left: 40px;">* B. microscope</p> <p style="margin-left: 40px;">C. endoscope</p> <p style="margin-left: 40px;">D. spectroscope</p>
2. Describe the development and exponential growth of scientific knowledge and technological innovations.	

### Comparison of Four Countries

Country	Population	Required Education	Percent of College Students	Number of Major Rivers	Coal and Oil Deposits
A	2 million	Grades 1–4	2	1	None
B	100 million	Grades 1–12	40	10	4 billion tons
C	25 million	Grades 1–10	20	5	1 billion tons
D	10 million	Grades 1–8	10	5	2 billion tons

2. According to the above data table, which country is most likely to become a world leader in energy production? Explain the reasons for your choice.

### Standard 5.3 Mathematical Applications

All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.

**Big Idea:** Science cannot be practiced or learned without appreciation of the role of mathematics in discovering and expressing natural laws. Tables, graphs, and equations are alternative ways of representing information or relationships- each with advantages and disadvantages.

### 5.3.8 A. Numerical Operations

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>▪ How is mathematics used to model objects, events and relationships?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Mathematics is a tool used to model objects, events, and relationships in the natural and designed world.</li> </ul>

Areas of Focus	Comments and Examples
<p>1. <b>Express quantities using appropriate number formats: decimals; percents; scientific notation.</b></p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Beginning to explore the use of significant figures during the middle grades</li> <li>Understanding the relationship between a phenomenon and the mathematical symbolic representation rather than memorizing formulas and learning algorithms for solving them</li> <li>Using ratio and proportion to solve problems</li> <li>Using common prefixes such as milli-, centi-, and kilo-</li> <li>Converting within a measurement system (e.g., centimeter to meter)</li> <li>Measuring with accuracy and precision (e.g., length, volume, mass, temperature and time)</li> <li>Expressing answers to reflect the degree of precision and accuracy of their measurements</li> <li>Using appropriate Standard International Units (SI) of measurement for mass (kg), length (m), and time (s)</li> </ul> <p><b>Sample Test Item:</b>            You have been walking your little brother to school every day along a busy street. The speed limit is 25 miles per hour (40 kilometers per hour). The cars and trucks appear to be going much faster than that. With only simple tools such as a stop watch, calculator and meter stick available to you, describe one way that you could effectively determine if a car is speeding.</p>

### 5.3.8 B. Geometry and Measurement

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>How do we use mathematics to model objects, events and relationships in science?</li> </ul>	<ul style="list-style-type: none"> <li>Mathematics is a tool used to model objects, events, and relationships in the natural and designed world.</li> </ul>
Area of Focus	Comments and Examples
<p>1. Perform mathematical computations using labeled quantities and express answers in correctly derived units.</p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Understanding the relationship between a phenomenon and the mathematical symbolic representation rather than memorizing formulas and learning algorithms for solving them</li> <li>Begin to explore the use of significant figures during the middle grades</li> </ul> <p><b>Inappropriate assessment items for this CPI:</b></p> <ol style="list-style-type: none"> <li>Convert 242.2 kg to grams.</li> <li>Pat is 5 feet 4 inches tall. What is the equivalent in SI units?</li> </ol>

### 5.3.8 C. Patterns and Algebra

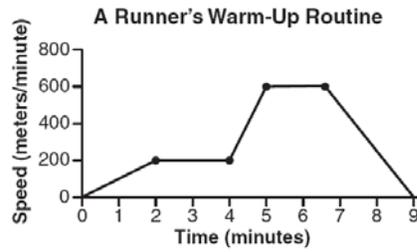
Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>How do we use mathematics to model objects, events and relationships in science?</li> </ul>	<ul style="list-style-type: none"> <li>Mathematics is a tool used to model objects, events, and relationships in the natural and designed world.</li> </ul>
Area of Focus	Comments and Examples
<p>1. Express physical relationships in terms of mathematical equations derived from collected data.</p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Understanding the relationship between a phenomenon and the mathematical symbolic representation rather than memorizing formulas and learning algorithms for solving them</li> </ul>

### 5.3.8 D. Data Analysis and Probability

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>How do we use mathematics to model objects, events and relationships in science?</li> </ul>	<ul style="list-style-type: none"> <li>Mathematics is a tool used to model objects, events, and relationships in the natural and designed world.</li> </ul>
Areas of Focus	Comments and Examples
<p>1. <b>Represent and describe mathematical relationships among variables using graphs and tables.</b></p> <p>2. <b>Analyze experimental data sets using measures of central tendency; mean; mode; median.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Students use graphing calculators and/or spread sheet programs to collect, manage, and report data.</li> </ul>

3. **Construct and use a graph of experimental data to draw a line of best fit and identify a linear relationship between variables.**

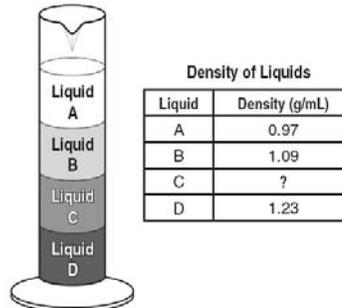
**Sample Test Items:**



1. The graph illustrates the pace that a runner has set for her warm-up routine. Which time interval shows her greatest acceleration?

- A. 0 to 2 minutes
- B. 4 to 5 minutes \*
- C. 5 to 7 minutes
- D. 7 to 9 minutes

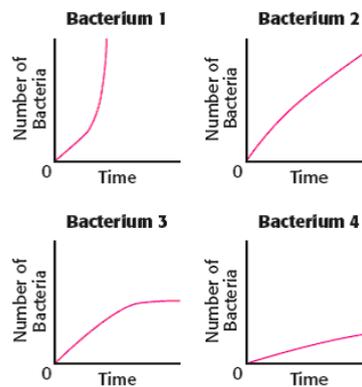
Use the illustration below to answer question 2



2. What is the approximate density of Liquid C?

- A. Less than 0.97 g/mL
- B. Greater than 1.23 g/mL
- C. Greater than 0.97 g/mL but less than 1.09 g/mL
- \* D. Greater than 1.09 g/mL but less than 1.23 g/mL

3. These graphs show the rate at which four different disease-producing bacteria grow.



Which bacterium would produce disease in the shortest amount of time?

- \* A. Bacterium 1
- B. Bacterium 2
- C. Bacterium 3

<p>4. Use computer spreadsheets, graphing and database applications to assist in quantitative analysis of data.</p>	<p style="text-align: right;">D. Bacterium 4</p> <p>4. Sonar is a tool that uses sound waves to measure the depth of the ocean. Sonar bounces sound waves off of the sea floor. The time that it takes for the sound to return can be used to determine the depth.</p> <p>a. Based on the data table provided below, which of the ships has steadily been moving into shallower water? Justify your choice.</p> <p>b. How would a new set of data be different than the original data if it had been taken in August and a second set of data were taken in January (assume northern hemisphere)? Explain.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">SHIP</th> <th colspan="4">SONAR READINGS</th> </tr> <tr> <th>1<sup>ST</sup></th> <th>2<sup>ND</sup></th> <th>3<sup>RD</sup></th> <th>4<sup>TH</sup></th> </tr> </thead> <tbody> <tr> <td>A</td> <td>.10 sec</td> <td>.15 sec</td> <td>.17 sec</td> <td>.21 sec</td> </tr> <tr> <td>B</td> <td>.17 sec</td> <td>.21 sec</td> <td>.18 sec</td> <td>.15 sec</td> </tr> <tr> <td>C</td> <td>.21 sec</td> <td>.17 sec</td> <td>.15 sec</td> <td>.10 sec</td> </tr> <tr> <td>D</td> <td>.11 sec</td> <td>.08 sec</td> <td>.15 sec</td> <td>.09 sec</td> </tr> </tbody> </table>	SHIP	SONAR READINGS				1 <sup>ST</sup>	2 <sup>ND</sup>	3 <sup>RD</sup>	4 <sup>TH</sup>	A	.10 sec	.15 sec	.17 sec	.21 sec	B	.17 sec	.21 sec	.18 sec	.15 sec	C	.21 sec	.17 sec	.15 sec	.10 sec	D	.11 sec	.08 sec	.15 sec	.09 sec
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**Standard 5.4 Nature And Process Of Technology**

All students will understand the interrelationships between science and technology and develop a conceptual understanding of the nature and process of technology.

**Big Idea:** The study of science and technology is interrelated and as such can assist in solving problems.

**5.4.8 A. Science and Technology**

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>▪ How do science and technology influence each other?</li> </ul>	<ul style="list-style-type: none"> <li>▪ The development of technology and advances in science are mutually supportive in driving innovation in both fields.</li> </ul>
Areas of Focus	Comments and Examples
<p>1. Compare and contrast science with technology, illustrating similarities and differences between these two human endeavors.</p>	

**5.4.8 B. Nature of Technology**

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>▪ Are there ways to circumvent physical and social constraints when using technology?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Physical constraints and social values play a role in limiting the use of technology to solve problems.</li> </ul>
Area of Focus	Comments and Examples
<p>1. Analyze a product or system to determine the problem it was designed to solve, the design constraints, trade-offs and risks involved in using the product or system, how the product or system might fail, and how the product or system might be improved.</p>	<p><b>Assessment Strategy:</b></p> <ul style="list-style-type: none"> <li>• Select a technological problem and describe the criteria and constraints that are addressed in solving the problem using the design loop.</li> </ul>

**5.4.8 C. Technological Design**

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>▪ How is the overarching concept of systems related to design and technology?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Thinking systematically means looking for the relationships between parts.</li> </ul>
Areas of Focus	Comments and Examples
<p>1. Recognize how feedback loops are used to control systems.</p>	<p><b>Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>• Engineer a technological system including: input, process, output and feedback.</li> <li>• Evaluate an existing designed solution with a faulty feedback loop in the control system, and determine how to repair it.</li> </ul>

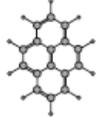
### Standard 5.5 Characteristics Of Life

All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life.

**Big Idea:** The natural world is defined by organisms and life processes which conform to principles regarding conservation and transformation of matter and energy. Knowledge about life processes can be applied to improving human health and well being.

#### 5.5.8 A. Matter, Energy and Organization in Living Systems

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>▪ How is matter transformed, and energy transferred/transformed in living systems?</li> </ul>	<ul style="list-style-type: none"> <li>▪ All organisms transfer matter and convert energy from one form to another.</li> <li>▪ Both matter and energy are necessary to build and maintain structures within the organism.</li> </ul>
Areas of Focus:	Comments and Examples
<p><b>1. Explain how the products of photosynthesis and respiration are recycled.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>• Creating models that illustrate the codependent nature of respiration and photosynthesis</li> <li>• Depicting and describing the cyclic flow of materials and energy that occurs through the processes of photosynthesis and respiration</li> <li>• Comparing the processes of photosynthesis and respiration in terms of reactants, products and energy transfer</li> <li>• Presenting evidence to support that photosynthesis and respiration are opposite reactions necessary to sustain life</li> </ul> <p><b>Sample Test Items:</b></p> <ol style="list-style-type: none"> <li>1. In a futuristic space station, the 20 human inhabitants are sustained by a large and diverse population of plants. A plant parasite is accidentally introduced and wipes out the plants. As the life support system engineer you need to:             <ul style="list-style-type: none"> <li>• Identify and explain the immediate problems could arise from this loss.</li> <li>• Outline and justify a solution to solve the problem.</li> </ul> </li> <li>2. Jill assembles a closed terrarium that contains moist soil, rocks, green plants, and two grasshoppers. After observing the terrarium for two months, she draws the following conclusion: The terrarium doesn't have enough consumers. What supporting data may have led Jill to this conclusion?</li> <li>3. Select an organism from the sample food web (below). Predict what would happen to the food web at the end of 6 months, then 2 years if that organism was eliminated. Justify your prediction.</li> </ol> <div style="text-align: center;"> </div>

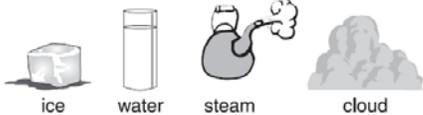
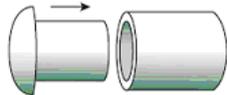
Areas of Focus	Comments and Examples
<p>1. <b>Recognize that complex multicellular organisms, including humans, are composed of and defined by interactions of the following:</b></p> <ul style="list-style-type: none"> <li>➤ Cells;</li> <li>➤ Tissues;</li> <li>➤ Organs; and</li> <li>➤ Systems.</li> </ul>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Relating the structure of cells, tissues, organs and systems to their functions in supporting life.</li> </ul> <p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Explaining how structure improves functional efficiency</li> <li>Explaining the relationship between complex organisms and their functional complexity</li> </ul> <p><b>Inappropriate assessment items for this CPI:</b></p> <ol style="list-style-type: none"> <li>Sid is observing an unknown cell under a microscope. The presence of which structure would help him to determine if the cell was from a plant or from an animal? <ul style="list-style-type: none"> <li>A. nucleus</li> <li>* B. cell wall</li> <li>C. ribosomes</li> <li>D. cell membrane</li> </ul> </li> <li>Which of the following shows a DNA molecule? <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>A</p> </div> <div style="text-align: center;">  <p>C</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="text-align: center;">  <p>B</p> </div> <div style="text-align: center;">  <p>D</p> </div> </div> </li> </ol> <p><i>These are inappropriate assessment items for this CPI because they are assessing learning targeted for instruction by the end of grade 4.</i></p>

**5.5.8 B. Diversity and Biological Evolution**

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>▪ How are organisms of the same kind different from each other?</li> <li>▪ How does this help them reproduce and survive?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Organisms are grouped in taxonomy based upon similarity.</li> </ul>

Areas of Focus	Comments and Examples
<p>1. <b>Compare and contrast kinds of organisms using their internal and external characteristics.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Classifying organisms based on internal and external characteristics into currently recognized kingdoms and justify their placement</li> <li>Given an assemblage of organisms that share a common group, identifying the traits that have been used to place them in this group</li> <li>Explaining how an increased number of similarities among organisms relate to their shared taxonomic grouping</li> <li>Explaining why there are more organisms grouped together at the top of the hierarchy than at the bottom</li> <li>Explaining how genetic similarity parallels structural similarity, and therefore taxonomic placement</li> </ul> <p><b>Sample Test Item:</b></p>

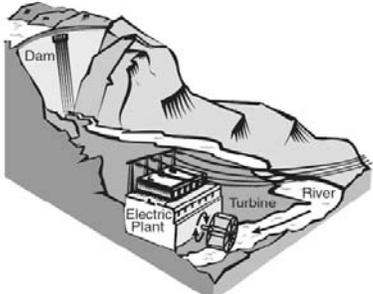
	 <p style="text-align: center;"> <span>tick</span>      <span>scorpion</span>      <span>shrimp</span>      <span>blue crab</span> </p> <p style="text-align: center;"><i>Use the illustrations above to answer the following question.</i></p> <p>You are the curator of a new exhibit at the New Jersey Museum of Science. You have determined that each of the specimens shown above belong to the same group in a scientific classification system. Give <b>three</b> convincing arguments to support the idea that these organisms are closely related and should therefore be displayed together. Be sure to include structures and physical characteristics of the organisms in your arguments.</p>															
<p><b>2. Discuss how changing environmental conditions can result in the evolution or extinction of a species.</b></p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Organisms that inherit characteristics advantageous for survival in their physical environment reproduce and increase the proportion of individuals with similar traits in the species.</li> </ul> <p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Relating traits of successful organisms in various environmental conditions</li> <li>Showing evidence that traits are passed from parent to offspring</li> <li>Explaining how heredity is the mechanism by which organisms evolve or become extinct</li> </ul>															
<p><b>3. Recognize that individual organisms with certain traits are more likely to survive and have offspring.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Explaining the concept of natural selection.</li> </ul> <p><b>Sample Test Item:</b>  A female bullfrog lays thousands of eggs. Most of the eggs hatch into tadpoles. The tadpoles compete for limited resources within their own ecosystem. A few of these tadpoles become adult bullfrogs. What characteristics might contribute to a tadpole's survival?</p>															
<b>5.5.8 C. Reproduction and Heredity</b>																
<b>Essential Questions</b>	<b>Enduring Understandings</b>															
<ul style="list-style-type: none"> <li>How does the understanding of manipulation of genetics, reproduction, development and evolution affect the quality of human life?</li> </ul>	<ul style="list-style-type: none"> <li>The structural and functional characteristics of an organism determine their continued survival over time under changing environmental conditions.</li> </ul>															
<b>Areas of Focus</b>	<b>Comments and Examples</b>															
<p><b>1. Describe how the sorting and recombining of genetic material results in the potential for variation among offspring of humans and other species.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Distinguishing between the variation of traits of organisms formed through asexual and sexual reproduction</li> <li>Describing how variation results when two individual parent cells combine to form a zygote</li> <li>Evaluating the positive and negative significance of variation among offspring</li> <li>Predicting variation using models such as Punnett Squares</li> </ul> <p><b>Sample Test Items:</b></p> <p>1. Which of the following is an example of asexual reproduction?</p> <p>A. birds laying eggs  B. dragonflies mating  C. oak tree producing acorns  * D. microorganism splitting in half</p> <div style="text-align: center;"> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2"></td> <td colspan="2" style="text-align: center;">Mother's Genes</td> </tr> <tr> <td colspan="2"></td> <td style="text-align: center;">F</td> <td style="text-align: center;">?</td> </tr> <tr> <td rowspan="2" style="vertical-align: middle;">Father's Genes</td> <td style="text-align: center;">F</td> <td style="text-align: center;">FF</td> <td></td> </tr> <tr> <td style="text-align: center;">?</td> <td></td> <td style="text-align: center;">ff</td> </tr> </table> </div>			Mother's Genes				F	?	Father's Genes	F	FF		?		ff
		Mother's Genes														
		F	?													
Father's Genes	F	FF														
	?		ff													

	<p>Looking at the Punnett Square above,</p> <ol style="list-style-type: none"> <li>What can you conclude about the genotype of both parents?</li> <li>If <b>F</b> is the symbol for curly fur and <b>f</b> is the symbol for straight fur, what is the probability that any of their offspring will have curly hair?</li> </ol>
<b>Standard 5.6 Chemistry</b> All students will gain an understanding of the structure and behavior of matter.	
<b>Big Idea:</b> Materials exist throughout our physical world. The structures of materials influence their physical properties, chemical reactivity and use.	
<b>5.6.8 A. Structure and Properties of Matter</b>	
<b>Essential Questions</b>	<b>Essential Understandings:</b>
<ul style="list-style-type: none"> <li>How do properties of materials determine their use?</li> </ul>	<ul style="list-style-type: none"> <li>The atomic structures of materials determine their properties.</li> </ul>
<b>Areas of Focus</b>	<b>Comments and Examples</b>
<ol style="list-style-type: none"> <li><b>Know that all matter is composed of atoms that may join together to form molecules.</b></li> </ol>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Creating models of simple molecules illustrating the atoms from which they are composed</li> <li>Constructing models of water, ammonia, and glucose and identifying the elements and number of atoms of which each is composed using recycled materials</li> </ul> <p><b>Sample Test Item:</b> If you took all of the atoms out of a chair, what would be left? Explain your answer.</p>
<ol style="list-style-type: none"> <li><b>Recognize that the phase of matter is determined by the arrangement and motion of atoms and molecules and that the motion of these particles is related to the energy of the system.</b></li> </ol>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Predicting the state of matter when energy is added or removed from it</li> <li>Identifying what state ice, water, and steam are in and developing a plan to change the state of matter</li> <li>Predicting the motion of the molecules of liquid water when enough energy is added and removed to change its state</li> </ul> <p><b>Sample Test Items:</b></p> <ol style="list-style-type: none"> <li>Tom's younger brother is learning how to read a thermometer and asks, "Why does the red stuff in the thermometer go up when it gets hot outside?" What is a correct explanation that Tom can give to his brother?</li> </ol> <div style="text-align: center;">  <p>ice      water      steam      cloud</p> </div> <ol style="list-style-type: none"> <li>In which form are the molecules moving the most rapidly?           <ol style="list-style-type: none"> <li>ice</li> <li>water</li> <li>* steam</li> <li>cloud</li> </ol> </li> </ol> <div style="text-align: center;">  </div> <ol style="list-style-type: none"> <li>In the process of repairing a damaged wing of an airplane, you need to place a metal rivet rod into a hole in a metal cylinder. It is too tight. Describe the best strategy to make the rivet fit.</li> </ol>
<ol style="list-style-type: none"> <li><b>Know that there are groups of elements that have similar properties, including highly reactive metals, less reactive metals, highly reactive non-metals, and some almost completely non-reactive gases.</b></li> </ol>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Using the periodic table to determine the physical properties of a given element</li> <li>Deconstructing and rearranging the elements of the Periodic Table in linear order by atomic number, and then spiraling the linear strip to illustrate that elements will form vertical groups with similar properties</li> <li>Conducting investigations, using a variety of materials to show that some materials conduct heat more readily than others. Identify these materials as conductors or insulators</li> </ul>

	<p><b>Sample Test Item:</b> Use the periodic table provided to answer the following question.</p> <ol style="list-style-type: none"> <li>You were helping your science teacher clean up the chemical storage cabinet and you found two containers, one labeled <b>Pb</b> and the other <b>Ge</b>. A basic rule is to store similar elements together. Would it be safe to store these two elements together? Explain the reasons for your decision.</li> <li>A student tests an unknown substance for the following properties and finds the results in the table below. Given the information, which of the following is the most reasonable conclusion for the student to reach? <table border="1" data-bbox="927 541 1243 720"> <thead> <tr> <th>Property</th> <th>Results</th> </tr> </thead> <tbody> <tr> <td>Ductile</td> <td><i>Ductile</i></td> </tr> <tr> <td>Malleable</td> <td><i>Malleable</i></td> </tr> <tr> <td>Luster</td> <td><i>Shiny</i></td> </tr> <tr> <td>Melting Point</td> <td><i>High</i></td> </tr> <tr> <td>Density</td> <td><i>13.6 g/cm<sup>3</sup></i></td> </tr> <tr> <td>Heat Conduction</td> <td><i>Good</i></td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>* A. substance is a metallic solid</li> <li>B. substance is a nonmetallic solid</li> <li>C. substance is a gas</li> <li>D. substance is a liquid</li> </ul> </li> <li>Given the properties of sodium, predict the properties of lithium based on its location in the Periodic Table.</li> <li>We have run out of neon; predict which element would be the best substitute to use in illuminated signs.</li> </ol>	Property	Results	Ductile	<i>Ductile</i>	Malleable	<i>Malleable</i>	Luster	<i>Shiny</i>	Melting Point	<i>High</i>	Density	<i>13.6 g/cm<sup>3</sup></i>	Heat Conduction	<i>Good</i>
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<p>4. <b>Recognize that a mixture often can be separated into the original substances using one or more of their characteristic physical properties.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Developing an effective strategy for separating mixtures</li> <li>Designing a method to separate a given mixture of uniform particles of salt, sand, and iron filings into pure substances</li> </ul>														
<b>5.6.8 B. Chemical Reactions</b>															
<b>Essential Questions</b>	<b>Essential Understanding:</b>														
<ul style="list-style-type: none"> <li>What determines the type and extent of a chemical reaction?</li> </ul>	<ul style="list-style-type: none"> <li>There are several ways in which elements and compounds react to form new substances and each reaction involves the flow of energy.</li> </ul>														
<b>Areas of Focus</b>	<b>Comments and Examples</b>														
<p>1. <b>Show how substances can chemically react with each other to form new substances having properties different from those of the original substances.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Designing an investigation to determine what happens when soap is added to hard water: A precipitate is produced during the chemical reaction between a soap-water solution and hard water. Soap scum is an example of a precipitate. Soap scum forms when certain minerals in hard water react with the soap molecules. (2005, Inquiry in Action, American Chemical Society)</li> <li>Conducting an experiment, using phenol red, calcium chloride, and bicarbonate of soda, to illustrate the change in properties of substances through chemical reaction</li> </ul> <p><b>Sample Test Item:</b> In 1881, an ancient Egyptian obelisk called Cleopatra's Needle was carefully moved from Alexandria (very dry climate) to New York City's Central Park. Although undamaged by the move, the surface of the monment has begun to crumble. Explain the most likely natural cause of the crumbling and offer a strategy that will prevent further damage.</p>														
<p>2. <b>Show that in most chemical reactions energy is transferred into or out of a system.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Designing an experiment to illustrate chemical reactions that are either endothermic or exothermic</li> </ul>														

	<ul style="list-style-type: none"> <li>Using commercially available products of exothermic and endothermic reactions, to describe the energy transfer (i.e. bottle warmer, cold packs, glow sticks)</li> </ul>
3. Demonstrate that regardless how substances within a simple closed system interact, the total mass of the system remains the same.	<b>Instructional/Assessment Strategies:</b> Designing an investigation to show that in a closed system the products of a reaction between baking soda and vinegar have the same mass as the original reactants
4. Illustrate how atoms are rearranged when substances react, but that the total number of atoms and the total mass of the products remain the same as the original substances.	<b>Instructional/Assessment Strategies:</b> <ul style="list-style-type: none"> <li>Using ball and stick models, demonstrate that two molecules of hydrogen and one molecule of oxygen can be rearranged to form two water molecules</li> <li>Using ball and stick models, demonstrate similar conservation of atoms when carbon dioxide and water molecules are rearranged to form glucose</li> </ul>
<b>Standard 5.7 Physics</b> All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.	
<b>Big Idea:</b> The flow of energy drives processes of change in all biological, chemical, physical and geological systems. The conservation of energy is a law that can be used to analyze and build understandings of diverse physical and biological systems.	
<b>5.7.8 A. Motion and Forces</b>	
<b>Essential Questions</b>	<b>Enduring Understandings</b>
<ul style="list-style-type: none"> <li>How would the universe be different if one or more of the laws of motion were suspended?</li> </ul>	<ul style="list-style-type: none"> <li>The same basic rules govern the motion of all bodies, from planets and stars to birds and billiard balls.</li> </ul>
<b>Areas of Focus:</b>	<b>Comments and Examples</b>
1. Use quantitative data to show that when more than one force acts on an object at the same time, the forces can reinforce or cancel each other producing a net (unbalanced) force that will change speed and/or direction of the object.	<b>Instructional/Assessment Strategies:</b> <ul style="list-style-type: none"> <li>Using levers, pulleys, and laboratory masses to generate and measure an unbalanced force</li> <li>Using additional masses to balance and measure that force</li> </ul>
2. Identify the factors that change the gravitational force on an object, i.e., mass and distance.	<b>Sample Test Items:</b> <ol style="list-style-type: none"> <li>What, if any, impact would there be on tides if the Moon's orbit was 700,000 km in diameter rather than 384,400 km? Explain.</li> <li>Using a stick, Joshua is trying to hit a ball into a hole 100 meters away. Which set of conditions will increase Joshua's chance of getting the ball into the hole?           <ol style="list-style-type: none"> <li>having a ball with a large mass and a stick with a large mass</li> <li>having a ball with a small mass and a stick with a small mass</li> <li>* having a ball with a small mass and using a large force on the stick</li> <li>having a ball with a large mass and using a small force on the stick</li> </ol> </li> <li>After more than 30 years, the spacecraft Pioneer 10 continues to travel through space, beyond the solar system. Which statement explains why this spacecraft continues to move?           <ol style="list-style-type: none"> <li>Pioneer 10 is in motion and will stay in motion.</li> <li>Pioneer 10 carries excess fuel to allow more motion.</li> <li>NASA astronauts are steering Pioneer 10.</li> <li>NASA has refueling missions to Pioneer 10.</li> </ol> </li> </ol>

## 5.7.8 B. Energy Transformations

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>How do we know that things have energy?</li> </ul>	<ul style="list-style-type: none"> <li>Energy takes many forms.</li> <li>These forms can be grouped into types of energy that are associated with the motion of mass (kinetic energy), and types of energy associated with the position of mass and with energy fields (potential energy).</li> </ul>
Areas of Focus:	Comments and Examples
<p>1. Identify that the sun is a major source of the Earth's energy and that solar energy includes visible, infrared and ultraviolet radiation.</p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>At 8:32 am, May 18, 1980, Mount St. Helens erupted. The column of steam and ash reached about 80,000 feet in less than 15 minutes, spread across US in 3 days, and circled Earth in 15 days. In all, approximately 1.4 billion cubic yards of ash were released into the atmosphere. What was the likely impact of this event on the weather in New Jersey? Explain.</li> </ul>
<p>2. Describe the characteristics of various forms of energy, including heat, light, sound, chemical, mechanical, and electrical and trace energy transformations from one form to another.</p>	<p><b>Sample Test Items:</b></p> <p>1. Electrical energy is used to power an incandescent lamp. How does the amount of electrical energy used compare to amount of light energy produced? The amount of electrical energy used is:</p> <ul style="list-style-type: none"> <li>* A. more than the amount of light energy produced</li> <li>B. less than the amount of light energy produced</li> <li>C. the same as the amount of light energy produced</li> </ul> <div style="text-align: center;">  </div> <p>2. As a river flows past a turbine in a hydroelectric plant, the kinetic energy of the river changes to:</p> <ul style="list-style-type: none"> <li>A. chemical energy</li> <li>B. nuclear energy</li> <li>* C. mechanical energy</li> <li>D. radiant energy</li> </ul>
<p>3. Describe how heat can be conducted through materials or transferred across space by radiation and know that if the material is a fluid, convection currents may aid the transfer of heat.</p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Conducting an energy audit of the classroom and identifying the causes for deficiencies with assistance from the local utility company</li> <li>Recommending cost effective solutions to reduce the amount of energy needed to maintain a constant temperature in your classroom based on the audit findings</li> <li>Evaluating and selecting the most efficient commercially available heating system for a specific geographic area and justifying the selection</li> </ul>
<p>4. Show that light is reflected, refracted, or absorbed when it interacts with matter and that colors may appear as a result of this interaction.</p>	<p><b>Sample Test Item:</b></p> <p>You have decided to participate in a wilderness survival course in the Pine Barrens. One of the skills that you are developing is spear fishing. Your instructor has placed practice targets 2 meters away from you in one meter of clear calm water. The target's actual size is 0.5 m across. Using the concept of refraction, explain why it may be difficult to hit the underwater practice target from the shore.</p>

### Standard 5.8 Earth Science

All students will gain an understanding of the structure, dynamics, and geophysical systems of the earth.

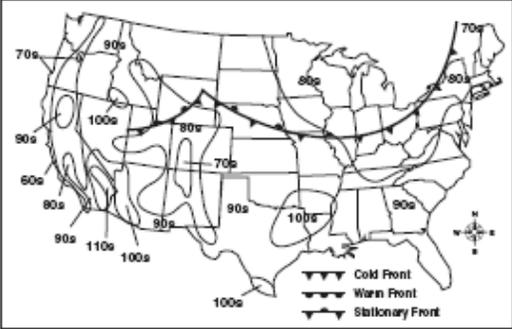
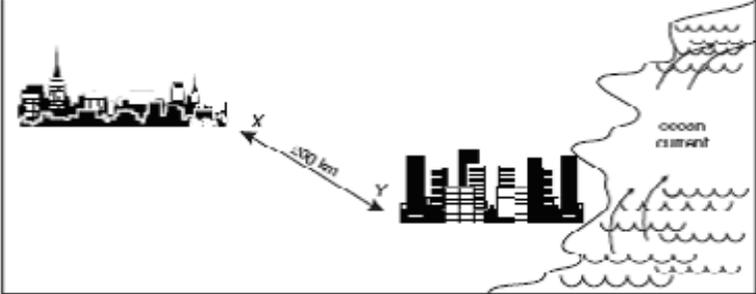
**Big Idea:** Earth's dynamic systems are made up of the geosphere, hydrosphere, atmosphere and biosphere. Interactions among these spheres have resulted in ongoing changes to the system. Some of these changes can be measured on human time scale, but others occur so slowly, that they must be inferred from geological evidence.

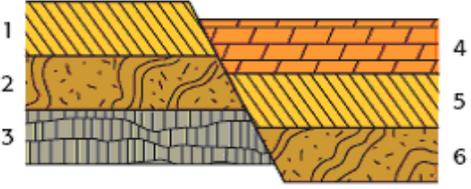
**5.8.8 A. Earth's Properties and Materials**

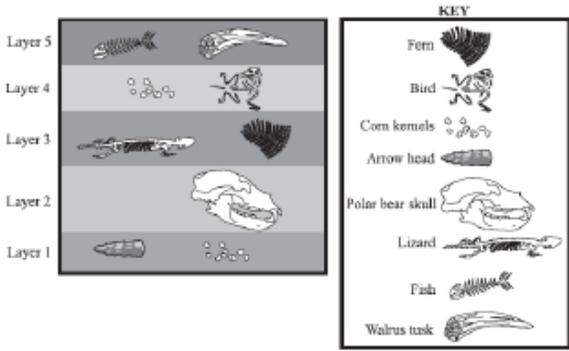
Essential Questions	Essential Understandings
<ul style="list-style-type: none"> <li>How does understanding the properties of Earth materials and the physical laws that govern behavior lead to predictions of Earth events?</li> </ul>	<ul style="list-style-type: none"> <li>Earth systems can be broken down into individual components which have observable measurable properties.</li> </ul>
1. Reinforce indicators from previous grade level.	

**5.8.8 B. Atmosphere and Water**

Essential Questions	Essential Understandings
<ul style="list-style-type: none"> <li>How do changes in one part of an Earth system affect other parts of the system?</li> </ul>	<ul style="list-style-type: none"> <li>Earth's components form systems. These systems continually interact at different rates of time, affecting the Earth regionally and globally.</li> </ul>

Areas of Focus:	Comments and Examples
<p>1. Describe conditions in the atmosphere that lead to weather systems and how these systems are represented on weather maps.</p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Differential heating of the Earth's surface results in the uneven heating of the atmosphere creating areas of low and high pressure.</li> </ul> <p><b>Sample Test Items:</b></p> <p>1. Imagine that you are the pilot of a restored biplane who is about to fly across country. Using a published weather map, write a description of the weather that you are likely to encounter if you travel in a straight line from Newark, NJ to San Francisco, CA. Then write a flight plan for the return flight that will allow you the best weather for your cross country flight. Use latitude and longitude to describe the location of the nightly rest stops.</p> <p align="center"><b>Weather Map</b></p>  <p>2. Using the weather map above. Describe the changes in the weather that are <b>most likely</b> to occur in New Jersey over the next two days.</p> <p>3. The average temperature of City X is warmer than the average temperature of City Y during the summer, but colder than City Y during the winter. Using the map shown below, explain why City Y has milder weather.</p> 

	<p>4. Wind occurs when air masses move from one place to another. What causes the movement of air masses?</p> <ul style="list-style-type: none"> <li>A. position of the moon</li> <li>* B. heating of the air</li> <li>C. revolution of Earth</li> <li>D. condensation of air</li> </ul>
<b>5.8.8 C. Processes that Shape the Earth</b>	
<b>Essential Questions</b>	<b>Essential Understandings:</b>
<ul style="list-style-type: none"> <li>▪ How do geologic events occurring today provide insight into Earth's past?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Earth's components form systems. These systems continually interact at different rates of time, affecting the shape of the Earth's surface regionally and globally.</li> </ul>
<b>Areas of Focus:</b>	<b>Comments and Examples</b>
<p><b>1. The many different kinds of rock and landforms are a result of a variety of processes that continually reshape the Earth's surface, including uplift of mountains, earthquakes and volcanoes, and the weathering, erosion, sedimentation and reformation of rock.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>• Using topographical maps and GIS data from NJ DEP explain the origin of the geologic regions in NJ.</li> <li>• Research and explain why the topography of Cape May County differs from Sussex County.</li> </ul> <p><b>Sample Test Items:</b></p> <p>1. Which statement BEST describes the movement of the plates that make up Earth's surface over millions of years?</p> <ul style="list-style-type: none"> <li>A. They moved for millions of years but have now stopped.</li> <li>B. They stayed the same for millions of years but are now moving.</li> <li>* C. They have been continually moving.</li> <li>D. They have never moved.</li> </ul> <p>2. A small, fast-moving river is in a V-shaped valley on the slope of a mountain. If you follow the river to where it passes through a plain, what will the river most likely look like compared with how it looked on the mountain slope? Explain why.</p>
<p><b>2. Show how successive layers of sedimentary rock and the fossils contained in them can be used to confirm the age, history, changing life forms, and geology of Earth.</b></p>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>• Interpreting the age, geologic history, and changing life forms, of a sample cross section of land</li> <li>• Determining the relative ages of a geologic sequence of rocks, given a variety of fossils and the layers where they were found</li> </ul> <p><b>Sample Test Items:</b></p> <p>1. Which evidence would be <b>most</b> helpful to scientists in determining the age of Earth?</p> <ul style="list-style-type: none"> <li>A. a comparison of Earth's composition to other planets' compositions</li> <li>B. soils, fossils, and remnants of mountains</li> <li>C. sediments, minerals, soils, and size of rocks</li> <li>* D. fossil records, rock records, and layers of earth</li> </ul> <p>2. Fossils of an animal that only survives in a tropical swamp are found in an arid (dry) section of northern Canada. Describe <b>three</b> changes that have occurred since the fossils were living organisms. Be sure to consider possible changes in life-forms, climate, environment, and geologic features.</p> <div style="text-align: center;">  </div> <p>3. Which rock layer is probably the oldest?</p> <ul style="list-style-type: none"> <li>A. 1</li> <li>* B. 3</li> <li>C. 4</li> <li>D. 6</li> </ul>

	<p>The picture below shows a series of rock layers and the fossils and objects they contain</p>  <p>4. Which two layers indicate a dramatic climate change from cold to warm? Be sure to justify your conclusion with specific evidence.</p>
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5.8.8 D. How We Study the Earth	
Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>How does technology extend human senses and understanding of Earth?</li> </ul>	<ul style="list-style-type: none"> <li>Technology enables us to better understand Earth's systems and the impact of Earth's systems on human activity.</li> </ul>
Areas of Focus:	Comments and Examples
<ol style="list-style-type: none"> <li>Utilize data from a variety of technological sources (e.g., geographic information systems (GIS) and global positioning systems (GPS)) to evaluate global and local changes caused by natural and human events.</li> </ol>	<p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Analyzing and explaining the physical and biological changes in the regions evidenced in the Mississippi and/or Amazon River Deltas using GIS data</li> <li>Analyzing and explaining the changes that occurred to the region as a result of a natural disaster such as the eruption of Mt. St. Helens and/or a tsunami in the Indian Ocean using GIS data</li> </ul>
<ol style="list-style-type: none"> <li>Explain how technology designed to investigate features of the Earth's surface impacts how scientists study the Earth.</li> </ol>	<p><b>Sample Test Item:</b>          Much of the progress made since 1960 in the science of predicting and tracking hurricanes has come from the use of</p> <ol style="list-style-type: none"> <li>onshore weather stations</li> <li>weather videotapes</li> <li>improved barometers</li> <li>weather satellites</li> </ol> <p>* D. weather satellites</p>

Standard 5.9 Astronomy & Space Science	
All students will gain an understanding of the origin, evolution, and structure of the universe.	
<b>Big Idea:</b> Our Solar System is part of the Milky Way Galaxy, which, in turn, is one of many galaxies in the known Universe. While the composition of planets vary considerably, their components and the applicable laws of science are universal.	

5.9.8 A. Earth, Moon, Sun System	
Essential Questions	Essential Understandings
<ul style="list-style-type: none"> <li>What predictable, observable patterns occur as a result of the interaction between the Earth, Moon, and Sun?</li> <li>What causes these patterns?</li> </ul>	<ul style="list-style-type: none"> <li>Observable, predictable patterns of movement in the Sun, Earth, Moon system occur because of gravitational interaction and energy from the Sun.</li> </ul>
Areas of Focus:	Comments and Examples
<ol style="list-style-type: none"> <li>Investigate Earth, Moon, and Sun as a system and explain how the motion of these bodies results in the phases of the moon and eclipses.</li> </ol>	
<ol style="list-style-type: none"> <li>Explain how the regular and predictable motions of the Earth and Moon produce tides.</li> </ol>	<p><b>Sample Test Item:</b>          What, if any, impact would there be on tides if the Moon's orbit were 700,000 km in diameter rather than 384,400 km? Explain.</p>

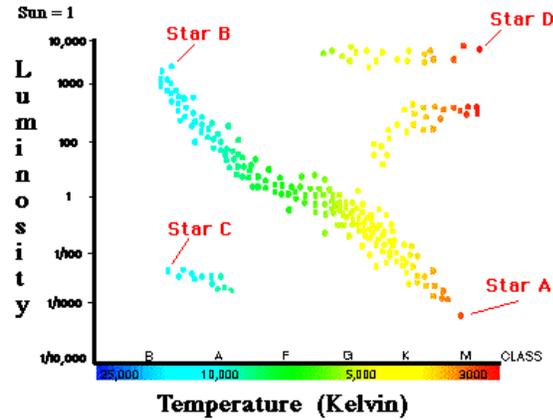
<p><b>3. Explain how the tilt, rotation and orbital pattern of the Earth relative to the Sun produce seasons and weather patterns</b></p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>The hemisphere experiencing summer receives more solar energy due to the angle of Sun's rays striking the Earth's atmosphere and surface as well as more energy due to longer days.</li> <li>Energy from the Sun interacts with the atmosphere, land and water resulting in local weather.</li> </ul> <p><b>Sample Test Item:</b> Which of the following is an important factor in explaining why seasons occur on Earth?</p> <ul style="list-style-type: none"> <li>A. Earth rotates on its axis.</li> <li>B. Sun rotates on its axis.</li> <li>* C. Earth's axis is tilted.</li> <li>D. Sun's axis is tilted.</li> </ul>
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### 5.9.8 B. Solar System

<b>Essential Questions</b>	<b>Enduring Understandings</b>
<ul style="list-style-type: none"> <li>How are planets and other objects in the Solar System similar and different to Earth?</li> <li>What implication does this have for the existence and sustaining of life?</li> </ul>	<ul style="list-style-type: none"> <li>Physical characteristics of planets depend on their distance from the Sun and their size.</li> </ul>
<b>Areas of Focus:</b>	<b>Comments and Examples</b>
<p><b>1. Describe the physical characteristics of the planets and other objects within the Solar System and compare Earth to the rest of the planets.</b></p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Comparison and contrast of solar systems, galaxies, and the universe</li> </ul> <p><b>Sample Test Items:</b></p> <ol style="list-style-type: none"> <li>The dwarf planet Pluto takes much longer to revolve around the Sun than other planets do. This is because Pluto           <ul style="list-style-type: none"> <li>* A. is farther from the Sun than other planets.</li> <li>B. is smaller than other planets.</li> <li>C. has fewer satellites than other planets.</li> <li>D. has a very slow rotation as compared to other planets.</li> </ul> </li> <li>Since the invention of the telescope and other technologies, scientists have been able to learn more about space.           <ul style="list-style-type: none"> <li>Identify four types of objects in space that scientists have discovered, other than the Sun, moons, or planets.</li> <li>Describe each object identified in part A.</li> </ul> </li> </ol>

### 5.9.8 C. Stars

<b>Essential Questions</b>	<b>Enduring Understandings</b>
<ul style="list-style-type: none"> <li>What characteristics does our Sun share with other stars?</li> </ul>	<ul style="list-style-type: none"> <li>The Sun is a star.</li> </ul>
<b>Areas of Focus:</b>	<b>Comments and Examples</b>
<p><b>1. The Sun is a star which is much closer to Earth than any other, which therefore appears much brighter and larger in the sky than any other star.</b></p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Stars have different properties</li> <li>A star's life cycle is predictable based on its initial mass</li> </ul> <p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Plotting the location of stars in an Hertzsprung-Russell (HR) diagram and comparing and contrasting the characteristics of the Sun with other stars when given a data table</li> <li>Comparing and contrasting the characteristics of the Sun to the other stars using a HR diagram</li> </ul>



Use the Hertzsprung-Russell (HR) diagram to answer the following question.

Betelgeuse is a red supergiant star located approximately 427 light-years from the Earth. It is the second brightest star in the constellation Orion, and the ninth brightest star in the night sky.

- Which of the identified stars on the HR Diagram is most likely Betelgeuse?
- Based on its position on the HR Diagram, describe at least three ways that Betelgeuse is different than the Sun.

**5.9.8 D. Galaxies and Universe**

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>▪ Is there order to the Universe?</li> </ul>	<ul style="list-style-type: none"> <li>▪ The Universe is made up of galaxies, each of which is composed of solar systems, having the same elements and governed by the same laws.</li> </ul>
Areas of Focus:	Comments and Examples
1. Know that the Universe consists of many billions of galaxies, each including billions of stars.	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>• A galaxy is a gravitationally-bound collection of stars. The Universe contains billions of galaxies.</li> <li>• Some distant galaxies are so far away that their light takes several billion years to reach the Earth.</li> </ul> <p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>• Distinguishing between the size of a solar system, a star and a galaxy</li> <li>• Describing relative distances between stars in a galaxy and between neighboring galaxies in terms of light years</li> </ul> <p><b>Sample Test Item:</b> Which distance is <b>most likely</b> described in light years?</p> <ul style="list-style-type: none"> <li>A. distance to the Moon</li> <li>* B. distance to a galaxy</li> <li>C. distance to Australia</li> <li>D. distance to an Earth satellite</li> </ul>

**Standard 5.10 Environmental Studies**

All students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena.

**Big Idea:** Organisms are linked to one another in an ecosystem by the flow of energy and the cycling of materials. Humans are an integral part of the natural system and human activities can alter the stability of ecosystems.

**5.10.8 A. Natural Systems and Interactions**

Essential Questions	Enduring Understandings
<ul style="list-style-type: none"> <li>▪ How can change in one part of an ecosystem affect change in other parts of the ecosystem?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Organisms and their environments are interconnected.</li> <li>▪ Changes in one part of the system will affect other parts of the system.</li> </ul>

<b>Areas of Focus:</b>	<b>Comments and Examples</b>
<p>1. Investigate the impact of catastrophic events such as forest fires, floods, and hurricanes on the environment of New Jersey.</p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Human health, quality of life, environment and the economy may be impacted by catastrophic events.</li> <li>The topography and engineered systems of New Jersey greatly influence the impact of catastrophic events.</li> </ul> <p><b>Instructional/Assessment Strategies:</b></p> <ul style="list-style-type: none"> <li>Identifying natural changes (i.e., wildfire, flood, drought) to an ecosystem</li> <li>Discussing how these changes affect the balance of an ecosystem</li> <li>Investigating the likely impact that a direct hit by a category 4 hurricane on the coast of New Jersey would have on the human health, quality of life, and the environment.</li> </ul> <p><b>Sample Test Item:</b>  Approximately 10,000 years ago the last great glacial period ended in New Jersey. As the ice retreated, barren land was all that remained. a.) Describe the probable sequence of ecosystem succession that took place. b.) Explain and justify how this succession would be similar to or different from one that results from a forest fire in the Pine Barrens.</p>
<b>5.10.8 B. Human Interactions and Impact</b>	
<b>Essential Questions</b>	<b>Enduring Understandings.</b>
<ul style="list-style-type: none"> <li>How do humans impact the diversity and stability of ecosystems?</li> </ul>	<ul style="list-style-type: none"> <li>Humans can alter the living and non-living factors within an ecosystem, thereby creating changes to the overall system.</li> </ul>
<b>Areas of Focus:</b>	<b>Comments and Examples</b>
<p>1. Compare and contrast practices that affect the use and management of natural resources.</p>	<p><b>Instructional Focus:</b></p> <ul style="list-style-type: none"> <li>Renewable and non-renewable resources must be managed differently.</li> <li>Human activity has altered Earth's atmosphere, land and oceans. This has changed the number and variety of plants and animals in the world, often negatively and permanently.</li> <li>Human intervention and management of natural resources has effects beyond those immediately apparent.</li> <li>Investigating and explaining how sanitation measures such as sewers, landfills, and water treatment are important in controlling the spread of organisms that contaminate and cause disease.</li> </ul> <p><b>Sample Test Items:</b></p> <p>1. A developer purchases a large plot of land for a housing development. Before the development begins, the forest</p> <ul style="list-style-type: none"> <li>supports fifty white-tail deer,</li> <li>has one large lake and four streams, and</li> <li>contains five species of trees.</li> </ul> <p>Describe and explain <b>three</b> ways that building the housing development will affect the deer population.</p> <p>2. As a field biologist for the New Jersey Department of Environmental Protection, research and develop cost effective strategies to reduce the environmental impact on an estuary should a tanker ship spill crude oil along the coast.</p>