# Table of Contents

To the Student ................................................................. v
Test-Taking Tips ............................................................ vi
Arkansas Department of Education Science Framework
Grades 6 and 7 ................................................................. vii
Student Recording Chart .................................................... xviii
Diagnostic Test (Multiple Choice) ....................................... 1
Diagnostic Test (Short Answer) .......................................... 9
Standards Practice (Multiple Choice) ................................. 19
  Standard 1: Characteristics and Processes of Science ............ 19
  Standard 2: Life Systems: Characteristics, Structure, and Function ......................................................... 23
  Standard 3: Life Cycles, Reproduction, and Heredity ........... 27
  Standard 4: Populations and Ecosystems ....................... 31
  Standard 5: Matter: Properties and Changes .................... 35
  Standard 6: Motion and Forces ...................................... 39
  Standard 7: Energy and Transfer of Energy ..................... 43
  Standard 8: Earth Systems ............................................ 47
  Standard 9: Earth’s History: Changes in Earth and Sky ...... 51
  Standard 10: Objects in the Universe .............................. 55
## Table of Contents (continued)

Standards Practice (Short Answer) ........................................ 59

- **Standard 1: Characteristics and Processes of Science** ........................................ 59
- **Standard 2: Life Systems: Characteristics, Structure, and Function** .......................... 63
- **Standard 3: Life Cycles, Reproduction, and Heredity** ........................................ 67
- **Standard 4: Populations and Ecosystems** ......................................................... 71
- **Standard 5: Matter: Properties and Changes** ..................................................... 75
- **Standard 6: Motion and Forces** ........................................................................... 79
- **Standard 7: Energy and Transfer of Energy** ....................................................... 83
- **Standard 8: Earth Systems** ............................................................................... 87
- **Standard 9: Earth’s History: Changes in Earth and Sky** ...................................... 91
- **Standard 10: Objects in the Universe** ................................................................. 94
To the Student:

Overview

The material in this booklet is designed to help you prepare for the Arkansas Comprehensive Testing, Assessment, and Accountability Program (ACTAAP).

It contains:
- the Arkansas Curriculum Framework,
- a Student Recording Chart,
- a Diagnostic Test, and
- practice questions for each standard.

How to Use This Book

Diagnostic Test  This test will help you identify any weaknesses you may have as you prepare to take the ACTAAP. Once you’ve taken the test and it’s been graded, complete the Student Recording Chart that is found on page xii. Circle each question that you answered incorrectly.

Practice  If you missed one or two of the questions for a particular standard, you could probably use some extra practice with that standard. The Student Recording Chart lists practice pages for each standard. Complete the appropriate practice pages. If you are unsure about how to answer some of the problems, you may want to refer to your science book.
Test-Taking Tips

Before the Test

- Be sure to get plenty of sleep the week before the test. A healthy amount of sleep is eight to nine hours every night.
- On the night before the test, try to do something relaxing but stimulating, such as playing a board game, exercising, or reading an enjoyable book. Cramming the night before the test can often hamper your memory and make you tired.
- On the morning of the test, eat a healthy breakfast with fresh foods that are high in protein and carbohydrates.
- On the morning of the test, clear your mind of any outside distractions so that you will be better able to focus on the test. If breaks are given during the test, use that time to relax and clear your mind.

During the Test

- Listen to and read all directions.
- Be sure you understand the question before reading the answer choices. Then, make sure to read and consider every answer choice.
- Remember to carefully consider all the information presented in the test’s graphics.
- If the test is timed, be sure to pace yourself.
- Always choose an answer. By eliminating as many incorrect choices as possible, you will have a good chance of guessing correctly and obtaining more points.
### Standard 1: Characteristics and Processes of Science

Students shall demonstrate and apply knowledge of the characteristics and processes of science using appropriate safety procedures, equipment, and technology.

<table>
<thead>
<tr>
<th>Processes of Science</th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS.1.6.1</td>
<td>Verify accuracy of observations</td>
<td>NS.1.7.1</td>
</tr>
<tr>
<td>NS.1.6.2</td>
<td>Analyze components of experimental design used to produce empirical evidence:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• hypothesis</td>
<td>• hypothesis</td>
</tr>
<tr>
<td></td>
<td>• replication</td>
<td>• replication</td>
</tr>
<tr>
<td></td>
<td>• sample size</td>
<td>• sample size</td>
</tr>
<tr>
<td></td>
<td>• appropriate use of control</td>
<td>• appropriate use of control</td>
</tr>
<tr>
<td></td>
<td>• use of standardized variables</td>
<td>• use of standardized variables</td>
</tr>
<tr>
<td>NS.1.6.3</td>
<td>Compare scientific data using mean, median, mode, and range using SI units</td>
<td>NS.1.7.3</td>
</tr>
<tr>
<td>NS.1.6.4</td>
<td>Construct and interpret scientific data using</td>
<td>NS.1.7.4</td>
</tr>
<tr>
<td></td>
<td>• data tables/charts</td>
<td>• histograms</td>
</tr>
<tr>
<td></td>
<td>• bar and double bar graphs</td>
<td>• circle graphs</td>
</tr>
<tr>
<td></td>
<td>• line graphs</td>
<td>• scatter plots</td>
</tr>
<tr>
<td></td>
<td>• stem and leaf plots</td>
<td>• double line graphs</td>
</tr>
<tr>
<td></td>
<td>• line graphs</td>
<td>• line graphs by approximating line of best fit</td>
</tr>
<tr>
<td>NS.1.6.5</td>
<td>Communicate results and conclusions from scientific inquiry</td>
<td>NS.1.7.5</td>
</tr>
<tr>
<td>NS.1.6.6</td>
<td>Develop and implement strategies for long-term, accurate data collection</td>
<td>NS.1.7.6</td>
</tr>
<tr>
<td>NS.1.6.7</td>
<td>Distinguish between scientific fact and opinion</td>
<td>NS.1.7.7</td>
</tr>
<tr>
<td>NS.1.6.8</td>
<td>Explain the role of prediction in the development of a theory</td>
<td>NS.1.7.8</td>
</tr>
<tr>
<td>NS.1.6.9</td>
<td>Define and give examples of laws and theories</td>
<td>NS.1.7.9</td>
</tr>
</tbody>
</table>

### Characteristics of Science

| NS.1.6.7             | Distinguish between questions that can and cannot be answered by science |
| NS.1.6.8             | Explain the role of testability and modification in the development of a theory |
| NS.1.6.9             | Compare and contrast hypotheses, laws, and theories                     |
**Strand 2: Life Science**

**Standard 2: Living Systems: Characteristics, Structure, and Function**

Students shall demonstrate and apply knowledge of living systems using appropriate safety procedures, equipment, and technology

<table>
<thead>
<tr>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structure and Function</strong></td>
<td><strong>Structure and Function</strong></td>
</tr>
<tr>
<td>LS.2.6.1 Observe, describe, and illustrate plant and animal tissues:</td>
<td>LS.2.7.1 Illustrate the hierarchical relationships of</td>
</tr>
<tr>
<td>• muscle</td>
<td>cells, tissues, organs, and organ systems</td>
</tr>
<tr>
<td>• blood</td>
<td></td>
</tr>
<tr>
<td>• skin</td>
<td></td>
</tr>
<tr>
<td>LS.2.6.2 Illustrate the hierarchical relationships of</td>
<td>LS.2.7.2 Analyze how two or more organs work together to perform a</td>
</tr>
<tr>
<td>cells, tissues, and organs</td>
<td>function (e.g., mouth and stomach to digest food)</td>
</tr>
<tr>
<td>LS.2.6.3 Investigate the functions of tissues</td>
<td>LS.2.7.3 Identify organ systems in vertebrates and plants</td>
</tr>
<tr>
<td>LS.2.6.4 Model and explain the functions of animal organs:</td>
<td>LS.2.7.4 Analyze the structure and function of tissues, organs, and</td>
</tr>
<tr>
<td>• heart</td>
<td>plant systems of a vertebrate and an angiosperm using various</td>
</tr>
<tr>
<td>• lung</td>
<td>models or methods of dissection</td>
</tr>
<tr>
<td>• kidneys</td>
<td></td>
</tr>
<tr>
<td>• eyes</td>
<td></td>
</tr>
<tr>
<td>LS.2.6.5 Model and explain the function of plant organs:</td>
<td>LS.2.7.5 Compare and contrast vertebrate systems and plant organ</td>
</tr>
<tr>
<td>• leaves</td>
<td>systems</td>
</tr>
<tr>
<td>• roots</td>
<td></td>
</tr>
<tr>
<td>LS.2.6.6 Dissect organs, including but not limited to</td>
<td>LS.2.7.6 Identify human body systems:</td>
</tr>
<tr>
<td>• heart</td>
<td>• nervous</td>
</tr>
<tr>
<td>• eye</td>
<td>• digestive</td>
</tr>
<tr>
<td>• lung</td>
<td>• circulatory</td>
</tr>
<tr>
<td>LS.2.6.7 Describe the relationship between organ function and the</td>
<td>• respiratory</td>
</tr>
<tr>
<td>following needs of cells:</td>
<td>• excretory</td>
</tr>
<tr>
<td>• oxygen</td>
<td></td>
</tr>
<tr>
<td>• food</td>
<td></td>
</tr>
<tr>
<td>• waste removal</td>
<td></td>
</tr>
<tr>
<td>LS.2.6.8 Investigate careers, scientists, and historical breakthroughs</td>
<td>LS.2.7.7 Relate the structure of vertebrate and plant body systems to</td>
</tr>
<tr>
<td>related to tissues and organs</td>
<td>their functions</td>
</tr>
<tr>
<td>LS.2.6.9</td>
<td>LS.2.7.8 Investigate functions of human body systems</td>
</tr>
<tr>
<td>LS.2.6.10</td>
<td>LS.2.7.9 Describe interactions between major organ systems</td>
</tr>
<tr>
<td>LS.2.6.11</td>
<td>LS.2.7.10 Investigate careers, scientists, and historical breakthroughs</td>
</tr>
<tr>
<td>related to life systems</td>
<td>related to life systems</td>
</tr>
</tbody>
</table>
### Strand 2: Life Science

#### Standard 3: Life Cycles, Reproduction, and Heredity

Students shall demonstrate and apply knowledge of life cycles, reproduction, and heredity using appropriate safety procedures, equipment, and technology

<table>
<thead>
<tr>
<th>Heredity and Reproduction</th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS.3.6.1 Describe characteristics of plants and animals manipulated through selective breeding</td>
<td>LS.3.7.1 Explain that the fertilized egg cell carries genetic information from each parent and multiplies to form a complete organism</td>
<td></td>
</tr>
<tr>
<td>LS.3.6.2 Predict the outcome of selective breeding practices over several generations</td>
<td>LS.3.7.2 Distinguish between sperm cells and egg cells</td>
<td></td>
</tr>
<tr>
<td>LS.3.6.3 Relate the development of Earth's present-day complex species from earlier, distinctly different simpler species</td>
<td>LS.3.7.3 Compare and contrast the structure and function of the sperm cell and the egg cell in vertebrates and plants and their role in sexual reproduction</td>
<td></td>
</tr>
<tr>
<td>LS.3.6.4 Investigate careers, scientists, and historical breakthroughs related to adaptations and selective breeding</td>
<td>LS.3.7.4 Investigate and analyze the development of embryos</td>
<td></td>
</tr>
<tr>
<td>LS.3.7.5 Dissect a poultry egg to analyze its structure (e.g., paper, plastic, or clay models, virtual dissection, or specimen dissection)</td>
<td>LS.3.7.6 Dissect a flower to analyze the reproductive system of angiosperms (e.g., paper, plastic, or clay models; virtual dissection; or specimen dissection)</td>
<td></td>
</tr>
<tr>
<td>LS.3.7.7 Differentiate between sexual and asexual reproduction in vertebrates and plants</td>
<td>LS.3.7.7 Identify the number and source of chromosomes in human body cells</td>
<td></td>
</tr>
<tr>
<td>LS.3.7.8 Identify the number and source of chromosomes in human sex cells</td>
<td>LS.3.7.10 Explain the role of cell division</td>
<td></td>
</tr>
<tr>
<td>LS.3.7.11 Investigate careers, scientists, and historical breakthroughs related to reproduction</td>
<td>LS.3.7.11 Investigate careers, scientists, and historical breakthroughs related to reproduction</td>
<td></td>
</tr>
</tbody>
</table>
### Standard 3: Life Cycles, Reproduction, and Heredity

Students shall demonstrate and apply knowledge of life cycles, reproduction, and heredity using appropriate safety procedures, equipment, and technology.

<table>
<thead>
<tr>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regulation and Behavior</strong></td>
<td><strong>Regulation and Behavior</strong></td>
</tr>
<tr>
<td>LS.3.6.5 Describe behavioral adaptations of organisms to the environment:</td>
<td>LS.3.7.12 Summarize the interactions between organ systems in the maintenance of homeostasis</td>
</tr>
<tr>
<td>• hibernation</td>
<td>• territorial behavior</td>
</tr>
<tr>
<td>• estivation</td>
<td>• migration</td>
</tr>
<tr>
<td>• tropism</td>
<td></td>
</tr>
<tr>
<td>LS.3.6.6 Differentiate between innate behaviors:</td>
<td></td>
</tr>
<tr>
<td>• migration</td>
<td>• imprinting and learned behaviors:</td>
</tr>
<tr>
<td>• web spinning</td>
<td>• speaking a language</td>
</tr>
<tr>
<td>• defensive posture</td>
<td>• using tools</td>
</tr>
<tr>
<td>• communication</td>
<td>• hunting skills</td>
</tr>
<tr>
<td>LS.3.6.7 Describe the following structural adaptations for survival in the environment:</td>
<td></td>
</tr>
<tr>
<td>• coloration</td>
<td>• ears</td>
</tr>
<tr>
<td>• mimicry</td>
<td>• spines</td>
</tr>
<tr>
<td>• odor glands</td>
<td>• teeth</td>
</tr>
<tr>
<td>• beaks</td>
<td>• thorns</td>
</tr>
<tr>
<td>• feet</td>
<td>• characteristics</td>
</tr>
<tr>
<td>• wings</td>
<td>of seeds</td>
</tr>
<tr>
<td>• fur</td>
<td></td>
</tr>
<tr>
<td>LS.3.6.8 Investigate careers, scientists, and historical breakthroughs related to learned and innate behaviors</td>
<td></td>
</tr>
</tbody>
</table>

### Standard 4: Populations and Ecosystems

Students shall demonstrate and apply knowledge of populations and ecosystems using appropriate safety procedures, equipment, and technology.

<table>
<thead>
<tr>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Populations and Ecosystems</strong></td>
<td><strong>Populations and Ecosystems</strong></td>
</tr>
<tr>
<td>LS.4.6.1 Identify environmental conditions that can affect the survival of individual organisms and entire species</td>
<td>LS.4.7.1 Explain the role of reproduction in the continuation of a species</td>
</tr>
<tr>
<td>LS.4.6.2 Conduct simulations demonstrating competition for resources within an ecosystem</td>
<td></td>
</tr>
<tr>
<td>LS.4.6.3 Conduct simulations demonstrating natural selection</td>
<td></td>
</tr>
<tr>
<td>LS.4.6.4 Analyze natural selection</td>
<td></td>
</tr>
</tbody>
</table>
### Strand 3: Physical Science

**Standard 5: Matter: Properties and Changes**  
Students shall demonstrate and apply knowledge of matter, including properties and changes, using appropriate safety procedures, equipment, and technology.

<table>
<thead>
<tr>
<th>Properties of Matter</th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
</table>
| PS.5.6.1 | Identify common examples of chemical properties:  
- ability to burn  
- ability to produce light  
- ability to react with other substances | PS.5.7.1 | Explain how a small number of naturally-occurring elements can result in the large variety of substances found in the world |
| PS.5.6.2 | Compare and contrast characteristics of physical and chemical properties | PS.5.7.2 | Create models of common compounds:  
- water  
- carbon dioxide  
- salt |
| PS.5.6.3 | Conduct investigations using acid/base indicators | PS.5.7.3 | Identify compounds as substances consisting of two or more elements chemically combined |
| PS.5.6.4 | Apply skills of scientific investigation to determine density using SI units | PS.5.7.4 | Compare and contrast properties of compounds to those of the elements that compose them:  
- salt: sodium, chlorine  
- water: hydrogen, oxygen  
- carbon dioxide: carbon, oxygen |
| PS.5.6.5 | Construct a density column using a minimum of four different liquids (e.g., alcohol, colored water, syrup, oil) | PS.5.7.5 | Demonstrate techniques for forming and separating mixtures:  
- mixing  
- magnetic attraction  
- evaporation  
- filtration  
- chromatography  
- settling |
| PS.5.6.6 | Use a density column to test the density of various solid objects (e.g., piece of candy, cork, candle, paper clip, egg) | PS.5.7.6 | Classify substances as  
- elements  
- compounds  
- mixtures |
| PS.5.6.7 | Identify characteristics of chemical changes:  
- burning  
- production of a new substance  
- production of light  
- color change  
- endothermic and exothermic reactions  
- reactivity | PS.5.7.7 | Distinguish among solvent, solute, and solution |
| PS.5.6.8 | Conduct investigations comparing and contrasting physical and chemical changes | PS.5.7.8 | Investigate the effect of variables on solubility rates |
| PS.5.6.9 | Demonstrate the law of the conservation of matter | PS.5.7.9 | Interpret solubility graphs |
| PS.5.6.10 | Investigate scientists, careers, and historical breakthroughs related to chemical properties and chemical changes | PS.5.7.10 | Investigate scientists, careers, and historical breakthroughs related to elements, mixtures, and compounds |
## Strand 3: Physical Science

### Standard 6: Motion and Forces
Students shall demonstrate and apply knowledge of motion and forces using appropriate safety procedures, equipment, and technology

<table>
<thead>
<tr>
<th>Motion and Forces</th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PS.6.6.1</strong></td>
<td>Compare and contrast simple machines and compound machines</td>
<td>PS.6.7.1</td>
</tr>
<tr>
<td><strong>PS.6.6.2</strong></td>
<td>Identify and analyze the simple machines that make up a compound machine</td>
<td>PS.6.7.2</td>
</tr>
<tr>
<td><strong>PS.6.6.3</strong></td>
<td>Conduct investigations of various forces using SI units (newton)</td>
<td>PS.6.7.3</td>
</tr>
</tbody>
</table>
| **PS.6.6.4**      | Recognize and give examples of different types of forces:  
|                   | • gravitational forces  
|                   | • magnetic forces  
|                   | • friction | PS.6.7.4 | Conduct investigations of Newton’s third law of motion |
| **PS.6.6.5**      | Understand why objects have weight | PS.6.7.5 | Explain how Newton’s three laws of motion apply to real world situations (e.g., sports, transportation) |
| **PS.6.6.6**      | Compare and contrast weight and mass | PS.6.7.6 | Investigate careers, scientists, and historical breakthroughs related to laws of motion |
| **PS.6.6.7**      | Describe the effects of force:  
|                   | • move a stationary object  
|                   | • speed up, slow down or change the direction of motion  
|                   | • change the shape of objects |  |
| **PS.6.6.8**      | Conduct investigations to demonstrate change in direction caused by force |  |
| **PS.6.6.9**      | Conduct investigations to calculate the change in speed caused by applying forces to an object |  |
| **PS.6.6.10**     | Investigate careers, scientists, and historical breakthroughs related to compound machines and forces |  |
### Strand 3: Physical Science

#### Standard 7: Energy and Transfer of Energy

Students shall demonstrate and apply knowledge of energy and transfer of energy using appropriate safety procedures, equipment, and technology.

<table>
<thead>
<tr>
<th></th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td>PS.7.6.1 Classify examples of energy forms:</td>
<td>PS.7.7.1 Identify natural resources used to supply energy needs</td>
</tr>
<tr>
<td></td>
<td>- chemical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- electromagnetic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- mechanical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PS.7.6.2 Summarize the application of the law of conservation of energy</td>
<td>PS.7.7.2 Describe alternatives to the use of fossil fuels:</td>
</tr>
<tr>
<td></td>
<td>in real world situations:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- electrical energy into mechanical energy</td>
<td>- solar energy</td>
</tr>
<tr>
<td></td>
<td>- electrical energy into heat</td>
<td>- geothermal energy</td>
</tr>
<tr>
<td></td>
<td>- chemical energy into mechanical energy</td>
<td>- wind</td>
</tr>
<tr>
<td></td>
<td>- chemical energy into light</td>
<td>- nuclear energy</td>
</tr>
<tr>
<td></td>
<td>PS.7.6.3 Conduct investigations demonstrating how energy</td>
<td>PS.7.7.3 Conduct investigations to identify types of potential energy</td>
</tr>
<tr>
<td></td>
<td>can be converted from one form to another</td>
<td>and kinetic energy</td>
</tr>
<tr>
<td></td>
<td>PS.7.6.4 Investigate the transfer of energy in real world situations:</td>
<td>PS.7.7.4 Investigate alternative energy sources</td>
</tr>
<tr>
<td></td>
<td>- conduction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- convection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- radiation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PS.7.6.5 Investigate careers, scientists, and historical</td>
<td>PS.7.7.5 Investigate careers, scientists, and historical breakthroughs</td>
</tr>
<tr>
<td></td>
<td>breakthroughs related to energy forms and conversions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Strand 4: Earth and Space Science

**Standard 8: Earth Systems**
Students shall demonstrate and apply knowledge of Earth’s structure and properties using appropriate safety procedures, equipment, and technology

<table>
<thead>
<tr>
<th></th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structure and Properties</strong></td>
<td><strong>ESS.8.6.1</strong> Identify and diagram the layers of the Earth:</td>
<td><strong>ESS.8.7.1</strong> Describe the composition and physical characteristics of the atmosphere</td>
</tr>
<tr>
<td></td>
<td>• crust</td>
<td>• inner and outer core</td>
</tr>
<tr>
<td></td>
<td>• mantle</td>
<td></td>
</tr>
<tr>
<td><strong>ESS.8.6.2</strong> Model the layers of the Earth</td>
<td><strong>ESS.8.7.2</strong> Investigate the influence of global patterns on local weather:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• movement of air masses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Coriolis effect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• global wind belts</td>
</tr>
<tr>
<td><strong>ESS.8.6.3</strong> Model how convection currents in the mantle affect lithosphere movement</td>
<td><strong>ESS.8.7.3</strong> Conduct investigations demonstrating the effects of solar energy on the atmosphere</td>
<td></td>
</tr>
<tr>
<td><strong>ESS.8.6.4</strong> Conduct investigations to identify the variables within volcanoes that cause different types of eruptions</td>
<td><strong>ESS.8.7.4</strong> Investigate the effect that oceans have on climate</td>
<td></td>
</tr>
<tr>
<td><strong>ESS.8.6.5</strong> Diagram and explain how volcanoes work</td>
<td><strong>ESS.8.7.5</strong> Identify elements of weather:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• air pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• wind speed</td>
</tr>
<tr>
<td><strong>ESS.8.6.6</strong> Explain how volcanic activity relates to mountain formation</td>
<td><strong>ESS.8.7.6</strong> Conduct investigations using weather measurement devices:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• anemometers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• barometers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• sling psychrometers</td>
</tr>
<tr>
<td><strong>ESS.8.6.7</strong> Connect short-term changes in climate with volcanic activity</td>
<td><strong>ESS.8.7.7</strong> Predict weather conditions using data on the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• air pressure: highs, lows, fronts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• clouds</td>
</tr>
<tr>
<td><strong>ESS.8.6.8</strong> Compare and contrast the different landforms caused by Earth’s internal forces:</td>
<td><strong>ESS.8.7.8</strong> Identify the causes and effects of weather-related phenomena:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• mountains</td>
<td>• thunderstorms</td>
</tr>
<tr>
<td></td>
<td>• plateaus</td>
<td>• tornadoes/hurricanes/cyclones/typhoons</td>
</tr>
<tr>
<td></td>
<td>• trenches</td>
<td>• islands</td>
</tr>
<tr>
<td><strong>ESS.8.6.9</strong> Research local, regional, and state landforms created by internal forces in the earth:</td>
<td><strong>ESS.8.7.9</strong> Explain tornado belt weather patterns using a map of the United States</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ozark Plateau</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Crater of Diamonds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ouachita Mountains</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• New Madrid Fault</td>
<td></td>
</tr>
</tbody>
</table>
### Strand 4: Earth and Space Science

#### Standard 8: Earth Systems

Students shall demonstrate and apply knowledge of Earth’s structure and properties using appropriate safety procedures, equipment, and technology.

<table>
<thead>
<tr>
<th>Structure and Properties</th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESS.8.6.10 Identify the effects of earthquakes on Earth’s surface:</td>
<td>ESS.8.7.10 Describe ways human beings protect themselves, others, and their property from adverse weather conditions</td>
<td></td>
</tr>
</tbody>
</table>
| • tsunamis  
• floods  
• changes in natural and man-made structures | |
| ESS.8.6.11 Investigate and map patterns of earthquake and volcanic activity | ESS.8.7.11 Describe and map climates of major Earth regions |
| ESS.8.6.12 Locate earthquake belts on Earth: | ESS.8.7.12 Analyze the effect of the shape of Earth and the tilt of Earth’s axis on climate |
| • Mediterranean-Trans-Asiatic  
• Circum-Pacific (Ring of Fire) | |
| ESS.8.6.13 Analyze how earthquake occurrences are recorded (seismograph) and measured (Richter scale) | ESS.8.7.13 Identify and explain the effects that human activities have on weather and atmosphere |
| ESS.8.6.14 Model the effect of major geological events on land and ocean features: | ESS.8.7.14 Describe causes and effects of acid precipitation |
| • mountain building  
• ocean trenches  
• island formation  
• mid-ocean ridges | |
| ESS.8.6.15 Investigate careers, scientists, and historical breakthroughs related to internal forces that change the Earth | ESS.8.7.15 Investigate careers, scientists, and historical breakthroughs related to atmosphere and weather |
| | |

#### Cycles

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ESS.8.7.16 Conduct investigations demonstrating the water cycle</td>
<td></td>
</tr>
<tr>
<td>ESS.8.7.17 Explain the relationship between the water cycle and ground water</td>
<td></td>
</tr>
<tr>
<td>ESS.8.7.18 Investigate cloud formation</td>
<td></td>
</tr>
<tr>
<td>ESS.8.7.19 Conduct investigations demonstrating the greenhouse effect</td>
<td></td>
</tr>
<tr>
<td>ESS.8.7.20 Research how human activities may contribute to global warming</td>
<td></td>
</tr>
<tr>
<td>ESS.8.7.21 Explain examples of actual events that cause temporary climate changes:</td>
<td></td>
</tr>
</tbody>
</table>
| • volcanic dust  
• drought  
• meteor impact | |
<table>
<thead>
<tr>
<th>Earth's History</th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
</table>
| ESS.9.6.1      | Research methods of determining geologic time:  
|                | - fossil records  
|                | - mountain building  
|                | rock sequencing | ESS.9.7.1  
|                | Analyze charts to infer past atmospheric conditions based on the organisms found in the fossil record |
| ESS.9.6.2      | Model rock layer sequencing based on characteristics of fossils | ESS.9.7.2  
|                | Demonstrate that Earth has a magnetic field that is detectible at the surface with a compass |
| ESS.9.6.3      | Analyze evidence that supports the theory of plate tectonics:  
|                | - matching coastlines  
|                | - similar rock types  
|                | fossil record | ESS.9.7.3  
|                | Compare and contrast Earth's magnetic field to those of natural or human-made magnets with  
|                | - North and South poles  
|                | - lines of force |
| ESS.9.7.4      | Analyze evidence of sea floor spreading:  
|                | - magnetic reversal  
|                | - molten material | ESS.9.7.5  
|                | Research ways in which people have used compasses |
### Strand 4: Earth and Space Science

#### Standard 10: Objects in the Universe
Students shall demonstrate and apply knowledge of objects in the universe using appropriate safety procedures, equipment, and technology

<table>
<thead>
<tr>
<th>Solar system: Sun, Earth, Moons, Planets, Galaxies</th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESS.10.6.1 Explain how planets seem to wander against the background of the stars</td>
<td></td>
<td>ESS.10.7.1 Identify and model the causes of night and day</td>
</tr>
</tbody>
</table>
| ESS.10.6.2 Compare the distance of the following:  
  - from the sun to Earth (light minutes)  
  - from the next nearest star to Earth (light years) | | ESS.10.7.2 Compare and contrast Earth’s day to those of other planets in our solar system |
| ESS.10.6.3 Describe how astronomers measure distance to stars | | ESS.10.7.3 Identify and model the cause of planetary years |
| ESS.10.6.4 Calculate the rate at which we would have to travel to other stars and planets in our solar system using current technology | | ESS.10.7.4 Compare and contrast Earth’s year to those of other planets in our solar system |
| ESS.10.6.5 Explain the effect of the sun on comets | | ESS.10.7.5 Identify and model the causes of seasons |
| ESS.10.6.6 Compare and contrast comets, meteors, and asteroids by  
  - size  
  - orbits  
  - nucleus  
  - mass | | ESS.10.7.6 Investigate careers, scientists, and historical breakthroughs related to rotations and revolutions of bodies in space |
| ESS.10.6.7 Model moon phases demonstrating the position of Earth, moon, and sun | | |
| ESS.10.6.8 Compare and contrast solar eclipse and lunar eclipse | | |
| ESS.10.6.9 Investigate careers, scientists, and historical breakthroughs related to the sun and space travel | | |
**Student Recording Chart**

**Directions:** Circle each question from the Diagnostic Test that you answered *incorrectly*. If there are one or two circles marked for a standard, write *Yes* in the *Need Practice?* box. Then complete the practice pages for that standard.

<table>
<thead>
<tr>
<th>Standard</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Question</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Need Practice?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Question</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Need Practice?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Question</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Need Practice?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Diagnostic Test: Multiple Choice
Part 1

Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

1. Change in atmospheric pressure is measured by a ______.
   A. telescope
   B. thermometer
   C. barometer
   D. microscope

2. Which enables humans to process food for energy?
   A. respiratory system
   B. immune system
   C. endocrine system
   D. digestive system

3. In a controlled scientific experiment, the relationship between independent and dependent variables is BEST studied by which method?
   A. changing one dependent variable at a time
   B. changing one independent variable at a time
   C. changing all dependent variables at the same time
   D. changing all independent variables at the same time

4. Which can result in an offspring that has traits that are NOT inherited from the offspring’s parents?
   A. mutation
   B. competition
   C. natural selection
   D. isolation

5. Based on the data in the graph above, the BEST conclusion is that as kinetic energy decreases, ______.
   A. the ball will stop bouncing
   B. potential energy remains unchanged
   C. potential energy decreases
   D. potential energy increases

6. If a plant reproduced asexually, which part of the plant would PROBABLY NOT be used during the reproduction process?
   A. leaves
   B. roots
   C. flower
   D. stem

7. Tea that has been sweetened with sugar is an example of a(n) ______.
   A. precipitate
   B. mixture
   C. element
   D. compound
8. Which is the order of these biological systems from the least to the most complex?
   A. R, Q, T, S
   B. S, T, R, Q
   C. T, S, Q, R
   D. R, Q, S, T

9. Which is NOT an inexhaustible energy resource?
   A. fossil fuels
   B. solar energy
   C. wind energy
   D. hydroelectric energy

10. The cell division process that creates sex cells is different from the cell division process that makes all other kinds of cells. Which is the process that creates sex cells?
    A. mitosis
    B. meiosis
    C. budding
    D. somatic splitting

11. The chemical processes that go on in the human stomach, liver, and lungs help keep humans alive. All of those processes are part of ________.
    A. osmosis
    B. circulation
    C. diffusion
    D. metabolism

12. In the diagram above, which part of the flower receives the pollen during pollination?
    A. A
    B. C
    C. E
    D. F

13. Why is a year on Mars almost twice as long as a year on Earth?
    A. Mars is almost twice the size of Earth.
    B. Mars is tilted on its axis at a greater angle than Earth.
    C. Mars has two moons, while Earth has only one.
    D. Mars takes almost twice as long to orbit the Sun.
14. Three identical bacteria cultures were grown at three different temperatures. The change in population for each temperature is shown in the graph above. Based on the data, which statement is true?
   A. The bacteria do not live past 72 hours.
   B. The bacteria cannot survive at temperatures lower than 15°C.
   C. The bacteria reproduce faster at warmer temperatures.
   D. The bacteria cannot reproduce at temperatures higher than 15°C.

15. When a spoonful of sugar is stirred into a cup of hot tea, what happens to the sugar?
   A. The sugar boils.
   B. The sugar dissolves.
   C. The sugar changes into a new substance.
   D. The sugar remains in the water as solid crystals.

16. An experimenter changes the ______ variable to study how it affects a system.
   A. dependent
   B. control
   C. manual
   D. independent

17. Cells in the stomach use the process of _____ to release chemicals that digest food.
   A. osmosis
   B. endocytosis
   C. active transport
   D. exocytosis

18. Which statement BEST explains why the continents and oceans on Earth have changed so greatly in shape and location over time?
   A. The gravitational forces of the Moon pulled them out of shape as the Moon orbited Earth.
   B. Heat from the Sun evaporated smaller bodies of water and exposed more ocean floor as land.
   C. Erosion redistributed the soil, causing mountains to form.
   D. Separate plates beneath the continents and oceans pulled apart and pressed together.

19. Which could be tested in a scientific investigation?
   A. whether or not the brand of tire chosen for a race car has an effect on the car’s speed
   B. which paint color is best for a race car
   C. which race-car driver is the best
   D. which rules the drivers should follow

20. A _____ occurs when the Moon moves directly between the Sun and Earth and throws a shadow on Earth.
   A. solar eclipse
   B. lunar eclipse
   C. waning gibbous
   D. waxing gibbous
21. The temperature is 22°C and it is partly cloudy. If a cold front were to approach, which would be the most accurate weather forecast?
   A. rain
   B. sleet
   C. fog
   D. no precipitation

22. The diagram above is a model of a water molecule. Which BEST describes the water molecule in the diagram?
   A. atom
   B. mixture
   C. element
   D. compound

23. Which waste is eliminated by both the respiratory and excretory systems?
   A. carbon dioxide
   B. water
   C. urea
   D. salt

24. The struggle among organisms to obtain the resources they need to survive and reproduce is called _____.
   A. competition
   B. carrying capacity
   C. population spacing
   D. symbiosis

25. The heart helps circulate blood. The heart is a type of ______.
   A. organelle
   B. tissue
   C. cell
   D. organ

26. Solar panels are a type of technology that can ______.
   A. produce greenhouse gases
   B. generate electricity
   C. monitor radioactivity
   D. insulate homes

27. You are pushing on the left side of a box with a force of 18 newtons. Your friend is pushing on the right side of the box with a force of 16 newtons. Which statement is true?
   A. The net force is pushing up with a strength of 2 N.
   B. The net force is pushing to the right with a strength of 2 N.
   C. The net force is pushing down with a strength of 2 N.
   D. The net force is pushing to the left with a strength of 2 N.
Use the diagram below to answer questions 28 and 29.

28. According to the diagram, what happens when the two astronauts collide in space?
   A. The astronauts will stop moving.
   B. The astronauts will move upward together.
   C. The astronauts will move to the left together.
   D. The astronauts will move to the right together.

29. What increases when the force applied to astronaut B increases?
   A. The acceleration of astronaut B increases.
   B. The force of gravity on astronaut B increases.
   C. The effect of inertia on astronaut B increases.
   D. The force of attraction of astronaut B increases.

30. Which is a description of heat?
   A. potential energy from atoms moving in many directions
   B. measure of the kinetic energy of atoms in an object
   C. transfer of kinetic energy from one object to another
   D. when two objects cause each other to lose atoms

31. Half of the Moon is visible from Earth during which phase?
   A. first quarter
   B. new moon
   C. last quarter
   D. full moon

32. A mid-ocean ridge is a series of underwater mountain ranges that cross the deep ocean floor. These mountains were created by _______.
   A. volcanic activity
   B. accumulation of sedimentary rock
   C. erosion of surrounding areas
   D. water pressure collapsing surrounding areas

33. Which is a compound?
   A. oxygen
   B. gold
   C. orange juice
   D. table salt
34. The diagram illustrates how a ______ is formed.
   A. cold front
   B. thunderstorm
   C. drought
   D. breeze

35. Which is a renewable organic matter that can be used as an energy source?
   A. coal
   B. petroleum
   C. sugarcane fibers
   D. wind power

36. ______ clouds are puffy, white clouds that usually form in fair weather.
   A. Stratus
   B. Cirrus
   C. Cumulus
   D. Nimbus

37. Which BEST describes a compound?
   A. two or more substances that are evenly mixed but not chemically combined
   B. combination of substances that do not combine chemically
   C. matter that has fixed composition and properties
   D. substances that consist of two or more elements chemically combined

38. Which protects researchers from having a few unusual results that may skew the conclusion for an entire experiment?
   A. accuracy
   B. peer review
   C. repeated trials
   D. background research

39. The diagram above shows a typical nuclear power plant. In which part of the power plant is the electricity produced?
   A. containment structure
   B. control rods
   C. reactor vessel
   D. turbine and generator
Use the illustration below to answer questions 40 and 41.

40. What will happen to the needle of the compass if the compass is moved far away from the wire?
   A. The needle will point toward Earth’s magnetic north pole.
   B. The needle will spin continuously until one end of the wire is disconnected from the battery.
   C. The needle will point in the direction of the magnetic field created around the wire once the wire is connected to the wire.
   D. The needle will point in the opposite direction of Earth’s magnetic north pole.

41. Which BEST describes the strength of a magnetic field surrounding a magnet?
   A. The magnetic field has the same strength at all points surrounding the magnet.
   B. The magnetic field is weakest close to the poles and grows stronger farther from the poles.
   C. The magnetic field is strongest close to the poles and grows weaker farther from the poles.
   D. The magnetic field is strongest close to the north pole of the magnet and grows weaker farther from the north pole.

42. What happens when you apply a force against a door?
   A. The door applies an equal force against you.
   B. The door applies a greater force in the same direction.
   C. The door does not apply a force in either direction.
   D. The door applies a greater force against you.

43. During a storm, several butterfly-eating birds were blown to a distant island. The island, which previously had no birds, was filled with butterflies of all colors. A few years later, all the butterflies were dark green and brown. Which is the most likely explanation for the change in the butterfly population?
   A. Gradualism is selecting against red, yellow, and blue butterflies.
   B. Natural selection caused the dark green and brown butterflies to survive and reproduce while butterflies of other colors did not.
   C. A new species of butterflies emerged.
   D. A genetic mutation led to punctuated equilibrium.

44. Wind is formed by _______.
   A. Earth’s tilt on its axis
   B. the uneven heating of Earth’s surface by the Sun
   C. the gravitational pull of the Sun and the Moon
   D. the revolution of Earth around the Sun
45. In the diagram above, which of these locations would enter the nighttime side of Earth next?
   A. A
   B. B
   C. C
   D. D

46. Genetic information is passed from parents to offspring during ______.
   A. metabolism
   B. incomplete dominance
   C. mitosis
   D. reproduction

47. The tilt of Earth’s axis is responsible for ______.
   A. the change between day and night
   B. the changing seasons
   C. solar eclipses
   D. lunar eclipses

48. Which is an example of balanced forces acting on an object?
   A. an acorn falling from a tree
   B. a car moving at a constant speed of 88 km/h
   C. a motorcycle changing speed from 80 km/h to 110 km/h
   D. a truck slowing down as it approaches a red light

49. Organisms grow by reproducing existing cells. In animal cells, this process takes place through ______.
   A. cloning
   B. mitosis
   C. fusion
   D. asexual reproduction
Diagnostic Test: Short Answer
Part 2

Read each question. Then, on the lines that follow, write your answer in complete sentences.

1. Analyze how the three types of muscle tissue in humans are similar to muscle tissue in other animals. Use an example to support your reasoning.

2. Infer why an individual organism does not evolve by natural selection.

3. Recently deposited rock layers are more likely to contain fossils resembling existing species. Support this statement with a sketch of several layers of sedimentary rock containing fossils. Explain how index fossils are used to date the ages of rock layers.

4. Sketch and label a diagram of the layers of Earth. Classify these layers of Earth as solid or liquid: inner core, outer core, mantle, lithosphere, and crust.
5. The graph below shows yearly rainfall for four biomes. Infer which biome would have the greatest number of plant and animal species. Support your answer. Explain how abiotic and biotic factors would influence life in the biome you selected.

![Yearly Rainfall in Selected Biomes](image)

6. Analyze the forces involved in skating. Sketch a diagram to show all the forces at work on the skater and the surface. Predict what would happen to the moving skater if all these forces were suddenly removed.

7. List the five major functions of skin.

8. Formulate three questions scientists might attempt to answer about the natural world. Write your questions as a hypothesis that could be tested in scientific investigations.
9. Predict how many chromosomes each daughter cell of the cell above will have at the end of meiosis.

10. Compare and contrast kinetic energy to potential energy. Include an example of each.

11. Describe the characteristics of the asthenosphere that allow the plates to ride on it.
12. Define cell. Include a description of a cell’s structure and function.

13. Identify four processes of physical changes in which substances change state.

14. Design a simple scientific investigation using observation, description, comparison, sample collection, or construction of a model.

15. Discuss how fossils are used to study past climates, environments, and plant and animal species.
16. Predict what you would observe if you mixed the liquids shown in the table below.

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Density (g/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olive oil</td>
<td>0.918</td>
</tr>
<tr>
<td>Corn oil</td>
<td>0.922</td>
</tr>
<tr>
<td>Water</td>
<td>1.00</td>
</tr>
</tbody>
</table>

17. *Most objects in the solar system have a regular and predictable motion.* Summarize how scientists use this principle together with scientific techniques to hypothesize the expansion of the universe.

18. Describe how unlimited food would affect the process of natural selection.
Use the graph below to answer questions 19 and 20.

19. Determine the speed of the object at 4 s.

20. Compare the acceleration of the object between 0 s and 3 s and the acceleration between 3 s and 5 s.

21. Briefly discuss the functions that all cells must perform.
22. Explain the energy transformations and transfers that occur when a candle is used to heat a beaker of water.

23. Suggest why animals that reproduce by external fertilization produce more eggs than animals that reproduce by internal fertilization.

24. Analyze why scientists use the light-year as a unit of measurement for distances in space.
25. What event is shown in the diagram above? What happens to the winds during this event? How is water affected during this event?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

26. Discuss why it is important to list specific data that show multiple trials and whether other scientists have repeated the data.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

27. Predict how the success of plants in a particular environment would be affected if the plants could not reproduce asexually.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
28. Refer to the figure to the right. Analyze how fossil records tell scientists about the changes in Earth’s atmospheric conditions through time.

29. Choose a species alive today and predict how it might evolve through natural selection. Be sure to explain how the traits that increase are advantageous.

30. Design a simple controlled experiment. Identify the independent variables, dependent variables, and constants in your experiment.
Use the table below to answer question 31.

<table>
<thead>
<tr>
<th>Planet</th>
<th>Distance from Sun (AU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.39</td>
</tr>
<tr>
<td>Venus</td>
<td>0.72</td>
</tr>
<tr>
<td>Earth</td>
<td>1.00</td>
</tr>
<tr>
<td>Mars</td>
<td>1.52</td>
</tr>
<tr>
<td>Jupiter</td>
<td>5.20</td>
</tr>
<tr>
<td>Saturn</td>
<td>9.58</td>
</tr>
<tr>
<td>Uranus</td>
<td>19.20</td>
</tr>
<tr>
<td>Neptune</td>
<td>30.04</td>
</tr>
</tbody>
</table>

31. Compare and contrast Earth’s year to that of other planets in our solar system. Explain how planetary years differ between the inner and outer planets.

32. Design an experiment to compare the properties of sodium chloride and sand.

33. State the law of conservation of energy. Design a three-step flowchart to show how energy can change forms.
Standards Practice: Multiple Choice

Standard 1
Characteristics and Processes of Science

Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

### Determining Lightbulb Lifespan

<table>
<thead>
<tr>
<th>Lightbulb</th>
<th>Lightbulb Lifespan (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q</td>
<td>33.5</td>
</tr>
<tr>
<td>R</td>
<td>37.7</td>
</tr>
<tr>
<td>S</td>
<td>41.3</td>
</tr>
<tr>
<td>T</td>
<td>39.2</td>
</tr>
</tbody>
</table>

1. Which is a good estimate of the average lifespan of the tested lightbulbs in the table above?
   - A. 20 h
   - B. 30 h
   - C. 40 h
   - D. 50 h

2. When scientists complete an investigation, they write detailed papers that describe what they did, what the results were, and what the experiment proved. Then other scientists and experts review the papers and check to see if the information is reliable enough to publish in a scientific journal. A research paper might NOT get published or taken seriously if ______.
   - A. all measurements and data are accurate
   - B. it makes a new scientific discovery
   - C. the results of the experiment cannot be reproduced
   - D. it uses only the scientific names and terms for objects or processes

### Effects of Acid Rain on a Lake

<table>
<thead>
<tr>
<th>Year</th>
<th>pH Level</th>
<th>Number of Fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>5.9</td>
<td>abundant</td>
</tr>
<tr>
<td>1950</td>
<td>5.5</td>
<td>many</td>
</tr>
<tr>
<td>1960</td>
<td>4.9</td>
<td>few</td>
</tr>
<tr>
<td>1970</td>
<td>4.2</td>
<td>very few</td>
</tr>
</tbody>
</table>

3. Which conclusion can be made by examining the data in the table above?
   - A. The pH level of the lake increased through the time span studied.
   - B. The lake became a popular fishing spot in 1950.
   - C. As the pH level decreased, the number of fish increased.
   - D. As the pH level decreased, the number of fish decreased.

4. What should an experimenter NEVER do before drawing a conclusion?
   - A. identify the problem
   - B. carry out the experiment
   - C. interpret evidence
   - D. choose the best outcome
Use the graph below to answer questions 5 and 6.

5. The graph above represents the change in velocity of four cars over a period of 6 seconds. Which line represents the car with the greatest acceleration?
   A. 1  
   B. 2  
   C. 3  
   D. 4

6. What is the relationship between time and velocity in the graph above?
   A. As time increases, velocity decreases.  
   B. As time decreases, velocity increases.  
   C. As time increases, velocity increases.  
   D. As time increases, velocity remains the same.

Use the graph below to answer questions 7 and 8.

7. The graph above shows the average ocean salinity over an 80-year period. A reasonable conclusion based on the data is that over time _______.
   A. the average ocean salinity has increased  
   B. the average ocean salinity has remained constant  
   C. the average salinity has decreased  
   D. the average ocean salinity varies constantly

8. In the graph above, the ocean salinity is the ________.
   A. control  
   B. sample size  
   C. independent variable  
   D. dependent variable
9. The graph above shows Emilio’s velocity as he walked to school. Using the information in the graph, Lisa concluded that Emilio stopped walking during the interval between 2 and 3 minutes. Why is Lisa’s conclusion wrong?

A. The data show that Emilio decreased his velocity during the interval between 2 and 3 minutes.
B. The data show that Emilio walked at a constant velocity during the interval between 2 and 3 minutes.
C. The data show that Emilio increased his velocity during the interval between 2 and 3 minutes.
D. The investigation was not repeated.

10. To explain an observation, hypotheses are sometimes developed from incomplete information and personal beliefs. Which of the following scientific methods are used to ensure the validity of a hypothesis?

A. developing a valid relationship between hypothesis and observation
B. verifying experimental results independently
C. designing new experiments to test the hypothesis
D. all of the above

11. How are scientific theories different from scientific laws?

A. Theories are accepted as truth by the scientific community while laws are not.
B. Laws do not try to explain why something happens while theories do.
C. Theories need to be supported by observations while laws do not.
D. Laws need to be based on the results of many investigations while theories do not.
Standards Practice: Multiple Choice

Standard 1
Characteristics and Processes of Science

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Tickets Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult females</td>
<td>250</td>
</tr>
<tr>
<td>Adult males</td>
<td>200</td>
</tr>
<tr>
<td>Student females</td>
<td>300</td>
</tr>
<tr>
<td>Student males</td>
<td>150</td>
</tr>
<tr>
<td>Senior citizens</td>
<td>100</td>
</tr>
</tbody>
</table>

Total number of tickets sold = 1,000

12. Which would be the most appropriate for visually comparing the number of tickets that each group purchased for the concert?
   A. bar graph
   B. line graph
   C. box-and-whisker plot
   D. stem-and-leaf plot

13. What is the first thing an experimenter should do after carrying out an experiment?
   A. interpret evidence
   B. draw conclusions
   C. form a hypothesis
   D. identify the problem

14. Which of the following describes a scientific law?
   A. an attempt to explain a pattern observed repeatedly in the natural world
   B. a reasonable guess that can be tested and is based on what is known and what is observed
   C. a rule that describes a pattern observed in nature
   D. a statement based on qualitative observations

15. Which BEST describes the purpose of the control group in a scientific investigation?
   A. The control group is expected to have the best results.
   B. The control group is used to test the greatest number of variables.
   C. Having a control group reduces the time it takes to perform the investigation.
   D. The results of the control group are used as the standard to which the other results are compared.
1. The heart, lungs, blood vessels, and blood work together to perform which function?
   A. They provide oxygen to all parts of the body.
   B. They remove the body’s tissue fluid.
   C. They protect the body from pathogens.
   D. They regulate the body’s temperature.

2. Which statement most accurately describes the endocrine system?
   A. The endocrine system is made up of bones that support the body.
   B. The endocrine system is made up of nerves that send messages to and from the brain.
   C. The endocrine system produces chemicals that regulate cellular processes.
   D. The endocrine system is made up of organs that digest and process food and wastes.

3. The human body is made up of many systems. Which system is most involved when a person feels pain?
   A. muscular
   B. digestive
   C. nervous
   D. circulatory

4. The pharynx, larynx, and trachea are all components of the ______ system.
   A. respiratory
   B. circulatory
   C. immune
   D. cardiovascular

5. Which processes food for energy?
   A. respiratory system
   B. immune system
   C. endocrine system
   D. digestive system

6. When the skin prevents disease-causing organisms from entering the body, it acts as part of which organ system?
   A. immune system
   B. circulatory system
   C. excretory system
   D. reproductive system
7. The bones in your body make up the skeletal system. Which is a function of the skeletal system?
   A. carrying impulses to your brain
   B. protecting your internal organs
   C. sending chemical messages in your blood
   D. transporting oxygen and glucose from digested food

8. Which two systems does your body use to walk, run, and jump?
   A. skeletal and reproductive systems
   B. skeletal and muscular systems
   C. muscular and excretory systems
   D. digestive and reproductive systems

9. Which systems, together with the skin, make up the excretory system?
   A. digestive, respiratory, and urinary systems
   B. circulatory, skeletal, and muscular systems
   C. reproductive, immune, and nervous systems
   D. respiratory, muscular, and nervous systems

10. Which body system works together with the circulatory system to provide muscle cells with oxygen?
    A. Digestive System
    B. Skeletal System
    C. Respiratory System
    D. Urinary System
Standards Practice: Multiple Choice

Standard 2

Living Systems: Characteristics, Structure, and Function

11. What is the main reason trees belong to the plant kingdom instead of the animal kingdom?
   A. Trees are green, like all other plants.
   B. Many animals live in trees and eat their fruit.
   C. Trees can adapt to different environments.
   D. Trees use sunlight and water to produce their own food.

12. What must happen to make your bones move?
   A. A set of muscles must expand.
   B. A set of bones must contract.
   C. Two sets of muscles must move in the same direction.
   D. One set of muscles must contract while another set of muscles relaxes.

13. In mammals, different life processes such as respiration and digestion are carried out by different body systems. Each body system consists of ________.
   A. muscles and bones
   B. hormonal glands
   C. nutrients and minerals
   D. specialized cells, tissues, and organs

14. Use the diagram below to answer questions 14 and 15.

   A
   B
   C
   D
   E
   F

   What is the function of part F in the diagram?
   A. It supports the flower.
   B. It produces pollen for the flower.
   C. It produces seeds.
   D. It extracts nutrients from the ground.

15. After fertilization, which part of the flower develops into a seed?
   A. A
   B. B
   C. C
   D. D
Standards Practice: Multiple Choice

Standard 2
Living Systems: Characteristics, Structure, and Function

Use the diagram below to answer questions 16 and 17.

16. This diagram shows the main parts of a plant. Which part is BEST adapted for capturing energy?
   A. A
   B. B
   C. C
   D. D

17. Which part of the plant is BEST adapted for absorbing water and minerals?
   A. A
   B. B
   C. C
   D. D

Biotechnology refers to the industry, techniques, and management of biological sciences for human benefit. One of the best-known versions of biotechnology is genetic engineering. Genetic engineering involves altering genetic material in living organisms. Important medical, industrial, and agricultural discoveries have been made using biotechnology, such as replication of human interferon (a virus-fighting protein), human insulin, the creation of disease-fighting strains of vegetables, and oil-eating bacteria.

18. Based on the passage above, which of the following groups of occupations would best apply to the field of biotechnology?
   A. doctor, lab technician, psychologist, biologist
   B. biologist, civil engineer, geneticist, agriculturalist
   C. computer specialist, chemist, architect, geneticist
   D. chemist, biologist, statistician, doctor

19. What role might a mathematician play in the field of biotechnology?
   A. projecting costs that need to be tracked and managed
   B. designing new experiments
   C. analyzing laboratory data requiring precise mathematical interpretation
   D. designing equipment for use in laboratories
1. Which is necessary for sexual reproduction of plants?
   A. stomata
   B. gametes
   C. chloroplasts
   D. cambium

2. Which best describes a fertilized egg cell?
   A. a cell that carries genetic information from one parent and multiplies to form a complete organism
   B. a cell that carries genetic information from each parent and multiplies to form part of an organism
   C. a cell that carries genetic information from one parent and multiplies to form half of an organism
   D. a cell that carries genetic information from each parent and multiplies to form a complete organism

3. Human body cells have ______ pairs of chromosomes.
   A. 12
   B. 23
   C. 36
   D. 48

4. The illustration above shows a cell. Which illustration shows what will form when the cell goes through meiosis?
   A. 
   B. 
   C. 
   D. 

Standards Practice: Multiple Choice

Standard 3
Life Cycles, Reproduction, and Heredity
Standards Practice: Multiple Choice

Standard 3
Life Cycles, Reproduction, and Heredity

Use the diagram below to answer questions 5 and 6.

7. During sexual reproduction, a male sperm cell merges with a female ovum. These sex cells are each ______.
   A. immature
   B. diploid
   C. haploid
   D. flagellated

8. During mitosis, DNA is copied and passed on to new cells. In which stage of the cell cycle is DNA copied?
   A. telophase
   B. metaphase
   C. prophase
   D. interphase

9. Human sex cells have ______ chromosomes.
   A. 23
   B. 26
   C. 36
   D. 48

5. Which part of the flower produces female sex cells?
   A. C
   B. D
   C. E
   D. F

6. Which part of the flower produces male sex cells?
   A. A
   B. B
   C. D
   D. E
Genetic counselors test for genetic disorders. They can determine the probability of a child having a genetic disorder. Genetic counselors also can help families find support and choose treatment options.

10. Based on the passage above, genetic counselors can _______.
   A. prevent genetic disorders  
   B. provide treatment options  
   C. cure genetic disorders  
   D. eliminate genetic disorders

11. During exercise, muscles use more oxygen and produce more carbon dioxide. The brain responds by directing the _______ and _______ to work harder to deliver oxygen and remove carbon dioxide.
   A. lungs, kidneys  
   B. heart, kidneys  
   C. heart, lungs  
   D. lungs, skin

12. Which process allows the body to maintain a stable internal environment?
   A. homeostasis  
   B. mitosis  
   C. adaptation  
   D. fertilization

13. Which part of the sperm enables it to move?
   A. A  
   B. B  
   C. C  
   D. D

14. Which part of the egg cell contains genetic information?
   A. A  
   B. B  
   C. C  
   D. D
Use the diagram below to answer questions 15 and 16.

15. Which process does the zygote undergo to develop into a new organism?
   A. meiosis I
   B. fertilization
   C. mitosis
   D. meiosis II

16. Which process occurs when the sperm and egg join?
   A. meiosis I
   B. fertilization
   C. mitosis
   D. meiosis II

Use the diagram below to answer questions 17 and 18.

17. The _____ is the source of food for the embryo and contains all the fat in the egg.
   A. germinal disk
   B. shell
   C. albumen
   D. yolk

18. A small white spot on the yolk, called a(n) _____, contains the female’s genetic material.
   A. germinal disk
   B. shell
   C. albumen
   D. yolk
1. Why do most amphibians live in moist places?
   A. to stabilize their body temperatures
   B. to keep their skin moist to enable absorption of oxygen
   C. to live in an environment with a large number and variety of insects
   D. to hibernate more comfortably

2. In a fishing lake, a foreign mussel is introduced that feeds on the available algae. The mussel has no predators and thrives. The algae that the mussel feeds on are the food for many of the fish in the lake. How will this most likely affect humans living near the lake?
   A. The mussels excrete hydrochloric acid, polluting the lake.
   B. The fish in the lake will begin to die off, leaving less fish for the humans to eat.
   C. The mussels excrete carbon dioxide, making the air around the lake toxic.
   D. The fish in the lake will thrive, overpopulating the lake.

3. Tortoises on the Galápagos Islands are generally similar, but those on each island are unique. The differences among the tortoises on different islands arose because of ______.
   A. convergent evolution
   B. geographic isolation
   C. climatic changes
   D. tectonic materials

4. Many complex life-forms reproduce sexually. Sexual reproduction results in offspring that ______.
   A. are identical to the mother
   B. are identical to both parents
   C. are identical to one parent but are completely different from the other
   D. share some traits with each parent but are not identical to either one
Standards Practice: Multiple Choice
Standard 4
Populations and Ecosystems

Use the diagram below to answer questions 5 and 6.

5. The diagram above represents a food web. The previous winter was quite mild. The mild weather caused the mouse population to increase the following spring. Which might you expect to happen to the ecosystem?
   A. The number of predators in the area will decrease.
   B. The ecosystem will become stabilized.
   C. The mouse population will remain at the new higher level for several years.
   D. Populations of other organisms that compete with the mice for food might decrease.

6. A local company sprayed an herbicide over the area represented by the food web. As a result, most of the plants in the area died. Which will be the most likely result from the decrease in the plant life in the area?
   A. fewer mice
   B. more snakes
   C. more foxes
   D. more mice

7. In which climate would you expect to discover many different types of animals living?
   A. cold and snowy
   B. hot and dry
   C. warm and moist
   D. cold and dry

8. Which are NOT a product of artificial selection?
   A. the many types of dogs
   B. the different species of wild cats
   C. ornamental maple trees
   D. race horses
Standards Practice: Multiple Choice

9. Which statement BEST explains how natural selection occurs?
   A. Natural selection occurs when differences between individual organisms result in differences in reproductive success.
   B. Natural selection occurs because organisms are geographically isolated.
   C. Natural selection occurs when an organism’s offspring grow vestigial structures.
   D. Natural selection occurs when organisms learn how to adapt to their environment and pass this knowledge on to their offspring.

10. Natural selection favors individuals with traits that help them survive and reproduce. Such individuals have _______.
    A. a narrow gene pool
    B. high fitness
    C. more alleles
    D. fewer alleles

11. Sometimes a population cannot grow to its biotic potential due to environmental factors. What are these environmental factors called?
    A. limiting factors
    B. biomes
    C. ecological pyramids
    D. carrying capacities

12. The illustration above shows spotted beetles and plain beetles on a tree. What would most likely happen to both beetle populations if, over a period of many years, the bark on all the trees they live on became spotted?
    A. The populations of spotted beetles would increase and the population of plain beetles would decrease.
    B. The population of plain beetles would increase and the population of spotted beetles would decrease.
    C. The population of spotted beetles would increase and the population of plain beetles would increase.
    D. The population of plain beetles would increase and the population of spotted beetles would stay the same.
13. The illustration above shows four Petri dishes that receive different amounts of light every day. The clock face indicates the amount of light each Petri dish receives. The Petri dishes are filled with euglenoids, one-celled organisms that use chloroplasts to survive.

Which plate can probably sustain the largest number of euglenoids?
A. W
B. X
C. Y
D. Z

14. Alligators in wetland regions normally feed on animals such as shorebirds. Shorebirds usually feed on small fish and frogs. Recently, scientists released a large number of alligators into a wetland region. Scientists expect that as a result of this increase in the alligator population, the population of small fish and frogs will ______.
A. remain about the same
B. rapidly decrease
C. become extinct
D. noticeably increase

15. Deserts do not support as much plant and animal life as other environments. Which factor does NOT normally limit the ability of organisms to live and grow in desert areas?
A. high temperatures
B. lack of water
C. crowding or lack of space
D. soil with little organic matter and nutrients
Use the illustration below to answer questions 1 and 2.

1. Which is the correct classification for the substance in the glass shown above?
   A. compound
   B. element
   C. mixture
   D. solution

2. Suppose a tablespoon of sand is added to the substance in the glass. Which would **BEST** describe the contents of the glass after the sand has been added?
   A. compound
   B. element
   C. mixture
   D. solution

3. All compounds have chemical formulas that describe their makeup. The chemical formula for a molecule of water is H₂O. According to its chemical formula, what is the composition of a water molecule?
   A. one hydrogen atom and one oxygen atom
   B. one hydrogen atom and two oxygen atoms
   C. two hydrogen atoms and one oxygen atom
   D. two hydrogen atoms and two oxygen atoms

4. Which is the correct chemical formula for sodium chloride, or table salt?
   A. NaCl
   B. ClNa
   C. Na₂Cl
   D. Cl₂Na

5. Sandra has a container filled with sand and small stones. She can separate the sand from the stones by passing it through a sieve. This combination of sand and stones is a(n) ________.
   A. mixture
   B. element
   C. solution
   D. compound
Standards Practice: Multiple Choice

Standard 5

Matter: Properties and Changes

6. Which has the ability to dissolve solids, liquids and gases?
   A. solvent
   B. solute
   C. solution
   D. precipitate

7. How does temperature affect the solubility of a sugar and water solution?
   A. Sugar dissolves faster and more sugar can be dissolved as the water is cooled.
   B. Sugar dissolves more slowly and more sugar can be dissolved as the water is heated.
   C. The sugar dissolves faster and less sugar can be dissolved as the water is heated.
   D. Sugar dissolves faster and more sugar can be dissolved as the water is heated.

8. Pharmacists who work in hospitals make intravenous (IV) solutions. How is knowledge of elements, mixtures, and compounds useful to pharmacists?
   A. It enables them to combine the correct amount of solute in the solvent to create the desired prescription.
   B. It enables them to advise patients of possible side effects to their prescription.
   C. It enables them to accurately order the medicines they need to have on hand.
   D. It enables them to store medicines appropriately.

9. Which statement is true?
   A. A large number of naturally occurring elements results in the small variety of substances found in the world.
   B. A small number of naturally occurring elements results in the large variety of substances found in the world.
   C. A small number of man-made elements results in the large variety of substances found in the world.
   D. A large number of man-made elements results in the small variety of substances found in the world.

10. Which solute in the illustration above will dissolve faster? Why?
    A. A; solutes dissolve faster when the surface area of the solute is increased.
    B. B; solutes dissolve faster when the surface area of the solute is increased.
    C. A; solutes dissolve faster when the surface area of the solute is decreased.
    D. B; solutes dissolve faster when the surface area of the solute is decreased.
Use the illustration below to answer questions 11 and 12.

11. According to the graph, which solute is affected the most by changes in temperature of the solvent?
   A. sodium chloride
   B. sucrose
   C. potassium chloride
   D. calcium carbonate

12. According to the graph, which solute is unaffected by temperature changes in the solvent water?
   A. sodium chloride
   B. sucrose
   C. potassium chloride
   D. calcium carbonate

13. Which BEST describes a solute?
   A. a homogeneous mixture made up of one or more substances
   B. substances that dissolve other substances
   C. a solid formed in a solution during a chemical reaction
   D. a substance that is dissolved in another substance

14. Which is NOT a method of separating a mixture?
   A. chromatography
   B. evaporation
   C. mixing
   D. filtration

15. How does temperature affect the solubility of a liquid-gas solution?
   A. As temperature increases, the solubility of a gas decreases.
   B. As temperature increases, the solubility of a gas increases.
   C. As temperature decreases, the solubility of a gas decreases.
   D. As temperature decreases, the solubility of a gas increases.
16. Which BEST describes a solution?  
A. a homogeneous mixture made up of one or more substances  
B. a substance that dissolves other substances  
C. a solid formed in a solution during a chemical reaction  
D. the substances that are dissolved in another substance

17. The illustration above shows the distillation process. Which BEST describes the purpose of distillation?  
A. to separate solute from solution  
B. to separate undissolved solute in a solvent  
C. to separate impurities from solution  
D. to separate all chemicals in a solvent

18. Sodium is a bright, silvery metal. It is soft and highly reactive, and it floats and can ignite spontaneously in water.  

Chlorine gas is a greenish yellow. The gas acts as an irritant for respiratory and other mucous membranes, and the liquid form will burn the skin.  

Sodium chloride is a clear, crystalline solid when pure. It is soluble in water and somewhat soluble in other solvents. It is odorless, and it has a characteristic taste.  

How do the properties of the elements compare to those of the compound?  
A. The compound is more reactive and dangerous than the elements.  
B. The reactivity of the elements is the same as the compound.  
C. The elements cannot be combined to form the compound.  
D. The elements are more reactive and dangerous than the compound.

19. How does pressure affect the solubility of a liquid-gas solution?  
A. As pressure increases, the solubility of a gas decreases.  
B. As pressure increases, the solubility of a gas increases.  
C. As pressure decreases, the solubility of a gas decreases.  
D. As pressure decreases, the solubility of a gas increases.
Standards Practice: Multiple Choice

Standard 6
Motion and Forces

1. The illustration above shows a large box being pushed in opposite directions by two men. The box changed its position in the room because the ______.
   A. opposite forces were balanced
   B. smooth floor created no friction
   C. man on the left side applied more force than the man on the right side
   D. man on the right side applied more force than the man on the left side

2. You are riding a bicycle while your friend jogs along with you. Your friend gives you a push in order to increase your speed. Which set of vectors shows the applied force on your bicycle?
   A. → →
   B. ← →
   C. → ←
   D. ↑ ↓

3. A bowling ball, a baseball, and a tennis ball are all dropped from a height of 15 meters at the same time. Assume gravity is the only force acting on all three objects. Which object will hit the ground first?
   A. baseball
   B. tennis ball
   C. bowling ball
   D. All three balls will hit the ground at the same time.

4. Suppose you are riding on a bicycle and it stops suddenly. What happens to your body?
   A. It also stops moving.
   B. It keeps moving forward.
   C. It moves backward.
   D. It speeds up.

5. A book is sliding along a desktop. Because the book is in motion, you know that the forces acting on the book are ______.
   A. balanced
   B. unbalanced
   C. in one direction only
   D. pushing upward and downward only
Standards Practice: Multiple Choice
Standard 6
Motion and Forces

6. Which picture shows the unbalanced force that would tip the seesaw to the right?
   A. 
   B. 
   C. 
   D. 

7. During a game of tug-of-war, a scarf tied in the center of the rope moves to the right. Because of this, we know that ______.
   A. the net force is zero
   B. the forces are balanced
   C. the team on the left is exerting a greater force
   D. the team on the right is exerting a greater force

8. When a force is exerted on a box, an equal force in the opposite direction is exerted by the box. These forces are called ______ forces.
   A. action-reaction
   B. centripetal
   C. frictional
   D. gravitational

9. A book sliding across the floor eventually comes to rest because ______.
   A. there are no forces acting on it
   B. there are forces acting on it
   C. of inelastic collisions
   D. of conservation of momentum

10. According to the first law of motion, a moving object, if no forces are acting on it, will ______.
    A. eventually come to rest
    B. eventually change direction
    C. slow down but never completely stop
    D. remain in motion with the same velocity forever
Standards Practice: Multiple Choice

Standard 6

Motion and Forces

11. In the diagram above, the car on the left is about to hit the car on the right. When the collision occurs, which **BEST** describes the motion of the driver in each car?
   A. Both drivers will move forward.
   B. Both drivers will move backward.
   C. The driver of the car on the left will move forward and the driver of the car on the right will move backward.
   D. The driver of the car on the left will move backward and the driver of the car on the right will move forward.

12. A box is sliding along a level floor. Friction is an unbalanced force acting on the box to slow it down. In which direction is the friction force acting?
   A. downward
   B. upward
   C. in the same direction as the movement of the box
   D. in the opposite direction of the movement of the box

13. Which **BEST** describes the second law of motion?
   A. For every action there is an equal and opposite reaction.
   B. An object at rest stays at rest unless acted upon by an external force, and an object in motion stays in motion in a straight line unless acted upon by an external force.
   C. The rate of change in momentum of an object is proportional to the force acting on the object and in the same direction.
   D. The rate of change in momentum of an object is proportional to the force acting on the object and in the opposite direction.

14. Who studied motion in detail and formulated the three laws of motion?
   A. Avogadro
   B. Einstein
   C. Newton
   D. Tyndall

15. In which career would the three laws of motion be most useful?
   A. artist
   B. park ranger
   C. chef
   D. crash tester
Standards Practice: Multiple Choice

Standard 6
Motion and Forces

16. Which **BEST** describes the third law of motion?
   A. For every action there is an equal and opposite reaction.
   B. An object at rest stays at rest unless acted upon by an external force, and an object in motion stays in motion in a straight line unless acted upon by an external force.
   C. The rate of change in momentum of an object is proportional to the force acting on the object and in the same direction.
   D. The rate of change in momentum of an object is proportional to the force acting on the object and in the opposite direction.

17. Which **BEST** describes the first law of motion?
   A. For every action there is an equal and opposite reaction.
   B. An object at rest stays at rest unless acted upon by an external force, and an object in motion stays in motion in a straight line unless acted upon by an external force.
   C. The rate of change in momentum of an object is proportional to the force acting on the object and in the same direction.
   D. The rate of change in momentum of an object is proportional to the force acting on the object and in the opposite direction.

18. Which illustration shows balanced forces?
   A. ![Illustration A](image)
   B. ![Illustration B](image)
   C. ![Illustration C](image)
   D. ![Illustration D](image)
Standards Practice: Multiple Choice

Standard 7
Energy and Transfer of Energy

1. Based on the diagram above, which is the correct sequence of energy changes needed to produce energy for the hair dryer?
   A. Heat → Mechanical → Chemical → Electrical
   B. Chemical → Heat → Mechanical → Electrical
   C. Electrical → Mechanical → Heat → Chemical
   D. Chemical → Mechanical → Heat → Electrical

2. Which is NOT a problem usually associated with nuclear energy?
   A. disposal of radioactive waste
   B. thermal pollution of rivers and streams
   C. environmental damage from mining and extraction of uranium
   D. emission of carbon dioxide into the atmosphere

3. When driving a car, the chemical energy in gasoline is converted to heat (thermal energy) in the engine. Most of this thermal energy is then converted to mechanical energy, which makes the car move. What happens to the rest of the thermal energy?
   A. It changes back to chemical energy.
   B. It is given off by the hot engine.
   C. It is conserved for the rest of the trip.
   D. It is destroyed by the engine.

4. About 75 percent of petroleum that is currently available is used for transportation. Hydrogen is the most abundant element in the universe. When it burns, it only produces water. What is true of hydrogen-powered vehicles?
   A. They will not pollute the environment.
   B. Sources of hydrogen are limited, so few can be available.
   C. They will pollute the environment.
   D. Petroleum-powered vehicles create less pollution.
5. One disadvantage of using solar energy to generate electricity is that the number of hours of available sunlight is not the same all over Earth. Which region of the United States has the greatest potential for producing electricity from solar energy?
   A. northwest  
   B. midwest  
   C. northeast  
   D. southwest

6. One disadvantage to wind power is that the large towers are unsightly. A mechanical engineer designed an offshore windmill 150 km from shore. What is true of offshore windmills?
   A. They are not large.  
   B. They are not in areas where people live.  
   C. They create pollution.  
   D. They do not create as much power.

7. When you move your arm, your body changes chemical energy supplied by food into _____ energy.
   A. light  
   B. electrical  
   C. potential  
   D. mechanical
8. What type of energy transfer occurs when the heat in the sand transfers to the boy’s feet?
   A. convection
   B. conduction
   C. radiation
   D. kinetic

9. If you pick up a book from the floor and place it on a shelf, energy is transferred to the book and stored in the form of ______ energy.
   A. kinetic
   B. potential
   C. chemical
   D. electrical

10. How does the structure shown above produce power for use in a home?
    A. The structure transforms chemical energy into mechanical energy.
    B. The structure transforms electrical energy into mechanical energy.
    C. The structure transforms chemical energy into electrical energy.
    D. The structure transforms mechanical energy into electrical energy.

11. Daria pulls a chair out from her desk. While the chair is moving, it has ______.
    A. force
    B. power
    C. kinetic energy
    D. potential energy
Standards Practice: Multiple Choice

Standard 7

Energy and Transfer of Energy

Use the passage below to answer questions 12–15.

An increasing world population has resulted in a dramatic increase in global energy consumption. Between 1970 and 2000, global energy consumption nearly doubled. In 2000, almost 90 percent of the energy used worldwide was obtained from fossil fuels.

Fossil fuels are a nonrenewable resource. As a result, the amounts of petroleum, coal, and natural gas on Earth continue to be used at an increasing rate. Some experts predict that by 2050, the amount of petroleum pumped from wells will only be about 20 percent of what is pumped currently. By this time not only will fuels like gasoline be more expensive, but also products like plastics that are made from chemical compounds found in petroleum.

Continued rates of fossil fuel consumption cause environmental problems such as air pollution, water pollution, and global warming. Alternative energy sources might reduce the environmental impact of increasing energy consumption.

12. Based on the passage, which might be a benefit resulting from the increasing use of alternative energy sources?
   A. Global energy use will decrease.
   B. Gasoline will become less expensive.
   C. Global population will decrease.
   D. The global supply of fossil fuels will decrease more slowly.

13. Based on the passage, what are two disadvantages to using fossil fuels?
   A. They are composed of inorganic materials and are readily available.
   B. They are scarce and inexpensive.
   C. They are nonrenewable and cause pollution.
   D. They burn inefficiently and are easily obtained.

14. Based on the passage, which is NOT an example of a fossil fuel?
   A. biomass
   B. petroleum
   C. coal
   D. natural gas

15. Which is NOT an alternative to the use of fossil fuels?
   A. geothermal energy
   B. hydroelectric energy
   C. hydrocarbon energy
   D. nuclear energy
1. Earth’s atmosphere is a mixture of gases. The air we breathe is about 78 percent nitrogen, 21 percent oxygen, and 1 percent other gases. Which circle graph **BEST** models this information?

   A. ![Circle Graph A]
   B. ![Circle Graph B]
   C. ![Circle Graph C]
   D. ![Circle Graph D]

2. Some of the surface water in oceans, lakes, and rivers evaporates and rises into the atmosphere as water vapor. What method of heat transfer is involved in this process?

   A. convection
   B. conduction
   C. radiation
   D. precipitation

3. The main processes of the water cycle are evaporation, condensation, and ______.
   A. respiration
   B. precipitation
   C. oxygenation
   D. condensation

4. According to the Fujita scale, which tornado classification would do the **MOST** damage?
   A. F0
   B. F1
   C. F2
   D. F3

5. Energy from the Sun heats Earth’s surface. The heat then rises from Earth’s surface, and the gases in the atmosphere reflect the heat back to Earth. This process is called ______.
   A. convection
   B. the greenhouse effect
   C. radiation
   D. conduction
6. Which receives the most solar radiation?
   A. the tropics
   B. the polar zones
   C. the oceans
   D. the temperate zones

7. What is the climate of a desert?
   A. The average temperature ranges from –34°C to 12°C, and annual precipitation ranges from 15 to 20 centimeters.
   B. The average temperature ranges from –30°C to 30°C, and annual precipitation ranges from 75 to 150 centimeters and is distributed evenly throughout the year.
   C. The average temperature ranges from 20°C to 25°C, and annual rainfall exceeds 2,000 millimeters and is evenly distributed throughout the year.
   D. The average temperature ranges from 20°C to 25°C, there is very little rainfall, and evaporation rates exceed rainfall.

8. Warm-water and cold-water currents move through the oceans of the northern and southern hemispheres. In the northern hemisphere, these currents move _______.
   A. clockwise
   B. counterclockwise
   C. in a straight line from west to east
   D. from the north pole to the south pole

9. In the graph above, in which two layers of the atmosphere does the temperature decrease with increasing altitude?
   A. troposphere and stratosphere
   B. mesosphere and thermosphere
   C. troposphere and mesosphere
   D. stratosphere and thermosphere

10. Who studies and predicts the weather?
    A. astrophysicist
    B. volcanologist
    C. hydrologist
    D. meteorologist
11. What does the instrument shown above measure?
   A. rainfall  
   B. temperature  
   C. humidity  
   D. atmospheric pressure

12. The boundary between cold-air and warm-air masses is called a _______.
   A. front  
   B. storm  
   C. climate  
   D. flood

13. Carbon dioxide and other pollutants trap the Sun’s heat and cause Earth to warm up. How do humans contribute to global warming?
   A. through the use of solar power  
   B. through the use of coal-burning power plants  
   C. through the use of hydroelectric power plants  
   D. through the use of wind power

14. Volcanoes release volcanic material into the stratosphere, creating a dust cover. How might this affect the weather?
   A. It might lead to a decrease in rain.  
   B. It might lead to an increase in rain.  
   C. It might lead to an increase in temperature.  
   D. It might lead to a decrease in temperature.

15. Which is NOT a way to protect yourself during a flood?
   A. Avoid walking or swimming through swiftly moving water.  
   B. Avoid trying to cross water in a vehicle.  
   C. Avoid camping near a stream during threatening weather conditions.  
   D. Avoid abandoning a vehicle that stalls in rapidly rising water.
Standards Practice: Multiple Choice

Standard 8
Earth Systems

Use the illustration below to answer questions 16 and 17.

16. Why is the shaded area in the illustration often called “tornado alley”?
   A. Tornadoes in the F1 category are most likely to occur.
   B. Tornadoes in the F2 category are most likely to occur.
   C. Tornadoes in the F4 and F5 categories are most likely to occur.
   D. Tornadoes in the F4 and F5 categories are least likely to occur.

17. What weather conditions occur in the shaded area of the illustration?
   A. The mountainous land in this area allows cold, dry polar air from Canada to collide with warm, humid tropical air from the Gulf of Mexico.
   B. The flat land in this area allows warm, dry air from Canada to collide with cool, dry air from the Gulf of Mexico.
   C. The valley in this area allows cold, dry polar air from Canada to collide with warm, humid tropical air from the Gulf of Mexico.
   D. The flat land in this area allows cold, dry polar air from Canada to collide with warm, humid tropical air from the Gulf of Mexico.

18. Clouds are classified mainly by shape and _______.
   A. color
   B. height
   C. temperature
   D. amount of water vapor

19. As air in Earth’s atmosphere is heated by the Sun, the warmer air expands and becomes less dense than the cooler air. As a result, the warmer air rises and the cooler air sinks. This cycle of warm air rising and cool air sinking is called a _______.
   A. tidal current
   B. surface current
   C. deep current
   D. convection current

20. Which of the following BEST describes the sources of acid rain?
   A. volcanoes, decaying vegetation, and burning fossil fuels
   B. burning fossil fuels only
   C. volcanoes and decaying vegetation only
   D. decaying vegetation only

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.
Standards Practice: Multiple Choice

Standard 9
Earth’s History: Changes in Earth and Sky

Use the diagram and table below to answer questions 1 and 2.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Composition</th>
<th>Estimated Age (years)</th>
<th>Depth (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Sedimentary rock</td>
<td>100,000</td>
<td>0–4</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>Sedimentary rock</td>
<td>6 million</td>
<td>8–9</td>
</tr>
<tr>
<td>P</td>
<td>Sedimentary rock</td>
<td>6.1 million</td>
<td>9–10</td>
</tr>
</tbody>
</table>

1. The diagram above models the site where the data in the table were collected by paleontologists. To improve their study, paleontologists should also record _______.
   A. the time of year
   B. information about layer N
   C. the address of the work site
   D. the weight of sedimentary rocks

2. What is the depth of layer N?
   A. 0–4 m
   B. 5–7 m
   C. 8–9 m
   D. 9–10 m

3. Earth’s core is iron-nickel, therefore Earth acts as a magnet. Earth’s magnetic poles are near its geographic poles. How does a compass use Earth’s magnetic poles?
   A. The needle of a compass is also a magnet. One pole is north seeking and points to Earth’s magnetic north pole.
   B. The needle of a compass is also a magnet. One pole is south seeking and points to Earth’s magnetic north pole.
   C. The needle of a compass is not a magnet; therefore, it does not point to either of Earth’s magnetic poles.
   D. A compass does not use Earth’s magnetic poles.

4. Which is NOT a use for a compass?
   A. a hiker navigating a trail
   B. a captain navigating the sea
   C. a pilot navigating the sky
   D. GPS navigating a car

5. Which of the following is NOT caused by plate tectonics?
   A. earthquakes
   B. volcanoes
   C. mountains
   D. tidal cycles
6. Scientists studying plate tectonics compiled the table above showing the distance that the North American continent moves from year to year. What does the 1999 measurement represent in this data set?
   A. the distance moved each year
   B. the mean and the mode of the data set
   C. the mean and the median of the data set
   D. the spread of the data

7. How is Earth’s magnetic field detectible with a compass?
   A. The north end of a compass points to the north pole. Since opposites attract, the magnetic field inside Earth must have its south end near the north pole.
   B. The north end of a compass points to the south pole. Since opposites attract, the magnetic field inside Earth must have its north end near the south pole.
   C. The south end of a compass points to the north pole. Since opposites attract, the magnetic field inside Earth must have its north end near the north pole.
   D. The south end of a compass points to the north pole. Since likes attract, the magnetic field inside Earth must have its south end near the north pole.

8. Which statement about magnets is NOT true?
   A. The north and south poles of magnets repel each other.
   B. Most magnets are made of iron.
   C. Magnetic fields allow magnets to attract objects without direct contact.
   D. Magnetic forces weaken if the distance between the magnet and an object are increased.

9. Earth generates its own magnetic field. This field is called the ______.
   A. electromagnet
   B. electromotive force
   C. magnetosphere
   D. biosphere

10. A paleontologist discovers a layer of sedimentary rock filled with fossils of known and unknown species. She collects some of the fossils of the unknown species for further analysis. Which would improve her analysis?
    A. dating the unknown fossils with those of a known species
    B. digging deeper to the next sedimentary layer
    C. studying the region’s geographic isolation
    D. collecting all of the unknown fossils
Standards Practice: Multiple Choice

Standard 9
Earth’s History: Changes in Earth and Sky

Use the graph below to answer questions 11 and 12.

11. The graph above shows fossil pollen from Howes Prairie in the Indiana Dunes. What change is indicated by the letter A?
   A. an increase in pine and a decrease in oak and grasses
   B. a decline in pine and an increase in oak and grasses
   C. a decline in oak and an increase in pine and grasses
   D. an increase in grasses and a decrease in pine and oak

12. How many years ago did grasses first peak?
   A. 4,000
   B. 3,000
   C. 2,000
   D. 1,000

13. In the process of seafloor spreading, the plates below an ocean basin pull apart and ______.
   A. a new floor is created by magma that fills the rift
   B. pressure inside Earth creates geysers of water on the surface
   C. cause tides to develop
   D. the continental plates move closer together

14. The Mariana Islands in the Pacific Ocean were formed by volcanic action. Which is MOST likely true?
   A. There are glaciers near the Mariana Islands.
   B. Tectonic plates collide near the Mariana Islands.
   C. The Mariana Islands are larger than most islands.
   D. The Mariana Islands are uninhabited.

15. Which is NOT true about the plates that make up Earth’s crust?
   A. The plates have not moved since Earth formed.
   B. Most plates lie below a combination of continent and ocean floor.
   C. The plates move slowly around Earth at different speeds.
   D. Different plates move in different directions.
Fossil Evidence of Biological Change

Much of the evidence for biological change comes from fossils. Most fossils are found in sedimentary rock.

Scientists use many different methods to find the ages of fossils or rock layers. Two important methods are relative dating and absolute dating.

Relative dating occurs when a rock layer or fossil is found to be older or younger than something else. For example, a scientist knows that in an undisturbed stack of rock layers, the oldest layer is on the bottom. He also knows that the rock layers get younger toward the top. The fossils in the rock sequence also are younger at the top.

Absolute dating gives an age in years for fossils or rocks. For example, it might be possible to learn that a particular fossil is sixty million years old. Absolute dating is usually done by finding the ratio of certain types of atoms in rocks or minerals.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Composition</th>
<th>Estimated age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>sedimentary rock</td>
<td>100,000</td>
</tr>
<tr>
<td>N</td>
<td>sedimentary rock</td>
<td>5 million</td>
</tr>
<tr>
<td>O</td>
<td>sedimentary rock</td>
<td>6 million</td>
</tr>
<tr>
<td>P</td>
<td>sedimentary rock</td>
<td>6.1 million</td>
</tr>
</tbody>
</table>

16. The diagram shows undisturbed layers of sedimentary rock. Which layer is the oldest?
   A. layer M  
   B. layer N  
   C. layer O  
   D. layer P

17. A fossil found in layer P would be ______.
   A. younger than fossils in the other layers  
   B. less than 100,000 years old  
   C. younger than 6 million years  
   D. older than 6 million years

18. If a fossil were found in layers O and P, but not M and N, which is the MOST likely to be true?
   A. The fossil species exists today.
   B. The fossil species died out around 6 million years ago.
   C. The fossil species died out less than 100,000 years ago.
   D. The layers tell us nothing about the fossil’s age.
Standards Practice: Multiple Choice

Mastering the ACTAAP

Use the diagram below to answer questions 1 and 2.

1. The diagram above shows four of Earth’s positions during its orbit around the Sun. In which positions are day and night equal in length?
   A. A and B
   B. B and D
   C. C and D
   D. A and C

2. Which position represents Earth’s position during summer in the northern hemisphere?
   A. A
   B. B
   C. C
   D. D

3. The Sun is ______ of times closer to Earth compared to the next closest star.
   A. billions
   B. thousands
   C. millions
   D. hundreds

4. Light from the Sun takes ______ minutes to reach Earth.
   A. 10
   B. 15
   C. 8
   D. 7

5. An astronomer measured the distance between two stars. The distance the astronomer recorded was probably measured in ______.
   A. light-years
   B. astronomical units
   C. kilometers
   D. miles

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.
6. It takes about one ______ for Earth to rotate around its axis.
   A. hour
   B. week
   C. day
   D. year

7. Future exploration of nearby planets will include the use of robots. Which group would be best suited to join NASA’s robotics team?
   A. mechanical engineers, nuclear scientists, ecologists
   B. electrical engineers, computer specialists, mechanical engineers
   C. computer specialists, physical therapists, electricians
   D. astronomers, medical doctors, architects

8. The distance between Earth and other planets is measured in ______.
   A. astronomical units
   B. light-years
   C. kilometers
   D. miles

9. Which illustration depicts a lunar eclipse?
   A. 
   B. 
   C. 
   D. 

10. Which statement is true of both asteroids and meteoroids?
    A. They are made of frozen gases and dust.
    B. They are rocky objects that vary widely in size, and they orbit the Sun.
    C. They are pieces of debris from the big bang that orbit Earth.
    D. Most of them are grouped together in a belt between the orbits of Earth and the Moon.
11. The diagram above shows the parts of a comet. Which part of a comet is formed when the Sun melts ice in the nucleus?
   A. coma
   B. ion tail
   C. hydrogen envelope
   D. dust tail

12. Which has been the greatest benefit of using the space shuttle?
   A. transporting astronauts and materials to and from space
   B. testing new space-age alloys
   C. determining how many flights into space a vehicle can make
   D. using solar energy to power spaceships

13. How is one year measured on a planet?
   A. One year is the length of time it takes a planet to revolve around Earth.
   B. One year is 365 days on all planets.
   C. One year is the length of time it takes a planet to rotate on its axis.
   D. One year is the length of time it takes a planet to revolve around the Sun.

14. Why do the planets seem to wander against the background of stars?
   A. Planets change their position slightly each hour.
   B. Planets change their position slightly from one night to the next.
   C. The background of stars changes its position slightly each hour.
   D. The background of stars changes its position slightly from one night to the next.

15. A satellite designed to test Einstein’s general theory of relativity will look for evidence that massive bodies cause space-time to curve. Which group would have been responsible for designing this satellite?
   A. chemical engineers, nuclear scientists, ecologists
   B. computer specialists, pharmacists, electricians
   C. electrical engineers, computer specialists, mechanical engineers
   D. astronomers, medical doctors, architects
Standards Practice: Multiple Choice

Standard 10  
Objects in the Universe

Use the reading passage below to answer questions 16–18.

**Mars Exploration Technology**

In 1965, a space probe flew over Mars and took the first close-up pictures of the red planet. Since then, more advanced spacecraft have been used to orbit and even land on Mars, giving NASA scientists a closer look at the planet’s surface. The Mars Exploration Rovers, for example, are robotic laboratories on wheels that explore up to 40 meters of the surface per sol, or Martian day.

Each rover is only equipped to run for 90 sols, so the rovers work nonstop to collect as much information as possible. The rovers take digital photographs and collect rock and soil samples, which they analyze using onboard instruments. This information is sent back to Earth, where scientists review the findings and then direct the rovers to look for new or additional information.

The rovers currently in use are unable to make the return trip to Earth. As technology improves, however, scientists hope to use spacecraft that can bring soil, rock, and atmospheric samples back to Earth for further study. Other future plans include underground explorations and sending human explorers to Mars.

16. One day on Mars is called a _______.
   A. sol
   B. rover
   C. Red Planet
   D. orbit

17. Which sequence correctly describes the development of the Mars exploration program from 1965 to the present?
   A. satellites, space photos, manned missions
   B. spacecraft landing, underground exploration
   C. spacecraft flying by, orbiting, landing, surface exploration
   D. surface exploration, underground exploration

18. An improved Mars rover would be able to _______.
   A. travel 20 meters per sol
   B. take digital photographs
   C. return to Earth with samples
   D. analyze rock and soil samples
Standards Practice: Short Answer

Standard 1
Characteristics and Processes of Science

Read each question. Then, on the lines that follow, write your answer in complete sentences.

1. Describe how a scientist might use natural phenomena to explain real-world problems. List three tools the scientist might use in scientific work.

2. Compare and contrast dependent and independent variables and constants in any experiment.

3. What is the difference between a scientific theory and a scientific law?

4. What is the purpose of a circle graph?
5. Explain why scientists conduct multiple trials for each experiment.

6. Analyze what conclusions geologists might draw from the discovery and observations of a moraine, a long narrow pile of pebbles and debris. Support your reasoning.

7. Identify the kind of graph that would best show the results of a survey of 144 people in which 75 ride a bus, 45 drive, 15 car pool, and 9 walk to work.

8. Explain why the points in a line graph are connected.
Use the following table to answer questions 9–12.

A scientist conducted multiple experimental trials using different specimen as shown in the frequency table below.

<table>
<thead>
<tr>
<th>Mass (kg)</th>
<th>Number of Specimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>95</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>90</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>85</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>80</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>75</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>70</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>65</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
</tbody>
</table>

9. Define *mean* in your own words.

10. Calculate the mean mass of the specimen.

11. Define *median* in your own words.

12. Identify the median mass of the specimen.
Use the following table to answer questions 13–16.

A scientist conducted multiple experimental trials using different specimen as shown in the frequency table below.

<table>
<thead>
<tr>
<th>Mass (kg)</th>
<th>Number of Specimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>95</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>90</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>85</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>80</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>75</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>70</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>65</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
</tbody>
</table>

13. Define **mode** in your own words.

14. Identify the mode of the specimen.

15. Define **range** in your own words.

16. Calculate the range of the samples.
1. Design a flow chart to show the systems that interact with each other to allow muscles to exercise, become stronger, and grow.

2. Summarize the function of roots in plants.

3. Why do most plants have many tiny roots rather than just a few large roots?

4. How do the digestive system and endocrine system work together to digest foods?
5. Predict how the circulatory system responds to physical exercise and relaxation to help maintain the body’s balance and homeostasis.

6. *Blood is a tissue.* Summarize in your own words the functions of blood.

7. Analyze the functions of the lymphatic system and its importance to homeostasis.

8. Summarize the function of the kidneys, how kidney failure affects homeostasis, and what treatments are available for patients with kidney failure.
9. Predict what would happen if your skin cells were unable to perform mitosis.

10. Muscular dystrophy is a disease that causes nerves to degenerate. How can this cause muscle degeneration?

11. Xylem in plants and bones in humans perform some of the same functions. Explain how these two tissues function similarly.
12. Discuss how an amphibian’s strong endoskeleton, respiratory system, and large eyes help it carry out the life process.

13. How do red blood cells and plasma work together to provide the body’s tissues with oxygen?

14. In flowering plants, what provides the same function as sperm cells provide for animals?
Standards Practice: Short Answer

Standard 3
Life Cycles, Reproduction, and Heredity

1. Rearrange the following events that happen during mitosis and cell division in the order that they happen: chromosomes line up at the center of the cell, nuclear membrane breaks apart, plasma membrane pinches inward, sister chromatids separate.

2. Compare the daughter cells formed in mitosis to the original cell that divided to produce them.

3. Discuss how each of the five senses works to help avoid danger and maintain homeostasis.

4. Give an example of how the environment can affect an organism’s phenotype.
Standards Practice: Short Answer
Standard 3
Life Cycles, Reproduction, and Heredity

5. Analyze how polar bears adapt to their biome.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

6. Evaluate the importance of sexual reproduction to genetic variation.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

7. Describe how color variation in snapdragons like those in the photo avoids extinction.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

8. Explain the importance of cell division.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
9. Distinguish between sperm cells and egg cells.

10. Explain how the nervous system maintains homeostasis.

11. How do body cells differ from sex cells?
Standards Practice: Short Answer

Standard 3  Life Cycles, Reproduction, and Heredity

12. Describe how reproduction helps the continuation of a species.

________________________________________________________________________
________________________________________________________________________

13. Model how an egg and a sperm join during fertilization to form a zygote. Label the vocabulary words in your sketch.

________________________________________________________________________
________________________________________________________________________

14. Describe how plants reproduce asexually.

________________________________________________________________________
________________________________________________________________________

15. You admire a friend’s houseplant. What would you do to grow an identical plant?

________________________________________________________________________
________________________________________________________________________
Standards Practice: Short Answer

Standard 4
Populations and Ecosystems

1. Predict what would happen to a species of birds if the climate in their environment changed very quickly.

   ___________________________________________
   ___________________________________________
   ___________________________________________
   ___________________________________________

2. List at least five reptile adaptations that contribute to a balanced condition, the ability to carry out life processes, and survival in their environment.

   ___________________________________________
   ___________________________________________
   ___________________________________________
   ___________________________________________

3. Predict how the extinction of a predator would affect the other species in the environment. Consider the prey of the predator and the things that the prey eats.

   ___________________________________________
   ___________________________________________
   ___________________________________________
   ___________________________________________

4. Describe the ecological roles of various organisms in a desert food web.

   ___________________________________________
   ___________________________________________
   ___________________________________________
   ___________________________________________
Standards Practice: Short Answer
Standard 4  
Populations and Ecosystems

5. Describe the effects landslides have on humans.

__________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________________
9. Explain the role of reproduction in the continuation of a species.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

10. Hypothesize how the effects of human activities have resulted in pollution to aquatic ecosystems.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

11. Compare and contrast a volcanic lahar and a mudslide. Analyze how they affect the environment.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Standards Practice: Short Answer

Standard 4  
Populations and Ecosystems

12. Describe the effects pyroclastic flows have on ecosystems.

__________________________________________________________

__________________________________________________________

__________________________________________________________

13. Evaluate the suggestion that people should dispose of hazardous waste by dropping it down oceanic trenches and letting it sink into the mantle with the subducting slab.

__________________________________________________________

__________________________________________________________

__________________________________________________________

14. Hypothesize how an oil spill would damage a coastal ecosystem. What would happen if most of the top predators were killed?

__________________________________________________________

__________________________________________________________

__________________________________________________________
1. Classify the unknown substance described in the table of properties as a solid metal, an ionic crystal, a covalent crystal, or a polymer. Explain your answer.

<table>
<thead>
<tr>
<th>Properties of an Unknown Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness</td>
</tr>
<tr>
<td>Melting point</td>
</tr>
<tr>
<td>Water solubility</td>
</tr>
<tr>
<td>Electrical conductivity in a water solution</td>
</tr>
</tbody>
</table>

2. List at least five characteristics of substances.

3. Explain why an indicator might not change color when it is placed in an acidic or basic solution.
4. Is the formation of substance C an endothermic or exothermic reaction? Explain.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

5. Design an experiment to compare properties of sodium chloride and sand.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

6. Define *density*. Then, identify two similar objects and compare the density of each.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Standards Practice: Short Answer

Standard 5
Matter: Properties and Changes

7. During a physical change a substance keeps its chemical composition and properties. Give an example of this statement as a substance melts from a solid to a liquid.

8. Compare and contrast a mixture and a compound. Support your reasoning with an example of each.

9. Design a chart to compare the definitions of solution, solute, and solvent. Give an example of a solution, its solvent, and solute(s).

10. Predict three different ways to quickly dissolve a solute.
Standards Practice: Short Answer

Standard 5
Matter: Properties and Changes

11. *The rate of a solution can be affected by the size of the particles, stirring, temperature, and the amount of solute already dissolved.* Predict how these same factors might affect the rate of a chemical reaction.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

12. What is the easiest way to separate a mixture of iron filings and sand? Explain your answer.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

13. Explain why adding sugar to iced tea is a physical change.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
1. Create a diagram showing the following forces acting on an object. What is the net force acting on the object?

<table>
<thead>
<tr>
<th>Forces on an Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction</td>
</tr>
<tr>
<td>Up</td>
</tr>
<tr>
<td>Down</td>
</tr>
<tr>
<td>Left</td>
</tr>
<tr>
<td>Right</td>
</tr>
</tbody>
</table>

2. Interpret how machines transfer mechanical energy from one object to another as they change direction, speed, or amount of force. Give an example of the energy transfers.

3. Define friction in your own words. List three ways to reduce friction.
Standards Practice: Short Answer

Standard 6
Motion and Forces

4. Design a unique compound machine that includes a lever, a pulley, a wheel and axle, and an inclined plane. Label each simple machine. Trace the transfer of energy from input to output.

5. Explain how slowing down is considered acceleration.

6. Compare an astronaut’s weight in orbit with the astronaut’s weight on Earth, assuming the mass of the astronaut does not change.

7. Provide an original example of Newton’s first law of motion. Discuss the forces, net force, balanced forces, and unbalanced forces at work in your example.
8. If the net force on a 2-kg object is 8.0 N, what is the object’s acceleration?

9. Hypothesize ways in which friction can be reduced.

10. Force is directly related to an object’s mass and acceleration. The greater the force, the greater the change in motion. Evaluate situations to show two or more examples of mass that support this statement.
11. State the way velocity can change.

12. Give an example of an object that is accelerating but is traveling at a constant speed.

13. Discuss how a swimmer uses Newton’s third law of motion to race through the water.
1. The figure below shows sound waves produced by a drum. Describe how energy is transferred by sound waves.

2. Analyze how chemical energy can be transformed into light, electricity, or mechanical motion, as well as heat. Give an example of each transformation.

3. Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature. Explain how this statement is true for conduction, radiation, and convection. Provide examples to support your responses.
4. List six forms of energy.

5. Give an example to show the meaning of the law of conservation of energy.

6. Describe how the potential energy and the kinetic energy of a ball change as the ball falls.
Standards Practice: Short Answer

Standard 7
Energy and Transfer of Energy

7. Design a chart to compare water, wind, nuclear, geothermal, and solar power. Include the categories of renewable/nonrenewable, pollution, availability, and cost.

8. Infer why you can keep cooler on a sunny day if you sit under a tree or an umbrella.

9. Design an experiment to test which colors of fabric are the most efficient absorbers of radiation. Design the experiment to test the fabrics by placing them in direct sunlight for a period of time.

10. Describe three methods of thermal energy transfer.
11. Explain why materials that contain many small pockets of air are good insulators.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

12. Explain whether your body gains or loses thermal energy if your body temperature is 37°C and the temperature of the air surrounding your body is 25°C.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

13. Analyze why all organic material resources aren’t renewable.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

14. Create a flow chart to show the energy flow from the Sun to using fossil fuels for energy.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
1. Identify the type of precipitation shown below. Explain how a cold front is involved in the formation of this type of precipitation.

2. Describe the difference between basaltic and granitic magma.

3. Explain why active volcanoes do not occur along the east coast of the United States.
4. Describe the tectonic setting that formed the Ouachita Mountains in Arkansas.

5. Compare the role of ozone in the troposphere and the stratosphere.

6. Draw a simple diagram showing the positions of Earth’s crust, mantle, and core.

7. Examine the reasons why the distribution of land and water influence the climate of a region.

8. Suppose you are a surfer. Using your knowledge of sea breezes and land breezes, determine the best time to surf.
9. Predict if the relative humidity of Location A will be higher, lower, or equal to the relative humidity of Location B. In both locations, the amount of water vapor in the air is the same, but Location A has a higher temperature.

10. Illustrate how chains of volcanoes and deep ocean trenches relate to subduction zones.

11. Discuss how a tsunami is evidence of movement at plate boundaries.

12. Analyze why precipitation is most likely to occur at frontal boundaries.

13. Analyze the factors that determine the differences in temperature observed with latitude, seasons, and altitude.
14. Analyze the importance of the hydrosphere.

15. Construct your own diagram of the water cycle. Pick a body of water near you and a specific type of precipitation. Include arrows showing the direction of water flow and label the processes that are occurring as water moves through the hydrosphere. Describe how the Sun drives the water cycle.

16. Compare and contrast a volcanic lahar and a mudslide. Analyze how they affect the environment.

17. During an earthquake, sand can be thrown up from the ground in a sand boil. Predict why it might be difficult to locate a sand boil a year after the earthquake.

18. Explain how the Coriolis effect affects air and water as it moves around Earth’s surface.
1. Refer to the figure below. Explain why the fossils in the image are in different layers.

2. Discuss the principle of superposition and how the relative age of a rock cannot tell scientists exactly how old the rock is.

3. Analyze how rock, fossil, and climate clues are the main types of evidence for continental drift. Explain how the puzzle shapes of the continents helped support Wegener’s hypothesis that the continents were once one large land mass.
Standards Practice: Short Answer

Standard 9
Earth’s History: Changes in Earth and Sky

4. Explain why magnetic polarity reversals are evidence of seafloor spreading.

5. Without direct contact, a magnet attracts certain materials and either attracts or repels other magnets. Design an experiment to test the magnetic attraction of 10 objects. Hypothesize which objects will be attracted to the magnet and why.

6. Infer how the Sun’s charged particles are affected by Earth’s magnetosphere and can cause auroras.

7. Your class is examining a road cut and finds several trilobite fossils. One is found at the bottom of the road cut and the other is found at the top. They look identical. Analyze which one is older.
Standards Practice: Short Answer

Standard 9

Earth’s History: Changes in Earth and Sky

8. Explain how the principle of superposition helps us understand that dinosaurs and humans didn’t live at the same time.

9. A middle Eocene sand dollar is thinner than an early Eocene sand dollar. Infer what might have caused the evolution in thickness.

10. Using a string and a magnet, how could you find out which direction is north?

11. Water molecules in the ocean contain oxygen-16 atoms and oxygen-17 atoms. Because oxygen-16 is lighter, it evaporates more quickly. If two fossil fish contain different amounts of oxygen-16 and oxygen-17, what can you conclude about the temperature of the ocean when the fish lived?
Standards Practice: Short Answer

Standard 10
Objects in the Universe

<table>
<thead>
<tr>
<th>Rotation Periods of the Planets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planet</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Mercury</td>
</tr>
<tr>
<td>Venus</td>
</tr>
<tr>
<td>Earth</td>
</tr>
<tr>
<td>Mars</td>
</tr>
<tr>
<td>Jupiter</td>
</tr>
<tr>
<td>Saturn</td>
</tr>
<tr>
<td>Uranus</td>
</tr>
<tr>
<td>Neptune</td>
</tr>
</tbody>
</table>

1. The length of Earth’s day is 24 h. Analyze what determines the length of a planet’s day.

2. Uranus rotates on an axis that is nearly parallel to the plane of its orbit around the Sun. In other words, it rotates on its side as it orbits the Sun. Predict how this affects day and night on this unusual planet.

3. The term *planet* comes from an ancient Greek word that means “the wanderers.” Why did the ancient Greeks refer to the planets as wanderers?
Standards Practice: Short Answer
Standard 10
Objects in the Universe

Use the table below to answer questions 1 and 2.

4. Discuss Earth’s rotation and revolution and how they affect day and night and the length of the year.

5. Our system of time is based on celestial observations. Explain the relationship of 24 hours in each day and Earth’s 24 time zones.

6. Summarize how the spherical shape of Earth rotating on its axis causes day and night to occur.

7. Explain how the shape of Earth’s orbit around the Sun and the tilt of Earth’s axis cause seasons.
8. Summarize what causes the phases of the Moon and how long it takes to complete a lunar cycle.

________________________________________________________________________

________________________________________________________________________

9. During which phase of the moon can a lunar eclipse occur?

________________________________________________________________________

________________________________________________________________________

10. Describe how a comet changes as it travels through space.

________________________________________________________________________

________________________________________________________________________

11. Sketch and describe the three main parts of a comet. Include the Sun in your sketch.

________________________________________________________________________

________________________________________________________________________

12. Analyze why a comet’s tail always blows from the comet away from the Sun even when the comet is approaching the Sun in its orbit.

________________________________________________________________________

________________________________________________________________________
13. Contrast meteoroids, meteors, and meteorites to show how they are defined and related.

14. Describe how a full moon produces so much light at night. Also, describe where the Moon is located in the Sun-Earth-Moon system during this lunar phase.

15. Sketch and label the Sun and the four parts of a comet as it moves away from the Sun.

16. Compare a total lunar eclipse with a total solar eclipse.

17. Describe the difference between rotation and revolution.