



	<p>metallic character of an element based on its location on the Periodic Table.</p>	<p>Development</p> <ul style="list-style-type: none"> <li>- Newland</li> <li>- Meyer Mendevleev</li> <li>- Moseley</li> <li>• Modern Periodic Table <ul style="list-style-type: none"> <li>- Classifying Elements</li> </ul> </li> </ul> <p>Group (family)</p> <ul style="list-style-type: none"> <li>-Alkali</li> <li>-Alkaline Earth</li> <li>-Halogen</li> <li>-Noble Gases</li> </ul> <ul style="list-style-type: none"> <li>• Metal vs. Nonmetal</li> <li>• Representative vs. Transition</li> <li>• Transition vs. Inner Transition</li> </ul> <p>-Lanthanide vs. Actinide</p> <p>Classifications of Elements</p> <ul style="list-style-type: none"> <li>• Organize elements by configuration <ul style="list-style-type: none"> <li>- Valance Electrons</li> <li>- Valance Electrons and Perios</li> <li>- Valence Electrons and</li> </ul> </li> </ul>		<p>Chapter 6</p>
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		<p style="text-align: center;">Group Numbers</p> <p>Periodic Trends</p> <ul style="list-style-type: none"> <li>• Atomic Radius <ul style="list-style-type: none"> <li>-period vs. group trend</li> </ul> </li> <li>• Ionic Radius <ul style="list-style-type: none"> <li>-period vs. group trend</li> </ul> </li> <li>• Ionization energy <ul style="list-style-type: none"> <li>- period vs. group trend</li> </ul> </li> <li>• Electronegativity <ul style="list-style-type: none"> <li>- period vs. group trend</li> </ul> </li> </ul>		
(Comprehension)	<p><b>9-12.P.1.2. Students are able to describe ways that atoms combine.</b></p> <ul style="list-style-type: none"> <li>• Name and write formulas for binary ionic and covalent compounds. Example: sodium</li> </ul>	<p>Forming Chemical Bonds</p> <ul style="list-style-type: none"> <li>• Chemical bonds <ul style="list-style-type: none"> <li>- formation of positive ions</li> <li>- formation of negative ions</li> </ul> </li> </ul> <p>Formation and nature of Ionic Bonds</p> <ul style="list-style-type: none"> <li>• Ionic bonds</li> </ul>		Chapter 8 & 9

	<p>chloride (NaCl), carbon dioxide (CO<sub>2</sub>)</p> <ul style="list-style-type: none"> <li>• Compare the roles of electrons in covalent, ionic, and metallic bonding.</li> <li>• Discuss the special nature of carbon covalent bonds.</li> </ul>	<ul style="list-style-type: none"> <li>• Properties of Ionic Bonds <ul style="list-style-type: none"> <li>-energy and the Ionic Bond</li> </ul> </li> </ul> <p>Names and formulas for Ionic Compounds</p> <ul style="list-style-type: none"> <li>• formulas for Ionic compounds <ul style="list-style-type: none"> <li>- determine the charge (oxidation number)</li> <li>- Compounds with Polyatomic Ions</li> </ul> </li> <li>• naming Ions and Ionic compounds</li> </ul> <p>Metallic bonds and Properties of Metals</p> <ul style="list-style-type: none"> <li>• Metallic Bonds <ul style="list-style-type: none"> <li>- properties of metals</li> </ul> </li> <li>• Alloys</li> </ul> <p>Covalent Bond</p> <ul style="list-style-type: none"> <li>• Why do atoms bond?</li> <li>• Covalent bond formation</li> <li>• Single covalent bond</li> <li>• Multiple covalent bonds <ul style="list-style-type: none"> <li>- Sigma vs. Pi Bond</li> </ul> </li> </ul> <p>Naming Molecules</p>		
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		<ul style="list-style-type: none"><li>• Naming binary molecular compounds</li><li>• Naming acids<ul style="list-style-type: none"><li>- binary</li><li>- ternary or oxyacids</li></ul></li><li>• Writing formulas from names</li></ul> <p>Forces of Attraction</p> <ul style="list-style-type: none"><li>• Intramolecular Forces<ul style="list-style-type: none"><li>- ionic</li><li>- covalent</li><li>- metallic</li></ul></li><li>• Intermolecular Forces<ul style="list-style-type: none"><li>- Dispersion Force (London Forces)</li><li>- Dipole-Dipole</li><li>- Hydrogen Bonds</li></ul></li></ul> <p>Liquids and Solids</p> <ul style="list-style-type: none"><li>• Liquids<ul style="list-style-type: none"><li>- density and compression</li><li>- fluidity</li><li>- viscosity</li></ul></li></ul>		Chapter 13
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- viscosity and temp
- surface tension
- capillary action

#### Solids

- density
- crystalline solids
  - unit cells
    - simple vs. body-centered
    - vs. Face centered
- molecular solids
- covalent network solids
- ionic solids
- metallic solids

#### Phase Changes

- endothermic phase changes
  - melting
  - vaporization
  - sublimation
- exothermic phase changes
  - condensation

		<ul style="list-style-type: none"> <li>- deposition</li> <li>- freezing</li> <li>• phase diagram</li> </ul>		
(Application)	<p><b>9-12.P.1.3. Students are able to predict whether reactions will speed up or slow down as conditions change.</b></p> <p><b>Examples:</b> temperature, concentration, surface area, and catalysts</p>	<p>Classifying chemical reactions</p> <ul style="list-style-type: none"> <li>• synthesis reaction</li> <li>• combustion reaction</li> <li>• decomposition reaction</li> <li>• replacement reactions <ul style="list-style-type: none"> <li>- single vs. double</li> </ul> </li> </ul> <p>Rate of reaction factors</p>		Chapter 10
(Application)	<p><b>9-12.P.1.4. Students are able to balance chemical equations by applying the Law of Conservation of Matter.</b></p> <ul style="list-style-type: none"> <li>• Trace number of particles in diagrams and pictures of balanced</li> </ul>	<p>Reaction and Equations</p> <ul style="list-style-type: none"> <li>• evidence of chemical reactions</li> <li>• representing chemical reactions <ul style="list-style-type: none"> <li>- word equation</li> <li>- skeleton equation</li> <li>- chemical equation</li> </ul> </li> </ul>		Chapter 10

	<p>equations.</p> <p>Example: Write out an equation with symbols:</p> $\text{Mg} + 2\text{HCL} \rightarrow \text{MgCl}_2 + 2\text{H}_2$	<ul style="list-style-type: none"> <li>balancing chemical equations</li> </ul> <p>conservation of mass</p>		Chapter 3
(Comprehension)	<p><b>9-12.P.1.5. Students are able to distinguish among chemical, physical, and nuclear changes.</b></p> <ul style="list-style-type: none"> <li>Differentiate between physical and chemical properties used to describe matter.</li> <li>Identify key indicators of chemical and physical changes.</li> <li>Describe the effects of changing pressure, volume, or temperature upon gases.</li> <li>Identify characteristics of a solution and factors</li> </ul>	<p>Properties of Matter</p> <ul style="list-style-type: none"> <li>Pure substances <ul style="list-style-type: none"> <li>element vs. compound</li> </ul> </li> <li>physical properties of matter <ul style="list-style-type: none"> <li>intensive vs. extensive</li> </ul> </li> <li>chemical properties of matter</li> <li>observing properties of matter</li> <li>states of matter <ul style="list-style-type: none"> <li>gas vs. liquid vs. solid</li> </ul> </li> </ul> <p>Changes in Matter</p> <ul style="list-style-type: none"> <li>physical changes</li> <li>chemical changes <ul style="list-style-type: none"> <li>evidence of chemical reaction</li> </ul> </li> </ul> <p>Mixtures of Matter</p>		Chapter 3





		<ul style="list-style-type: none"> <li>- low density</li> <li>- compression and expansion</li> <li>- diffusion vs. effusion</li> </ul> <p style="text-align: center;">Graham's Law of Effusion</p> <ul style="list-style-type: none"> <li>• Gas Pressure <ul style="list-style-type: none"> <li>- measuring air pressure</li> <li>-Barometer vs. manometer</li> <li>- units of pressure</li> <li>- Dalton's Law of Partial Pressure</li> </ul> </li> </ul> <p>Unstable Nuclei and radioactive Decay</p> <ul style="list-style-type: none"> <li>• Radioactivity</li> <li>• Types of radiation <ul style="list-style-type: none"> <li>- Alpha Radiation</li> <li>- Beta Radiation</li> <li>- Gamma Radiation</li> <li>- Nuclear Stability</li> </ul> </li> </ul> <p>Nuclear Radiation</p> <ul style="list-style-type: none"> <li>• Discovery of radioactivity</li> <li>• Types of radiation</li> </ul>		
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		<ul style="list-style-type: none"><li>- Alpha</li><li>- Beta</li><li>- Gamma</li></ul> <p>Radioactive Decay</p> <ul style="list-style-type: none"><li>• Nuclear Stability</li><li>• Types of Radioactive Decay<ul style="list-style-type: none"><li>- Alpha</li><li>- Beta</li><li>- Gamma</li><li>- Positron Emission</li><li>- Electron Capture</li></ul></li><li>• writing and balancing nuclear equations</li><li>• Radioactive Series</li></ul> <p>Transmutation</p> <ul style="list-style-type: none"><li>• induced transmutation</li><li>• radioactive decay rates</li><li>• radioactive dating</li></ul> <p>Fission and Fusion</p> <ul style="list-style-type: none"><li>• nuclear reactions and energy</li></ul>		
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		<ul style="list-style-type: none"> <li>• nuclear fission</li> <li>• nuclear reactor</li> <li>• nuclear fusion</li> </ul> <p>Applications and effects of Nuclear Reactions</p> <ul style="list-style-type: none"> <li>• detecting radioactivity</li> <li>• uses of radiation</li> <li>• biological effects of radiation</li> </ul>		
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**Indicator 3: Analyze interactions of energy and matter.**

<b>Bloom's Taxonomy Level</b>	<b>Standard</b>	<b>Supporting Skills</b>	<b>Assessments</b>	<b>Resources</b>
(Application)	<b>9-12.P.3.1. Students are able to describe the relationships among potential energy, kinetic energy, and work as applied to the Law of</b>	States of Matter - Kinetic Theory - Thermal Energy - Average Kinetic Energy		Chapter 16

	<p><b>Conservation of Energy.</b></p> <ul style="list-style-type: none"> <li>Describe how energy can be transferred and transformed to produce useful work.</li> </ul> <p>Examples:</p> <p>Diagram simple energy transfers, describing the objects and the forms of energy gained and lost.</p> <p>Use simple machines as an example of the transmission of energy.</p> <ul style="list-style-type: none"> <li>Given the formulas, calculate the mechanical advantage and efficiency of selected systems.</li> <li>Explain methods of heat transfer.</li> </ul> <p>Examples:</p>	<p>Thermal Expansion</p> <p>Solid or Liquid?</p> <ul style="list-style-type: none"> <li>Amorphous Solid vs. Liquid</li> </ul> <p>Crystals</p> <p>How thermal energy affects matter</p> <p>Properties of fluids</p> <ul style="list-style-type: none"> <li>Archimede's Principle</li> <li>Pascal's Principle</li> <li>Bernoulli's Principle</li> </ul>		
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	conduction, radiation, and convection			
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**Physical Science  
Performance Descriptors**

<b>Advanced</b>	<p><b>High school students performing at the advanced level:</b></p> <ul style="list-style-type: none"><li>• predict the type of bonds formed as elements combine;</li><li>• balance chemical equations involving polyatomic ions;</li><li>• analyze and solve a problem involving velocity, acceleration, force, work, energy, or power;</li><li>• construct or design a model that illustrates the Law of Conservation of Energy to show energy changes from potential to kinetic in doing work;</li><li>• describe electrical effects in terms of motion and concentrations of charged particles.</li></ul>
<b>Proficient</b>	<p><b>High school students performing at the proficient level:</b></p> <ul style="list-style-type: none"><li>• use the Periodic Table to determine the properties of elements and the ways they combine;</li><li>• given a variable, predict whether reactions will speed up or slow down as conditions change;</li><li>• balance simple chemical equations;</li><li>• describe chemical, physical, and nuclear changes at the atomic and macroscopic levels;</li><li>• calculate velocity, acceleration, force, work, energy, and power given the formulas;</li><li>• given the forces acting on an object, predict its motion using Newton's Laws;</li><li>• apply the Law of Conservation of energy to show energy changes from potential to kinetic in doing work;</li><li>• describe how characteristics of waves are related to one another;</li><li>• describe electrical effects in terms of motion and concentrations of charged particles.</li></ul>
<b>Basic</b>	<p><b>High school students performing at the basic level:</b></p> <ul style="list-style-type: none"><li>• use the Periodic Table to determine the properties of the 1<sup>st</sup> 18 elements;</li><li>• provide the coefficients for an unbalanced synthesis or decomposition equation;</li><li>• identify chemical and physical changes at the macroscopic level;</li><li>• calculate velocity and force given the formulas;</li><li>• given an example, identify which of Newton's Laws is illustrated;</li><li>• identify the characteristics of waves;</li><li>• identify electricity as movement of charged particles.</li></ul>

**Core High School Nature of Science  
Standards, Supporting Skills, Assessments, and Resources**

**Indicator 1: Understand the nature and origin of scientific knowledge.**

<b>Bloom's Taxonomy Level</b>	<b>Standard</b>	<b>Supporting Skills</b>	<b>Assessments</b>	<b>Resources</b>
(Evaluation)	<b>9-12.N.1.1. Students are able to evaluate a scientific discovery to determine and describe how societal, cultural, and personal beliefs influence scientific investigations and interpretations.</b>	<p>Scientific Research</p> <ul style="list-style-type: none"> <li>• Types of Investigations               <ul style="list-style-type: none"> <li>- pure research vs. applied research</li> </ul> </li> </ul> <p>Examples: telescope, birth control pill, penicillin, electricity</p> <ul style="list-style-type: none"> <li>• Recognize scientific knowledge is not merely a set of static facts but is dynamic and affords the best current explanations.</li> </ul> <p>Examples: spontaneous generation, relativity, geologic time</p> <ul style="list-style-type: none"> <li>• Discuss how progress in science can be affected by social issues.</li> </ul>		Chapter 1 & 2



**Indicator 2: Apply the skills necessary to conduct scientific investigations.**

Bloom's Taxonomy Level	Standard	Supporting Skills	Assessments	Resources
(Synthesis)	<p><b>9-12.N.2.1. Students are able to apply science process skills to design and conduct student investigations.</b></p> <ul style="list-style-type: none"> <li>• Identify the questions and concepts to guide the development of hypotheses.</li> <li>• Analyze primary sources of information to guide the development of the procedure.</li> <li>• Select and use appropriate instruments to extend observations and measurements.</li> <li>• Revise explanations and models based on evidence and logic.</li> <li>• Use technology and mathematic skills to</li> </ul>	<p>Scientific Method</p> <ul style="list-style-type: none"> <li>• Systematic Approach               <ul style="list-style-type: none"> <li>- observation (qualitative vs. quantitative)</li> <li>- hypothesis</li> <li>- experiments (independent vs. dependent variable vs. control)</li> <li>- conclusion</li> </ul> </li> <li>• representing data</li> <li>• graphs               <ul style="list-style-type: none"> <li>- bar vs. circle vs. line</li> </ul> </li> <li>• line graphs</li> <li>• interpreting graphs</li> <li>• investigation               <ul style="list-style-type: none"> <li>- Density (accuracy vs.</li> </ul> </li> </ul>		Chapter 1 & 2

	<p>enhance investigations, communicate results, and defend conclusions.</p> <p>Examples:</p> <p>Computer-based data collection</p> <p>Graphical analysis and representation</p> <p>Use appropriate technology to display data (i.e. spreadsheets, PowerPoint, web).</p>	<p>precision)</p> <ul style="list-style-type: none"> <li>- open-ended density</li> </ul>		
(Application)	<p><b>9-12.N.2.2. Students are able to practice safe and effective laboratory techniques.</b></p> <ul style="list-style-type: none"> <li>• Handle hazardous materials properly.</li> <li>• Use safety equipment correctly.</li> <li>• Practice emergency procedure.</li> <li>• Wear appropriate attire.</li> </ul>	Lab safety		Chapter 1 & 2

	<ul style="list-style-type: none"> <li>Practice safe behaviors.</li> </ul>			
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**Core High School Nature of Science  
Performance Descriptors**

<b>Advanced</b>	<p><b>High school students performing at the advanced level:</b></p> <ul style="list-style-type: none"> <li>given a scientific discovery, evaluate how different societal, cultural, and personal beliefs influenced the investigation and its interpretation;</li> <li>design and conduct an investigation using an alternative student- developed hypothesis.</li> </ul>
<b>Proficient</b>	<p><b>High school students performing at the proficient level:</b></p> <ul style="list-style-type: none"> <li>given a scientific discovery narrative, determine and describe how societal, cultural, and personal beliefs influenced the investigation and its interpretation;</li> <li>describe the role of observation and evidence in the development and modification of hypotheses, theories, and laws; then apply science process skills to design and conduct student investigations.</li> </ul>
<b>Basic</b>	<p><b>High school students performing at the basic level:</b></p> <ul style="list-style-type: none"> <li>describe the role of observation in the development of hypotheses, theories, and laws and conduct student investigations;</li> <li>given a scientific discovery narrative, identify the cultural and personal beliefs that influenced the investigation.</li> </ul>

**Core High School Science, Technology, Environment, and Society  
Standards, Supporting Skills, and Examples**

**Indicator 1: Analyze various implications/effects of scientific advancement within the environment and society.**

<b>Bloom's Taxonomy Level</b>	<b>Standard</b>	<b>Supporting Skills</b>	<b>Assessments</b>	<b>Resources</b>
(Application)	<p><b>9-12.S.1.1. Students are able to explain ethical roles and responsibilities of scientists and scientific research.</b></p> <p><b>Examples:</b></p> <p>Sharing of data Accuracy of data Acknowledgement of sources Following laws Animal research Human research Managing hazardous materials and wastes</p>	<p>Units of Measurement</p> <ul style="list-style-type: none"> <li>• SI units</li> <li>• Base units</li> <li>• Derived units               <ul style="list-style-type: none"> <li>- density</li> </ul> </li> <li>• temperature               <ul style="list-style-type: none"> <li>- Kelvin vs. Celsius</li> </ul> </li> </ul> <p>Scientific Notation</p> <ul style="list-style-type: none"> <li>• Addition/subtraction with scientific notation</li> <li>• Multiplication/division with scientific notation</li> <li>• dimensional analysis</li> <li>• reliability of measurements</li> <li>• precision vs. Accuracy</li> </ul>		Chapter 1

		<ul style="list-style-type: none"> <li>- percent error</li> <li>• significant figures</li> <li>• rounding numbers</li> </ul>		
(Evaluation)	<p><b>9-12.S.1.2. Students are able to evaluate and describe the impact of scientific discoveries on historical events and social, economic, and ethical issues.</b></p> <p><b>Examples:</b> cloning, stem cells, gene splicing, nuclear power, patenting new life forms, emerging diseases, AIDS, resistant forms of bacteria, biological and chemical weapons, global warming, and alternative fuels</p>			

**Indicator 2: Analyze the relationships/interactions among science, technology, environment, and society.**

<b>Bloom's Taxonomy Level</b>	<b>Standard</b>	<b>Supporting Skills</b>	<b>Assessments</b>	<b>Resources</b>
(Evaluation)	<b>9-12.S.2.1. Students are able to describe immediate and</b>	Benefits of Chemistry Examples: environmental,		Chapter 1 & 2

	<p><b>long-term consequences of potential solutions for technological issues.</b></p>	<p>communication, internet, entertainment, construction, manufacturing, power and transportation, energy sources, health technology, and biotechnology issues</p> <ul style="list-style-type: none"> <li>• Describe how the pertinent technological system operates.</li> </ul> <p>Example: waste management facility</p>		
(Analysis)	<p><b>9-12.S.2.2. Students are able to analyze factors that could limit technological design.</b></p> <p><b>Examples:</b> ethics, environmental impact, manufacturing processes, operation, maintenance, replacement, disposal, and liability</p>			
(Synthesis)	<p><b>9-12.S.2.3. Students are able to analyze and describe the benefits, limitations, cost, and consequences involved in using, conserving, or recycling resources.</b></p>	<p>Examples: mining, agriculture, medicine, school science labs, forestry, energy, disposable diapers, computers, tires</p>		

**Core High School Science Technology, Environment, and Society  
Performance Descriptors**

<b>Advanced</b>	<p><b>High school students performing at the advanced level:</b></p> <ul style="list-style-type: none"> <li>• modify a technology taking into consideration limiting factors of design;</li> <li>• given a narrative of a scientific discovery, defend a position on the impact of the ethical issues.</li> </ul>
<b>Proficient</b>	<p><b>High school students performing at the proficient level:</b></p> <ul style="list-style-type: none"> <li>• given a narrative of a scientific discovery, identify and evaluate the immediate and long-term consequences of scientific issues;</li> <li>• identify and explain ethical roles and responsibilities of scientists conducting a given research project.;</li> <li>• evaluate factors that could limit technological design;</li> <li>• given a narrative description of a resource, analyze and describe the benefits, limitations, cost, and consequences involved in its use, conservation, or recycling.</li> </ul>
<b>Basic</b>	<p><b>High school students performing at the basic level:</b></p> <ul style="list-style-type: none"> <li>• given a narrative of a scientific discovery, identify the immediate consequences of scientific issues;</li> <li>• identify ethical roles and responsibilities concerning a given research project;</li> <li>• identify factors that could limit technological design;</li> <li>• given a narrative description of a resource, describe a benefit and limitation involved in its use, conservation, or recycling.</li> </ul>