

# Active Physics Correlation to the Pennsylvania Standards

<b>Correlation key:</b>																		
<p><b>"X" Coverage</b> = Secondary concept of the activity or problem. Students gain a basic understanding or introduction of the concept.</p> <hr/> <p><b>"XX" In-depth coverage</b> = Primary concept that is the focus of the activity or problem. Students gain thorough understanding of the concept.</p>	Communication			Home			Medicine			Predictions			Sports			Transportation		
	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3

## 3.1. Unifying Themes

*Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to...*

### Grade 10

#### A. Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.

• Identify the function of subsystems within a larger system (e.g., role of thermostat in an engine, pressure switch).			x		x	x												x	
• Describe the interrelationships among inputs, processes, outputs, feedback and control in specific systems.			x															x	
• Explain the concept of system redesign and apply it to improve technological systems.																		x	
• Apply the universal systems model to illustrate specific solutions and troubleshoot specific problems.																			
• Analyze and describe the effectiveness of systems to solve specific problems.																			

#### B. Describe concepts of models as a way to predict and understand science and technology.

• Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA).			x	xx			x		x	xx		x	x				x	x	
• Examine the advantages of using models to demonstrate processes and outcomes (e.g., blueprint analysis, structural stability).			x	xx			x		x	xx		x	x				x	x	
• Apply mathematical models to science and technology.										xx			x						

#### C. Apply patterns as repeated processes or recurring elements in science and technology.

• Examine and describe recurring patterns that form the basis of biological classification, chemical periodicity, geological order and astronomical order.											x									
• Examine and describe stationary physical patterns.																				
• Examine and describe physical patterns in motion.	xx												xx	x	x	xx	xx	x	xx	xx

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**D. Apply scale as a way of relating concepts and ideas to one another by some measure.**

• Apply dimensional analysis and scale as a ratio.				<b>XX</b>			<b>XX</b>			<b>X</b>								
• Convert one scale to another.				<b>XX</b>			<b>XX</b>			<b>X</b>								

**E. Describe patterns of change in nature, physical and man-made systems.**

• Describe how fundamental science and technology concepts are used to solve practical problems (e.g., momentum, Newton's laws of universal gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, gas laws, feedback systems).	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>XX</b>	<b>X</b>	<b>XX</b>	<b>XX</b>
• Recognize that stable systems often involve underlying dynamic changes (e.g., a chemical reaction at equilibrium has molecules reforming continuously).																		
• Describe the effects of error in measurements.										<b>XX</b>							<b>X</b>	
• Describe changes to matter caused by heat, cold, light or chemicals using a rate function.																		

**3.2. Inquiry and Design**

**A. Apply knowledge and understanding about the nature of scientific and technological knowledge.**

• Compare and contrast scientific theories and beliefs.	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>
• Know that science uses both direct and indirect observation means to study the world and the universe.	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>
• Integrate new information into existing theories and explain implied results.	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>

**B. Apply process knowledge and organize scientific and technological phenomena in varied ways.**

• Describe materials using precise quantitative and qualitative skills based on observations.	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>
• Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>

<p><b>"X" Coverage</b> = Secondary concept of the activity or problem. Students gain a basic understanding or introduction of the concept.</p> <hr/> <p><b>"XX" In-depth coverage</b> = Primary concept that is the focus of the activity or problem. Students gain thorough understanding of the concept.</p>	Communication			Home			Medicine			Predictions			Sports			Transportation		
	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3
<ul style="list-style-type: none"> <li>Use process skills to make inferences and predictions using collected information and to communicate, using space / time relationships, defining operationally.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<b>C. Apply the elements of scientific inquiry to solve problems.</b>																		
<ul style="list-style-type: none"> <li>Generate questions about objects, organisms and/ or events that can be answered through scientific investigations.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Evaluate the appropriateness of questions.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Design an investigation with adequate control and limited variables to investigate a question.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Conduct a multiple step experiment.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Organize experimental information using a variety of analytic methods.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Judge the significance of experimental information in answering the question.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Suggest additional steps that might be done experimentally.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<b>D. Identify and apply the technological design process to solve problems.</b>																		
<ul style="list-style-type: none"> <li>Examine the problem, rank all necessary information and all questions that must be answered.</li> </ul>		xx		xx	xx	xx	x						x	x	x			xx
<ul style="list-style-type: none"> <li>Propose and analyze a solution.</li> </ul>		xx		xx	xx	xx	x						x	x	x			xx
<ul style="list-style-type: none"> <li>Implement the solution.</li> </ul>		xx		xx	xx	xx	x						x	x	x			xx
<ul style="list-style-type: none"> <li>Evaluate the solution, test, redesign and improve as necessary.</li> </ul>		xx		xx	xx	xx	x						x	x	x			xx
<ul style="list-style-type: none"> <li>Communicate the process and evaluate and present the impacts of the solution.</li> </ul>		xx		xx	xx	xx	x						x	x	x			xx
<b>3.4. Physical Science, Chemistry and Physics</b>																		
<b>A. Explain concepts about the structure and properties of matter.</b>																		
<ul style="list-style-type: none"> <li>Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable.</li> </ul>																		
<ul style="list-style-type: none"> <li>Explain the repeating pattern of chemical properties by using the repeating patterns of atomic structure within the periodic table.</li> </ul>																		
<ul style="list-style-type: none"> <li>Predict the behavior of gases through the use of Boyle's, Charles' or the ideal gas law, in everyday situations.</li> </ul>																		

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<ul style="list-style-type: none"> <li>Describe phases of matter according to the Kinetic Molecular Theory.</li> <li>Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent).</li> <li>Recognize formulas for simple inorganic compounds.</li> <li>Describe various types of chemical reactions by applying the laws of conservation of mass and energy.</li> <li>Apply knowledge of mixtures to appropriate separation techniques.</li> </ul>																		
<ul style="list-style-type: none"> <li>Understand that carbon can form several types of compounds.</li> </ul>																		
<b>B. Analyze energy sources and transfers of heat.</b>																		
<ul style="list-style-type: none"> <li>Determine the efficiency of chemical systems by applying mathematical formulas.</li> <li>Use knowledge of chemical reactions to generate an electrical current.</li> <li>Evaluate energy changes in chemical reactions.</li> </ul>																		
<ul style="list-style-type: none"> <li>Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion).</li> </ul>					x										x	x		x
<ul style="list-style-type: none"> <li>Explain resistance, current and electromotive force (Ohm's Law).</li> </ul>					x													
<b>C. Distinguish among the principles of force and motion.</b>																		
<ul style="list-style-type: none"> <li>Identify the relationship of electricity and magnetism as two aspects of a single electromagnetic force.</li> </ul>		xx				xx												
<ul style="list-style-type: none"> <li>Identify elements of simple machines in compound machines.</li> </ul>																		
<ul style="list-style-type: none"> <li>Explain fluid power systems through the design and construction of appropriate models.</li> </ul>																		
<ul style="list-style-type: none"> <li>Describe sound effects (e.g., Doppler effect, amplitude, frequency, reflection, refraction, absorption, sonar, seismic).</li> </ul>	x		x				xx		xx									x
<b>D. Explain essential ideas about the composition and structure of the universe.</b>																		
<ul style="list-style-type: none"> <li>Compare the basic structures of the universe (e.g., galaxy types, nova, black holes, neutron stars).</li> <li>Describe the structure and life cycle of stars, using the Hertzsprung-Russell diagram.</li> </ul>																		

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<ul style="list-style-type: none"> <li>Describe the nuclear processes involved in energy production in a star.</li> <li>Explain the "red-shift" and Hubble's use of it to determine stellar distance and movement.</li> <li>Compare absolute versus apparent star magnitude and their relation to stellar distance.</li> <li>Explain the impact of the Copernican and Newtonian thinking on man's view of the universe.</li> <li>Identify and analyze the findings of several space instruments in regard to the extent and composition of the solar system and universe.</li> </ul>																			
<b>3.7. Technological Devices</b>																			
<b>A. Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.</b>																			
<ul style="list-style-type: none"> <li>Select and safely apply appropriate tools, materials and processes necessary to solve complex problems.</li> <li>Apply advanced tool and equipment manipulation techniques to solve problems.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<b>B. Apply appropriate instruments and apparatus to examine a variety of objects and processes.</b>																			
<ul style="list-style-type: none"> <li>Describe and use appropriate instruments to gather and analyze data.</li> <li>Compare and contrast different scientific measurement systems; select the best measurement system for a specific situation.</li> <li>Explain the need to estimate measurements within error of various instruments.</li> <li>Apply accurate measurement knowledge to solve everyday problems.</li> <li>Describe and demonstrate the operation and use of advanced instrumentation in evaluating material and chemical properties (e.g., scanning electron microscope, nuclear magnetic resonance machines).</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<b>Computer literacy, including the use of hardware and software in standard statements C, D, and E, should be integrated across all content areas.</b>																			
<b>C. Apply basic computer operations and concepts.</b>																			
<ul style="list-style-type: none"> <li>Identify solutions to basic hardware and software problems.</li> <li>Apply knowledge of advanced input devices.</li> </ul>																			

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<ul style="list-style-type: none"> <li>Apply knowledge of hardware setup.</li> <li>Describe the process for basic software installation and demonstrate it.</li> <li>Analyze and solve basic operating systems problems.</li> </ul>																		
<ul style="list-style-type: none"> <li>Apply touch keyboarding skills and techniques at expectable speed and accuracy.</li> </ul>	xx		xx	xx	xx		x	xx	x	x	x	x	xx	x	x	xx	xx	x
<ul style="list-style-type: none"> <li>Demonstrate the ability to perform basic software installation.</li> </ul>																		
<b>D. Utilize computer software to solve specific problems.</b>																		
<ul style="list-style-type: none"> <li>Identify legal restrictions in the use of software and the output of data.</li> <li>Apply advanced graphic manipulation and desktop publishing techniques.</li> <li>Apply basic multimedia applications.</li> <li>Apply advanced word processing, database and spreadsheet skills.</li> </ul>																		
<ul style="list-style-type: none"> <li>Describe and demonstrate how two or more software applications can be used to produce an output.</li> <li>Select and apply software designed to meet specific needs.</li> </ul>																	x	
<b>E. Apply basic computer communications systems.</b>																		
<ul style="list-style-type: none"> <li>Identify and explain various types of on-line services.</li> <li>Identify and explain the function of the parts of a basic network.</li> <li>Describe and apply the components of a web page and their function.</li> <li>Explain and demonstrate file transfer within and out side of a computer network.</li> <li>Identify, describe and complete advanced on-line research.</li> </ul>																		
<b>3.8. Science, Technology and Human Endeavors</b>																		
<b>A. Analyze the relationship between societal demands and scientific and technological enterprises.</b>																		
<ul style="list-style-type: none"> <li>Identify past and current tradeoffs between increased production, environmental harm and social values (e.g., increased energy needs, power plants, automobiles).</li> </ul>					x													
<ul style="list-style-type: none"> <li>Compare technologies that are applied and accepted differently in various cultures (e.g., factory farming, nuclear power).</li> </ul>				xx														

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<ul style="list-style-type: none"> <li>Describe and evaluate social change as a result of technological developments.</li> </ul>			x	xx				x	xx			x				xx	x	x
<ul style="list-style-type: none"> <li>Assess the social impacts of a specific international environmental problem by designing a solution that applies the appropriate technologies and resources.</li> </ul>																		
<b>B. Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.</b>																		
<ul style="list-style-type: none"> <li>Identify several problems and opportunities that exist in your community, apply various problem-solving methods to design and evaluate possible solutions.</li> </ul>							x											
<ul style="list-style-type: none"> <li>Analyze a recently invented item, describing the human need that prompted its invention and the current and potential social impacts of the specific invention.</li> </ul>																		
<ul style="list-style-type: none"> <li>Apply knowledge of oceanography, meteorology, geology and human anatomy to explain important considerations that need to be made for construction of homes, buildings and businesses in the United States.</li> </ul>																		
<ul style="list-style-type: none"> <li>Assess the impacts that agricultural science has had on meeting human needs and improving the quality of life.</li> </ul>																		
<b>C. Evaluate possibilities consequences and impacts of scientific and technological solutions.</b>																		
<ul style="list-style-type: none"> <li>Relate scientific and technological advancements in terms of cause and effect.</li> </ul>																		
<ul style="list-style-type: none"> <li>Describe and evaluate the impacts that financial considerations have had on specific scientific and technological applications.</li> </ul>																		
<ul style="list-style-type: none"> <li>Compare and contrast potential solutions to technological, social, economic and environmental problems.</li> </ul>																		
<ul style="list-style-type: none"> <li>Analyze the impacts on society of accepting or rejecting scientific and technological advances.</li> </ul>																		
<b>Grade 12</b>																		
<b>3.1. Unifying Themes</b>																		
<b>A. Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.</b>																		
<ul style="list-style-type: none"> <li>Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems.</li> </ul>																		x
<ul style="list-style-type: none"> <li>Apply systems analysis to predict results.</li> </ul>																		

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<ul style="list-style-type: none"> <li>Analyze and describe the function, interaction and relationship among subsystems and the system itself.</li> </ul>			x															x	
<ul style="list-style-type: none"> <li>Compare and contrast several systems that could be applied to solve a single problem.</li> </ul>																			
<ul style="list-style-type: none"> <li>Evaluate the causes of a system's inefficiency.</li> </ul>																			
<b>B. Apply concepts of models as a method to predict and understand science and technology.</b>																			
<ul style="list-style-type: none"> <li>Evaluate technological processes by collecting data and applying mathematical models (e.g., process control).</li> </ul>				xx			x	x	x	xx			xx			xx	x		
<ul style="list-style-type: none"> <li>Apply knowledge of complex physical models to interpret data and apply mathematical models.</li> </ul>																			
<ul style="list-style-type: none"> <li>Appraise the importance of computer models in interpreting science and technological systems.</li> </ul>																			
<b>C. Assess and apply patterns in science and technology.</b>																			
<ul style="list-style-type: none"> <li>Assess and apply recurring patterns in natural and technological systems.</li> </ul>											xx								
<ul style="list-style-type: none"> <li>Compare and contrast structure and function relationships as they relate to patterns.</li> </ul>																			
<ul style="list-style-type: none"> <li>Assess patterns in nature using mathematical formulas.</li> </ul>											xx								
<b>D. Analyze scale as a way of relating concepts and ideas to one another by some measure.</b>																			
<ul style="list-style-type: none"> <li>Compare and contrast various forms of dimensional analysis.</li> </ul>																			
<ul style="list-style-type: none"> <li>Assess the use of several units of measurement to the same problem.</li> </ul>																			
<ul style="list-style-type: none"> <li>Analyze and apply appropriate measurement scales when collecting data.</li> </ul>																			
<b>E. Evaluate change in nature, physical systems and man-made systems.</b>																			
<ul style="list-style-type: none"> <li>Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories).</li> </ul>																			
<ul style="list-style-type: none"> <li>Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire).</li> </ul>																			

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<ul style="list-style-type: none"> <li>Explain how correlation of variables does not necessarily imply causation.</li> <li>Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).</li> </ul>																		
<b>3.2. Inquiry and Design</b>																		
<b>A. Evaluate the nature of scientific and technological knowledge.</b>																		
<ul style="list-style-type: none"> <li>Know and use the ongoing scientific processes to continually improve and better understand how things work.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Critically evaluate the status of existing theories (e.g., germ theory of disease, wave theory of light, classification of subatomic particles, theory of evolution, epidemiology of AIDS).</li> </ul>												xx						
<b>B. Evaluate experimental information for appropriateness and adherence to relevant science processes.</b>																		
<ul style="list-style-type: none"> <li>Evaluate experimental data correctly within experimental limits.</li> <li>Judge that conclusions are consistent and logical with experimental conditions.</li> <li>Interpret results of experimental research to predict new information or improve a solution.</li> </ul>	xx		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Evaluate experimental data correctly within experimental limits.</li> <li>Judge that conclusions are consistent and logical with experimental conditions.</li> <li>Interpret results of experimental research to predict new information or improve a solution.</li> </ul>	xx		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Interpret results of experimental research to predict new information or improve a solution.</li> </ul>				xx					xx	xx							xx	
<b>C. Apply the elements of scientific inquiry to solve multi-step problems.</b>																		
<ul style="list-style-type: none"> <li>Generate questions about objects, organisms and/or events that can be answered through scientific investigations.</li> <li>Evaluate the appropriateness of questions.</li> <li>Design an investigation with adequate control and limited variables to investigate a question.</li> <li>Organize experimental information using analytic and descriptive techniques.</li> <li>Evaluate the significance of experimental information in answering the question.</li> <li>Project additional questions from a research study that could be studied.</li> </ul>																		
<ul style="list-style-type: none"> <li>Design an investigation with adequate control and limited variables to investigate a question.</li> <li>Organize experimental information using analytic and descriptive techniques.</li> <li>Evaluate the significance of experimental information in answering the question.</li> <li>Project additional questions from a research study that could be studied.</li> </ul>				xx					xx	xx								
<ul style="list-style-type: none"> <li>Organize experimental information using analytic and descriptive techniques.</li> <li>Evaluate the significance of experimental information in answering the question.</li> <li>Project additional questions from a research study that could be studied.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Evaluate the significance of experimental information in answering the question.</li> <li>Project additional questions from a research study that could be studied.</li> </ul>	xx		xx	xx			x	x	x	xx	xx	xx	xx	xx	xx	xx	xx	
<ul style="list-style-type: none"> <li>Project additional questions from a research study that could be studied.</li> </ul>	xx	xx		xx			xx	xx	xx	xx		xx	xx		xx		xx	
<b>D. Analyze and use the technological design process to solve problems.</b>																		
<ul style="list-style-type: none"> <li>Assess all aspects of the problem, prioritize the necessary information and formulate questions that must be answered.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx

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	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3
<ul style="list-style-type: none"> <li>Propose, develop and appraise the best solution and develop alternative solutions.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Implement and assess the solution.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Evaluate and assess the solution, redesign and improve as necessary.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<ul style="list-style-type: none"> <li>Communicate and assess the process and evaluate and present the impacts of the solution.</li> </ul>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
<b>3.4. Physical Science, Chemistry and Physics</b>																		
<b>A. Apply concepts about the structure and properties of matter.</b>																		
<ul style="list-style-type: none"> <li>Apply rules of systematic nomenclature and formula writing to chemical substances.</li> </ul>																		
<ul style="list-style-type: none"> <li>Classify and describe, in equation form, types of chemical and nuclear reactions.</li> </ul>																		
<ul style="list-style-type: none"> <li>Explain how radioactive isotopes that are subject to decay can be used to estimate the age of materials.</li> </ul>											x							
<ul style="list-style-type: none"> <li>Explain how the forces that bind solids, liquids, and gases affect their properties.</li> </ul>																		
<ul style="list-style-type: none"> <li>Characterize and identify important classes of compounds (e.g., acids, bases, salts).</li> </ul>																		
<ul style="list-style-type: none"> <li>Apply the conservation of energy concept to fields as diverse as mechanics, nuclear particles and studies of the origin of the universe.</li> </ul>					x								x	x	x			
<ul style="list-style-type: none"> <li>Apply the predictability of nuclear decay to estimate the age of materials that contain radioactive isotopes.</li> </ul>											x							
<ul style="list-style-type: none"> <li>Quantify the properties of matter (e.g., density, solubility coefficients) by applying mathematical formulas.</li> </ul>																		
<b>B. Apply and analyze energy sources and conversions and their relationship to heat and temperature.</b>																		
<ul style="list-style-type: none"> <li>Determine the heat involved in illustrative chemical reactions.</li> </ul>																		
<ul style="list-style-type: none"> <li>Evaluate mathematical formulas that calculate the efficiency of specific chemical and mechanical systems.</li> </ul>																		
<ul style="list-style-type: none"> <li>Use knowledge of oxidation and reduction to balance complex reactions</li> </ul>																		
<ul style="list-style-type: none"> <li>Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat.</li> </ul>																		

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	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3
<b>C. Apply the principles of motion and force.</b>																		
• Evaluate wave properties of frequency, wavelength and speed as different media.	xx																	
• Propose and produce modifications to specific mechanical power systems that will improve their efficiency.																		
• Analyze the principles of translational motion, velocity and acceleration as they relate to free fall and projectile motion.													xx		xx	xx		
• Analyze the principles of rotational motion to solve problems relating to angular momentum, and torque.																		
• Interpret a model that illustrates circular motion and acceleration.														xx		xx		
• Describe inertia, motion, equilibrium, and action/reaction concepts through words, models and mathematical symbols.											xx		xx				xx	
<b>D. Analyze the essential ideas about the composition and structure of the universe.</b>																		
• Analyze the Big Bang Theory's use of gravitation and nuclear reaction to explain a possible origin of the universe.																		
• Compare the use of visual, radio and x-ray telescopes to collect data regarding the structure and evolution of the universe.			x															
• Correlate the use of the special theory of relativity and the life of a star.																		
<b>3.7. Technological Devices</b>																		
<b>A. Apply advanced tools, materials and techniques to answer complex questions.</b>																		
• Demonstrate the safe use of complex tools and machines within their specifications.																		
• Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution.	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
• Evaluate and use technological resources to solve complex multi-step problems.																		
<b>B. Evaluate appropriate instruments and apparatus to accurately measure materials and processes.</b>																		
• Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment.											xx							

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	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3
<ul style="list-style-type: none"> <li>Evaluate the appropriate use of different measurement scales (macro and micro).</li> </ul>																		
<ul style="list-style-type: none"> <li>Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.</li> </ul>																		
<b>Computer literacy, including the use of hardware and software in standard statements C, D, and E, should be integrated across all content areas.</b>																		
<b>C. Evaluate computer operations and concepts as to their effectiveness to solve specific problems.</b>																		
<ul style="list-style-type: none"> <li>Describe and demonstrate atypical software installation.</li> </ul>																		
<ul style="list-style-type: none"> <li>Analyze and solve hardware and advanced software problems.</li> </ul>																		
<ul style="list-style-type: none"> <li>Assess and apply multiple input and output devices to solve specific problems.</li> </ul>																		
<b>D. Evaluate the effectiveness of computer software to solve specific problems.</b>																		
<ul style="list-style-type: none"> <li>Evaluate the effectiveness of software to produce an output and demonstrate the process.</li> </ul>																		
<ul style="list-style-type: none"> <li>Design and apply advanced multimedia techniques.</li> </ul>																		
<ul style="list-style-type: none"> <li>Analyze, select and apply the appropriate software to solve complex problems.</li> </ul>	x		x	x								x	x		x	x		x
<ul style="list-style-type: none"> <li>Evaluate the effectiveness of the computer as a presentation tool.</li> </ul>	x		x	x								x	x		x	x		x
<ul style="list-style-type: none"> <li>Analyze the legal responsibilities of computer users.</li> </ul>																		
<ul style="list-style-type: none"> <li>Assess the effectiveness of computer communications systems.</li> </ul>																		
<b>E. Assess the effectiveness of a computer based communications system.</b>																		
<ul style="list-style-type: none"> <li>Transfer files among different computer platforms.</li> </ul>																		
<ul style="list-style-type: none"> <li>Analyze the effectiveness of on-line information resources to meet the needs for collaboration, research, publications, communications and productivity.</li> </ul>																		
<ul style="list-style-type: none"> <li>Apply knowledge of protocol standards to solve connectivity problems.</li> </ul>																		
<b>3.8. Science, Technology and Human Endeavors</b>																		
<b>A. Synthesize and evaluate the interactions and constraints of science and technology on society.</b>																		

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	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3
<ul style="list-style-type: none"> <li>Compare and contrast how scientific and technological knowledge is both shared and protected.</li> </ul>																		
<ul style="list-style-type: none"> <li>Evaluate technological developments that have changed the way humans do work and discuss their impacts (e.g., genetically engineered crops)</li> </ul>																		
<ul style="list-style-type: none"> <li>Evaluate socially proposed limitations of scientific research and technological application.</li> </ul>																		
<b>B. Apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life.</b>																		
<ul style="list-style-type: none"> <li>Apply appropriate tools, materials and processes to solve complex problems.</li> </ul>		xx	xx	xx	x	x		xx	xx			x			x		xx	
<ul style="list-style-type: none"> <li>Use knowledge of human abilities to design or modify technologies that extend and enhance human abilities.</li> </ul>																	xx	
<ul style="list-style-type: none"> <li>Apply appropriate tools, materials and processes to physical, informational or biotechnological systems to identify and recommend solutions to international problems.</li> </ul>			xx	xx	xx													
<ul style="list-style-type: none"> <li>Apply knowledge of agricultural science to develop a solution that will improve on a human need or want.</li> </ul>																		
<b>C. Evaluate the consequences and impacts of scientific and technological solutions.</b>																		
<ul style="list-style-type: none"> <li>Propose solutions to specific scientific and technological applications, identifying possible financial considerations.</li> </ul>																		
<ul style="list-style-type: none"> <li>Analyze scientific and technological solutions through the use of risk/benefit analysis.</li> </ul>																		
<ul style="list-style-type: none"> <li>Analyze and communicate the positive or negative impacts that a recent technological invention had on society.</li> </ul>																		
<ul style="list-style-type: none"> <li>Evaluate and describe potential impacts from emerging technologies and the consequences of not keeping abreast of technological advancements (e.g., assessment alternatives, risks, benefits, costs, economic impacts, constraints).</li> </ul>																		