

**Enduring Understanding # 1: Scientific inquiry affords all learners opportunities to make observations, pose questions, develop hypotheses, design and conduct investigations, and analyze data to draw conclusions.**

### Applied Physics

Students will understand:	Essential Questions	Students will know the/that	Students will be able to	Notes
<p>1.1 The inquiry process is essential to formulate questions and think critically.</p> <p>1.2 Inquiry is the application of creative thinking to new and unfamiliar situations.</p> <p>1.3 Technology is a tool to enhance scientific discovery.</p>	<p>-What is a scientific question?</p> <p>-What is a testable hypothesis?</p> <p>-How do I know if my experimental procedure aligns with my hypothesis?</p> <p>-How do I minimize my error in collected data?</p> <p>-Why is it important to replicate scientific experiments?</p>	<p>-The steps to understand scientific inquiry include: observing, classifying, using numbers, plotting graphs, measuring, inferring, predicting, formulating models, interpreting data, hypothesizing, and experimenting.</p> <p>-A scientific investigation often means repeating certain steps of the process.</p>	<p>-Construct data tables.</p> <p>-Make and use graphs.</p> <p>-Make reasonable conclusions based upon data.</p> <p>-Use dimensional analysis.</p> <p>-Use data and analysis to validate or refute hypotheses and communicate that information to others.</p> <p>-Repeat experiments to verify results.</p> <p>-Write clear instructions for investigating.</p>	

**Enduring Understanding # 2: Exploring systems, order, and organizations in our natural and designed world are integral to understanding the scientific disciplines and their interdependence.**

**Students will understand that...**

### Applied Physics

Students will understand:	Essential Questions	Students will know the/that	Students will be able to	Notes
<p>2.1 Mechanical Systems technologically and scientifically affect our everyday world.</p>	<p>-How do objects move?</p> <p>-Why do objects move?</p> <p>-What is mechanical resistance?</p> <p>-How is energy transferred?</p> <p>-How does a technician need to use mechanical systems?</p>	<p>-How and why objects move.</p> <p>-How energy is transferred.</p> <p>-How to use tools to measure quantities in mechanical systems.</p>	<p>Measure forces, work, rates, resistance and energy in a mechanical system.</p> <p>Calculate forces, work, rates, resistance and energy in a mechanical system.</p>	
<p>2.2 Electrical Systems technologically and scientifically affect our</p>	<p>-How do electrons move?</p> <p>-Why do electrons</p>	<p>-How and why electrons move.</p> <p>-How energy is</p>	<p>-Measure forces, work, rates, resistance and</p>	

everyday world.	<ul style="list-style-type: none"> <li>move?</li> <li>-What is electrical resistance?</li> <li>-How is energy transferred?</li> <li>-Where does a technician need to use current, voltage, resistance?</li> </ul>	<ul style="list-style-type: none"> <li>transferred.</li> <li>-How to use tools to measure quantities in electrical systems.</li> </ul>	<ul style="list-style-type: none"> <li>energy in a electrical system.</li> <li>-Calculate forces, work, rates, resistance and energy in a electrical system.</li> </ul>	
2.3 Fluid Systems technologically and scientifically affect our everyday world.	<ul style="list-style-type: none"> <li>-How do fluids move?</li> <li>-Why do fluids move?</li> <li>-What is drag?</li> <li>-How is energy transferred?</li> <li>-How does a technician need to use fluid systems?</li> </ul>	<ul style="list-style-type: none"> <li>-How and why fluids move</li> <li>-How energy is transferred</li> <li>-How use metric tools to measure quantities in fluid systems.</li> </ul>	<ul style="list-style-type: none"> <li>-Measure forces, work, rates, resistance and energy in a fluid system.</li> <li>-Calculate forces, work, rates, resistance and energy in a fluid system.</li> </ul>	
2.4 Thermal Systems technologically and scientifically affect our everyday world.	<ul style="list-style-type: none"> <li>-How does heat move?</li> <li>-Why does heat move?</li> <li>-What is thermal resistance?</li> <li>-How is energy transferred?</li> <li>-How does a technician need to use fluid systems?</li> </ul>	<ul style="list-style-type: none"> <li>-How and why heat move</li> <li>-How energy is transferred</li> <li>-How to use tools to measure quantities in thermal systems</li> </ul>	<ul style="list-style-type: none"> <li>-Measure forces, work, rates, resistance and energy in a thermal system.</li> <li>-Calculate forces, work, rates, resistance and energy in a thermal system.</li> </ul>	This is an optional unit done only if time allows.
<b>Enduring Understanding # 3: Both contemporary and historical scientific understandings inform technological, ethical, cultural and life decisions.</b>				
<b>Applied Physics</b>				
<b>Students will understand:</b>	<b>Essential Questions</b>	<b>Students will know the/that</b>	<b>Students will be able to</b>	<b>Notes</b>
3.1 Scientific knowledge and technological advances occur in response to societal problems or conflict over time.	<ul style="list-style-type: none"> <li>-What is the relationship between science and technology?</li> <li>-What human material and energy resources will be needed to build, install, and maintain technology?</li> <li>-What are the practical applications of technology?</li> </ul>	<ul style="list-style-type: none"> <li>-The availability of technology often sparks new scientific advances.</li> <li>-Technology usually affects society more directly than science because it solves practical problems.</li> <li>-Science affects society by stimulating curiosity and enlarging or challenging the world view.</li> </ul>	<ul style="list-style-type: none"> <li>-Make informed decisions based on evidence.</li> <li>-Utilize effective problem solving.</li> <li>-Have a reasoned discussion about the development of new technology based upon a risk benefit analysis.</li> </ul>	

3.2 Knowledge generated by one generation may be expanded, modified or discarded historically.	-Is science literacy important?			
3.3 The Montana native traditional beliefs are deeply rooted in an understanding of ecology, geology, astronomy, and biology systems.		Native cultures are holistic and view nature's interactive relationships.		

**Enduring Understanding # 1: Scientific inquiry affords all learners opportunities to make observations, pose questions, develop hypotheses, design and conduct investigations, and analyze data to draw conclusions.**

### General and Math Physics

Students will understand:	Essential Questions	Students will know the/that	Students will be able to	Notes
<p>1.1 That the inquiry process is essential to formulate questions and think critically.</p> <p>1.2 Inquiry is the application of creative thinking to new and unfamiliar situations.</p> <p>1.3 Technology is a tool to enhance scientific discovery.</p>	<p>-What is a scientific question?</p> <p>-What is a testable hypothesis?</p> <p>-How do I know if my experimental procedure aligns with my hypothesis?</p> <p>-How do I minimize my error in collected data?</p> <p>-Why is it important to replicate scientific experiments?</p>	<p>-The steps to understand scientific inquiry include: observing, classifying, using numbers, plotting graphs, measuring, inferring, predicting, formulating models, interpreting data, hypothesizing, and experimenting.</p> <p>-A scientific investigation often means repeating certain steps of the process.</p>	<p>-Construct data tables.</p> <p>-Make and use graphs.</p> <p>-Make reasonable conclusions based upon data.</p> <p>-Use dimensional analysis.</p> <p>-Use data and analysis to validate or refute hypotheses and communicate that information to others.</p> <p>-Repeat experiments to verify results.</p> <p>-Write clear instructions for investigating.</p>	<p>Math Physics requires Algebra II Trig for problem solving and is designed for students with an interest in math/physical sciences/engineering.</p> <p>General Physics requires Algebra I and is designed for students interested in liberal arts. It stresses conceptual understanding with minimal mathematical applications.</p>

**Enduring Understanding # 2: Exploring systems, order, and organizations in our natural and designed world are integral to understanding the scientific disciplines and their interdependence.**

General and Math Physics				
Students will understand:	Essential Questions	Students will know the/that	Students will be able to	Notes
2.1 There are interrelationships between kinematics, dynamics and energy transformations.	-How do objects move? -Why do objects move? -What are the fundamental conserved quantities in nature?	-Difference between velocity and acceleration. -How to add vectors. -Newton's three laws. -Law of conservation of energy and momentum. -How energy is transformed.	-Apply Newton's three laws. -Describe the interactions between objects in a system. -Apply the concepts of kinetics and dynamics to conservation in a system.	
2.2 Waves are an intrinsic part of nature.	-What are the differences between electromagnetic waves and mechanical waves?	-Properties of waves. -Types of waves. -Wave interactions.	-Recognize the Doppler effect and determine the direction of a frequency shift. -Add waves. -Recognize what happens to a wave when it hits a boundary. -Recognize how energy and amplitude are related.	
2.3 Light is both particle and wave in nature.	-How is light like a particle? -How is light like a wave?	-Laws of reflection and refraction. -Characteristics of lenses.	-Solve problems using the thin lens equation. -Solve problems using Snell's law.	
2.4 Electricity and magnetism are interrelated.	-What are the differences between static and current electricity? -How are current, voltage, resistance and power related? -What are the properties of electro-magnetic induction?	-Static involves an accumulation and discharge of charge. -Basic type of circuits. -Relationships between current, voltage, resistance and power in a closed circuit. -Properties of electro-magnetic induction.	-Identify differences between electric fields and potentials. -Calculate current, voltage, resistance and power in basic circuits. -Make predictions involving electro-magnetic induction.	
Enduring Understanding # 3: Both contemporary and historical scientific understandings inform technological, ethical, cultural and life decisions.				
General and Math Physics				
Students will understand:	Essential Questions	Students will know the/that	Students will be able to	Notes
3.1 Scientific knowledge and technological advances occur in	-What is the relationship between science and technology?	-The availability of technology often sparks new scientific advances.	-Make informed decisions based on evidence.	

<p>response to societal problems or conflict over time.</p>	<p>-Is science literacy important?</p>	<p>-Technology usually affects society more directly than science because it solves practical problems.</p>	<p>-Utilize effective problem solving.</p>
<p>3.2 Knowledge generated by one generation may be expanded, modified or discarded historically.</p>	<p>-How does science evolve?</p>	<p>-Native cultures are holistic and view nature as interactive relationships.</p>	<p>-Have a reasoned discussion about the development of new technology based upon a risk benefit analysis.</p>
<p>3.3 The Montana Native traditional beliefs are deeply rooted in an understanding of ecology, geology, astronomy, and biology systems.</p>	<p>-What human material and energy resources will be needed to build, install, and maintain technology?</p>	<p>-Science affects society by stimulating curiosity and enlarging or challenging the world view.</p>	
	<p>-What are the practical applications of technology?</p>		
	<p>-Why was there a shift from a Newtonian to modern physics?</p>		