

Pre-AP Physics Curriculum (SCI 329/ 330)

Date		Hobbs Science Standards 10 th - 12 th Grade	NM Standards & Benchmarks	Resources Basic text is Holt <u>Physics</u>
		By being embedded throughout the curriculum, these Processing Skills will be addressed throughout the year.		
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
<hr/> <hr/> <hr/> <hr/>	1	<ol style="list-style-type: none"> 1. Describe the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions. 2. Design and conduct scientific investigations that include: <ul style="list-style-type: none"> • Testable hypotheses • Controls and variables • Methods to collect, analyze, and interpret data • Results that address hypotheses being investigated • Predictions based on results • Re-evaluation of hypotheses and additional experimentation as necessary • Error analysis. 3. Use appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, microscopes). 4. Convey results of investigations using scientific concepts, methodologies, and expressions, including: <ul style="list-style-type: none"> • Scientific language and symbols • Diagrams, charts, and other data displays • Mathematical expressions and processes (e.g., mean, median, slope, proportionality) • Clear, logical, and concise communication 	<p>I, I, I, 1</p> <p>I, I, I, 2</p> <p>I, I, I, 3</p> <p>I, I, I, 4</p>	Unit Conversion Lab

		<ul style="list-style-type: none"> Reasoned arguments. <p>5. Understand how scientific theories are used to explain and predict natural phenomena (e.g., plate tectonics, ocean currents, structure of atom).</p>	I, I, I, 5	
2	<p>1. Understand how scientific processes produce valid, reliable results, including:</p> <ul style="list-style-type: none"> Consistency of explanations with data and observations Openness to peer review Full disclosure and examination of assumptions Testability of hypotheses Repeatability of experiments and reproducibility of results. <p>2. Use scientific reasoning and valid logic to recognize:</p> <ul style="list-style-type: none"> Faulty logic Cause and effect The difference between observation and unsubstantiated inferences and conclusion Potential bias <p>3. Understand how new data and observations can result in new scientific knowledge.</p> <p>4. Critically analyze an accepted explanation by reviewing current scientific knowledge.</p> <p>5. Examine investigations of current interest in science (e.g., superconductivity, molecular machines, age of the universe).</p> <p>6. Examine the scientific processes and logic used in investigations of past events (e.g., using data from crime scenes, fossils), investigations that can be planned in advance but are only done once (e.g., expensive or time-consuming experiments such as medical clinical trials), and investigations of phenomena that can be repeated easily and frequently.</p>	<p>I, I, II, 1</p> <p>I, I, II, 2</p> <p>I, I, II, 3</p> <p>I, I, II, 4</p> <p>I, I, II, 5</p> <p>I, I, II, 6</p>		
3	<p>1. Create multiple displays of data to analyze and explain the relationships in scientific investigations.</p> <p>2. Use mathematical models to describe, explain, and predict natural phenomena.</p>	<p>I, I, III, 1</p> <p>I, I, III, 2</p>		

<hr/> <hr/> <hr/>		<p>3. Use technologies to quantify relationships in scientific hypotheses (e.g., calculators, computer spreadsheets and databases, graphing software, simulations, modeling).</p> <p>4. <i>Identify and apply measurement techniques and consider possible effects of measurement errors.</i></p> <p>5. <i>Use mathematics to express and establish scientific relationships (e.g., scientific notation, vectors, dimensional analysis).</i></p>	<p>I, I, III, 3</p> <p>I, I, III, 4</p> <p>I, I, III, 5</p>	
<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>4</p>	<p style="text-align: center;">Science and Technology</p> <p>1. Know how science enables technology but also constrains it, and recognize the difference between real technology and science fiction (e.g., rockets vs. antigravity machines; nuclear reactors vs. perpetual-motion machines; medical X-rays vs. Star-Trek tricorders).</p> <p>2. Understand how advances in technology enable further advances in science (e.g., microscopes and cellular structure; telescopes and understanding of the universe).</p> <p>3. Evaluate the influences of technology on society (e.g., communications petroleum, transportation, nuclear energy, computers, medicine, genetic engineering) including both desired and undesired effects, and including some historical examples (e.g., the wheel, the plow, the printing press, the lightning rod).</p> <p>4. Understand the scientific foundations of common technologies (e.g., kitchen appliances, radio, television, aircraft, rockets, computers, medical X-rays, selective breeding, fertilizers and pesticides, agricultural equipment).</p> <p>5. Analyze the impact of digital technologies on the availability, creation, and dissemination of information.</p> <p>6. <i>Examine the role that New Mexico research facilities play in current space exploration (e.g., Very Large Array, Goddard Space Center).</i></p>	<p>III, I, I, 1</p> <p>III, I, I, 2</p> <p>III, I, I, 3</p> <p>III, I, I, 4</p> <p>III, I, I, 6</p> <p>III, I, I, 7</p>	

<hr/> <hr/> <hr/>		<p>7. Describe uses of radioactivity (e.g. nuclear power, nuclear medicine, radiometric dating).</p> <p>8. Understand how knowledge about the universe comes from evidence collected from advanced technology (e.g., telescopes, satellites, images, computer models).</p> <p>9. <i>Describe the key observations that led to the acceptance of the Big Bang theory and that the age of the universe is over 10 billion years.</i></p>	<p>III, I, I, 8</p> <p>II, III, I, 3</p> <p>II, III, I, 4</p>	
<hr/> <hr/> <hr/> <hr/> <hr/>	<p>5</p>	<p style="text-align: center;">Science and Society</p> <p>1. Describe how human activities have affected ozone in the upper atmosphere and how it affects health and the environment.</p> <p>2. Describe how scientific knowledge helps decision makers with local, national, and global challenges (e.g., Waste Isolation Pilot Project [WIPP], mining, drought, population growth, alternative energy, climate change).</p> <p>3. Describe major historical changes in scientific perspectives (e.g., atomic theory, germs, cosmology, relativity, plate tectonics, evolution) and the experimental observations that triggered them.</p> <p>4. Know that societal factors can promote or constrain scientific discovery (e.g., government funding, laws and regulations about human cloning and genetically modified organisms, gender and ethnic bias, AIDS research, alternative-energy research).</p> <p>5. Describe how environmental, economic, and political interests impact resource management and use in New Mexico.</p>	<p>III, I, I, 7</p> <p>III, I, I, 9</p> <p>III, I, I, 10</p> <p>III, I, I, 11</p> <p>III, I, I, 13</p>	
<hr/> <hr/>	<p>6</p>	<p style="text-align: center;">Science and Individuals</p> <p>1. <i>Describe New Mexico's role in nuclear science (e.g., Manhattan Project, WIPP, national laboratories).</i></p> <p>2. Identify how science has produced knowledge that is relevant to individual health and material prosperity.</p>	<p>III, I, I, 14</p> <p>III, I, I, 15</p>	

		<p>3. Understand that reasonable people may disagree about some issues that are of interest to both science and religion (e.g., the origin of life on Earth, the cause of the Big Bang, the future of Earth).</p> <p>4. Identify important questions that science cannot answer (e.g., questions that are beyond today's science, decisions that science can only help to make, questions that are inherently outside the realm of science).</p> <p>5. Understand that scientists have characteristics in common with other individuals (e.g., employment and career needs, curiosity, desire to perform public service, greed, preconceptions and biases, temptation to be unethical, core values, including honesty and openness).</p> <p>6. Know that science plays a role in many different kinds of careers and activities (e.g., public service, volunteers, public office holders, researchers, teachers, doctors, nurses, technicians, farmers, ranchers).</p>	<p>III, I, I, 16</p> <p>III, I, I, 17</p> <p>III, I, I, 18</p> <p>III, I, I, 19</p>	
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Pre-AP Physics Curriculum (SCI 329/ 330)

(1st 9 weeks- 1st 4 ½ weeks)

Date		Hobbs Science Standards 10 th - 12 th Grade	NM Standards & Benchmarks	Resources Basic text is Holt <u>Physics</u>
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
<hr/> <hr/> <hr/> <hr/>	7	<p style="text-align: center;">Mechanics</p> <p>Kinematics</p> <ol style="list-style-type: none"> 1. Describe motion in terms of displacement, time, and velocity. 2. Motion in one dimension. <ul style="list-style-type: none"> • Explore free fall, neglecting air resistance 3. Vectors <ul style="list-style-type: none"> • Discuss the scalar and vector quantities and graphical vector addition. • Use Pythagorean Theorem and trigonometric functions to find resultant vectors and vector components. 4. Motion in two dimensions. <ul style="list-style-type: none"> • Explore projectile motion 	II, I, III, 6 II, I, III, 7 II, I, III, 8 II, I, III, 9 II, I, III, 10	<p style="text-align: center;">APEX</p> Core Physical Science Sem. 1- Units 2 & 3 Honors Physical Science Sem. 1- Units 2 & 3 Motorized Car lab Acceleration of Cart on Inclined Plane Lab Projectile Lab with Ballistic Pendulum Lab

Pre-AP Physics Curriculum (SCI 329/ 330)

(1st 9 weeks- 2nd 4 ½ weeks)

Date		Hobbs Science Standards 10 th - 12 th Grade	NM Standards & Benchmarks	Resources Basic text is Holt <u>Physics</u>
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	8	<p style="text-align: center;">Mechanics</p> <p>Newton's Laws of Motion</p> <ol style="list-style-type: none"> 1. Predict the motion of an object based on the net force applied to the object. 2. Identify each of Newton's 3 Laws of Motion. 3. Analyze and calculate net force when 2 or more forces are involved. 4. Apply vectors to calculate net force on an object. 5. Use knowledge of forces and vectors to construct most efficient tower. 	<p>II, I, III, 6 II, I, III, 7 II, I, III, 8 II, I, III, 9 II, I, III, 10</p>	<p style="text-align: center;">APEX</p> <p>Core Physical Science Sem. 1- Units 2 & 3 Honors Physical Science Sem. 1- Units 2 & 3</p> <p>Newton's Law Lab Friction Block Lab with CBL</p> <p>Tower Project</p> <p>Vector Treasure Hunt</p>
<p>_____</p> <p>_____</p> <p>_____</p>	9	<p style="text-align: center;">Mechanics</p> <p>Work, Energy, Power</p> <ol style="list-style-type: none"> 1. Apply knowledge of the constancy of energy in the universe and the forms that energy takes to real-life problems and situations. 2. Calculate potential and kinetic energies of objects due to their position and speed. 3. Determine work done on and by an object. 	<p>II, I, II, 1 II, I, II, 3 II, I, II, 6</p>	<p style="text-align: center;">APEX</p> <p>Core Physical Science Sem. 1- Unit 4 Honors Physical Science Sem. 1- Unit 4</p> <p>Shoot for Grade Lab Pulley Lab Elevator Lab</p>

<hr/>		4. Analyze the effects of a simple machine. 5. Calculate the power used in a process.		
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(2nd 9 weeks- 3rd 4 ½ weeks)

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		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Basic text is Holt <u>Physics</u> Supplemental books, labs, videos, projects, digital curriculum
<p>_____</p> <p>_____</p> <p>_____</p>	10	<p style="text-align: center;">Mechanics</p> <p>Oscillations and Gravitation</p> <ol style="list-style-type: none"> 1. Explain how force, velocity, and acceleration change as an object vibrates with simple harmonic motion. 2. Analyze the forces on an object traveling in a circular path. 3. Explore Newton’s Universal Law of Gravitation. 	<p>II, I, II, 1 II, I, III, 6 II, I, III, 8 II, I, III, 9</p>	<p style="text-align: center;">APEX</p> <p>Core Physical Science Sem. 1- Units 2 & 3 Honors Physical Science Sem. 1- Units 2 & 3</p> <p>Period of a Pendulum Lab Centripetal Force Lab with CBL</p> <p>Video- “Armageddon”</p>
<p>_____</p> <p>_____</p>	11	<p style="text-align: center;">Waves and Optics</p> <p>Wave Motion- Sound and Physical Optics</p> <ol style="list-style-type: none"> 1. Understand concepts of wave motion, including wave speed, frequency, wavelength, amplitude, and energy, and discuss their relationships. 2. Discuss how sound waves are produced and explore the basic characteristics of sound waves. 	<p>II, I, II, 8 II, I, III, 9 II, I, III, 10 II, I, III, 11 II, I, III, 12</p>	<p style="text-align: center;">APEX</p> <p>Core Physical Science Sem. 1- Unit 5 Honors Physical Science Sem. 1- Unit 5</p> <p>Slinky Lab Tuning Fork Lab with CBL</p>

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Date		Hobbs Science Standards 10 th - 12 th Grade	NM Standards & Benchmarks	Resources Basic text is Holt <u>Physics</u>
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
_____	12	Wave Motion- Sound and Physical Optics 1. Apply the laws of reflection to plane mirrors and use ray diagrams to determine image location. 2. Show how image location and magnification are calculated for concave and convex mirrors.	II, I, II, 8 II, I, III, 9 II, I, III, 10 II, I, III, 11 II, I, III, 12	APEX Core Physical Science Sem. 1- Unit 5 Honors Physical Science Sem. 1- Unit 5 Concave Mirror Lab
_____	13	Geometric Optics 1. Investigate which direction light will bend when it enters a new medium and use Snell's Law to predict angle of refraction.	II, I, II, 8 II, I, III, 9 II, I, III, 10 II, I, III, 11 II, I, III, 12	APEX Core Physical Science Sem. 1- Unit 5 Honors Physical Science Sem. 1- Unit 5 Index of Refraction Lab

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(3rd 9 weeks- 5th 4 ½ weeks)

Date	Hobbs Science Standards 10 th - 12 th Grade	NM Standards & Benchmarks	Resources
	Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Basic text is Holt <u>Physics</u> Supplemental books, labs, videos, projects, digital curriculum
14	Electricity and Magnetism Electrostatics 1. Understand basic properties of electric charge. 2. Discuss conductors, insulators, and methods of charging. 3. Compare electric force with gravitational force.	II, I, II, 1 II, I, III, 2 II, I, III, 3 II, I, III, 5	APEX Core Physical Science Sem. 1- Unit 6 Honors Physical Science Sem. 1- Unit 6 Static Electricity Lab Faraday Cage Demo
15	Conductors, Capacitors, Dielectrics 1. Examine electric fields, draw electric field lines and calculate electric field strength. 2. Relate capacitance to the storage of electrical potential energy in the form of separated charges. 3. Calculate the capacitance of various devices.	II, I, II, 1 II, I, III, 2 II, I, III, 3 II, I, III, 5	APEX Core Physical Science Sem. 1- Unit 6 Honors Physical Science Sem. 1- Unit 6 Electrostatic Generator Demo
16	Electric Circuits 1. Describe the basic properties of electric current.	II, I, III, 2 II, I, III, 5	APEX Core Physical Science Sem. 1- Unit 6 Honors Physical Science Sem. 1- Unit 6

<hr/> <hr/>		<p>2. Calculate resistance, current, and potential difference using the definition of resistance.</p> <p>3. Interpret and construct circuit diagrams.</p>		<p>Resistors in Series and Parallel Circuit Lab Circuit Design Lab</p>
<hr/>	<p>17</p>	<p>Magnetostatics</p> <p>1. Describe the magnetic field around a permanent magnet and apply this to the orientation of the Earth's magnetic field.</p>	<p>II, I, III, 2 II, I, III, 5</p>	<p>APEX Core Physical Science Sem. 1- Unit 6 Honors Physical Science Sem. 1- Unit 6 Field Tracing Activity</p>

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(3rd 9 weeks- 6th 4 ½ weeks)

Date		Hobbs Science Standards 10 th - 12 th Grade	NM Standards & Benchmarks	Resources
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Basic text is Holt <u>Physics</u> Supplemental books, labs, videos, projects, digital curriculum
<hr/> <hr/> <hr/>	18	<p style="text-align: center;">Fluid Mechanics</p> <ol style="list-style-type: none"> 1. Fluids and buoyant force <ul style="list-style-type: none"> • Distinguish a liquid from a gas. • Explain why some objects float and some objects sink. 2. Fluid Pressure <ul style="list-style-type: none"> • Calculate the pressure exerted by a fluid. • Calculate how pressure varies with depth in a fluid. 3. Fluids in motion <ul style="list-style-type: none"> • Examine the motion of a fluid using the continuity equation. • Properties of gases. 	I, I, I, 1 II, I, III, 4	<p style="text-align: center;">APEX</p> Honors Physical Science Sem. 1- Unit 3 Density of Fluid Lab with Floating Object Buoyant Force Lab with Submerged Object Fluid Flow Lab Boyle's Law Lab

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(4th 9 weeks- 7th 4 ½ weeks)

Date	Hobbs Science Standards 10 th - 12 th Grade	NM Standards & Benchmarks	Resources
	Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Basic text is Holt <u>Physics</u> Supplemental books, labs, videos, projects, digital curriculum
19	<p style="text-align: center;">Heat, Kinetic Theory, and Thermodynamics</p> <p>Temperature and Heat</p> <ol style="list-style-type: none"> Describe the changes in the temperatures of two objects reaching thermal equilibrium. Identify the various temperature scales, and be able to convert from one scale to another. 	II, I, II, 2 II, I, II, 4 II, I, II, 5	<p>APEX</p> Core Physical Science Sem. 2- Unit 4 Honors Physical Science Sem. 2- Unit 4
20	<p>Ideal Gas Laws</p> <ol style="list-style-type: none"> Use the Ideal Gas Law to predict the properties of an ideal gas under different conditions. 	II, I, I, 10 II, I, II, 2 II, I, II, 4 II, I, II, 5	<p>APEX</p> Core Physical Science Sem. 2- Unit 4 Honors Physical Science Sem. 2- Unit 4
21	<p>Laws of Thermodynamics</p> <ol style="list-style-type: none"> Apply the first law of Thermodynamics to describe cyclic processes. Apply the Second Law of Thermodynamics to show the efficiency of a heat engine. 	II, I, I, 10 II, I, II, 2 II, I, II, 4 II, I, II, 5	<p>APEX</p> Core Physical Science Sem. 2- Unit 4 Honors Physical Science Sem. 2- Unit 4

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		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
<p>_____</p> <p>_____</p> <p>_____</p>	22	<p style="text-align: center;">Summary of Conservation of Energy</p> <ol style="list-style-type: none"> 1. Identify the following forms of energy: mechanical, thermal, electrical, photoelectric, chemical, pneumatic. 2. Calculate results using the above forms of energy. 3. Convert forms of energy and calculate energy gains or losses. 	II, I, II, 1 II, I, II, 3 II, I, II, 6 II, I, II, 7	Rube Goldberg Project
<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	23	<p>Rube Goldberg Project</p> <ol style="list-style-type: none"> 1. Build a Rube Goldberg type machine using the following energy transfers: mechanical, thermal, electrical, photoelectric, chemical, pneumatic. 2. Calculate values of individual energy transfers within the machine. 3. Summarize results of project in terms of energy gains, losses, and mechanical advantages. 4. Create a blueprint/ plan for design. 5. Evaluate the design and compare it to the actual product. 	II, I, II, 1 II, I, II, 3 II, I, II, 6 II, I, II, 7	Rube Goldberg Project