AP Physics Curriculum (SCI 331/ 332)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Cutnell & Johnson Physics
		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
_____	**1**	1. Describe the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions.	I, I, I, 1	
_____		2. Design and conduct scientific investigations that include: • 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.	I, I, I, 2	
_____		3. Use appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, microscopes).	I, I, I, 3	
_____		4. Convey results of investigations using scientific concepts, methodologies, and expressions, including: • 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	I, I, I, 4	

_____		• Reasoned arguments. 5. Understand how scientific theories are used to explain and predict natural phenomena (e.g., plate tectonics, ocean currents, structure of atom).	I, I, I, 5	
_____	**2**	1. Understand how scientific processes produce valid, reliable results, including: • 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.	I, I, II, 1	
_____		2. Use scientific reasoning and valid logic to recognize: • Faulty logic • Cause and effect • The difference between observation and unsubstantiated inferences and conclusion • Potential bias	I, I, II, 2	
_____		3. Understand how new data and observations can result in new scientific knowledge.	I, I, II, 3	
_____		4. Critically analyze an accepted explanation by reviewing current scientific knowledge.	I, I, II, 4	
_____		5. Examine investigations of current interest in science (e.g., superconductivity, molecular machines, age of the universe).	I, I, II, 5	
_____		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.	I, I, II, 6	
_____	**3**	1. Create multiple displays of data to analyze and explain the relationships in scientific investigations.	I, I, III, 1	
_____		2. Use mathematical models to describe, explain, and predict natural phenomena.	I, I, III, 2	

_____		3. Use technologies to quantify relationships in scientific hypotheses (e.g., calculators, computer spreadsheets and databases, graphing software, simulations, modeling).	I, I, III, 3	
_____		4. *Identify and apply measurement techniques and consider possible effects of measurement errors.*	I, I, III, 4	
_____		5. *Use mathematics to express and establish scientific relationships (e.g., scientific notation, vectors, dimensional analysis*).	I, I, III, 5	
		Science and Technology		
_____	**4**	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).	III, I, I, 1	
_____		2. Understand how advances in technology enable further advances in science (e.g., microscopes and cellular structure; telescopes and understanding of the universe).	III, I, I, 2	
_____		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).	III, I, I, 3	
_____		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).	III, I, I, 4	
_____		5. Analyze the impact of digital technologies on the availability, creation, and dissemination of information.	III, I, I, 6	
_____		6. *Examine the role that New Mexico research facilities play in current space exploration (e.g., Very Large Array, Goddard Space Center*).	III, I, I, 7	

_____		7. Describe uses of radioactivity (e.g. nuclear power, nuclear medicine, radiometric dating).	III, I, I, 8	
_____		8. Understand how knowledge about the universe comes from evidence collected from advanced technology (e.g., telescopes, satellites, images, computer models).	II, III, I, 3	
_____		9. *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*.	II, III, I, 4	
		Science and Society		
_____	**5**	1. Describe how human activities have affected ozone in the upper atmosphere and how it affects health and the environment.	III, I, I, 7	
_____		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).	III, I, I, 9	
_____		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.	III, I, I, 10	
_____		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).	III, I, I, 11	
_____		5. Describe how environmental, economic, and political interests impact resource management and use in New Mexico.	III, I, I, 13	
		Science and Individuals		
_____	**6**	1. *Describe New Mexico's role in nuclear science (e.g., Manhattan Project, WIPP, national laboratories*).	III, I, I, 14	
_____		2. Identify how science has produced knowledge that is relevant to individual health and material prosperity.	III, I, I, 15	

_____		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).	III, I, I, 16	
_____		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).	III, I, I, 17	
_____		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).	III, I, I, 18	
_____		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).	III, I, I, 19	

AP Physics Curriculum (SCI 331/ 332)

(1st 9 weeks- 1st 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Cutnell & Johnson Physics
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
_____ _____	**7**	**Mechanics** **Kinematics** 1. Motion in one dimension. 2. Motion in two dimensions.	II, I, III, 6 II, I, III, 7 II, I, III, 8 II, I, III, 9	**APEX** Honors Physical Science Sem. 1- Units 2 & 3 AP Physics Sem. 1- Units 2 & 3
_____ _____	**8**	**Systems of Particles, Linear Momentum** 1. Impulse and Momentum 2. Conservation of Linear Momentum, collisions	II, I, III, 6 II, I, III, 7 II, I, III, 8 II, I, III, 9	**APEX** Honors Physical Science Sem. 1- Unit 4 AP Physics Sem. 1- Units 2 & 3
_____	**9**	**Newton's Laws of Motion** 1. Static Equilibrium	II, I, II, 11 II, I, III, 6 II, I, III, 7 II, I, III, 8 II, I, III, 9 II, I, III, 10	**APEX** Honors Physical Science Sem. 1- Units 2 & 3 AP Physics Sem. 1- Units 2 & 3

AP Physics Curriculum (SCI 331/ 332)

(1st 9 weeks- 2nd 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Cutnell & Johnson Physics
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
_____ _____	**10**	**Mechanics** **Newton's Laws of Motion** 1. Dynamics of a single particle. 2. Systems of two or more bodies.	II, I, III, 6 II, I, III, 7 II, I, III, 8 II, I, III, 9	**APEX** Honors Physical Science Sem. 1- Units 2 & 3 AP Physics Sem. 1- Units 2 & 3
_____ _____ _____ _____	**11**	**Mechanics** **Work, Energy, Power** 1. Work-energy theorem 2. Conservative forces and potential energy 3. Conservation of energy 4. Power	II, I, II, 1 II, I, II, 3 II, I, II, 6	**APEX** Honors Physical Science Sem. 1- Unit 4 AP Physics Sem. 1- Unit 3

AP Physics Curriculum (SCI 331/ 332)

(2nd 9 weeks- 3rd 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Cutnell & Johnson Physics
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
_____ _____	**12**	**Mechanics** **Circular Motion and Rotation** 1. Uniform circular motion 2. Torque and rotational statics	II, I, III, 6 II, I, III, 7 II, I, III, 8 II, I, III, 9	**APEX** Honors Physical Science Sem. 1- Units 2 & 3 AP Physics Sem. 1- Unit 4
_____ _____ _____ _____ _____	**13**	**Oscillations and Gravitation** 1. Simple harmonic motion 2. Mass-spring system 3. Pendulum and oscillations 4. Law of Gravitation 5. Orbits of planets and satellites, Kepler's Laws	II, I, III, 1 II, I, III, 2 II, I, III, 6 II, I, III, 7 II, I, III, 8 II, I, III, 9	**APEX** Honors Physical Science Sem. 1- Units 2 & 3 AP Physics Sem. 1- Units 4 & 5
_____	**14**	**Waves and Optics** **Wave Motion** 1. Traveling waves	II, I, II, 7 II, I, II, 8 II, I, III, 9 II, I, III, 10	**APEX** Honors Physical Science Sem. 1- Unit 5 AP Physics Sem. 1- Unit 5

_____ _____ _____		2. Standing waves 3. Doppler effect 4. Superposition	II, I, III, 11 II, I, III, 12	

AP Physics Curriculum (SCI 331/ 332)

(2nd 9 weeks- 4th 4 ½ weeks)

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		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
_____ _____ _____	**15**	**Waves and Optics** **Physical Optics** 1. Interference and diffraction 2. Dispersion of light 3. Electromagnetic Spectrum	II, I, II, 7 II, I, II, 8 II, I, III, 9 II, I, III, 10 II, I, III, 11 II, I, III, 12	**APEX** Honors Physical Science Sem. 1- Unit 5 AP Physics Sem. 2- Units 4 & 5
_____ _____ _____	**16**	**Geometric Optics** 1. Reflection and Refraction 2. Mirrors 3. Lenses	II, I, II, 7 II, I, II, 8 II, I, III, 9 II, I, III, 10 II, I, III, 11 II, I, III, 12	**APEX** Honors Physical Science Sem. 1- Unit 5 AP Physics Sem. 2- Units 4 & 5

AP Physics Curriculum (SCI 331/ 332)

(3rd 9 weeks- 5th 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Cutnell & Johnson Physics
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	17	**Electricity and Magnetism** **Electrostatics**	II, I, II, 1 II, I, III, 1 II, I, III, 3 II, I, III, 5	**APEX** Honors Physical Science Sem. 1- Unit 6 AP Physics Sem. 2- Units 1 & 2
_____		1. Charge, field, potential		
_____		2. Coulomb's Law, field, potential		
_____		3. Planar fields		
	18	**Conductors, Capacitors, Dielectrics**	II, I, II, 1 II, I, III, 1 II, I, III, 3 II, I, III, 5	**APEX** Honors Physical Science Sem. 1- Unit 6 AP Physics Sem. 2- Units 1 & 2
_____		1. Electrostatics		
_____		2. Parallel plate capacitors		
	19	**Electric Circuits**	II, I, II, 1 II, I, III, 1 II, I, III, 3 II, I, III, 5	**APEX** Honors Physical Science Sem. 1- Unit 6 AP Physics Sem. 2- Units 1 & 2
_____		1. Current, resistance, power		
_____		2. Direct current with batteries and resistors		
_____		3. Capacitors in circuits		

AP Physics Curriculum (SCI 331/ 332)

(3rd 9 weeks- 6th 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Cutnell & Johnson Physics
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	20	**Electricity and Magnetism** **Magnetostatics**	II, I, II, 1 II, I, III, 1 II, I, III, 3 II, I, III, 5	**APEX** Honors Physical Science Sem. 1- Unit 6 AP Physics Sem. 2- Units 1,2&3
_____		1. Forces on moving charges.		
_____		2. Forces on current carrying wire		
_____		3. Fields of long current-carrying wires.		
	21	**Electromagnetism**	II, I, II, 1 II, I, III, 1 II, I, III, 3 II, I, III, 5	**APEX** Honors Physical Science Sem. 1- Unit 6 AP Physics Sem. 2- Units 1,2&3
_____		1. Induction		
	22	**Fluid Mechanics and Thermal Physics** **Fluid Mechanics**	II, I, III, 2 II, I, III, 4	**APEX** Honors Physical Science Sem. 1- Unit 3 AP Physics Sem. 1- Unit 4
_____		1. Hydrostatic pressure		
_____		2. Buoyancy		
_____		3. Fluid flow continuity		
_____		4. Bernoulli's equation		

AP Physics Curriculum (SCI 331/ 332)

(4th 9 weeks- 7th 4 ½ weeks)

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		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
_____ _____ _____	**23**	**Fluid Mechanics and Thermal Physics** **Temperature and Heat** 1. Mechanical equivalent of heat 2. Specific and latent heat 3. Heat transfer and thermal expansion	II, I, II, 2 II, I, II, 4 II, I, II, 5 II, I, III, 2 II, I, III, 4	**APEX** Honors Physical Science Sem. 2- Unit 4 AP Physics Sem. 1- Unit 6
_____ _____	**24**	**Kinetic Theory and Thermodynamics** 1. Ideal Gases • Kinetic model • Ideal gas law 2. Laws of thermodynamics • First law (pV diagrams) • Second law (heat engines)	II, I, II, 2 II, I, II, 4 II, I, II, 5 II, I, III, 2 II, I, III, 4	**APEX** Honors Physical Science Sem. 2- Unit 4 AP Physics Sem. 1- Unit 6

AP Physics Curriculum (SCI 331/ 332)

(4th 9 weeks- 8th 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Cutnell & Johnson Physics
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	25	**Atomic and Nuclear Physics** **Atomic Physics and Quantum Effects** 1. Photons and photoelectric effect 2. Atomic energy levels 3. Wave-particle duality	II, I, II, 1 II, I, II, 8 II, I, II, 9 II, I, III, 1	**APEX** Honors Physical Science Sem. 2- Unit 5 AP Physics Sem. 2- Unit 6
	26	**Nuclear Physics** 1. Nuclear reactions 2. Mass-energy equivalence	II, I, II, 1 II, I, II, 8 II, I, II, 9 II, I, III, 1	**APEX** Honors Physical Science Sem. 2- Unit 5 AP Physics Sem. 2- Unit 6
	27	**Review for AP Test**		**APEX** Honors Physical Science Sem. 1- All Units Sem. 2- All Units AP Physics Sem. 1- All Units Sem. 2- All Units