AP Chemistry Curriculum (SCI 327/ 328)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Zumdahl Chemistry
		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	**Reading Standards for Literacy** I. Key Ideas and Details _____ A. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. _____ B. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. _____ C. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. II. Craft and Structure _____ A. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. _____ B. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understand on the information or ideas. _____ C. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text; identifying important issues that remain unresolved. III. Integration of Knowledge and Ideas _____ A. Integrate and evaluate multiple sources of information presented in diverse		

_______ _______ _______		formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. B. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. C. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. IV. Range of Reading and Level of Text Complexity A. By the end of grade 12, read and comprehend science/technical texts in the grades 11- CCR text complexity band independently and proficiently.		
_______ _______	**2**	**Writing Standards for Literacy** I. Text Types and Purposes A. Write arguments focused on discipline-specific content. 1. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. 2. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values and possible biases. 3. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. 4. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 5. Provide a concluding statement or section that follows from and supports the argument presented. B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. 1. Introduce a topic and organize complex ideas, concepts and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures,		

		tables), and multimedia when useful to aiding comprehension. 2. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. 3. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. 4. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. 5.Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic). II. Production and Distribution of Writing		
_____		A. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		
_____		B. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.		
_____		C. Use technology, including the Internet, to produce, publish and update individual or shared writing products in response to ongoing feedback, including new arguments or information. III. Research to Build and Present Knowledge		
_____		A. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.		
_____		B. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation..		
_____		C. Draw evidence from informational texts to support analysis, reflection and research.		

_____		IV. Range of Writing A. Write routinely over extended timeframes (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.		
_____	**3**	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 • Reasoned arguments.	I, I, I, 4	
_____		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	
_____	**4**	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	I, I, II, 1	

		• Repeatability of experiments and reproducibility of results.		
_____		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	
_____	**5**	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.,*	I, I, III, 5	

		scientific notation, vectors, dimensional analysis).		
	6	**Science and Technology**		
_____		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	

	7	**Science and Society**		
_____		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	
	8	**Science and Individuals**		
_____		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	III, I, I, 18	

_____		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).		
_____		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 Chemistry Curriculum (SCI 327/ 328)

(1st 9 weeks- 1st 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Zumdahl Chemistry
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	9	**Structure of Matter** **Chemical Reactions and Stoichiometry**		**APEX** Chemistry Honors Sem. 1- Units 3,4 & 5 Chemistry AP Sem. 1- Units 1, 2, 3 &6
_____		1. Measurement Topics		
_____		2. Symbols and formulas	II, I, I, 8	Multiple Choice & Free Response Questions in Preparation for the AP Chemistry Examination
_____		3. Periodic table	II, I, I, 8	
_____		4. Ionic and covalent bonds	II, I, I, 7	
_____		5. Nomenclature	II, I, I, 8	Chapter 1 Chapter 3 Chapter 4 Chapter 14 Chapter 16 Chapter 17
_____		6. Balance equations	II, I, I, 14	
_____		7. Reaction Types A. Acid-base reactions • Concepts of Arrhenius ▪ Properties of acids and bases ▪ Acid base neutralization • Concepts of Bronsted-Lowry ▪ Amphiprotic species ▪ Relative strengths of acids and bases ▪ Polyprotic acids	II, I, I, 13	

		• Concepts of Lewis • Coordination complexes B. Precipitation reactions C. Oxidation-reduction reactions • Oxidation number • Electron transport • Electrochemistry ▪ Electrolytic and galvanic cells ▪ Faraday's laws ▪ Standard half-cell potentials ▪ Nernst equation ▪ Prediction of the direction of redox reactions		
_____		8. Stoichiometry A. Percent composition B. Empirical formulas C. Solutions D. Mole relationships (mass and volume) • Percent yield • Limiting reagents • Titrations and other analyses E. Ionic and molecular species present in chemical systems F. Net ionic equations G. Balancing equations, including redox reactions	II, I, I, 14	
	10	**Atomic Theory and Atomic Structure**		**APEX** Chemistry Honors Sem. 1- Unit 2 Chemistry AP Sem. 1- Units 1 & 5 Multiple Choice & Free Response Questions in Preparation for the AP Chemistry
_____		1. Evidence for the atomic theory	II, I, I, 6	
_____		2. Atomic masses A. Determined by chemical and physical means	II, I, I, 6	
_____		3. Atomic number and mass number A. Isotopes	II, I, I, 6	

_____		4. Electron energy levels A. Atomic spectra B. Quantum numbers C. Atomic orbitals	II, I, I, 8	Examination Chapter 2 Chapter 7
_____		5. Periodic relationships A. Atomic radii B. Ionization energies C. Electron affinities D. Oxidation states	II, I, I, 4	

AP Chemistry Curriculum (SCI 327/ 328)

(1st 9 weeks- 2nd 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Zumdahl Chemistry
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	11	**Structure of Matter** **Chemical Bonding**		**APEX** Chemistry Honors Sem. 1- Unit 3 Chemistry AP Sem. 1- Units 6 & 7
_____		1. Binding forces A. Types • Ionic • Covalent • Metallic • Hydrogen bonding • Van der Waals ▪ London dispersion forces B. Relationships • States of matter • Structures of matter • Properties of matter C. Polarity of bonds • Electronegativities	II, I, I, 8	Multiple Choice & Free Response Questions in Preparation for the AP Chemistry Examination Chapter 8 Chapter 9 Chapter 19 Chapter 20 Chapter 21 Chapter 22
_____		2. Molecular models A. Lewis structures B. Valence bond • Hybridization of orbitals • Resonance	II, I, I, 9	

_____		• Sigma • Pi C. VSPER 3. Geometry of molecules and ions A. Structural isomerism of simple organic molecules and coordination complexes B. Dipole moments of molecules C. Relation of physical properties to molecular structure	II, I, I, 4	
_____ _____ _____ _____	**12**	**Nuclear Chemistry** 1. Nuclear equations 2. Half-lives 3. Radioactivity 4. Chemical applications	II, I, I, 11 II, I, I, 11 II, I, I, 11 II, I, I, 11	**APEX** Chemistry Honors Sem. 2- Unit 4 Chemistry AP Sem. 2- Unit 7 Multiple Choice & Free Response Questions in Preparation for the AP Chemistry Examination Chapter 18

AP Chemistry Curriculum (SCI 327/ 328)

(2nd 9 weeks- 3rd 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Zumdahl Chemistry
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	13	**States of Matter** **Gases, Liquids and Solids**		**APEX** Chemistry Honors Sem. 2- Unit 1 Chemistry AP Sem. 1- Units 8 & 9
_____		1. Laws of ideal gases A. Ideal gases B. Boyle's Law C. Charles' Law D. Dalton's Law of Partial Pressure E. Graham's Law F. Henry's Law G. Van der Waal's Equation of State for an ideal gas H. Partial pressures	II, I, I, 1	Multiple Choice & Free Response Questions in Preparation for the AP Chemistry Examination Chapter 5 Chapter 10
_____		2. Kinetic-Molecular Theory A. Interpretation of ideal gas laws on the basis of this theory B. Avogadro's hypothesis and the mole concept C. Dependence of kinetic energy of molecules on temperature D. Deviations from ideal gas laws	II, I, I, 15	
_____		3. Liquids and solids from the Kinetic-Molecular Theory viewpoint	II, I, I, 1	
_____		4. Phase diagrams of one-component systems	II, I, I, 1	

_____		5. Changes of state A. Critical points B. Triple points	II, I, I, 1	
_____		6. Structure of solids A. Lattice energies	II, I, I, 4	

AP Chemistry Curriculum (SCI 327/ 328)

(2nd 9 weeks- 4th 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Zumdahl Chemistry
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	14	**States of Matter** **Solutions and Colloids**		**APEX** Chemistry Honors Sem. 2- Unit 1 Chemistry AP Sem. 2- Unit 1
_____		1. Types of solutions	II, I, I, 3	
_____		2. Factors affecting solubility	II, I, I, 3	Multiple Choice & Free Response Questions in Preparation for the AP Chemistry Examination
_____		3. Methods of expressing concentration	II, I, I, 3	
_____		4. Raoult's law ad colligative properties A. Nonvolatile solutes B. Osmosis	II, I, I, 3	Chapter 11
_____		5. Non-ideal behavior	II, I, I, 3	
	15	**Spectroscopy and Chromatography**		
_____		1. Spectroscopy A. Regions of electromagnetic interest ▪ Radio-nuclear magnetic resonance ▪ Microwave- ESR ▪ IR- Molecular vibrations ▪ UV/ visible ▪ X-ray	II, I, I, 3	

		▪ Mass spectrometry 2. Separation techniques A. Distillation B. Recrystallization C. Chromatography D. Ion exchange columns	II, I, I, 3	

AP Chemistry Curriculum (SCI 327/ 328)

(3rd 9 weeks- 5th 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Zumdahl Chemistry
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	16	**Reactions** **Equilibrium**		**APEX** Chemistry Honors Sem. 2- Unit 2 Chemistry AP Sem. 2- Units 2 & 3
_____		1. Dynamic equilibrium A. Physical and chemical B. Le Chatelier's principle C. Equilibrium constants (law of mass action)	II, I, I, 2	Multiple Choice & Free Response Questions in Preparation for the AP Chemistry Examination Chapter 13 Chapter 15
_____		2. Quantitative treatment A. Equilibrium constants for gaseous reactions- K_p, K_c B. Equilibrium constants for reactions in solution • Constants for acids and bases- pK and pH • Solubility-product constants and their application to precipitation and the dissolution of slightly soluble compounds • Common ion effect ▪ Buffers ▪ Hydrolysis	II, I, I, 1 II, I, I, 2 II, I, I, 5	

AP Chemistry Curriculum (SCI 327/ 328)

(3rd 9 weeks- 6th 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Zumdahl Chemistry
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	17	**Reactions** **Kinetics**		**APEX** Chemistry Honors Sem. 2- Unit 2 Chemistry AP Sem. 2- Unit 4
_____		1. Rate of reaction	II, I, I, 14	Multiple Choice & Free Response Questions in Preparation for the AP Chemistry Examination Chapter 12
_____		2. Use of experimental data and graphical analysis A. Determine reactant order B. Determine rate constants C. Determine reaction rate laws	II, I, I, 14	
_____		3. Factors that change the rate of the reaction A. Temperature B. Concentration C. Nature of substance D. Catalysts (energy of activation)	II, I, I, 15	
_____		4. Relationship between the rate-determining step and a mechanism	II, I, I, 14	

AP Chemistry Curriculum (SCI 327/ 328)

(4th 9 weeks- 7th 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Zumdahl Chemistry
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	18	**Reactions** **Thermodynamics**		**APEX** Chemistry Honors Sem. 2- Unit 3 Chemistry AP Sem. 1- Unit 4 Sem. 2- Unit 5
_____		1. State functions	II, I, I, 15	
_____		2. Thermal energy, heat, and temperature	II, I, I, 15	Multiple Choice & Free Response Questions in Preparation for the AP Chemistry Examination
_____		3. First law A. Change in enthalpy B. Heat of formation C. Heat of reaction D. Hess's law E. Heats of vaporization and fusion F. Calorimetry	II, I, I, 15	Chapter 6 Chapter 16
_____		4. Second law A. Entropy B. Free energy of formation C. Free energy of reaction dependence of change in free energy on enthalpy and entropy changes	II, I, I, 15	
_____		5. Relationship of change in free energy to equilibrium constants and electrode potentials	II, I, I, 12	

AP Chemistry Curriculum (SCI 327/ 328)

(4th 9 weeks- 8th 4 ½ weeks)

Date		Hobbs Science Standards 11th- 12th Grade	NM Standards & Benchmarks	Resources Basic text is Zumdahl Chemistry
		Students will be able to:	Strand, Standards, Benchmarks, & Performance Standards	Supplemental books, labs, videos, projects, digital curriculum
	19	**Review for AP Exam** 1. Review all concepts for the AP Chemistry Exam.		**APEX** Chemistry Honors Sem. 1- All Units Sem. 2- All Units Chemistry AP Sem. 1- All Units Sem. 2- All Units Multiple Choice & Free Response Questions in Preparation for the AP Chemistry Examination