

***Prentice Hall Chemistry: The Central Science, Revised 8<sup>th</sup> Edition, ©2002***

Correlated to:

**Alabama Course of Study for Chemistry Core  
(Grades 9-12)**

Date Taught	ALABAMA COURSE OF STUDY FOR CHEMISTRY CORE	Date Taught	PAGE(S) WHERE TAUGHT (If submission is not a book, cite appropriate location(s))
	<b>PROCESS AND APPLICATION</b>		
	Students will: 1. Understand fundamental assumptions about the universe upon which the scientific enterprise is based. <ul style="list-style-type: none"> <li>• Concern with natural phenomena</li> <li>• Discoverable and understandable operation of the universe</li> <li>• Linking of natural causes with natural effects</li> <li>• Consistent and predictable operation of the universe</li> </ul>		SE: The Study of Chemistry 1-4, Basic Forces 41; Earth's Atmosphere 683-686; The Outer Regions of the Atmosphere 686-688; Ozone in the Upper Atmosphere 688-691; Chemistry of the Troposphere 691-699; The World Ocean 699-701; Fresh Water 701-705 TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	2. Discuss science as a body of knowledge and an investigative process. <ul style="list-style-type: none"> <li>• Unified, open-ended structure of observations set in a testable framework of ideas</li> <li>• Common purpose and philosophy among the science disciplines</li> <li>• Limited scope and certainty</li> <li>• Simple solutions, comprehensive results, clearest and reliable explanations, accurate basis for predictions</li> </ul>		SE: The Study of Chemistry 1-4; The Scientific Method 13; Chemistry in the News 18-20; Science is discussed in this manner throughout the entire text. Extensive mathematical examples are provided. Examples of real-life applications of science are presented in an informative manner in the Chemistry at Work sections in each chapter. The applications show the integration of chemistry with other fields. TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>

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	3. Conduct scientific investigations systematically. <ul style="list-style-type: none"> <li>• Identifying and framing the question carefully</li> <li>• Forming a hypothesis</li> <li>• Identifying and managing variables effectively</li> <li>• Developing a practical and logical procedure</li> <li>• Presenting conclusions based on investigation/previous research</li> </ul>		SE: The Scientific Method 13; Exercises at the end of each chapter require students to propose procedures, evaluate results and make conclusions. For example: 1.75,1.76,1.77, 4.104, 7.73, 14.85, 15.72, 17.55-17.60, 19.87 LM: Experiments throughout; Review questions at the end of each laboratory experiment require students to propose procedures for investigations and make conclusions based on experimental results. TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	4. Exhibit behaviors appropriate to the scientific enterprise consistently.		SE: Appropriate scientific behavior is modeled throughout text. For example: Chemistry and Life: The Health Effects of Low-Frequency EMFs 193, Chemistry and Life: Controlling Nitric Oxide Emissions 584, Chemistry and Life: Entropy and Life 724, LM: Appropriate scientific behavior is modeled throughout laboratory experiments. TECH: Appropriate scientific behavior is modeled throughout the Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	5. Demonstrate correct care and safe use of instruments, equipment, and chemicals.		LM: Laboratory Safety and Work Instructions xiii-xvii; Common Laboratory Apparatus xviii-xix; Basic Laboratory Techniques 1-16
	6. Demonstrate the ability to choose, construct, and/or assemble appropriate equipment for scientific investigations.		LM: Qualitative-Analysis Techniques A30-A31; Common Laboratory Apparatus xviii-xix; Basic Laboratory Techniques 1-16

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	7. Apply critical and integrated science-thinking skills. <ul style="list-style-type: none"> <li>• Observing</li> <li>• Classifying</li> <li>• Measuring with appropriate units and significant figures</li> <li>• Inferring</li> <li>• Predicting</li> <li>• Solving problems</li> <li>• Interpreting data</li> <li>• Designing experiments</li> <li>• Formulating hypotheses</li> <li>• Communicating</li> </ul>		SE: Units of Measurement 12-17; Uncertainty in Measurement 20-24; Dimensional Analysis 24-28; Problem-solving is thoroughly addressed and demonstrated in every chapter of the text. LM: experiments throughout TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	8. Use mathematical models, simple statistical models, and graphical models to express patterns and relationships determined from sets of scientific data.		SE: Graphs 1017 LM: Experiments throughout; Graphical Interpretation of Data: Calibration Curves and Least-Squares Analysis A12-A15; Spreadsheets A23-A29
	9. Solve for unknown quantities by manipulating variables.		SE: Dimensional Analysis 24-28; End of Chapter exercises throughout the text address this type of problem solving. For examples, see exercises: 1.41-1.50, 1.62-1.64, 1.66-1.73, 3.59-3.66, 3.72-3.80, 3.84-3.105, 4.65-4.74, 6.13-6.22, 10.17-10.47, 13.19-13.40 LM: Chemical Arithmetic A3-A11; Review questions and laboratory reports throughout TECH: Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a> ; Problem Solving Center; Central Science Live Student CD-ROM: All chapters have many mathematical problems to solve interactively.

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	10. Use written and oral communication skills to present and explain scientific phenomena and concepts individually or in collaborative groups using technical and non-technical language.		SE: End of Chapter questions throughout the text address this skill. For examples, see exercises: 1.74, 1.75, 1.77, 2.71, 4.104, 5.111, 6.93, 7.79, 12.23-12.28, 15.77, 18.56 LM: Lab experiments throughout TECH: Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a> ; Current Events section- Students are asked to find answers to questions and report them. Problem Solving section- numerous problems are given for students to solve.
	11. Choose appropriate technology to retrieve relevant information from the Internet such as electronic encyclopedias, indices, and databases.		TECH: Central Science Live: Companion Website ( <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a> ) contains links to many topic specific websites including numerous databases and other information sources. Current Topic section involves web site searches to answer questions.
	12. Analyze the advantages and disadvantages of widespread use of and reliance on technology.		SE: Chemistry at Work segments in each chapter discuss chemistry in terms of modern technology and applications. The Mass Spectrometer 78; Liquid Crystals 436-440; Polymers 440-449; Biomaterials 449-454; Ceramics 454-458; Thin Films 459-462 LM: Spreadsheets A23-A29 TECH: Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a> Current Topics

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	13. Practice responsible use of technology systems, information, and software such as following copyright laws.		TECH: Central Science Live Companion Website (www.prenhall.com/brown) Central Science Student CD-ROM
	14. Evaluate technology-based options for lifelong learning.		TECH: Central Science Live Companion Website (www.prenhall.com/brown) and Central Science Student CD-ROM contain review notes, interactive quizzes, Problem-solving, current issues, and reference links.
	15. Identify the uses of technology in scientific applications.		SE: Chemistry at Work segments in each chapter discuss chemistry in terms of modern technology and applications. The Mass Spectrometer 78; Liquid Crystals 436-440; Polymers 440-449; Biomaterials 449-454; Ceramics 454-458; Thin Films 459-462 TECH: Central Science Live Companion Website: www.prenhall.com/brown; Current Topics
	16. Collect data and construct and analyze graphs, tables, and charts using tools such as computer- or calculator-based probeware.		LM: Labs do not specifically describe the use of computer or calculator-based probeware because the differences in each type and brand would prevent uniform experimental. The following labs could easily be adapted to use computer or calculator-based probeware: Experiment 2, 17, 18, 19, 22, 23, 24, 25, 26, 31, 32
	17. Differentiate the classifications of matter. <ul style="list-style-type: none"> <li>• Pure substances</li> <li>• Mixtures</li> </ul>		SE: Classifications of Matter 5-11 LM: Experiment 3: Separations of the Components of a Mixture; Experiment 10: Paper Chromatography: Separations of Cations and Dyes TECH: Central Science Student CD-ROM; Central Science Live Companion Website: www.prenhall.com/brown

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	18. Differentiate between physical and chemical properties/changes.		SE: Properties of Matter 11-12 LM: Experiment 2: Identification of Substances by Physical Properties; Experiment 3: Chemical Reactions TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	19. Use the kinetic theory to explain the states and properties (microscopic and macroscopic) of matter.		SE: Kinetic-Molecular Theory 373-375; A Molecular Comparison of Liquids and Solids 393-395 TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
<b>STRUCTURE OF ATOMS</b>			
	20. Use the periodic table to determine the number of protons, electrons, and neutrons in isotopes of elements.		SE: The Modern View of Atomic Structure 41-44; The Periodic Table 44-46; Development of the Periodic Table 227-229 TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	21. Summarize benchmark discoveries in the historical development of the atomic theory.		SE: The Atomic Theory of Matter 35-36; The Discovery of Atomic Structure 37-41; Quantized Energy and Photons 190-192; Bohr's Model of the Hydrogen Atom 194-198; The Wave Behavior of Matter 198-200; Quantum Mechanics and Atomic Orbitals 200-203 LM: Experiment 12: Atomic Spectra and Atomic Structure TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>

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	22. Describe atoms using different electron notations. <ul style="list-style-type: none"> <li>• Electron configuration</li> <li>• Orbital notation</li> <li>• Electron dot notation</li> </ul>		SE: Electron Configurations 209-214; Electron Configurations and the Periodic Table 214-218; Chemical Bonds, Lewis Symbols, and the Octet Rule 261-263 TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
<b>PERIODIC TABLE</b>			
	23. Use the periodic table for specific purposes. <ul style="list-style-type: none"> <li>• Predicting patterns of change of properties by groups and periods</li> <li>• Classifying elements as metals, nonmetals, metalloids, noble gases</li> <li>• Predicting bond types</li> <li>• Assigning valences/oxidation numbers based on electron configuration</li> </ul>		SE: The Periodic Table 44-46; Molecules and Molecular Compounds 47-49; Ions and Ionic Compounds 49-53; Oxidation-Reduction Reactions 120-125; Electron Shells and Sizes of Atoms 229-233; Ionization Energy 233-236; Electron Affinities 236-238; Metals, Nonmetals and Metalloids 238-243; Group Trends for Active Metals 243-248; Group Trends for Selective Nonmetals 248-253; Sizes of Ions 269-270; Periodic Trends and Chemical Reactions 841-844; Transition Metals 914-920 LM: Experiment 15: Activity Series; Experiment 18: The Chemistry of Oxygen: Basic and Acidic Oxides and the Periodic Table TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>

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<b>SOLUTIONS</b>			
	24. Describe the preparation and properties of solutions. <ul style="list-style-type: none"> <li>• Components</li> <li>• Classifications</li> <li>• Solubility and concentrations</li> <li>• Conductivity</li> <li>• Colligative properties</li> </ul>		SE: General Properties of Aqueous Solutions 106-109; Precipitation Reactions 109-113; Concentrations of Solutions 126-131; The Solution Process 469-474; Saturated Solutions and Solubility 474-475; Ways of Expressing Concentration 482-486; Colligative Properties 486-495  LM: Experiment 19: Colligative Properties: Freezing-Point Depression and Molar Mass; Experiment 21: Reactions in Aqueous Solutions: Metathesis Reactions and Net Ionic Equations; Experiment 25: Determination of the Solubility-Product Constant for a Sparingly Soluble Salt  TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	25. Relate certain factors to solubility and rate of solution. <ul style="list-style-type: none"> <li>• Nature of solute and solvent</li> <li>• Temperature</li> <li>• Agitation</li> <li>• Surface area</li> <li>• Pressure of gases</li> </ul>		SE: The Solution Process 469-474; Saturated Solutions and Solubility 474-475; Factors Affecting Solubility 476-482; Factors That Affect Solubility 662-668  LM: Experiment 21: Reactions in Aqueous Solutions: Metathesis Reactions and Net Ionic Equations; Experiment 25: Determination of the Solubility-Product Constant for a Sparingly Soluble Salt  TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>

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	26. Understand the nature and interactions of acids and bases. <ul style="list-style-type: none"> <li>• Proton donors or acceptors</li> <li>• Physical properties</li> <li>• Effects on indicators</li> <li>• Neutralization reactions</li> <li>• Degree of ionization</li> </ul>		SE: Acid-Base Reactions 114-120; Acids and Bases: A Brief Review 593-599; Brønsted-Lowry Acids and Bases 594-599; The Auto ionization of Water 599-601; The pH Scale 601-605; Weak Acids 606-615; Weak Bases 615-618; Acid-Base Titrations 651-658; Strong Acids and Bases 605-606  LM: Experiment 20: Titration of Acids and Bases; Experiment 22: Determination of the Dissociation Constant for a Weak Acid; Experiment 23: Titration Curves of Polyprotic Acids; Experiment 24: Hydrolysis of Salts and pH of Buffer Solutions  TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	27. Compare characteristics of isotopes of the same element. <ul style="list-style-type: none"> <li>• Nuclear composition</li> <li>• Stability</li> <li>• Physical properties</li> <li>• Chemical properties</li> </ul>		SE: The Modern View of Atomic Structure 41-44; Radioactivity 805-808; Patterns of Nuclear Stability 809-812; Hydrogen 844-848  TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	28. Demonstrate an understanding of basic nuclear concepts and issues. <ul style="list-style-type: none"> <li>• Distinguishing between nuclear and chemical changes</li> <li>• Identifying three types of nuclear radiation (alpha, beta, gamma)</li> <li>• Applying half life to dating techniques</li> <li>• Differentiating fission and fusion</li> <li>• Evaluating environmental issues associated with nuclear waste</li> </ul>		SE: Radioactivity 805-808; Nuclear Transmutations 812-815; Rates of Radioactive Decay 815-819; Detection of Radioactivity 819-820; Nuclear Fission 824-828; Nuclear Fusion 828-829; Biological Effects of Radiation 829-834  TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>

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<b>INTERACTIONS OF MATTER AND ENERGY</b>			
	29. Compare and contrast bond types. <ul style="list-style-type: none"> <li>• Ionic</li> <li>• Covalent</li> <li>• Metallic</li> </ul>		SE: Molecules and Molecular Compounds 47-49; Ions and Ionic Compounds 49-54; Covalent Bonding 270-272; Bond Polarity and Electronegativity 273-278; Bonding in Solids 421-426; Metallic Bonding 908-912 LM: Experiment 11: Molecular Geometries of Covalent Molecules: Lewis Structures and VSEPR Theory TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	30. Apply rules of nomenclature and formula writing.		SE: Naming Inorganic Compounds 54-60; Chelates 933-940; Alkanes 964-969; Unsaturated Hydrocarbons 971-979; Functional Groups; Alcohols and Ethers 979-982; Compounds with a Carbonyl Group 982-987 LM: Experiment 5: Chemical Formulas TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>

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	31. Demonstrate an understanding of matter interactions. <ul style="list-style-type: none"> <li>• Writing balanced chemical equations</li> <li>• Identifying chemical reactions</li> <li>• Analyzing stoichiometric relationships</li> </ul>		SE: Chemical Equations 67-70; Patterns of Chemical Reactivity 70-74; Atomic and Molecular Weights 74-77; The Mole 77-82; Empirical Formulas from Analyses 83-86; Quantitative Information from Balanced Equations 86-90; Limiting Reagents 91-94; Solution Stoichiometry and Chemical Analysis 131-136; Balancing Oxidation-Reduction Reactions 753-758; Electrolysis 785-793  LM: Experiment 4: Chemical Reactions; Experiment 5: Chemical Formulas; Experiment 16: Electrolysis, the Faraday, and Avogadro's Number; Experiment 21: Reactions in Aqueous Solutions: Metathesis Reactions and Net Ionic Equations  TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	32. Apply quantitative relationships among pressure, volume, temperature, and number of particles in ideal gases.		SE: Pressure 353-358; The Gas Laws 358-362; The Ideal-Gas Equation 362-366; Further Applications of the Ideal-Gas Equation 367-369; Gas Mixtures and Partial Pressures 369-373; Molecular Effusion and Diffusion 376-379  LM: Experiment 13: Behavior of Gases: Molar Mass of a Vapor; Experiment 14: Determination of R: The Gas-Law Constant  TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>

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	33. Analyze factors affecting reaction rates in relation to the kinetic theory. <ul style="list-style-type: none"> <li>• Temperature</li> <li>• Surface area</li> <li>• Catalyst</li> <li>• Concentration</li> <li>• Nature of reactants</li> </ul>		SE: Reaction Rates 510-514; The Dependence of Rate on Concentration 515-518; The Change of Concentration with Time 519-525; Temperature and Rate 525-532; Catalysis 539-547 LM: Experiment 27: Rates of Chemical Reactions I: A Clock Reaction; Experiment 28: Rates of Chemical Reactions II: Rate and Order of H <sub>2</sub> O <sub>2</sub> Decomposition TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	34. Explain physical and chemical changes as endothermic and exothermic energy changes. <ul style="list-style-type: none"> <li>• Specific heat calculations</li> <li>• Heats of fusion and vaporization</li> <li>• Heats of solution</li> <li>• Heats of reaction</li> </ul>		SE: The First Law of Thermodynamics 149-153; Enthalpy 153-154; Enthalpies of Reaction 155-158; Calorimetry 158-164; Hess's Law 164-166; Enthalpies of Formation 166-167; Foods and Fuels 170-176; Phase Changes 405-408 LM: Experiment 26: Heat of Neutralization TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>
	35. Apply LeChâtelier's principle to explain a variety of changes in physical and chemical equilibria.		SE: Vapor Pressure 409-411; Phase Diagrams 412-414; The Concept of Equilibrium 560-562; Le Châtelier's Principle 576-584; The Common-Ion Effect 641-644 TECH: Central Science Student CD-ROM; Central Science Live Companion Website: <a href="http://www.prenhall.com/brown">www.prenhall.com/brown</a>

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