

## Pine Hill Public Schools Curriculum

Content Area:	<b>Science</b>		
Course Title/ Grade Level:	AP Chemistry / 11 or 12th grade		
Unit 1:	Mathematics of Chemistry	Duration:	<b>1 week</b>
Unit 2:	Atoms, molecules and Ions	Duration:	<b>1 ½ weeks</b>
Unit 3:	Stoichiometry	Duration:	<b>1 week</b>
Unit 4:	Reactions in solution, REDOX equations	Duration:	<b>2 weeks</b>
Unit 5:	Gases	Duration:	<b>1 ½ weeks</b>
Unit 6:	Electronic structure of the elements	Duration:	<b>1 ½ weeks</b>
Unit 7:	Chemical Bonding	Duration:	<b>2 weeks</b>
Unit 8:	Intro to Thermodynamics	Duration:	<b>2 weeks</b>
Unit 9:	Liquids and Solids	Duration:	<b>2 weeks</b>
Unit 10:	Solutions	Duration:	<b>2 weeks</b>
Unit 11:	Reaction Rates and Equilibrium	Duration:	<b>3 ½ weeks</b>
Unit 12:	Gaseous Chemical Equilibrium	Duration:	<b>2 weeks</b>
Unit 13:	Acids and Bases	Duration:	<b>3 weeks</b>
Unit 14:	Precipitation Equilibria	Duration:	<b>3 ½ weeks</b>
Unit 15:	Spontaneity in Chemical Reactions	Duration:	<b>1 week</b>
Unit 16:	Special Topics in Chemistry	Duration:	<b>1 week</b>
Date Created or Revised:	2011		
BOE Approval Date:	8/28/12		

**Pine Hill Public Schools  
Science Curriculum**

<b>Unit Title:</b> Mathematics of Chemistry		<b>Unit # 1</b>
<b>Course or Grade Level:</b> AP Chemistry		<b>Length of Time:</b> 1 week
<b>Pacing</b>		
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• In science how do you communicate information that has a numerical format</li> <li>• What are the ways to treat numbers when making measurements</li> <li>• How can we make sure that we communicate what we are measuring</li> </ul>	
<b>Content</b>	<ul style="list-style-type: none"> <li>• Scalar and vector measurements</li> <li>• Essential parts of a graph</li> <li>• Types of measurements</li> <li>• Metric system</li> <li>• Significant digits</li> <li>• Rules for rounding measurements</li> <li>• Scientific notation</li> <li>• Scientific method of problem solving</li> <li>• Writing a lab report</li> </ul>	
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Writing lab reports</li> <li>• Following directions when performing an experiment</li> <li>• Correct use of laboratory equipment</li> <li>• Problem solving and note taking</li> </ul>	
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Display information and interpret information on various types of graphs (line graphs, histograms, pie charts...)</li> <li>• Express measurements using appropriate labels and units</li> <li>• Perform calculations and report answers with the appropriate amount of significant digits</li> <li>• Express measurements metric units</li> <li>• Express measurements in various magnitudes using metric prefixes</li> <li>• Use the rule for expressing answers to calculations with the correct number of significant digits</li> <li>• Express numbers in scientific notation</li> <li>• Analyze information using experimental error</li> </ul>	
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>	
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>	
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>	
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>	

**2009 NJCCCS**

**Standard:** 5.1, 5.2

**Strand(s):** A, B, D -A

**Content Statement(s):**

**CPI # / CPI(s):** 1,2-1,3-2,3-4


21<sup>st</sup> Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u>21<sup>st</sup> Century Skills</u>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

<b>Unit Title:</b> Atoms, molecules and Ions		<b>Unit # 2</b>
<b>Course or Grade Level:</b> AP CHEMISTRY		<b>Length of Time:</b> 1.5 week
<b>Pacing</b>		
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• What are some of the fundamental laws of chemistry?</li> <li>• What is the modern interpretation of the atom?</li> <li>• How are chemical compounds named?</li> </ul>	
<b>Content</b>	<ul style="list-style-type: none"> <li>• Dalton's Atomic theory and the laws of chemistry</li> <li>• Experiments that portray the structure of the atom</li> <li>• Describe how atoms can form compounds</li> <li>• Chemical nomenclature for binary and ternary compounds</li> <li>• Chemical nomenclature for naming acids</li> </ul>	
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Interpret the laws of chemistry and how they contribute to the modern view of the atom</li> <li>• Express isotope identity using nuclear symbols</li> <li>• Interpret experimental results that describe atomic structure</li> <li>• Name binary and ternary compounds for monovalent cations</li> <li>• Name compounds using polyvalent cations using –ous, -ic technique</li> <li>• Name compounds using polyvalent cations using the stock system</li> <li>• Name molecular compounds using the Greek Prefix system</li> <li>• Name acids and bases</li> </ul>	
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Display information and interpret information on various types of graphs (line graphs, histograms, pie charts...)</li> <li>• Express measurements using appropriate labels and unit</li> </ul>	
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>	
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>	
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>	
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>	

**2009 NJCCCS**

**Standard:** 5.1, 5.2

**Strand(s):** A,B,D - A

**Content Statement(s):**

**CPI # / CPI(s):**

(1,2), (1,3), (2,3)

21<sup>st</sup> Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u>21<sup>st</sup> Century Skills</u>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

<b>Unit Title:</b> Stoichiometry		<b>Unit # 3</b>
<b>Course or Grade Level:</b> AP CHEMISTRY		<b>Length of Time:</b> 1 week
<b>Pacing</b>		
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• What is the mathematical relationship between elements as they form compounds</li> </ul>	
<b>Content</b>	<ul style="list-style-type: none"> <li>• Determining atomic and molecular mass</li> <li>• Determining percent composition</li> <li>• Empirical and molecular formula calculation</li> <li>• Types of chemical reactions</li> <li>• Balancing chemical equations</li> <li>• Stoichiometric calculations</li> <li>• Redox reactions</li> </ul>	
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Use the mole concept to convert among moles, mass and number of particles of a sample</li> <li>• Calculate mass percents of the parts of a compound</li> <li>• Calculate the empirical and molecular formula of a compound from experimental data</li> <li>• To identify the characteristics of a chemical reaction and the information given by a balanced equation</li> <li>• Perform stoichiometric calculations using balanced equations</li> <li>• Balance redox reactions in acid and basic solutions</li> </ul>	
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of percents and proportions</li> </ul>	
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>	
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>	
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> <li>•</li> </ul>	
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>	
<b>2009 NJCCCS</b>		
<b>Standard:</b> 5.1, 5.2		
<b>Strand(s):</b> A,B,D – A, B,D		
<b>Content Statement(s):</b>	<b>CPI # / CPI(s):</b> (1,2,3), (2), (2,3), (1,2,3), (1,2,3), (1,2,3)	

<u>21<sup>st</sup> Century Themes</u>							
	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u>21<sup>st</sup> Century Skills</u>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

**Unit Title:** Reactions in solution, REDOX equations

**Unit # 4**

**Course or Grade Level:** AP CHEMISTRY

**Length of Time:** 2 week

**Pacing**

**Essential Questions**

- How do chemicals behave in an aqueous environment

**Content**

- Behavior of solutes in water
- Measurements of solute concentration
- Solution stoichiometry
- Predicting precipitates
- Colligative properties of solution

**Skills**

- Classify compounds as electrolytes or nonelectrolytes
- Perform calculations to determine solution concentration (molarity, molality, mole fraction)
- Perform calculations involving colligative properties of solutions (freezing point, boiling point, osmotic pressure, Raoult's Law)
- Predict the precipitates when solutions are mixed
- Solve stoichiometric calculations when reactants are in solution

**Math Skills/  
Science  
Processes**

- Express measurements with appropriate labels
- Mathematically convert measurements into desired units to correctly solve problems
- Input data into calculators for solving problems
- Understand the concept of percents and proportions

**Assessments**

- Chapter tests
- Vocabulary lists
- Study guides
- Homework assignments
- Experiments/reports
- Chapter problem solutions

**Interventions /  
differentiated  
instruction**

- Provide advanced notice for tests
- Present materials suitable to student's level of functioning
- Include hands-on-activities

**Inter-  
disciplinary  
Connections**

- Mathematical connections
- Connection to English
- Science and society
- Scientific discoveries and the link to Ethics

**Lesson  
resources /  
Activities**

- Hands-on-activities
- Laboratory exercises related to subject matter
- Chapter study guides
- Oral presentation of chapter concepts

**2009 NJCCCS**

**Standard:** 5.1, 5.2

**Strand(s):** A,B,D – A,C

**Content Statement(s):**

**CPI # / CPI(s):** (1,2,3), (1,2,3,4), (1,2,3)

**21<sup>st</sup> Century Themes**

Global Awareness

Financial, Economic,  
Business, and Entrepreneurial  
Literacy

Civic Literacy

Health Literacy



21<sup>st</sup> Century Skills

	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

<b>Unit Title:</b> Gases		<b>Unit # 5</b>
<b>Course or Grade Level:</b> AP CHEMISTRY		<b>Length of Time:</b> 1.5 week
<b>Pacing</b>		
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• What factors affect the behavior of matter in the gas phase</li> </ul>	
<b>Content</b>	<ul style="list-style-type: none"> <li>• Measuring gas pressure</li> <li>• Gas Laws (Boyle, Charles, Avogadro, Combined)</li> <li>• Gas Equation of State</li> <li>• Kinetic-Molecular Theory</li> <li>• Ideal gas vs. Real gas behavior</li> <li>• van der Waals equation</li> <li>• Graham's Law</li> </ul>	
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Convert gas pressures from one unit of measure to another</li> <li>• Solve gas problems for changing conditions using the gas laws</li> <li>• Determine gas characteristics using the gas equation of state</li> <li>• Use gas laws to solve stoichiometry problems in which one of the materials is a gas</li> <li>• Use the principles of the Kinetic-Molecular Theory to explain gas behavior</li> <li>• Explain how a real gas deviates in behavior from an ideal gas</li> </ul>	
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of percents and proportions</li> </ul>	
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>	
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>	
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>	
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>	
<b>2009 NJCCCS</b>		
<b>Standard:</b> 5.1, 5.2		
<b>Strand(s):</b> A,B,D – A,D		
<b>Content Statement(s):</b>		<b>CPI # / CPI(s):</b> (1), (1,3), (1,2,3), (1,3), (1)

21<sup>st</sup> Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u>21<sup>st</sup> Century Skills</u>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

<b>Unit Title:</b> Electronic structure of the elements		<b>Unit # 6</b>
<b>Course or Grade Level:</b> AP CHEMISTRY		<b>Length of Time:</b> 1.5 week
<b>Pacing</b>		
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• How are electrons arranged in the atom?</li> <li>• How does the electron distribution within the atom affect the physical and chemical properties of the element?</li> </ul>	
<b>Content</b>	<ul style="list-style-type: none"> <li>• The nature of electromagnetic radiation</li> <li>• Bohr model of the atom</li> <li>• Quantum Mechanical model of the atom</li> <li>• Electron configuration</li> <li>• Quantum number designations</li> <li>• Lewis structures</li> <li>• Development of the periodic table</li> <li>• Periodic trends of atomic properties</li> </ul>	
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Describe the contributions of various scientists (Bohr, Millikan, Rutherford, Hund, Einstein, Schrodinger etc.) in the development of the modern view of the atom</li> <li>• Be able to write the ground state electron configuration for elements of the periodic table</li> <li>• Know the probability shapes of the electron sublevels</li> <li>• Give the quantum numbers for the electron positions of an element</li> <li>• Know the definition of the atomic properties that listed in the text</li> <li>• Be able to predict and explain variation in atomic properties by location of the elements on the periodic chart</li> </ul>	
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of percents and proportions</li> <li>• Use models and diagrams to illustrate concepts</li> </ul>	
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>	
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>	
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>	
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>	
<b>2009 NJCCCS</b>		
<b>Standard:</b> 5.1, 5.2		
<b>Strand(s):</b> A,B,C,D – A,B		
<b>Content Statement(s):</b>		<b>CPI # / CPI(s):</b> (3), (3), (2,3), (1)

<u>21<sup>st</sup> Century Themes</u>							
	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u>21<sup>st</sup> Century Skills</u>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

**Unit Title:** Chemical Bonding

**Unit # 7**

**Course or Grade Level:** AP CHEMISTRY

**Length of Time:** 2 week

<b>Pacing</b>	
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• What are the ways that atoms are joined together to form compounds?</li> <li>• How does the shape of a compound affect its properties</li> </ul>
<b>Content</b>	<ul style="list-style-type: none"> <li>• Types of chemical bonds (ionic, covalent, metallic)</li> <li>• Bond polarity</li> <li>• Energy of bond formation</li> <li>• Lewis structure of compounds</li> <li>• Molecular geometry (VSEPR theory)</li> <li>• Octet rule and its exceptions</li> <li>• Hybridization of orbitals</li> <li>• Sigma and pi bonds</li> <li>• Molecular orbital theory</li> <li>• Resonance bonding</li> </ul>
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Write Lewis symbols for common atoms, ions and compounds</li> <li>• Use electronegativity to predict bond polarity</li> <li>• Describe the formation of ionic and covalent bonds in terms of electron attractions</li> <li>• Explain dipole formation in molecules</li> <li>• Predict oxidation numbers of elements based on electron configuration</li> <li>• Predict the shape of molecules based on VSEPR theory</li> <li>• Use the concept of hybridization of orbitals to explain molecular geometry</li> <li>• Illustrate the basic molecular shapes by knowing the distribution of electrons around the central atom</li> <li>• Determine the basic crystal cell for an ionic compound</li> </ul>
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of percents and proportions</li> <li>• Use models and diagrams to illustrate concepts</li> </ul>
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>

**2009 NJCCCS**

**Standard:** 5.1, 5.2

<b>Strand(s):</b> A,B,C,D – A,C						
<b>Content Statement(s):</b>				<b>CPI # / CPI(s):</b> (3), (1,3), (2), (1,2,3), (2,5), (1,2)		
<u><b>21<sup>st</sup> Century Themes</b></u>						
	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy	Health Literacy
<u><b>21<sup>st</sup> Century Skills</b></u>						
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration	Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills	

**Pine Hill Public Schools  
Science Curriculum**

<b>Unit Title:</b> Intro to Thermodynamics		<b>Unit # 8</b>
<b>Course or Grade Level:</b> AP CHEMISTRY		<b>Length of Time:</b> 2 week
<b>Pacing</b>		
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• How do the Laws of Thermodynamics govern the behavior of a chemical reaction?</li> </ul>	
<b>Content</b>	<ul style="list-style-type: none"> <li>• Spontaneous processes and entropy</li> <li>• The second law of thermodynamics</li> <li>• Entropy changes in chemical reactions</li> <li>• Enthalpy changes in a chemical reaction</li> <li>• Free energy and chemical reactions</li> <li>• Electrochemistry and cell potential</li> <li>• Electrochemical cells and calculations</li> </ul>	
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Explain the concept of entropy and its role in a spontaneous process</li> <li>• Use the second law of thermodynamics to determine entropy changes</li> <li>• Apply the relationship between changes in entropy and enthalpy at a stated temperature</li> <li>• Use the concept of free energy in the equation <math>G = H - TS</math> to determine reaction spontaneity</li> <li>• Calculate enthalpy changes, entropy changes and free energy changes in chemical reactions</li> <li>• Use Hess's Law to determine the enthalpy of formation of a compound</li> <li>• Use free energy of formation to predict reaction spontaneity</li> <li>• Show the relationship between K and changes in free energy</li> <li>• Use the formula <math>\Delta G^{\circ} = -RT\ln(K)</math> to determine direction of a reaction</li> </ul>	
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of percents and proportions</li> <li>• Interpreting graphs and diagrams</li> </ul>	
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>	
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>	
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>	
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>	

**2009 NJCCCS**

**Standard:** 5.1, 5.2

**Strand(s):** A,B,C – C,D

**Content Statement(s):**

**CPI # / CPI(s):** (2), (3), (1), (1), (4,5)




21<sup>st</sup> Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u>21<sup>st</sup> Century Skills</u>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

**Unit Title:** Liquids and Solids

**Unit # 9**

**Course or Grade Level:** AP CHEMISTRY

**Length of Time:** 2 week

<b>Pacing</b>	
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• What are the dynamics involved in changing the state of matter</li> </ul>
<b>Content</b>	<ul style="list-style-type: none"> <li>• Intermolecular forces of attraction (London forces, van der Waals hydrogen bonding)</li> <li>• Behavior of matter in the liquid state</li> <li>• Vapor pressure and changes of state</li> <li>• Phase diagrams</li> <li>• Metallic bonding</li> <li>• Unit cells</li> </ul>
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Compare the normal boiling point or freezing point value for elements or compounds based on a comparison of their intermolecular forces of attraction</li> <li>• Explain how hydrogen bonding can account for deviations in expected values for boiling points and freezing points</li> <li>• Explain the bonding between atoms in a metallic solid in terms of empty orbitals and a mobile sea of electrons</li> <li>• Interpret phase diagrams to show the strength of intermolecular forces of attraction</li> </ul>
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of percents and proportions</li> <li>• Interpreting graphs and diagrams</li> </ul>
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>

**2009 NJCCCS**

**Standard:** 5.1, 5.2

**Strand(s):** A,B,D – A,B,C,D

**Content Statement(s):**

**CPI # / CPI(s):** (1,2,3), (1), (2), (2), (3), 1,2), (4)

**21<sup>st</sup> Century Themes**

Global Awareness

Financial, Economic,  
Business, and Entrepreneurial  
Literacy

Civic Literacy

Health Literacy

21<sup>st</sup> Century Skills

	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

<b>Unit Title:</b> Solutions		<b>Unit # 10</b>
<b>Course or Grade Level:</b> AP CHEMISTRY		<b>Length of Time:</b> 2 week
<b>Pacing</b>		
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• How do the Laws of Thermodynamics govern the behavior of a chemical reaction?</li> </ul>	
<b>Content</b>	<ul style="list-style-type: none"> <li>• Spontaneous processes and entropy</li> <li>• The second law of thermodynamics</li> <li>• Entropy changes in chemical reactions</li> <li>• Enthalpy changes in a chemical reaction</li> <li>• Free energy and chemical reactions</li> <li>• Electrochemistry and cell potential</li> <li>• Electrochemical cells and calculations</li> </ul>	
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Explain the concept of entropy and its role in a spontaneous process</li> <li>• Use the second law of thermodynamics to determine entropy changes</li> <li>• Apply the relationship between changes in entropy and enthalpy at a stated temperature</li> <li>• Use the concept of free energy in the equation <math>G = H - TS</math> to determine reaction spontaneity</li> <li>• Calculate enthalpy changes, entropy changes and free energy changes in chemical reactions</li> <li>• Use Hess's Law to determine the enthalpy of formation of a compound</li> <li>• Use free energy of formation to predict reaction spontaneity</li> <li>• Show the relationship between K and changes in free energy</li> <li>• Use the formula <math>\Delta G^{\circ} = -RT\ln(K)</math> to determine direction of a reaction</li> </ul>	
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of percents and proportions</li> <li>• Interpreting graphs and diagrams</li> </ul>	
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>	
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>	
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>	
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>	
<b>2009 NJCCCS</b>		
<b>Standard:</b> 5.1, 5.2		
<b>Strand(s):</b> A,B,C – C,D		
<b>Content Statement(s):</b>	<b>CPI # / CPI(s):</b> (2), (3), (1), (1), (4,5)	

21<sup>st</sup> Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u>21<sup>st</sup> Century Skills</u>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

**Unit Title:** Reaction Rates and Equilibrium

**Unit # 11**

**Course or Grade Level:** AP CHEMISTRY

**Length of Time:** 3.5 week

<b>Pacing</b>	
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• What are the factors that drive chemical reactions?</li> <li>• How does LeChatelier's Principle describe reaction tendencies?</li> </ul>
<b>Content</b>	<ul style="list-style-type: none"> <li>• Solubility equilibria and solubility product</li> <li>• Reaction rates and rate law expression</li> <li>• Determining rate order</li> <li>• Reaction mechanisms</li> <li>• Reaction kinetics</li> <li>• Equilibrium constants</li> <li>• Equilibrium expression involving pressure and/or concentrations</li> <li>• Solving equilibrium problems</li> <li>• Applying Le Chatelier's Principle</li> <li>• Catalysts in chemical reactions</li> </ul>
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Determine reaction rates from experimental data</li> <li>• Calculate the form of the rate law for a reaction using the method of initial rates</li> <li>• Determine the order of reaction using concentration and reaction time</li> <li>• To propose a reaction mechanism and apply the concept of the rate determining step</li> <li>• Use the collision model to describe reaction kinetics</li> <li>• Determine activation energy from values of <math>\ln(k)</math> and <math>1/T</math></li> <li>• Describe the role of catalysts in reaction rates</li> <li>• Determine the law of mass action and calculate the <math>K_{eq}</math> and <math>K_p</math> for reactions</li> <li>• Predict the direction of a system to reach equilibrium by applying Le Chatelier's Principle</li> <li>• Solve equilibrium calculations</li> <li>• Calculate the solubility product of a salt from its solubility</li> <li>• Use <math>K_{sp}</math> values to compare solubility of salts</li> </ul>
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of logarithmic relationships</li> <li>• Interpreting graphs and diagrams</li> </ul>
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>

<b>Standard:</b> 5.1, 5.2							
<b>Strand(s):</b> A,B,C,D – A,C,D							
<b>Content Statement(s):</b>				<b>CPI # / CPI(s):</b> (2,3), (1,2), (3), (2), (1,6), (1), (5)			
<u><b>21<sup>st</sup> Century Themes</b></u>							
	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u><b>21<sup>st</sup> Century Skills</b></u>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

<b>Unit Title:</b> Gaseous Chemical Equilibrium		<b>Unit # 12</b>
<b>Course or Grade Level:</b> AP CHEMISTRY		<b>Length of Time:</b> 2 week
<b>Pacing</b>		
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• How do reversible reactions behave as reaction time progresses</li> <li>• How can the equilibrium state of a reaction be mathematically determined</li> </ul>	
<b>Content</b>	<ul style="list-style-type: none"> <li>• Interaction of forward and reverse reactions</li> <li>• Writing the equilibrium constant expression</li> <li>• Determining K from experimental data</li> <li>• Applications of the equilibrium constant</li> <li>• Using the equilibrium expression at non-standard conditions</li> </ul>	
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Describing quantitatively the progress of a reversible reaction as it heads toward equilibrium</li> <li>• Using partial pressures to determine an equilibrium constant</li> <li>• Applying the reciprocal rule to chemical equilibria</li> <li>• Applying the rule of multiple equilibria</li> <li>• Applying the coefficient rule to determine an equilibrium constant</li> <li>• Solving for equilibria in heterogeneous conditions</li> <li>• Using the reaction quotient to determine direction of a reaction</li> <li>• Solve problems involving changes in the conditions on an equilibrium system</li> <li>• Using the van't Hoff equation so solve for equilibrium problems</li> </ul>	
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of logarithmic relationships</li> <li>• Interpreting graphs and diagrams</li> </ul>	
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>	
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>	
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>	
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>	
<b>2009 NJCCCS</b>		
<b>Standard:</b> 5.1, 5.2		
<b>Strand(s):</b> A,B,D – A,C,D		
<b>Content Statement(s):</b>		<b>CPI # / CPI(s):</b> (3), (1), (1), (2), (1), (5)



<b><u>21<sup>st</sup> Century Themes</u></b>							
	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<b><u>21<sup>st</sup> Century Skills</u></b>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

**Unit Title:** Acids and Bases

**Unit # 13**

**Course or Grade Level:** AP CHEMISTRY

**Length of Time:** 3 week

<b>Pacing</b>	
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• What are the characteristics of acids and bases?</li> <li>• How do acids and bases interact with each other?</li> </ul>
<b>Content</b>	<ul style="list-style-type: none"> <li>• pH scale</li> <li>• Acid-base theories (Arrhenius, Bronsted-Lowry, Lewis)</li> <li>• Calculating pH of strong acid or base</li> <li>• Calculating pH of weak acid or base</li> <li>• Affect of salt solutions on pH</li> <li>• Acid and basic anhydrides</li> <li>• Titrations of acids and bases</li> <li>• Common ion effect</li> <li>• Buffer solutions</li> <li>• Titration curves and acid-base indicators</li> </ul>
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Use the acid-base theories to determine the nature of chemical compounds</li> <li>• Derive the expression for the dissociation constant of a weak acid or base</li> <li>• Write dissociation equations for acids and bases</li> <li>• Compare acid strengths based on dissociation constants</li> <li>• Calculate pH of strong acid or base solutions</li> <li>• Use pH to determine solution concentrations</li> <li>• Calculate pH of weak acid or base solutions</li> <li>• Determine percent dissociation of acid or base solutions</li> <li>• Calculate dissociation constants from percent dissociation</li> <li>• Calculate the pH of polyprotic acid or base solutions</li> <li>• Calculate the pH of salt solutions</li> <li>• Calculate pH of buffer solutions</li> <li>• Calculate the pH of a solution at different stages in a titration</li> <li>• Interpret titration curves</li> <li>• Selecting a suitable indicator</li> </ul>
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of logarithmic relationships</li> <li>• Interpreting graphs and diagrams</li> </ul>
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>

<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>						
<b>2009 NJCCCS</b>							
<b>Standard:</b> 5.1, 5.2							
<b>Strand(s):</b> A,B,D – A,C,D							
<b>Content Statement(s):</b>				<b>CPI # / CPI(s):</b> (3), (1), (1), (2), (1), (5)			
<u><b>21<sup>st</sup> Century Themes</b></u>							
	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u><b>21<sup>st</sup> Century Skills</b></u>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

**Unit Title:** Precipitation Equilibria

**Unit # 14**

**Course or Grade Level:** AP CHEMISTRY

**Length of Time:** 3.5 week

<b>Pacing</b>	
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• What is the equilibrium involved in the formation of a precipitate</li> <li>• How can the formation of a precipitate be calculated from solution concentrations</li> </ul>
<b>Content</b>	<ul style="list-style-type: none"> <li>• Solubility equilibria and solubility product</li> <li>• Calculating solubility from solubility product expression</li> <li>• Determining whether a precipitate will form</li> <li>• Applying the common ion effect to formation of precipitates</li> <li>• Applying solubility principles to selective precipitation</li> </ul>
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Writing solubility expressions</li> <li>• Calculate <math>K_{sp}</math> from solubility</li> <li>• Determining molarity from <math>K_{sp}</math> expression</li> <li>• Solving problems involving the common ion effect and <math>K_{sp}</math></li> <li>• Calculate the solubility product of a salt from its solubility</li> <li>• Use <math>K_{sp}</math> values to compare solubility of salts</li> </ul>
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of logarithmic relationships</li> <li>• Interpreting graphs and diagrams</li> </ul>
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>

**2009 NJCCCS**

**Standard:** 5.1, 5.2

**Strand(s):** A,B,C,D – A,C,D

**Content Statement(s):**

**CPI # / CPI(s):** (2,3), (1,2), (3), (2), (1,6), (1), (5)

[21<sup>st</sup> Century Themes](#)

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<b><u>21<sup>st</sup> Century Skills</u></b>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

**Unit Title:** Spontaneity in Chemical Reactions

**Unit # 15**

**Course or Grade Level:** AP CHEMISTRY

**Length of Time:** 1 week

<b>Pacing</b>	
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• What are the factors that determine the spontaneity of a reaction</li> <li>• How are entropy, enthalpy and Gibbs free energy interrelated</li> </ul>
<b>Content</b>	<ul style="list-style-type: none"> <li>• What is the role of entropy in a change of a state</li> <li>• Using the second Law of Thermodynamics</li> <li>• What is Gibbs Free Energy</li> <li>• Application of the Gibbs-Helmholtz equation</li> <li>• Effect of pressure and concentration changes with respect to reaction spontaneity</li> </ul>
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Calculating entropy changes in a chemical reaction</li> <li>• Calculating free energy for a chemical reaction</li> <li>• Calculate free energy changes at other than standard temperature</li> <li>• Solving for free energy changes involving the equilibrium constant</li> <li>• Calculate the solubility product of a salt from its solubility</li> <li>• Use Ksp values to compare solubility of salts</li> </ul>
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of logarithmic relationships</li> <li>• Interpreting graphs and diagrams</li> </ul>
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Chapter tests</li> <li>• Vocabulary lists</li> <li>• Study guides</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> <li>• Chapter problem solutions</li> </ul>
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>

**2009 NJCCCS**

**Standard:** 5.1, 5.2

**Strand(s):** A,B,C,D – A,C,D

**Content Statement(s):**

**CPI # / CPI(s):** (2,3), (1,2), (3), (2), (1,6), (1), (5)

[21<sup>st</sup> Century Themes](#)

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<b><u>21<sup>st</sup> Century Skills</u></b>							
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

**Pine Hill Public Schools  
Science Curriculum**

<b>Unit Title:</b> Special Topics in Chemistry		<b>Unit # 16</b>
<b>Course or Grade Level:</b> AP CHEMISTRY		<b>Length of Time:</b> 1 week
<b>Pacing</b>		
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>• How can the concepts of chemistry be used to solve special problems</li> </ul>	
<b>Content</b>	<ul style="list-style-type: none"> <li>• Qualitative analysis</li> <li>• Special projects in chemistry</li> </ul>	
<b>Skills</b>	<ul style="list-style-type: none"> <li>• Use the principles of chemistry to isolate and identify the components of a chemical compound</li> <li>• Research a topic in chemistry and devise a strategy to solve the problem</li> </ul>	
<b>Math Skills/ Science Processes</b>	<ul style="list-style-type: none"> <li>• Express measurements with appropriate labels</li> <li>• Mathematically convert measurements into desired units to correctly solve problems</li> <li>• Input data into calculators for solving problems</li> <li>• Understand the concept of logarithmic relationships</li> <li>• Interpreting graphs and diagrams</li> </ul>	
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Teacher evaluation of special projects</li> <li>• End of course exam</li> <li>• Homework assignments</li> <li>• Experiments/reports</li> </ul>	
<b>Interventions / differentiated instruction</b>	<ul style="list-style-type: none"> <li>• Provide advanced notice for tests</li> <li>• Present materials suitable to student's level of functioning</li> <li>• Include hands-on-activities</li> </ul>	
<b>Inter-disciplinary Connections</b>	<ul style="list-style-type: none"> <li>• Mathematical connections</li> <li>• Connection to English</li> <li>• Science and society</li> <li>• Scientific discoveries and the link to Ethics</li> </ul>	
<b>Lesson resources / Activities</b>	<ul style="list-style-type: none"> <li>• Hands-on-activities</li> <li>• Laboratory exercises related to subject matter</li> <li>• Chapter study guides</li> <li>• Oral presentation of chapter concepts</li> </ul>	

**2009 NJCCCS**

**Standard:**

**Strand(s):**

**Content Statement(s):**

**CPI # / CPI(s):**

[21<sup>st</sup> Century Themes](#)

Global Awareness	Financial, Economic, Business, and Entrepreneurial Literacy	Civic Literacy	Health Literacy
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[21<sup>st</sup> Century Skills](#)

Creativity and Innovation	Critical Thinking and Problem Solving	Communication and Collaboration	Information Literacy
Media Literacy	ICT Literacy	Life and Career Skills	