ADV CHEM: FALL TRIMESTER: Units 1-5		
Week	**Topics**	**Labs/Activities**
1-6	**REVIEW UNITS 1-4/10TH GRADE CHEM** **UNIT 1: ATOMIC STRUCTURE AND PROPERTIES** **UNIT 2: MOLECULAR AND IONIC COMPOUND STRUCTURE AND PROPERTIES** **UNIT 3: INTERMOLECULAR FORCES AND PROPERTIES** **UNIT 4: CHEMICAL REACTIONS** • Summer Packet Review and Test • Students work in groups to make complete a series of labs where labs will be assessed through a lab contract. • Lab Safety: Activities to relate to SDS sheets, safe practices in lab and at home including a lab safety QA and the completion of safety contracts	▪ Gravimetric Analysis: *What Makes Hard Water Hard?** ▪ Titration: *How Much Acid is in Fruit Juices and Soft Drinks?** ▪ Beer's Law: Co^{2+} concentration in soil ▪ Separation by Paper Chromatography ▪ Standardization of a NaOH solution ▪ Molar Mass of a Butane Lab
7-10	**UNIT 5: KINETICS** **Topic 5.1:** Reaction rates **Topic 5.2:** Introduction to Rate Law **Topic 5.3:** Concentration Changes Over Time **Topic 5.4:** Elementary Reactions **Topic 5.5:** Collision Model **Topic 5.6 & 5.10:** Reaction Energy Profiles **Topic 5.7:** Introduction to Reaction mechanisms **Topic 5.11:** Catalysis	▪ Reactions & Rates PhET Activity (Students work through a series of activities focusing on enhancing their understanding of reactions and rates across multiple representations. ▪ Prep: Determine the Rate Law for Bleach & Food Dye Rxn* (Students are asked to determine the rate law of the reaction between bleach and a food color of their choice. They are given no further instruction.) ▪ Catalytic Decomposition of Hydrogen Peroxide (Students add several different components to H_2O_2 and measure rate of decomposition. For those that act as catalysts, student must assign the class of catalysis.)
11	**Review and Unit 5 EXAM**	
12	**THANKSGIVING BREAK**	

Note: * denotes an inquiry based activity. Those titles that are italicized denote investigations from the AP guided-inquiry experiments from the College Board

ADV CHEM: WINTER TRIMESTER: Units 6 and 9 (Partial)		
Week	**Topics**	**Labs/Activities**
1-3	**UNIT 6: THERMODYNAMICS** **Topic 6.1:** Endothermic and Exothermic Reactions **Topic 6.2:** Energy Diagrams **Topic 6.3:** Heat Transfer and Thermal Equilibrium **Topic 6.4**: Heat Capacity and Calorimetry **Topic 6.6**: Introduction to Enthalpy of Reaction **Topic 6.7**: Bond Enthalpies	▪ Maxwell-Boltzmann Distribution: Conceptual Analysis (Students run the ActivPhysics Online simulation & answer questions.) ▪ Calorimetry: *The Hand Warmer Design Challenge: Where Does the Heat Come From?**
	WINTER BREAK	
4-6	**UNIT 6: THERMODYNAMICS (cont.)** **Topic 6.8**: Enthaply of Formation **Topic 6.9**: Hess' Law	▪ Using Hess's Law in an Acid-Base Reaction ▪ Enthalpy of Combustion for MgO* (Students must design a lab given a materials list and the knowledge that ΔH must be measured indirectly.)
7-9	**UNIT 9: APPLICATIONS OF THERMODYNAMICS** **Topic 9.1**: Introduction to Entropy **Topic 9.2**: Absolute Entropy and Entropy Change **Topic 9.3**: Gibbs Free Energy and Thermodynamic Favorability **Topic 9.4**: Thermodynamic and Kinetic Control	▪ Entropy (Students engage in the Chemtours Activity) ▪ Spontaneity Lab* **(**Students observe multiple reactions or processes to explain the possible spontaneity both qualitatively and quantitatively.
10-11	**UNIT 7: EQUILIBRIUM** **Topic 7.1**: Introduction to Equilibrium **Topic 7.2**: Direction of Reversible Reactions **Topic 7.3**: Reaction Quotient and Equilibrium Constant **Topic 7.4**: Calculating the Equilibrium Constant **Topic 7.5**: Magnitude of the Equilibrium Constant **Topic 7.6**: Properties of the Equilibrium Constant **Topic 7.7**: Calculating Equilibrium Concentrations **Topic 7.9**: Introduction to La Chatelier's Principle **Topic 7.10:** Reaction Quotient and La Chatelier's Principle	▪ Equilibrium: Can We Make the Colors of the Rainbow? An Application of Le Chatelier's Principle. *
12	**Review and Unit 6/9 EXAM**	

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ADV CHEM: SPRING TRIMESTER: Units 7 (cont.), 8 and 9 (partial)		
Week	**Topics**	**Labs/Activities**
1	**UNIT 9: APPLICATIONS OF THERMODYNAMICS** **Topic 9.5:** Free Energy and Equilibrium	Spontaneity Lab Revisited* (Students take a look back at the spontaneity lab using ΔG° and RT to estimate K where appropriate. They will then expand their conclusions to incorporate a qualitative analysis of equilibria.)
2-4	**UNIT 8: ACIDS AND BASES** **Topic 8.1:** Introduction to Acids and Bases **Topic 8.2:** pH and pOH of Strong Acids and Bases **Topic 8.3:** Weak Acid and Base Equilibria **Topic 8.7:** pH and pKa **Topic 8.6:** Molecular Structure of Acids and Bases	▪ Chem Activity 43: Acid Strength ▪ Chem Activity 46: Relative Acid Strength ▪ Chem Activity 47" Acid/Base Strength of Conjugate Pairs
5	**EBC**	
	SPRING BREAK	
6-9	**Topic 8.4:** Acid-Base Reactions and Buffers **Topic 8.5:** Acid-Base Titrations **Topic 8.8:** Properties of Buffers **Topic 8.9:** Henderson-Hasselbach Equation **Topic 8.10:** Buffer Capacity	▪ Acid-Base Titration: *How do the Structure and the Initial Concentration of an Acid and a Base Influence the pH of the Resultant Solution During a Titration?** ▪ Buffer Design: *The Preparation and Testing of an Effective Buffer: How Do Components Influence a Buffer's pH and Capacity?**
10	**Topic 7.11:** Introduction to Solubility Equilibria **Topic 7.12:** Common-Ion Effect **Topic 7.13:** pH and Solubility **Topic 7.14:** Free Energy of Dissolution	▪ Chem Activity 41: The Solubility Product ▪ Connecting Solubility, Equilibrium and Periodicity in a Green, Inquiry Experiment* (Students titrate three hydroxide solutions to determine the relationship between periodicity and solubility of the cations.)
11	**FINAL EXAM WEEK**	
12	**GRADUATION**	
9	**AP Exam on May 18th, 2021 Recommended over the first date of 5/2 (Week 7)**	

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