Randolph Township Schools
Randolph High School

AP Chemistry Curriculum

" An investment in knowledge pays the best interest"
~ Benjamin Franklin

Department of
Science, Technology, Engineering, and Math
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Curriculum Developed
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Board APPROVAL
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Randolph Township Schools
Department of Science, Technology, Engineering, and Math

AP Chemistry

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Randolph Township Schools

Mission Statement

We commit to inspiring and empowering all students in Randolph Schools to reach their full potential as unique, responsible and educated members of a global society.

Randolph Township Schools
Affirmative Action Statement

Equality and Equity in Curriculum

The Randolph Township School district ensures that the district's curriculum and instruction are aligned to the state's standards. The curriculum addresses the elimination of discrimination and the achievement gap, as identified by underperforming school-level AYP reports for state assessments. The curriculum provides equity in instruction, educational programs and provides all students the opportunity to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

N.J.A.C. 6A:7-1.7(b): Section 504, Rehabilitation Act of 1973; N.J.S.A. 10:5; Title IX, Education Amendments of 1972

RANDOLPH TOWNSHIP BOARD OF EDUCATION
EDUCATIONAL GOALS
VALUES IN EDUCATION

The statements represent the beliefs and values regarding our educational system. Education is the key to self-actualization, which is realized through achievement and self-respect. We believe our entire system must not only represent these values, but also demonstrate them in all that we do as a school system.

We believe:

- The needs of the child come first
- Mutual respect and trust are the cornerstones of a learning community
- The learning community consists of students, educators, parents, administrators, educational support personnel, the community and Board of Education members
- A successful learning community communicates honestly and openly in a non-threatening environment
- Members of our learning community have different needs at different times. There is openness to the challenge of meeting those needs in professional and supportive ways
- Assessment of professionals (i.e., educators, administrators and educational support personnel) is a dynamic process that requires review and revision based on evolving research, practices and experiences
- Development of desired capabilities comes in stages and is achieved through hard work, reflection and ongoing growth

Randolph Township Schools
Department of Science, Technology, Engineering, and Math

Introduction

Randolph Township Schools is committed to excellence. We believe that all children are entitled to an education that will equip them to become productive citizens of the 21st century. We believe that an education grounded in the fundamental principles of science, technology, engineering, and math (STEM) will provide students with the skills and content necessary to become future leaders and lifelong learners.

A sound STEM education is grounded in the principles of inquiry, rigor, and relevance. Students will be actively engaged in learning as they use real-world STEM skills to construct knowledge. They will have ample opportunities to manipulate materials and solve problems in ways that are developmentally appropriate to their age. They will work in an environment that encourages them to take risks, think critically, build models, observe patterns, and recognize anomalies in those patterns. Students will be encouraged to ask questions, not just the "how" and the "what" of observed phenomena, but also the "why". They will develop the ability, confidence, and motivation to succeed academically and personally.

STEM literacy requires understandings and habits of mind that enable students to make sense of how our world works. As described in Project 2061's *Benchmarks in Science Literacy, The Standards for Technological Literacy,* and *Professional Standards for Teaching Mathematics,* literacy in these subject areas enables people to think critically and independently. Scientifically and technologically literate citizens deal sensibly with problems that involve mathematics, evidence, patterns, logical arguments, uncertainty, and problem-solving.

Randolph Township Schools
Department of Science, Technology, Engineering, and Math

Advanced Placement Chemistry

Introduction

AP Chemistry designed to be the equivalent of the general chemistry course taken during the first year of college. For most students, the course enables them to take a second year course in the chemistry sequence at their college or to take courses in other fields where general chemistry is a prerequisite. This course is structured around the six big ideas articulated in the AP Chemistry curriculum framework provided by the College Board.

A special emphasis is placed on the seven science practices, which capture important aspects of the work that scientists engage in, with learning objectives that combine content with inquiry and reasoning skills. AP Chemistry is open to students that have completed a year of chemistry who wish to take part in a rigorous and academically challenging course.

Big Idea 1: Structure of matter
Big Idea 2: Properties of matter-characteristics, states, and forces of attraction
Big Idea 3: Chemical reactions
Big Idea 4: Rates of chemical reactions
Big Idea 5: Thermodynamics
Big Idea 6: Equilibrium

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Curriculum Pacing Chart
Advanced Placement Chemistry

SUGGESTED TIME ALLOTMENT	Big Idea	CONTENT - UNIT OF STUDY
4 weeks	**I**	**Structure of matter**
4 weeks	**II**	**Properties of matter-characteristics, states, and forces of attraction**
6 weeks	**III**	**Chemical reactions**
7 weeks	**IV**	**Rates of chemical reactions**
7 weeks	**V**	**Thermodynamics**
8 weeks	**VI**	**Equilibrium**

RANDOLPH TOWNSHIP SCHOOL DISTRICT
AP Chemistry
UNIT I: Structure of Matter/Properties of matter

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
The chemical elements are fundamental building materials of matter, which retain their identity in chemical reactions.	• Why is chemistry considered the enabling science?
The atoms of each element have unique structures arising from interactions between electrons and nuclei.	• How can we understand something we cannot see?
Periodicity is a useful principle for understanding properties and predicting trends, which can examine the composition of materials or generate ideas for designing new materials.	• How are the properties of a substance dependent on its composition and structure?

KNOWLEDGE	SKILLS	CCSS
Students will know:	**Students will be able to:**	
Chemical analysis provides a method for determining the relative number of atoms in a substance, which can be used to identify the substance or determine its purity.	Apply mathematical relationships to mass data in order to justify a claim regarding the identity or purity of a substance.	NJCCCS Science 5.1.12.A1-3 5.1.12.B1-4 5.1.12.C1-3 5.1.12.D1-3
The mole is the fundamental unit for counting number of particles on the macroscopic level and allows quantitative connections to be drawn to the atomic level.	Connect the number of particles, moles, mass, and volume of substances to one another, both qualitatively and quantitatively.	5.3.12.A.6 5.3.12.D.1 5.3.12.D.2
The atom is composed of negatively charged electrons, which can leave the atom, and a positively charged nucleus that is made of protons and neutrons. The attraction of the electrons to the nucleus is the basis of the structure of the atom. Coulomb's law is qualitatively useful for understanding the structure of the atom.	Explain the distribution of electrons in an atom or ion based upon data.	Common Core ELA RST.11-12.2 RST.11-12.3 RST.11-12.8 RST.11-12.9 WHST.11-12.1 WHST.11-12.4
The electronic structure of the atom can be described using an electron configuration that reflects the concept of electrons in quantized energy levels, the energetics of the electrons in the atom can be understood by consideration of Coulomb's law.	Describe the electronic structure of the atom, using PES data, ionization energy data, and/or Coulomb's Law to construct explanations of how the energies of electrons within shells in atoms vary.	Common Core Math HSN-Q.1 HSN-Q.2 HSN-Q.3
Many properties of atoms exhibit periodic trends that are reflective of the	Justify with evidence the arrangement of the periodic	

periodicity of electronic structure.	table and can apply periodic properties to chemical reactivity.	
The currently accepted best model of the atom is based on the quantum mechanical model. Scientific models are subject to refinement and change in response to new experimental results.	Given information about a particular model of the atom, determine if the model is consistent with specified evidence.	
The interaction of electromagnetic waves or light with matter is a powerful means to probe the structure of atoms and molecules, and to measure their concentration.	Justify the selection of a particular type of spectroscopy to measure properties associated with vibrational or electronic motions of molecules. Design or interpret the results of an experiment regarding the absorption of light to determine the concentration of an absorbing species in a solution.	
Conservation of atoms makes it possible to compute the masses of substances involved in physical and chemical processes.	Express the law of conservation of mass quantitatively and qualitatively.	

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Curriculum Pacing Chart
Advanced Placement Chemistry

SUGGESTED TIME ALLOTMENT	CONTENT – UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
4 weeks	**Unit I – Structure of Matter** o **Matter, Measurement, and Problem Solving** o **Atoms and Elements** o **Molecules, Compounds, and Chemical Equations** o **Chemical Quantities and Aqueous Reactions** o **Gases** o **Kinetic Molecular Theory** o **The Quantum-Mechanical Model** o **Periodic Properties of the Elements**	**BOOKS:** **Chemistry A Molecular Approach** **Nivaldo J. Tro** **Chemistry** **Zumdahl** **Suggested Laboratory Investigations** **Molar Volume Lab** **Hess's law Lab** **Spectrum and Spectroscopy Lab** **Gravimetric Analysis of a Sulfate Mixture**

RANDOLPH TOWNSHIP SCHOOL DISTRICT
AP Chemistry
UNIT II: Properties of matter

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
Matter can be described by it physical properties. The physical properties depend on the spacing between the particles and the forces of attraction among the paraticles.	• Why is it possible for different compounds to have the same composition but very different physical and chemical properties?
Forces of attraction between particles are important in determining many macroscopic properties of a substance.	• How does the structure of a molecule relate to its form and function?
The strong electrostatic forces of attraction holding atoms together in a unit are called chemical bonds.	• Why do atoms form ionic bonds or covalent bonds, or metallic bonds?

KNOWLEDGE	SKILLS	CCSS
Students will know: The different properties of solids and liquids can be explained by differences in their structures. The gaseous state can be effectively modeled with a mathematical equation relating macroscopic properties. A gas has neither volume nor definite shape, because the effects of attractive forces are minimal.	**Students will be able to:** Design or interpret data from, an experiment that uses gravimetric analysis to determine the concentration of an analyte in a solution. Design an experiment that uses titration to determine the concentration of an analyte in a solution. Explain the relative strengths of acids and bases based on molecular structure, interparticle forces, and solution equilibrium. Use the KMT and concepts of intermolecular forces to make predictions about the macroscopic properties of gases, including ideal and non-ideal behavior. Refine multiple representations of a sample of matter in the gas phase to accurately represent the effect of changes in macroscopic properties on the samples.	**NJCCCS Science** 5.1.12.A1-3 5.1.12.B1-4 5.1.12.C1-3 5.1.12.D1-3 5.2.12.A-D 5.3.12.A.6 5.3.12.D.1 5.3.12.D.2 **Common Core ELA** RST.11-12.2 RST.11-12.3 RST.11-12.8 RST.11-12.9 WHST.11-12.1 WHST.11-12.4 **Common Core Math** HSN-Q.1 HSN-Q.2 HSN-Q.3

	Apply mathematical relationships or estimation to determine macroscopic variables for ideal gases.	
Solutions are homogenous mixtures in which the physical properties are dependent on the concentration of the solute and the strengths of all interactions among the particles of the solute and solvent.	Create or interpret representations that link the concept of molarity with particle views of solution.	
Intermolecular forces play a key role in determining the properties of substances.	Predict properties of samples consisting of particles with no permanent dipole on the basis of London dispersion forces.	
In covalent bonding, electrons are shared between the nuclei of two atoms. Electronegativity differences between the two atoms account for the polarity of the bond.	Describe the relationships between the structural features of polar molecules and the forces of attraction between the particles. Use Lewis diagrams and VSEPR to predict the geometry of molecules, identify hybridization, and make predictions about polarity.	
Ionic bonding results from the net attraction between oppositely charged ions, closely packed together in a crystal lattice.	Apply Coulomb's law to explain the factors that contribute to the solubility of ionic compounds.	
Metallic bonding describes an array of positively charged metal cores surrounded by a sea of mobile valence electrons.	Apply the electron sea model of metallic bonding to predict or make claims about the macroscopic properties of metals or alloys.	

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Curriculum Pacing Chart
Advanced Placement Chemistry

SUGGESTED TIME ALLOTMENT	CONTENT – UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
4 weeks	**Unit II: Properties of matter** ○ **Types of Chemical Bonds** ○ **Electronegativity** ○ **Bond Polarity and Dipole Moments** ○ **Partial ionic Character of Covalent Bonds** ○ **Lewis Structures** ○ **Resonance** ○ **VSEPR Model** ○ **Hybridization and the Localized Electron Model** ○ **Solutions** ○ **Factors Affecting Solubility**	**BOOKS:** **Chemistry A Molecular Approach** **Nivaldo J. Tro** **Chemistry** **Zumdahl** **Suggested Laboratory Investigations** **Molar Mass of a Volatile Liquid** **Guided Inquiry Bonding Lab** Guided Inquiry Investigation of solids **Intermolecular Forces**

RANDOLPH TOWNSHIP SCHOOL DISTRICT
AP Chemistry
UNIT III: Chemical Reactions

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	
Chemical changes are represented by a balanced chemical equation that identifies the ratios with which reactants react and products form.	• How do chemists link the macroscopic and particulate worlds of chemistry?	
Chemical and physical transformations may be observed in several ways and typically involve a change in energy.	• How can we predict the result of mixing two solutions?	
Elementary reactions are mediated by collisions between molecules. Only collisions having sufficient energy and proper orientations of reactants lead to products. Reaction rates may be increased by the presence of a catalyst.	• Why can the same reactants yield different products?	
KNOWLEDGE	**SKILLS**	**CCSS**
Students will know: Quantitative information can be derived from stoichiometric calculations that utilize the mole ratios from the balanced chemical equation. Classes of chemical reactions include synthesis, decomposition, acid-base, and oxidation-reduction reactions Electrochemistry shows the interconversion between chemical and electrical energy in electrolytic cells.	**Students will be able to:** Relate quantities to identify stoichiometric relationships for a reaction, including situations involving limiting reactants and situations in which the reaction has not gone to completion. Design a plan to collect data on the synthesis or decomposition of a compound to confirm the conservation of matter and the law of definite proportions. Interpret the results of an experiment involving a redox titration. Make predictions about galvanic or electrolytic reactions based on half-cell reactions and potentials.	NJCCCS Science: 5.1.12.A1-3 5.1.12.B1-4 5.1.12.C1-3 5.1.12.D1-3 5.3.12.A.6 5.3.12.D.1 5.3.12.D.2 Common Core ELA: RST.11-12.2 RST.11-12.3 RST.11-12.8 RST.11-12.9 WHST.11-12.1 WHST.11-12.4 Common Core Math: HSN-Q.1 HSN-Q.2 HSN-Q.3

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Curriculum Pacing Chart
Advanced Placement Chemistry

SUGGESTED TIME ALLOTMENT	CONTENT – UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
6 weeks	**Unit III: Chemical Reactions** ○ **Types of Chemical Reactions** ○ **Describing Reactions in Solution** ○ **Acid-Base Reactions** ○ **Stoichiometry of Precipitation Reactions** ○ **Oxidation-Reduction Reactions** ○ **Balancing Redox Reactions**	**BOOKS:** **Chemistry A Molecular Approach** **Nivaldo J. Tro** **Chemistry** **Zumdahl** **Suggested Laboratory Investigations** **Copper Reaction Lab** **Redox Titration Lab** **Single Replacement reactions and the Activity Series**

RANDOLPH TOWNSHIP SCHOOL DISTRICT
AP Chemistry
UNIT IV: Rates of chemical reactions

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
Reaction rates that depend on temperature and other environmental factors are determined by measuring changes in concentrations of reactants or products over time.	• Why are some reactions reversible whereas others are not?
Elementary reactions are mediated by collisions between molecules. Only collisions having sufficient energy and proper orientations of reactants lead to products. Reaction rates may be increased by the presence of a catalyst.	• Do reactions occur in one step or several steps?
Reaction rates may be increased by the presence of a catalyst.	• Why and how do biological processes depend on catalysis?

KNOWLEDGE	SKILLS	CCSS
Students will know: The rate law shows how the rate depends on reactant concentration. The mechanism of a multiuse reaction consists of a series of elementary reactions that add up to the overall reactions. The rate is determined by the slow step. Catalysts function by lowering the activation energy of an elementary step in a reactions mechanism, and by providing a new faster reaction mechanism.	**Students will be able to:** Analyze concentration vs. time data to determine the rate law for a zero, first, or second order reaction. Evaluate alternative explanations, as expressed by reaction mechanisms to determine which are consistent with data regarding the overall rate a reaction, and data that can be used to infer the presence of a reaction intermediate. Translate a reaction energy profile of a chemical reactions occurring in the presence and absence of a catalyst.	NJCCCS Science: 5.1.12.A1-3 5.1.12.B1-4 5.1.12.C1-3 5.1.12.D1-3 5.3.12.A.6 5.3.12.D.1-2 Common Core ELA: RST.11-12.2 RST.11-12.3 RST.11-12.8 RST.11-12.9 WHST.11-12.1 WHST.11-12.4 Common Core Math: HSN-Q.1 HSN-Q.2 HSN-Q.3

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Curriculum Pacing Chart
Advanced Placement Chemistry

SUGGESTED TIME ALLOTMENT	CONTENT – UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
7 weeks	**Unit IV: Rates of Chemical Reactions** ○ **Reaction Rates** ○ **Rate Laws** ○ **Determining the Form of the Rate Law** ○ **The Integrated Rate Law** ○ **Reaction Mechanisms** ○ **A Model for Chemical Kinetics** ○ **Catalysis**	**BOOKS:** **Chemistry A Molecular Approach** **Nivaldo J. Tro** **Chemistry** **Zumdahl** **Suggested Laboratory Investigations** **Vapor Pressure of Liquids** **Guided Inquiry Lab Determining the Rate Law of a Crystal Violet Reaction** **Preparation of Solutions Lab** Actions, Reactions, and Interactions

RANDOLPH TOWNSHIP SCHOOL DISTRICT
AP Chemistry
UNIT V: Thermodynamics

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	
Energy is neither created nor destroyed, but only transformed from one form to another.	• Where does the energy come from in an exothermic reaction?	
Breaking bonds requires energy, and making bonds releases energy.	• What are the energy considerations when reactions occur?	
Chemical or physical processes are driven by a decrease in enthalpy or an increase in entropy, or both.	• When does a chemical process result in useful work?	
KNOWLEDGE	**SKILLS**	**CCSS**
Students will know: Energy is transferred between systems either through heat transfer or through one system doing work on the other system. Chemical systems undergo three main processes that change their energy: heating/cooling, phase transitions, and chemical reactions. The net energy change during a reaction is the sum of the energy required to break the bonds in the reactant molecules and the energy released in forming the bonds of the product molecules Some physical or chemical processes involve both a decrease in the internal energy of the	**Students will be able to:** Create graphical representations in order to connect the dependence of potential energy to the distance between atoms. Generate explanations or make predictions about the transfer of thermal energy arising from molecular collisions. To use conservation of energy to relate the magnitudes of the energy changes or the direction of energy flow. Estimate energy changes associated with heating/cooling a substance Design an experiment in which calorimetry is used to determine the change in enthalpy of a chemical process at constant pressure. Draw qualitative and quantitative connections between the reaction enthalpy and the energies involved in the breaking and formation of chemical bonds. Predict whether a chemical or physical process in	<u>NJCCCS Science:</u> 5.1.12.A1-3 5.1.12.B1-4 5.1.12.C1-3 5.1.12.D1-3 5.3.12.A.6 5.3.12.D.1-2 <u>Common Core ELA:</u> RST.11-12.2 RST.11-12.3 RST.11-12.8 RST.11-12.9 WHST.11-12.1 WHST.11-12.4 <u>Common Core Math:</u> HSN-Q.1 HSN-Q.2 HSN-Q.3

components and an increase in the entropy. These processes are “thermodynamically” favored. External sources of energy can be used to drive change in cases where the Gibbs free energy change is positive.	thermodynamically favorable by calculating the change in Gibbs free energy. Explain why a thermodynamically favored chemical reaction may not produce large amounts of product or why a thermodynamically unfavored chemical reaction can produce large amounts of product for certain sets of initial conditions.	

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Curriculum Pacing Chart
Advanced Placement Chemistry

SUGGESTED TIME ALLOTMENT	CONTENT – UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
7 weeks	**Unit V: Thermodynamics** ○ **Enthalpy and Calorimetry** ○ **Hess's Law** ○ **Standard Enthalpies of Formation** ○ **Spontaneous Processes and Entropy** ○ **Entropy and Second Law of Thermodynamics** ○ **Free Energy** ○ **Gibbs Free Energy and Chemical Reactions** ○ **Gibbs Free Energy and Equilibrium** ○ **Free energy and work**	**BOOKS:** **Chemistry A Molecular Approach** **Nivaldo J. Tro** **Chemistry** **Zumdahl** **Suggested Laboratory Investigations** **Hess's law Lab** Calorimetry Lab

RANDOLPH TOWNSHIP SCHOOL DISTRICT
AP Chemistry
UNIT VI: Equilibrium

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	
Chemical equilibrium is a dynamic, reversible state in which rates of opposing processes are equal.	• How is balance achieved in chemical systems? How is balance maintained in chemical systems?	
Chemical equilibrium plays an important role in acid-base chemistry and in solubility.	• Why should we study acid-base chemistry?	
The equilibrium constant is related to temperature and the difference in Gibbs free energy between reactant and products.	• How can we predict the spontaneity of a chemical reaction?	
KNOWLEDGE	**SKILLS**	**CCSS**
Students will know: When a system is at equilibrium, all macroscopic variables, such as concentrations, partial pressure, and temperature, do not change over time. Equilibrium results from an equality between the rates of the forward and reverse reactions, at which point Q=K. The magnitude of the equilibrium constant, K, can be used to determine whether the equilibrium lies toward the reactant side or product side. Systems at equilibrium respond to disturbances by partially countering the effect of the disturbance (Le Chatelier's principle). Chemical equilibrium reasoning can be used to describe the proton-transfer reactions of acid-base chemistry.	**Students will be able to:** Construct an explanation that connects the observations to the reversibility of the underlying chemical reactions or processes. Relate kinetics to equilibrium. Given data, calculate the equilibrium constant. Use Le Chatelier's Principle to design a set of conditions that will optimize a desired outcome, such as product yield. Generate particulate representation of an acid or base to explain the species that will have large versus small concentrations at equilibrium. Distinguish between strong and weak acid solutions with similar values of pH, including percent ionization and the amount of base needed to reach the equivalence point of a titration. Interpret titration data for monoprotic or polyprotic acids. Determine the concentration of the titrant and	NJCCCS Science: 5.1.12.A1-3 5.1.12.B1-4 5.1.12.C1-3 5.1.12.D1-3 5.3.12.A.6 5.3.12.D.1-2 Common Core ELA: RST.11-12.2 RST.11-12.3 RST.11-12.8 RST.11-12.9 WHST.11-12.1 WHST.11-12.4 Common Core Math: HSN-Q.1 HSN-Q.2 HSN-Q.3

	the pKa for a weak acid, or the pKb for a weak base.	
The pH in an important characteristic of aqueous solutions that can be controlled with buffers.	Design a buffer solution with a target pH and buffer capacity by selecting an appropriate conjugate acid-base pair and estimating the concentrations needed to achieve the desired capacity. Identify a solution as being a buffer solution and explain the buffer mechanism.	
The solubility of a substance can be understood in terms of chemical equilibrium.	Predict the solubility of a salt, or rank the solubility of salts, given the relevant Ksp values. Interpret data regarding the relative solubility of salts in terms of factors (common ions, pH) that influence the solubility.	
When the difference in Gibbs free energy between reactants and products is much larger than the thermal energy, the equilibrium constant is either very small or very large. When the change in the Gibbs free energy is comparable to the thermal energy (RT), the equilibrium constant is near 1.	Analyze the enthalpic and entropic changes associated with the dissolution of a salt, using particulate level representations. Express the equilibrium constant in terms of delta G and RT and use this relationship to estimate the magnitude of K and, consequently, the thermodynamic favorability of the process.	

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Curriculum Pacing Chart
Advanced Placement Chemistry

SUGGESTED TIME ALLOTMENT	CONTENT – UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
8 weeks	**Unit VI: Equilibrium** ○ **The Equilibrium Condition** ○ **The Equilibrium Constant** ○ **Solving Equilibrium Problems** ○ **Le Chatelier's Principle** ○ **The Nature of Acids and Bases** ○ **Solving Acid-Base Equilibrium Problems** ○ **The Effect of Structure on Acid-Base Properties** ○ **Buffer Solutions** ○ **Titration and pH Curves** ○ **Solubility Equilibria and the Solubility Product** ○ **Electrochemistry**	**<u>BOOKS:</u>** **Chemistry A Molecular Approach** **Nivaldo J. Tro** **Zumdahl Chemistry** **Lab Manuals: Zumdahl** **AP Chemistry Guided Inquiry Experiments: Applying the Science Practices 2013 The College Board** **Advanced Chemistry with Vernier** **Vernier Software and Technology** **Laboratory Experiments for AP Chemistry. Sally Vonderbrink** **<u>Suggested Laboratory Investigations</u>** **Restoring Balance Le Chatelier's Principle** **Determining the Activation Energy of a Reaction** **Determining Kc with various initial concentrations** **Determining Ka by half titration** **Guided Inquiry Types of Titrations** **Guided Inquiry Preparation of a Buffer** **Molar Solubility and Determination of Ksp** **Voltaic Cell Lab**

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Advanced Placement Chemistry

APPENDIX A

RESOURCES:

TEXT AND ELECTRONIC TEXT

Chemistry A Molecular Approach
Nivaldo J. Tro
ISBN-13 978-0-13-309994-2

Chemistry
Zumdahl

ISBN NUMBER, NAME, COPYRIGHT
ISBN-13:978-0-07-231944-6
ISBN-0-669-41794-7

WEB ADDRESSES:

http://www.collegeboard.com
http://www.organic-chemistry.org/namedreactions/
http://www2.chemistry.msu.edu:80/faculty/reusch/VirtTxtJml/nomen1.htm
http://www.ncbi.nlm.nih.gov/pubmed
http://www.chemhelper.com/
http://www.khanacademy.org/
http://www.mhhe.com/physsci/chemistry/atkins
http://epa.gov
http://chemistry.boisestate.edu/people/richardbanks/organic/organicchem.html
http://cdc.gov
http://epa.gov/sustainability/basicinfo.htm
http://chemmybear.com

SOFTWARE NAMES:
Vernier Probes
E-Chem
BK Chem

RANDOLPH TOWNSHIP SCHOOL DISTRICT
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APPENDIX B

ASSESSMENT:

LIST OF ASSEMENT/TYPE

Blackboard student responses to teacher supplied questions, readings, or scenarios
Student responses to classmate's Blackboard postings
Class discussions
Laboratory data and participation
Design of experiment
Project and/or paper

SUGGESTED RUBRICS TBD

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Advanced Placement Chemistry

APPENDIX C

SAMPLE INTERDISCIPLINARY UNITS

All topics of study will explore the connections between various disciplines of science, math and related subjects. Students will be required to read scientific papers and articles thereby including a literacy component. In addition, students will be using technology throughout the course to construct and share their work.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Advanced Placement Chemistry

APPENDIX D

PLACEMENT CRITERIA

Any high school student who has completed one year of Honors Chemistry with an A average may enroll in the course.