AP Chemistry Syllabus

Curricular Requirements	Page(s)
CR1 Students and teachers use a recently published (within the last 10 years) college-level chemistry textbook.	5
CR2 The course is structured around the enduring understandings within the big ideas as described in the AP Chemistry Curriculum Framework.	1, 9-25
CR3a The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 1.	9-25
CR3b The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 2.	9-25
CR3c The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 3.	9-25
CR3d The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 4.	9-25
CR3e The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 5.	9-25
CR3f The course provides students with opportunities outside the laboratory environment to meet the learning objectives within Big Idea 6.	9-25
CR4 The course provides students with the opportunity to connect their knowledge of chemistry and science to major societal or technological components (e.g., concerns, technological advances, innovations) to help them become scientifically literate citizens.	19, 25
CR5a Students are provided the opportunity to engage in investigative laboratory work integrated throughout the course for a minimum of 25 percent of instructional time.	1, 9-19
CR5b Students are provided the opportunity to engage in a minimum of 16 hands-on laboratory integrated throughout the course while using basic laboratory equipment to support the learning objectives listed within the AP Chemistry Curriculum Framework.	9-19
CR6 The laboratory investigations used throughout the course allow students to apply the seven practices defined in the AP Chemistry Curriculum Framework. At minimum, six of the required 16 Laboratories are conducted in a guided-inquiry format.	9-19
CR7 The course provides opportunities for students to develop, record, and maintain evidence of their verbal, written, and graphic communication skills through laboratory reports, summaries of literature or scientific investigations, and oral, written, and graphic presentations.	2, 6, 9-19

Course Description

This AP Chemistry course is designed to be the equivalent of the general chemistry course usually taken during the first year of college. For most students, the course enables them to undertake, as a freshman, second year work in the chemistry sequence at their institution or to register in 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. **[CR2]** A special emphasis will be 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 all students that have completed a year of chemistry who wish to take part in a rigorous and academically challenging course.

A. P. Chemistry at our high school is a 1.5 credit course. Prerequisites for this course are: *two credits in algebra *one credit in chemistry *one credit in physics (may be taken concurrently) Classes meet for 83 minutes each day for semester one (90 days), and 83 minutes every other day for semester two (45 days). The course includes hands on laboratory component comparable to college level chemistry laboratories and includes instruction in laboratory processes and procedures as appropriate for each laboratory. Overall, approximately one third of class time is spent engaged in laboratory work to include over sixteen hands-on laboratory experiences and six guided-inquiry investigations which encompasses over 25% of the course time **[CR5a]**. This means a minimum of one 83 minute period per week, PLUS time spent on pre and post laboratory work outside of class. Most weeks, there is additional laboratory time, because the majority of the college level laboratories cannot be completed in an 83 minute period. In each laboratory experiment, students work in groups of two, and actively communicate with their lab partners. The collaborative process of working in a group is stressed, and group collaboration methods are suggested by the teacher during the labs. The students physically manipulate equipment and materials in order to make relevant observations and collect data; manipulate the collected data to

form conclusions and verify hypotheses; and communicate and compare results and procedures, informally to other experimenters, and also in a formal, written report to the teacher **[CR7]**.
PASCO Scientific Laboratory Data Collection System is used in the AP Chemistry Lab for real-time data collection. The PASCO System includes: Passport (digital probe ware which connects to our networked PC's), ScienceWorkshop, and DataStudio Software (data collection and data analysis software). Students are required to submit a formal written report for each lab experiment. Students are required to keep a formal laboratory notebook/binder.
This mandatory binder is where graded laboratory reports are kept in an organized method, with an index for each academic quarter. Laboratory work counts approximately 1/3 (33%) of the grade each quarter. The laboratory notebook is graded at the end of each quarter. The laboratory binder goes with the student to college so professors can evaluate the placement of the student in a college laboratory program.

CR2-The course is structured around the enduring understandings within the big ideas as described in the AP Chemistry Curriculum Framework.

CR5a - Students are provided the opportunity to engage I investigative laboratory work integrated throughout the course of a minimum of 25 percent of instructional time.

CR7 – The course provides opportunities for students to develop, record, and maintain evidence of their verbal, written, and graphic communication skills through laboratory reports, summaries of literature or scientific investigations, and oral, written, and graphic presentations.

Big Idea Chapters

Big Idea 1: Chemical Foundations - Atoms, Molecules, and Ions – Stoichiometry – Types of

Chemical Reactions and Solution Stoichiometry – Gases – Atomic Structure and Periodicity – Bonding: General Concepts – Covalent Bonding: Orbitals – Liquids and Solids – Acid- Base Equilibria – The Representative Elements – Transition Metals and Coordination Chemistry

Big Idea 2: Chemical Foundations - Atoms, Molecules, and Ions – Types of Chemical Reactions and Solution Stoichiometry – Gases – Bonding: General Concepts –Liquids and Solids – Properties of Solutions – Acids and Bases – A Spontaneity, Entropy, and Free Energy – The Representative Elements – Organic and Biological Molecules

Big Idea 3: Chemical Foundations - Atoms, Molecules, and Ions – Stoichiometry – Types of Chemical Reactions and Solution Stoichiometry – Gases – Thermochemistry – Acids and Bases – Acid- Base Equilibria – Electrochemistry

Big Idea 4: Chemical Kinetics – The Nucleus: A Chemist's View

Big Idea 5: Types of Chemical Reactions and Solution Stoichiometry – Gases – Thermochemistry – Atomic Structure and Periodicity – Bonding: General Concepts – Covalent Bonding: Orbitals – Liquids and Solids – Properties of Solutions – Chemical Kinetics – Spontaneity, Entropy, and Free Energy – Electrochemistry – The Representative Elements – Organic and Biological Molecules

Big Idea 6: Types of Chemical Reactions and Solution Stoichiometry – Liquids and Solids – Properties of Solutions – Chemical Equilibrium – Acids and Bases – Acid- Base Equilibria – Solubility and Complex Ion Equilibria – Spontaneity, Entropy, and Free Energy – Electrochemistry – Transition Metals and Coordination Chemistry

Textbooks, Laboratory Books, and References

Beran, Jo Allan. Laboratory Principles of General Chemistry, Seventh Edition. New York: John Wiley and Sons, 2004.

Budavari, Susan., ed. The Merck Index: An Encyclopedia of Chemicals, Drugs, and Biologicals, 11th Edition. Rahway, N.J, 1989.

The College Board. AP Chemistry Guided-Inguiry Experiments: Applying the Science Practices, New York, 2013.

Decoste, Donald. Inquiry Based Learning Guide, Belmont, CA, 2014

Demmin, Peter. AP Chemistry, Fifth Edition. New York: D&S Marketing Systems Inc., 2005.

Hall, James F. Experimental Chemistry. A Laboratory Manual to accompany Zumdahl's Chemistry, 6th Edition. New York, 2003.

Holmquist , Dan and Donald Volz. Chemistry with Calculators. Oregon: Vernier Software and Technology, 2003.

Kelter, Paul B. Student Study Guide to accompany Zumdahl's Chemistry, 9th edition. Belmont California: (Engage Learning), 2014.

Lide, David R., ed. CRC Handbook of Chemistry and Physics, 79th Edition, Boca Raton, Florida: CRC Press, 1998.

Little, John. AP Experimental Chemistry, Ninth Edition. Stockton, California: (Engage Learning), 2014.

PASCO Scientific Laboratory Data Collection System:Passport (digital probeware which connects to our networked PC's) PASCO Scientific, Roseville, Ca. 95747

Petrucci, Ralph H. General Chemistry, 5th Edition. New York: Macmillan Publishing Company, 1989.

Trout, Laura. POGIL Activities for High School Chemistry. USA, 2012

Vonderbrink, Sally. Laboratory Experiments for AP Chemistry. Batavia: Flinn Scientific, 2001.

Weiss, Gerald S. and Robert K. Wismer and Thomas G. Greco. Experiments n General Chemistry: A Laboratory Program to accompany Petrucci's General Chemistry. New York, 1985.

Zumdahl, Steven S. and Susan A. Zumdahl. Chemistry, 9th Edition. Belmont California: (Engage Learning), 2014. [CR1]

CR1-Students and teachers use a recently published (within the last 10years) college-level chemistry textbook.

Required Materials

Graphing calculator, splash proof goggles, chemical apron, chemical gloves, and a three ring laboratory binder is required.

Laboratories

The laboratories that are completed require following or developing processes and procedures, taking observations, and data manipulation. See laboratory list provided for laboratory details. Students communicate and collaborate in laboratory groups; however, each student writes a laboratory report in a laboratory binder for every laboratory they perform. A minimum of 25% of student contact time will be spent doing hands-on laboratory activities. [CR5a]

CR5a-Students are provided the opportunity to engage in investigative laboratory work integrated throughout the course for a minimum of 25 percent of instructional time

The 10 Parts of a Laboratory Report [CR7]

CR7-The course provides opportunities for students to develop, record, and maintain evidence of their verbal, written, and graphic communication skills through laboratory reports, summaries of literature or scientific investigations, and oral, written, and graphic presentations.

A specific format will be given to the student for each laboratory. Students must follow that format and label all sections very clearly. AP Chemistry laboratory reports are much longer and more in depth than the ones completed in the first year chemistry course. Therefore, it is important that students don't procrastinate when doing pre-laboratory and post-laboratory work. Late laboratories will not be accepted. Laboratories not completed in class must be done at lunch or before/ after school by appointment.

Pre-Lab Work

Pre-laboratory work is to be completed and turned in of the day the laboratory is performed.

Title

The title should be descriptive. For example, "pH Titration Lab" is a descriptive title and "Experiment 5" is not a descriptive title.

Date

This is the date the student performed the experiment.

Purpose

A purpose is a statement summarizing the "point" of the laboratory.

Procedure Outline

Students need to write an outline of the procedure. They should use bulleted statements or outline format to make it easy to read. If a student is doing a guided inquiry lab, they may be required to write a full procedure that they develop.

Pre-Lab Questions

Students will be given some questions to answer before the laboratory is done. They will need to either rewrite the question or incorporate the question in the answer. The idea here is that when someone (like a college professor) looks at a student's laboratory binder, they should be able to tell what the question was by merely looking at their laboratory report. It is important to produce a good record of lab work.

Data Tables

Students will need to create any data tables or charts necessary for data collection in the laboratory.

During the Laboratory - Data

Students need to record all their data directly in their laboratory binder. They are NOT to be recording data on their separate laboratory sheet. They need to label all data clearly and always include proper units of measurement. Students should underline, use capital letters, or use any device they choose to help organize this section well. They should space things out neatly and clearly.

Post-Laboratory Work - Calculations and Graphs

Students should show how calculations are carried out. Graphs need to be titled, axes need to be labeled, and units need to be shown on the axis. To receive credit for any graphs, they must be at least 1/2 page in size.

Conclusions

This will vary from lab to lab. Students will usually be given direction as to what to write, but it is expected that all conclusions will be well thought out and well written.

Post Lab Error Analysis Questions

Follow the same procedure as for Pre-Laboratory Questions.

Advanced Placement Chemistry- The - Laboratory Notebook

A record of lab work is an important document, which will show the quality of the laboratory work

that students have performed.

Chapter **Correlated Learning Objective**

All laboratory and non-laboratory activities are listed below with the learning objectives and science practices. After the chapter and correlation the laboratory and non-laboratory (page 19) activities will be named and described.

Chapter 1: Chemical Foundations [CR2]
Homework: 1
Quiz: 1
Test: 1
Sections:

1.1 Chemistry: An Overview	
1.2 The Scientific Method	
1.3 Units of Measurement	
1.4 Uncertainty in Measurement	
1.5 Significant Figures and Calculations	
1.6 Learning to Solve Problems Systematically	
1.7 Dimensional Analysis	
1.8 Temperature	
1.9 Density	
1.10 Classification of Matter	LO 2.7, LO 2.10, LO 3.10

Laboratory and Non-Laboratory Activities [CR3b] [CR3c] [CR5a] [CR5b] [CR6] [CR7]

Inquiry Laboratory: Density Challenge	SP1, SP2, SP3, SP4, SP5, SP6, SP7
Laboratory: Density Determination	SP2, SP4, SP5, SP6, SP7
Non-laboratory Activity: Classification of Matter	LO 2.7, LO 2.10, LO 3.10, SP1

Chapter 2: Atoms, Molecules, and Ions [CR2]
Homework: 1
Quiz: 1
Test: 1
Sections:

2.1 The Early History of Chemistry	
2.2 Fundamental Chemical Laws	LO 1.1, LO 1.17, LO 3.5, LO 3.6
2.3 Dalton's Atomic Theory	LO 1.17
2.4 Early Experiments to Characterize the Atom	
2.5 The Modern View of Atomic Structure: An Introduction	
2.6 Molecules and Ions	LO 2.17
2.7 An Introduction to the Periodic Table	LO 2.17
2.8 Naming Simple Compounds	

Laboratory and Non-Laboratory Activities [CR3a] [CR3c] [CR5a] [CR5b] [CR6] [CR7]

Laboratory: Quantitative Determination of an Empirical Formula	LO 1.18, LO 3.1, SP2, SP3, SP5, SP6, SP7

Chapter 3: Stoichiometry [CR2]
Homework: 3

Quiz: 1
Test: 1
Sections:

3.1 Counting by Weighing	
3.2 Atomic Masses	LO 1.14
3.3 The Mole	LO 1.4
3.4 Molar Mass	LO 1.4
3.5 Learning to Solve Problems	LO 1.4
3.6 Percent Composition of Compound	LO 1.1, LO 1.3
3.7 Determining the Formula of a Compound	LO 1.2, LO 3.6
3.8 Chemical Equations	LO 1.18, LO 3.1
3.9 Balancing Chemical Equations	LO 1.17, LO 1.18
3.10 Stoichiometric Calculations: Amounts of Reactants and Products	LO 1.17, LO 1.18, LO 1.19
3.11 The Concept of Limiting Reactant	LO 1.17, LO 3.3, LO 3.4

Laboratory and Non-Laboratory Activities[CR3a] [CR3b] [CR5a] [CR5b] [CR6] [CR7]

Laboratory: The Solubility of a Salt	LO 2.8, LO 2.9, LO 2.14, LO 3.10, SP2, SP3, SP4, SP5, SP6, SP7
Inquiry Activity/Laboratory: Conversions	LO. 1.14, LO 1.4, SP2, SP3, SP5, SP6, SP7
Laboratory: Types of Chemical Reactions	LO 1.17, LO 1.18, LO 3.1, SP3, SP4, SP5, SP6, SP7
Non-Laboratory Activity: Stoichiometry	LO 1.17, LO 1.18, LO 1.19 SP2, SP3
Non-Laboratory Activity: Average Atomic Mass	LO 1.14, LO 1.4, SP2

Chapter 4: Types of Chemical Reactions and Solution Stoichiometry [CR2]
Homework: 5
Quiz: 1
Test: 1
Sections:

4.1 Water, the Common Solvent	LO 2.8, LO 2.9, LO 2.14, LO 3.10
4.2 The Nature of Aqueous Solutions: Strong and Week Electrolytes	LO 2.8, LO 2.9, LO 3.10
4.3 The Composition of Solutions	LO 1.4, LO 2.8, LO 2.9 LO 3.10
4.4 Types of Chemical Reactions	LO 3.1, LO 3.10
4.5 Precipitation Reactions	LO 1.17, LO 1.18, LO 3.1 LO 3.10 LO 3.2, LO 3.10
4.6 Describing Reactions in Solution	LO 3.1, LO 3.2, LO 3.10
4.7 Stoichiometry of Precipitation Reactions	LO 3.1, LO 3.2, LO 3.10
4.8 Acid- Base Reactions	LO 3.1, LO 3.2, LO 3.3, LO 3.4, LO 3.10
4.9 Oxidation-Reduction Reactions	LO 1.18, LO 3.1, LO 3.8, LO 3.9, LO 3.10
4.10 Balancing Oxidation – Reduction Equation	LO 3.9, LO 3.10

Laboratory and Non-Laboratory Activities [CR3a] [CR3c] [CR5a] [CR5b] [CR6] [CR7]

Laboratory: Calculations with a Chemical Reaction	LO 1.18, LO 3.1, LO 3.10, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Non-Laboratory Activity: Types of Chemical Reactions	LO 3.1, LO 3.10

Chapter 5: Gases [CR2] [CR5a] [CR5b]
Homework: 3
Quiz: 1
Test: 1
Sections:

5.1 Pressure	LO 2.4, LO 2.6
5.2 The Gas Laws of Boyle, Charles, and Avogadro	LO 1.4, LO 2.4, LO 2.6
5.3 The Ideal Gas Law	LO 1.4, LO 2.4, LO 2.5, LO 2.6
5.4 Gas Stoichiometry	LO 2.6, LO 3.4
5.5. Dalton's Law of Partial Pressures	LO 1.3, LO 2.6
5.6 The Kinetic Molecular Theory of Gases	LO 2.4, LO 5.2
5.7 Effusion and Diffusion	LO 1.3
5.8 Real Gases	LO 2.12, LO 2.15
5.9 Characteristics of Several Real Gases	LO 2.15
5.10 Chemistry in the Atmosphere	

Laboratory and Non-Laboratory Activities [CR3a] [CR3b] [CR5a] [CR5b] [CR6] [CR7]

Non-Laboratory Activity: Gas Laws	LO 1.4, LO 2.4, LO 2.5, LO 2.6, SP1, SP2, SP3, SP6
Inquiry/Laboratory: Boyles Law	LO 1.4, LO 2.4, LO 2.5, LO 2.6, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Laboratory: Diffusion of Gases	LO 1.3, SP4, SP5, SP6, SP7

Chapter 6: Thermochemistry [CR2]
Homework: 2
Quiz: 1
Test: 1
Sections:

6.1 The Nature of Energy	LO 5.3, LO 5.4
6.2 Enthalpy and Calorimetry	LO 3.11, LO 5.3, LO 5.5, LO 5.6, LO 5.7
6.3 Hess's Law	LO 3.11
6.4 Standard Enthalpies of Formation	LO 6.4
6.5 Present Sources of Energy	
6.6 New Energy Sources	

Laboratory and Non-Laboratory Activities [CR3c] [CR3e] [CR5a] [CR5b] [CR6] [CR7]

Non-Laboratory Inquiry Activity: Potential vs Kinetic	LO 5.3, LO 5.4, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Inquiry Laboratory: Specific Heat Set	LO 3.11, LO 5.3, LO 5.5, LO 5.6, LO 5.7, SP2, SP3, SP4, SP5, SP6, SP7
Laboratory: Enthalpy of a Chemical Reaction (Hess's Law)	LO 3.11, SP2, SP3, SP4, SP5, SP6, SP7

Chapter 7: Atomic Structure and Periodicity [CR2]
Homework: 2
Quiz: 1
Test: 1
Sections:

7.1 Electromagnetic Radiation	LO 1.15

7.2 The Nature of Matter	
7.3 The Atomic Spectrum of Hydrogen	
7.4 The Bohr Model	LO 1.12
7.5 The Quantum Mechanical Model of the Atom	LO 1.12
7.6 Quantum Numbers	
7.7 Orbital Shapes and Energies	
7.8 Electron Spin and the Pauli Principle	
7.9 Polyelectronic Atoms	
7.10 The History of the Periodic Table	
7.11 The Aufbau Principle and the Periodic Table	LO 1.9, LO 1.10, LO 1.12
7.12 Periodic Trends in Atomic Properties	LO 1.5, LO 1.6, LO 1.7, LO 1.9, LO 1.10
7.13 The Properties of a Group: The Alkali Metals	LO 1.9, LO 1.10

Laboratory and Non-Laboratory Activities [CR3a] [CR3b] [CR5a] [CR5b] [CR6] [CR7]

Non – Laboratory Activity: Electron Configuration	LO 1.8, LO 2.1, SP1, SP7
Laboratory: Determination of Wavelength of Maximum Absorbance	LO 1.15, SP3, SP4, SP5, SP6, SP7
Laboratory: Thin Layer Chromatography	SP3, SP4, SP5, SP6, SP7

Chapter 8: Bonding: General Concepts [CR2]
Homework: 3
Quiz: 1
Test: 1
Sections:

8.1 Types of Chemical Bonds	LO 1.7, LO 2.1, LO 2.17 LO 5.1
8.2 Electronegativity	LO 2.1, LO 2.17
8.3 Bond Polarity and Dipole Moments	LO 2.1, LO 2.17
8.4 Ions: Electron Configurations and Size	LO 1.8, LO 2.1
8.5 Partial Ionic Character of Covalent Bonds	LO 1.8, LO 2.1, LO 2.23 LO 2.24
8.6 Partial Ionic Character of Covalent Bonds	LO 2.1
8.7 The Covalent Chemical Bond: A Model	LO 2.1
8.8 Covalent Bond Energies and Chemicals Reactions	LO 1.15, LO 2.1, LO 5.8
8.9 The Localized Electron Bonding Model	LO 2.1
8.10 Lewis Structures	LO 2.1, LO 2.21
8.11 Exceptions to the Octet Rule	LO 2.1, LO 2.21
8.12 Resonance	LO 2.1, LO 2.21
8.13 Molecular Structure: The VSEPR Model	LO 2.1, LO 2.21

Laboratory and Non-Laboratory Activities [CR3a] [CR3b] [CR3e] [CR5a] [CR5b] [CR6] [CR7]

Laboratory Activity: Model Kits	LO 1.7, LO 2.1, LO 2.17 LO 5.1 SP1, SP3, SP4, SP5, SP6, SP7
Non – Laboratory Inquiry Activity: Redraw	LO 1.7, LO 2.1, LO 2.17 LO 2.21, LO 5.1, SP1, SP3, SP4, SP5, SP6
Non-Laboratory Activity: Bond Energy	LO 1.7, LO 2.1, LO 2.17 LO 5.1, SP1

Chapter 9: Covalent Bonding: Orbitals [CR2]
Homework: 2
Quiz: 1
Test: 1
Sections:

9.1 Hybridization and the Localized Electron	
9.2 The Molecular Orbital Model	
9.3 Bonding in Homonuclear Diatomic Molecules	
9.4 Bonding in Heteronuclear Diatomic Molecules	
9.5 Combining the Localized Electron and Molecular Orbital Models	
9.6 Photoelectron Spectroscopy (PES)	LO 1.6, LO 1.7, LO 1.15

Laboratory and Non-Laboratory Activities[CR3a] [CR3b] [CR3e] [CR5a] [CR5b] [CR6] [CR7]

Laboratory: Molecular Shapes and Structures/Molecular Models and Covalent Bonding	LO 1.7, LO 2.1, LO 2.17 LO 2.21, LO 5.1, SP1, SP3, SP5, SP6, SP7

Chapter 10: Liquids and Solids [CR2]
Homework: 2
Quiz: 1
Test: 1
Sections:

10.1 Intermolecular Forces	LO 1.11, LO 2.1, LO 2.3, LO 5.9, LO 5.11 LO 2.11, LO 2.13, LO 2.16
10.2 The Liquid State	LO 2.1, LO 2.3, LO 2.16 LO 5.9
10.3 An Introduction to Structures and Types of Solids	LO 2.1, LO 2.3, LO 2.16, LO 2.19, LO 2.22, LO 2.31 LO 5.9
10.4 Structure and Bonding in Metals	LO 2.1, LO 2.3, LO 2.16 LO 2.19, LO 2.20, LO 2.22 LO 2.25, LO 2.26, LO 2.27 LO 2.28, LO 5.9
10.5 Carbon and Silicon: Network Atomic Solids	LO 2.1, LO 2.3, LO 2.16 LO 2.22, LO 2.29, LO 2.30
10.6 Molecular Solids	LO 2.1, LO 2.3, LO 2.16, LO 2.22, LO 2.31 LO 2.32, LO 5.9
10.7 Ionic Solids	LO 2.1, LO 2.3, LO 2.16, LO 2.22, LO 2.23, LO 2.24, LO 5.9
10.8 Vapor Pressure and Changes of State	LO 2.1, LO 2.19, LO 5.6, LO 5.10
10.9 Phase Diagrams	

Laboratory and Non-Laboratory Activities [CR3b] [CR3e] [CR5a] [CR5b] [CR6] [CR7]

Inquiry Laboratory: Fun Things to do with Dry Ice	LO 2.1, LO 2.3, LO 2.16, LO 2.19, LO 2.22, LO 2.31 LO 5.9, SP1, SP2, SP3, SP4, SP5, SP6, SP7

Non – Laboratory Inquiry Activity: Phase Diagram Determination	LO 2.1, LO 2.19, LO 5.6, LO 5.10, SP1, SP3, SP5, SP6, SP7

Chapter 11: Properties of Solutions [CR2]
Homework: 3
Quiz: 1
Test: 1
Sections:

11.1 Solution Composition	LO 2.8
11.2 The Energies of Solution Formation	LO 2.9, LO 2.14, LO 2.15, LO 5.10, LO 6.24
11.3 Factors Affecting Solubility	LO 2.15
11.4 The Vapor Pressures of Solutions	
11.5 Boiling-Point Elevation and Freezing-Point Depression	
11.6 Osmotic Pressure	
11.7 Colligative Properties of Electrolyte	
11.8 Colloids	

Laboratory and Non-Laboratory Activities [CR3b] [CR5a] [CR5b] [CR6] [CR7]

Non – Laboratory Activity: Mathematical determination of molarity, molality, and normality.	LO 2.8, SP2, SP7
Guided Inquiry Activity: Temperature vs Dissolved Sugar	LO 2.15, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Laboratory: Molar Mass by Freezing Point Depression	SP2, SP3, SP4, SP5, SP6, SP7

Chapter 12: Chemical Kinetics [CR2]
Homework: 2
Quiz: 1
Test: 1
Sections:

12.1 Reaction Rates	
12.2 Rate Laws: An Introduction	LO 4.1
12.3 Determining the Form of the Rate Law	LO 4.1
12.4 The Integrated Rate Law	LO 4.1, LO 4.2, LO 4.3
12.5 Reaction Mechanisms	LO 4.7
12.6 A Model for Chemical Kinetics	LO 4.4, LO 4.5, LO 4.6
12.7 Catalysis	LO 4.8, LO 4.9

Laboratory and Non-Laboratory Activities [CR3d] [CR5a] [CR5b] [CR6] [CR7]

Non – Laboratory Inquiry Activity: Reactions in Nature	LO 4.1, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Inquiry Laboratory/Activity: Reaction Rates	LO 4.4, LO 4.5, LO 4.6, LO 4.7, LO 4.8, LO 4.9, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Inquiry Activity: Baking Soda and Vinegar	LO 4.4, LO 4.5, LO 4.6, LO 4.7, LO 4.8, LO 4.9, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Non – Laboratory Inquiry Activity/Simulation: Reaction & Rates	LO 4.1, SP1, SP2, SP3, SP4, SP5, SP6, SP7

Activity: Order of Reaction	LO 4.1, LO 4.2, LO 4.3, SP2
Inquiry Activity/Demonstration: Glow stick and temperature.	LO 4.4, LO 4.5, LO 4.6, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Inquiry Laboratory – Iodine clock Reaction	LO 4.4, LO 4.5, LO 4.6, LO 4.7, LO 4.8, LO 4.9, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Laboratory: Rates of Chemical Reactions	LO 4.4, LO 4.5, LO 4.6, LO 4.7, LO 4.8, LO 4.9, SP1, SP2, SP3, SP4, SP5, SP6, SP7

Chapter 13: Chemical Equilibrium [CR2]
Homework: 2
Quiz: 1
Test: 1
Sections:

13.1 The Equilibrium Condition	LO 6.1
13.2 The Equilibrium Constant	LO 6.1, LO 6.7
13.3 Equilibrium Expressions Involving Pressures	LO 6.1, LO 6.5
13.4 Heterogeneous Equilibria	LO 6.1, LO 6.2
13.5 Applications of the Equilibrium Constant	LO 6.1, LO 6.2, LO 6.4, LO 6.5, LO 6.6
13.6 Solving Equilibrium Problems	LO 6.1, LO 6.2, LO 6.5, LO 6.6
13.7 Le Chatelier's Principle	LO 6.1, LO 6.3, LO 6.8, LO 6.9, LO 6.10

Laboratory and Non-Laboratory Activities[CR3b] [CR3e] [CR5a] [CR5b] [CR6] [CR7]

Laboratory; Determination of the Dissociation Constant of a Weak Acid	LO 2.2, LO 6.1, LO 6.11, LO 6.12, LO 6.14, SP2, SP3, SP4, SP5, SP6, SP7
Guided Inquiry Laboratory: Equilibrium/Equilibrium Constant	LO 2.2, LO 6.1, LO 6.11, LO 6.12, LO 6.14, SP1, SP2, SP3, SP4, SP5, SP6, SP7

Chapter 14: Acids and Bases [CR2]
Homework: 3
Quiz: 1
Test: 1
Sections:

14.1 The Nature of Acids and Bases	LO 2.2, LO 3.7, LO 6.1, LO 6.11
14.2 Acid Strength	LO 2.2, LO 6.1, LO 6.11, LO 6.12, LO 6.14
14.3 The pH Scale	LO 2.2, LO 6.1
14.4 Calculating the pH of Strong Acid Solutions	LO 2.2, LO 6.1, LO 6.11, LO 6.15
14.5 Calculating the pH of Weak Acid Solutions	LO 2.2, LO 6.1, LO 6.11, LO 6.15, LO 6.16
14.6 Bases	LO 2.2, LO 6.1, LO 6.11, LO 6.15, LO 6.16

14.7 Polyprotic Acids	LO 6.1, LO 6.11, LO 6.15
14.8 Acid-Base Properties of Salts	LO 2.1, LO 6.1, LO 6.16
14.9 The Effect of Structure of Acid-Base of Salts	LO 2.2, LO 6.1
14.10 Acid-Base Properties of Oxides	LO 6.1
14.11 The Lewis Acid-Base Model	LO 6.1
14.12 Strategy for Solving Acid-Base Problems	LO 6.1

Laboratory and Non-Laboratory Activities [CR3b] [CR3c] [CR3e] [CR6] [CR7]

Non-Laboratory Activity: Acids and Bases	LO 2.2, LO 3.7, LO 6.1, LO 6.11, LO 6.12, LO 6.14, SP1, SP2
Non-Laboratory Activity: Calculating pH	LO 2.2, LO 6.1 SP1, SP2

Chapter 15: Acid-Base Equilibria [CR2]
Homework: 3
Quiz: 1
Test: 1
Sections:

15.1 Solutions of Acid or Bases Containing a Common Ion	LO 6.1, LO 6.16, LO 6.17
15.2 Buffered Solutions	LO 6.1, LO 6.16, LO 6.17, LO 6.18, LO 6.19, LO 6.20
15.3 Buffering Capacity	LO 6.1, LO 6.20
15.4 Titrations and pH Curves	LO 1.20, LO 3.3, LO 6.1, LO 6.12, LO 6.13, LO 6.15
15.5 Acid-Base Indicators	LO 1.20, LO 6.1

Laboratory and Non-Laboratory Activities [CR3a] [CR3c] [CR3e] [CR5a] [CR5b] [CR6] [CR7]

Laboratory: Titration of Acids and Bases	LO 1.20, LO 3.3, LO 6.1, LO 6.12, LO 6.13, LO 6.15 SP2, SP3, SP4, SP5, SP6, SP7

Chapter 16: Solubility and Complex Ion Equiliria [CR2]
Homework: 2
Quiz: 1
Test: 1
Sections:

16.1 Solubility Equilibria and the Solubility Product	LO 6.1, LO 6.21, LO 6.22, LO 6.23
16.2 Precipitation and Qualitative Analysis	LO 6.1, LO 6.23
16.3 Equilibria Involving Complex Ions	LO 6.1

Chapter 17: Spontaneity, Entropy, and Free Energy [CR2]
Homework: 3
Quiz: 1
Test: 1
Sections:

17.1 Spontaneous Processes and Entropy	LO 2.15, LO 5.12, LO 5.18
17.2 Entropy and the Second Law of Thermodynamics	LO 5.12
17.3 The Effect of Temperature on Spontaneity	LO 5.3, LO 5.12
17.4 Free Energy	LO 5.13, LO 5.14
17.5 Entropy Changes in Chemical Reactions	LO 5.12

17.6 Free Energy and Chemical Reactions	LO 5.13, LO 5.14, LO 5.15, LO 5.16, LO 5.17, LO 5.18
17.7 The Dependence of Free Energy on Pressure	LO 5.18
17.8 Free Energy and Equilibrium	LO 5.18, LO 6.25
17.9 Free Energy and Work	LO 5.15

Chapter 18: Electrochemistry [CR2]
Homework: 3
Quiz: 1
Test: 1
Sections:

18.1 Balancing Oxidation-Reduction Equations	LO 3.2, LO 3.8
18.2 Galvanic Cells	LO 2.18
18.3 Standard Reduction Potentials	LO 2.18, LO 3.12, LO 3.13, LO 6.1
18.4 Cell Potential, Electrical Work, and Free Energy	LO 3.12, LO 3.13, LO 6.1
18.5 Dependence of Cell Potential on Concentration	LO 3.12, LO 3.13, LO 6.1
18.6 Batteries	
18.7 Corrosion	LO 6.1
18.8 Electrolysis	LO 3.12, LO 3.13, LO 5.15
18.9 Commercial Electrolytic Processes	

Laboratory and Non-Laboratory Activities [CR3c] [CR5a] [CR5b] [CR6] [CR7]

Non – Laboratory Activity: Creating an Electrolytic Cell	LO 3.12, LO 3.13, LO 5.15, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Laboratory: An Investigation of Voltaic Cells-The Nerst Equation	LO 3.12, LO 3.13, LO 6.1, SP2, SP3, SP4, SP5, SP6, SP7
Non-Laboratory Oxidation and Reduction	LO 3.2, LO 3.8

Chapter 19: The Nucleus: A Chemist's View [CR2]
Homework: 2
Quiz: 1
Test: 1
Sections:

19. 1 Nuclear Stability and Radioactive Decay	
19.2 The Kinetics of Radioactive Decay	LO 4.3
19.3 Nuclear Transformations	
19.4 Detection and Uses of Radioactivity	LO 4.3
19.5 Thermodynamic Stability of the Nucleus	
19.6 Nuclear Fission and Nuclear Fusion	
19.7 Effects of Radiation	

Laboratory and Non-Laboratory Activities [CR3d]

Non – Laboratory Guided Activity: Reaction Transfer	LO 4.3, SP1, SP2, SP3, SP4, SP5, SP6, SP7
Non – Laboratory Guided Activity: Half-Life	LO 4.1, LO 4.3, SP1, SP2, SP3, SP4, SP5, SP6, SP7

Chapter 20: The Representative Elements [CR2]
Homework: 1
Quiz: 1

Test: 1
Sections:

20.1 A Survey of the Representative Elements	LO 1.10, LO 1.11, LO 2.17
20.2 The Group 1A Elements	LO 1.10, LO 1.11, LO 5.18
20.3 The Chemistry of Hydrogen	LO 1.10, LO 1.11
20.4 The Group 2A Elements	LO 1.10, LO 1.11
20.5 The Group 3A Elements	LO 1.10, LO 1.11
20.6 The Group 4A Elements	LO 1.10, LO 1.11
20.7 The Group 5A Elements	LO 1.10, LO 1.11
20.8 The Chemistry of Nitrogen	LO 1.10, LO 1.11
20.9 The Chemistry of Phosphorus	LO 1.10, LO 1.11
20.10 The Group 6A Elements	LO 1.10, LO 1.11
20.11 The Chemistry of Oxygen	LO 1.10, LO 1.11
20.12 The Chemistry of Sulfur	LO 1.10, LO 1.11
20.13 The Group 7A Elements	LO 1.10, LO 1.11
20.14 The Group 8A Elements	LO 1.10, LO 1.11

Chapter 21: Transition Metals and Coordination Chemistry [CR2]
Homework: 1
Quiz: 1
Test: 1
Sections:

21.1 The Transition Metals: A Survey	LO 1.10, LO 1.11
21.2 The First-Row Transition Metals	
21.3 Coordination Compounds	
21.4 Isomerism	
21.5 Bonding in Complex ions: The localized Electron Model	
21. 6 The Crystal Field Model	
21.7 The Biological Importance of Coordination Complexes	
21.8 Metallurgy and Iron and Steel Production	

Laboratory and Non-Laboratory Activities [CR3a] [CR5a] [CR5b] [CR6] [CR7]

Laboratory: Chemistry of Complex Ions	LO 1.10, LO 1.11, SP1, SP3, SP4, SP5, SP6, SP7

Chapter 22: Organic and Biological Molecules [CR2]
Homework: 2
Quiz: 1
Test: 1
Sections:

22.1 Alkanes: Saturated Hydrocarbons	
22.2 Alkenes and Alkynes	
22.3 Aromatic Hydrocarbons	
22.4 Hydrocarbon Derivatives	
22.5 Polymers	
22.6 Natural Polymers	LO 2.15, LO 5.11

Laboratory and Non-Laboratory Activities [CR3a] [CR5a] [CR5b] [CR6] [CR7]

Non – Laboratory Activity: Creating a Bucky-ball	LO 1.10, LO 1.11, SP1, SP3, SP4, SP5, SP6, SP7
Non – Laboratory Inquiry Activity: Model Kits	LO 1.10, LO 1.11, SP1, SP3, SP4, SP5, SP6, SP7
Laboratory: Spectrophotometric Analysis of Commercial Aspirin	LO 1.10, LO 1.11, SP1, SP2,

SP3, SP4, SP5, SP6, SP7

End of Course Societal Activity **[CR4]** **[BI1], [BI2], [BI3], [BI4] [BI5], [BI6]**

Description: The students will choose a current societal issue that relates to chemistry to be researched, and presented to the class. The topics include, but are not limited to, fracking ethanol, cosmetics, paints, durable chemical products, and inventions. The students will determine as a base the formula, manufacturing aspects, implications on the environment, abstraction of raw materials, and societal implications. They must maintain a log that shows the developmental processes of their project with records that depict the evidence of all verbal, written, computer generated, and graphic communications that were needed from the inquiry stage to formal presentation. Summaries of respected literature and scientific investigated practices must be evident. Their presentation to the class must have an oral, written, and graphic aspect.

[CR2]-The course is structured around the enduring understandings within the big ideas as described in the AP Chemistry Curriculum Framework.

[CR3a] The students are provided opportunities outside the laboratory environment to meet the learning objectives within Big Idea 1: Structure of matter.

[CR3b] The students are provided opportunities outside the laboratory environment to meet the learning objectives within Big Idea 2: Properties of matter-characteristics, states, and forces of attraction.

[CR3c] The students are provided opportunities outside the laboratory environment to meet the learning objectives within Big Idea 3: Chemical reactions.

[CR3d] The students are provided opportunities outside the laboratory environment to meet the learning objectives within Big Idea 4: Rates of chemical reactions.

[CR3e] The students are provided opportunities outside the laboratory environment to meet the learning objectives within Big Idea 5: Thermodynamics

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[CR3f] The students are provided opportunities outside the laboratory environment to meet the learning objectives within Big Idea 6: Equilibrium.

[CR4] The course provides students with the opportunity to connect their knowledge of chemistry and science to major societal or technological components (e.g., concerns, technological advances, innovations) to help them become scientifically literate citizens.

[CR5a] Students are provided the opportunity to engage in investigative laboratory work integrated throughout the course for a minimum of 25 percent of instructional time.

[CR5b] Students are provided the opportunity to engage in a minimum of 16 hand-on integrated throughout the course while using basic laboratory equipment to support the learning objectives listed within the AP Chemistry Curriculum Framework.

[CR6] The laboratory investigations used throughout the course allow students to apply the seven practices defined in the AP Chemistry Curriculum Framework. At minimum, six of the required 16 Laboratories are conducted in a guided-inquiry format.

[CR7] The course provides opportunities for students to develop, record, and maintain evidence of their verbal, written, and graphic communication skills through laboratory reports, summaries of literature or scientific investigations, and oral, written, and graphic presentations.

Chapter 1
Inquiry Laboratory: Density Challenge

Description: The students need to determine how much sand can be placed in a film canister and still allow the film canister to float in water. They are to design their own experiment and carry it out based on the materials found in their laboratory drawers an throughout the room

Laboratory: Density Determination

Description: The density of solids and liquids are measured through varied means. Regular and irregular solids as well as one liquid are used. Each group has a different set of unknown metals and through their densities determines their identity from a chart.

Non-laboratory Activity: Classification of Matter **[BI2], [BI3]**

Description: Classification of objects from pictures. Deductive reasoning and sorting skills are incorporated. Prior knowledge is applied to objects.

Chapter 2
Laboratory: Quantitative Determination of an Empirical Formula

Description: Pure tin is gained from a multilevel laboratory with excess nitric acid. Tin-oxide is produced; mole ratios between products and reactants are determined as well as empirical formulas calculated.

Chapter 3
Laboratory: The Solubility of a Salt

Description: The solubility of a given salt at various temperatures is determined through experimentation. The gained data points are plotted to make a solubility curve.

Inquiry Activity/Laboratory: Conversions

Description: Atoms of graphite on paper, molecules of water swallowed, moles of chalk in a piece of chalk, and atoms of copper in a penny are determined through open ended experimentation and calculations. The students then create a real-life application of determining moles of a different substance. They create an activity and then present/implement this activity in class.

Laboratory: Types of Chemical Reactions

Description: A variety of reactions that are characterized as the five types of reactions are conducted. These reactions are theoretically balanced. All observations are recorded to include those that do not occur. Rational based on the activity series etcetera is listed to confirm the reaction occurring or not occurring.

Non-Laboratory Activity: Stoichiometry **[BI1]**

Description: Stoichiometry problems are determined theoretically and factually through models. The models are manipulated to show that the amounts of reactants can only create a set amount of products if there are no reactants in excess. Additional atoms are added to see how excess reactants will be found on the product end.

Non-Laboratory Activity: Average Atomic Mass **[BI1]**

Description: Average atomic mass is calculated. The usefulness of scientists to use the average in place of individual values is explored through this activity.

Chapter 4
Laboratory: Calculations with a Chemical Reaction

Description: A reaction between two solutions is observed. The moles of reactants and products are calculated. The excess reactant is determined and compared with the theoretical amounts that are solved for through stoichiometry.

Non-Laboratory Activity: Types of Chemical Reactions **[BI3]**

Description: Types of reactions are explored with patterns for these reactions exposed. These patterns are then followed to predict future reaction outcomes from a new set of reactants.

Chapter 5

Non-Laboratory Activity: Gas Laws **[BI1], [BI2]**

Description: Mathematical calculations of the gas laws are explored. These manipulations originate from the ideal gas law which is used as the base for the remaining laws. Unit cancellation and comparison between the laws are determined through student manipulation of the formula and unit cancellation.

Inquiry Laboratory: Boyles Law

Description: Boyles Law is explained and materials provided for the students to create their own gas law experiment. Students create experiment from manipulative set that include, but are not limited to, Pasco pressure software, syringe, and wooden blocks. The student designed procedure is designed, data gained and graphed.

Laboratory: Diffusion of Gases

Description: Two gases are placed at opposite ends of a glass tube. They diffuse to the center where they reaction. The rate at which they react together enables the rate of diffusion of the gases to be determined.

Chapter 6

Non-Laboratory Inquiry Activity: Potential vs Kinetic **[BI5]**

Description: Marker drops from teachers hand chin level. A discussion ensues about what has happened, including the energy in the system and how that energy remains the same. The students transfer past kinetic and potential energy ideas to new situation. Practical application is explored to include other energy transfers (gas in car).

Inquiry Laboratory: Specific Heat Set

Description: Students determine the identity of an unknown pure metal through calorimetery. Each student is provided with an unknown metal and their individual and community laboratory equipment in addition to a calorimeter. They are allowed to use Pasco temperature probes, and computers for the processing of data and looking up specific heat values to determine their unknown pure metal.

Laboratory: Enthalpy of a Chemical Reaction (Hess's Law)

Description: This laboratory encompasses three separate parts. Energy is determined for a liquid based on the enthalpy of solution in part I and neutralization of solutions in part II. Hess's Law is used to calculate energy through experimentation in part III.

Chapter 7

Non – Laboratory Activity: Electron Configuration **[BI1], [BI2]**

Description: Orbital Notation, Electron-Configuration, and Nobel Gas Configuration are determined for a variety of elements. These elements are then compared to one another. This comparison shows students how the subshells compare to one another as well as multiple ways of displaying the same information in a useful formate.

Laboratory: Determination of Wavelength of Maximum Absorbance

Description: The wavelength of maximum absorbance of any colored solution is determined. This laboratory utilizes a spectrophotometer and correlates wavelengths and visual colorations.

Laboratory: Thin Layer Chromatography

Description: A thin layer chromatography is used to determine compounds that make up a chemical mixture's identity. The separation of the mixture into its primary chemical components is separated out through the movement of the solvent through the mixture. The bands of a pure substance are compared to the mixture to

determine the components of the unknown mixture's identity.

Chapter 8

Activity: Model Kits

Description: Model kits are used to show bonds and angles between atoms in a compound. These compounds include single, double, and triple bonds. Bond angles based on shared and unshared electron pairs are examined. The structures shape and angle is determined.

Non – Laboratory Inquiry Activity: Redraw **[BI1], [BI2], [BI5]**

Description: Based on a set of drawn molecules the correctness is determined from creating the molecule from the model kits. The student works independently creating the models on the page, some of which cannot occur the way they are drawn. Student identified errors are redrawn based on the results of the model kit. The student then creates five models and transposes those models into lewis structures. The students' lewis structures are given to other groups, who replicate the structure.

Non-Laboratory Activity: Bond Energy **[BI1], [BI2], [BI5]**

Description: The students are given experimental data. Based on this data the student draws mathematical relationships between the variables of mass, temperature change, and heat. These relationships are then generalized for new situations that can occur in the classroom and real world experiences/

Chapter 9

Laboratory: Molecular Shapes and Structures/Molecular Models and Covalent Bonding

Description: Based on a set of teacher provided molecules the student creates the model of each molecule. Each model is then chemical named and the formula written. The bond type and central atom hybridization is listed for each molecule. The shape and angle is determined. The lewis structure is created.

Chapter 10

Inquiry Laboratory: Fun Things to do with Dry Ice **[BI2], [BI5]**

Description: Eight dry ice activities are given to the students. They must determine why the events occur through prior knowledge, in room resources, and the internet.. The students then must come up with two activities of their own. For each activity the student writes down the steps, sets up the apparatus, and instructs the class on these activities.

Non – Laboratory Inquiry Activity: Phase Diagram Determination

Description: Students determine the state of matter of a substance at a particular temperature and pressure based on a phase diagram. Students incorporate and transfers prior knowledge regarding phases of matter as well as understanding and interpreting graphs.

Chapter 11

Non – Laboratory Activity: Mathematical determination of molarity, molality, and normality. **[BI2]**

Description: Students work through the mathematical concepts of molarity, molality, and normality. The utilize units to see how prior equations may be needed as a sub-problem. They then create their own scenarios based on real world applications. These scenarios are presented to the group, and answers are gone over by the individual students.

Guided Inquiry Activity: Temperature vs Dissolved Sugar

Description: Students determine through independent experimentation how an increase in temperature increases the amount of dissolved particles such as table sugar. The students are given only a sugar and a scale in addition to their individual and community laboratory drawer equipment. They are to show the relationship through graphic data how temperature relates to solubility of table sugar

Laboratory: Molar Mass by Freezing Point Depression

Description: The molar mass of an unknown substance is determined by measuring the freezing point depression of a solution of an unknown substance and BHT. The freezing point of BHT is first determined. Pasco equipment is used to show the small increments of temperature between the pure BHT and the unknown substance with BHT.

Chapter 12

Non – Laboratory Inquiry Activity: Reactions in Nature **[BI4]**

Description: Students utilize picture and make predictions from past experience and observations regarding reactions occurring in nature. They determine time duration and factors that cause these reactions. The used of the internet and other resources is incouraged.

Inquiry Laboratory/Activity: Reaction Rates

Description: The students will research naturally occurring reactions in nature by the use of educationally sound resources. These resources may include, but are not limited to, the printed text, journals, on-line professional resources, and education sites such as Discovery Education. The students then in groups of two create a laboratory based on the data from their research. This activity will utilize the identified chemicals that create the reaction and the varying of these reactants to change the rate of reaction.

Inquiry Activity: Baking Soda and Vinegar

Description: Prior knowledge of reactions and creating formulas is used to draw a connection between the reduction of reactants and creation of products in a chemical reaction. This knowledge is then transferred to graph reaction rates of both reactants and products as a reaction progresses over time.

Non – Laboratory Inquiry Activity/Simulation: Reaction & Rates **[BI4]**

Description: Students are to utilize the Reaction & Rates simulation activity website. This program allows students to select a reaction, determine the number of starting molecules, the initial temperature, and see how the amount of products and reactants can change depending on these factors. They can change the variables and see how it changes the reaction and rate of reaction.

Activity: Order of Reaction

Description: A set of experimental data is given to the students. The data is plotted. Based on the plotted data the students determine the order of the reaction.

Inquiry Activity/Demonstration: Glow stick and temperature.

Description: Two activated identical glow sticks are placed in a beaker of cold water and a beaker of hot water. They are observed over a time period. Intensity of light correlated to rate of reaction is determined by the student. This opens up the correlation of temperature and the rate of reaction both initially and over a time period.

Inquiry Laboratory – Iodine clock Reaction

Description: Students determine how the concentration, temperature and catalysts change the rate of reaction. They create their own laboratory procedures; make the solutions, list safety precautions, and write laboratory questions and rubric answer keys.

Laboratory: Rates of Chemical Reactions

Description: The concentration and temperature is change between two reactants as stated in the laboratory. The rate of the reaction is recorded. Correlation between these two systems is determined as well as the rate of the reaction.

Chapter 13

Laboratory; Determination of the Dissociation Constant of a Weak Acid

Description: Students are given an unknown acid and perform a titration. From the titration data they then

determine the pKa value of an unknown acid.

Guided Inquiry Laboratory: Equilibrium/Equilibrium Constant

Description: Students determine the identity of unknown reactants based on the results of mixing premeasured reactants that show Le Chatelier's principle. Based on the shift the students are able predict the possible reactants. These reactants are then further identified through the use of resources and further exploration.

Chapter 14

Non-Laboratory Activity: Acids and Bases **[BI2], [BI3], [BI6]**

Description: A variety of acids and bases are given. Properties of acids and bases, their role in reactions, and conjugate pairs in a reaction are explored.

Non-Laboratory Activity: Calculating pH **[BI2], [BI6]**

Description: Hydronium and hydroxide concentrations are calculated. The use of mathematical calculations and the relationship between pH and an acids hydronium concentration; as well as the pOH value and a bases hydroxide concentration are correlated.

Chapter 15

Laboratory: Titration of Acids and Bases

Description: A known base's concentration is used to determine a known acids concentration. Students determine the concentration of an unknown acid's strength through a titration experiment by gaining the volumes of each reached at the endpoint.

Chapter 16

Chapter 17

Chapter 18

Non – Laboratory Activity: Creating an Electrolytic Cell **[BI3], [BI5]**

Description: Students depict with three dimensional creative items a non-functioning electrolytic cell with a key. The model is presented by the student, who explains all aspects of the model.

Laboratory: An Investigation of Voltaic Cells-The Nerst Equation

Description: An oxidation-reduction reaction is created. The voltage produced by this oxidation-reduction reaction and the effect of concentration on that potential is determined through the experiment.

Non-Laboratory Oxidation and Reduction **[BI3]**

Description: Identification of chemical reactions as either redox or non-redox. This is accomplished by analyzing oxidation numbers of the atoms involved in the reactions and how it may changes on the product side.

Chapter 19

Non – Laboratory Guided Activity: Reaction Transfer **[BI4]**

Description: Students are given samples of non-nuclear reactions and asked how they are balanced. A nuclear reaction is given with all mass numbers. The students are to determine how the new products are formed, leading them to the transfer of subatomic particles. Reactions missing one part are then given and through the mathematical manipulation the mass, atomic number, and substance are determined.

Non – Laboratory Guided Activity: Half-Life **[BI4]**

Description: Sample data is given and plotted for a half-life reaction. Based on the graphed data the students determine if half-life reactions are zero, first, or second order.

Chapter 20

Chapter 21

Laboratory: Chemistry of Complex Ions

Description: Complex ions are determined by experimentation through the reactants creating precipitates. The complete reactions are written. The reaction results are placed in a charted.

Chapter 22

Non – Laboratory Activity: Creating a Bucky-ball **[BI1]**

Description: Students investigate the three allotropes of carbon. The properties and bonds are discussed. A Bucky-ball fullerene model is cut out, colored, and taped together to show the bond connections of this soccer ball shaped structure.

Non – Laboratory Inquiry Activity: Model Kits **[BI1]**

Description: Organic compounds (primarily alkanes/alkenes/alkynes/cycloalkanes) are listed for the students to create through model kit sets. These organic models are but together and named based on the structures created in the model kits. A set of bonds and atoms are placed in separate bags for the students to create and name the isomers. The bags are placed on the table and students rotate to the station. They then create their own model kit baggy with an answer key of all isotopes with formulas and names. These are checked by the teacher and then shared with the other student groups. Students may use any resources when crating their baggy.

Laboratory: Spectrophotometric Analysis of Commercial Aspirin

Description: Students are provided with a variety of aspirin samples. They then use a mortar and petal set to create a powder. An equal amount of each aspirin is used for the individual laboratory sample sets. The amount of acetylsalicylic acid is determined for each variety of aspirin brand with the use of a spectrophotometer.

End of Course Societal Activity **[CR4]** **[BI1], [BI2], [BI3], [BI4] [BI5], [BI6]**

Description: The students will choose a current societal issue that relates to chemistry to be researched, and presented to the class. The topics include, but are not limited to, fracking ethanol, cosmetics, paints, durable chemical products, and inventions. The students will determine as a base the formula, manufacturing aspects, implications on the environment, abstraction of raw materials, and societal implications. They must maintain a log that shows the developmental processes of their project with records that depict the evidence of all verbal, written, computer generated, and graphic communications that were needed from the inquiry stage to formal presentation. Summaries of respected literature and scientific investigated practices must be evident. Their presentation to the class must have an oral, written, and graphic aspect.