CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

ACS EXAM NOTES:

- The format of the units on the ACS exam is different than what is typically used in texts. For example, grams/mole is written on the exam as $g*mol^{-1}$. If not exposed to this format throughout the course, students can be confused by its use on the exam.
- Students are provided with a periodic table and limited reference sheet in the inside cover of the exam.
- Students should be provided with an additional reference sheet including polyatomic ion names and charges, activity series, solubility rules, and a periodic table that includes the names of the elements

PACING GUIDE NOTES:
Based on a 90 day semester, this guide consists of 80 instructional days, with 10 flex days for:

- ½ days = 1 per semester
- Pep Rallies/Assemblies (Holiday program, Black History Month, spring music program, etc.)
- Inclement Weather Days
- Holiday Interruptions
- Cumulative Review—2 days
- District Assessment (Midterm and Final)=4 days (depending on class period)
- Specific Attention to Science and Engineering Practices

Content Areas	**Science and Engineering Practices**
Pacing	These practices are NOT a distinct unit and should be taught throughout the course as a means to understand the content. A minimum of 30% hands-on investigation is required.
Conceptual Understanding	**H.C.1A** The practices of science and engineering support the development of science concepts, develop the habits of mind that are necessary for scientific thinking, and allow students to engage in science in ways that are similar to those used by scientists and engineers. **H.C.1B** Technology is any modification to the natural world created to fulfill the wants and needs of humans. The engineering design process involves a series of iterative steps to solve a problem and often leads to the development of a new or improved technology.
SC Performance Indicators	**H.C.1A.1** Ask questions to (1) generate hypotheses for scientific investigations, (2) refine models, explanations, or designs, or (3) extend the results of investigations or challenge scientific arguments or claims. **H.C.1A.2** Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	Science and Engineering Practices
SC Performance Indicators	**H.C.1A.3** Plan and conduct controlled scientific investigations to answer questions, test hypotheses, and develop explanations: (1) formulate scientific questions and testable hypotheses based on credible scientific information, (2) identify materials, procedures, and variables, (3) use appropriate laboratory equipment, technology, and techniques to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures. **H.C.1A.4** Analyze and interpret data from informational texts and data collected from investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning, (2) support or refute hypotheses, explanations, claims, or designs, or (3) evaluate the strength of conclusions. **H.C.1A.5** Use mathematical and computational thinking to (1) use and manipulate appropriate metric units, (2) express relationships between variables for models and investigations, and (3) use grade-level appropriate statistics to analyze data. **H.C.1A.6** Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions form scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams. **H.C.1A.7** Construct and analyze scientific arguments to support claims, explanations, or designs using evidence and valid reasoning from observations, data, or informational texts. **H.C.1A.8** Obtain and evaluate scientific information to (1) answer questions, (2) explain or describe phenomena, (3) develop models, (4) evaluate hypotheses, explanations, or claims, or designs or (5) identify and/or fill gaps in knowledge. Communicate using the conventions and expectations of scientific writing or oral presentations by (1) evaluating grade-appropriate primary and secondary literature, or (2) reporting the results of student experimental investigations. **H.C.1B.1** Construct devices or design solutions using scientific knowledge to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the device or solutions, (3) generate and communicate ideas for possible devices or solutions, (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and refine the design if needed, and (6) communicate the results.

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	Science and Engineering Practices
Content Focus	Provide opportunities for students to practice: • Asking scientific questions • Differentiating between questions answerable through science and non-science based questions • Developing hypotheses that are testable • Making predictions based on a hypothesis • Understanding and applying the terms "refute" and "verify" to a test of a hypothesis • Using evidence to support arguments • Giving examples of useful scientific models and determining the limitations of these modelsDeveloping and improving upon models • Understanding and applying the terms "inverse" and "direct" relationship • Recognizing the general shape of a graph depicting an inverse or direct relationship • Recognizing and understanding the general shape of a graph depicting a linear or exponential relationship • Differentiating between "correlation" and "causation" • Developing methods for testing a hypothesis • Interpreting and analyzing a wide variety of graphs • Identifying the x and y axis on a graph and the scale and units used for each • Making graphs by hand and with the assistance of a computer • Performing calculations based on numbers obtained from a graph • Identify independent variable/dependent variables and manipulated/responding values in an experiment • Evaluating a procedure for its controllability • Developing procedures for a controlled test • Identifying examples of qualitative data and quantitative data • Creating appropriate data tables for a given procedure • Obtaining measurements using metric units • Converting units • Deducing the resulting units from a given calculation using dimensional analysis • Reading and making sense of "grade-appropriate" scientific literature • Reporting findings in various formats such as lab report, poster, or presentation • Establishing the relationship between science and technology • Designing solutions to a specific problem • Evaluating a potential solution to a problem based on the testing of established criteria • Improving and refining a potential solution to a problem based on the results of testing and evaluation • Understanding and adhering to all lab safety rules and procedures

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Science and Engineering Practices**
Content Focus	• Identifying, locating, and modeling the use of all safety equipment including safety shower, eye wash, first aid kit, gas shut off, fume hood, fire blanket, Sharps disposal, emergency exits, goggle station, apron station, hot mitts, and any other safety equipment pertaining to lab exercises • Selecting and safely using appropriate lab equipment including electronic balances, graduated cylinders, beakers, flasks, well plates, test tubes, test tube racks, biurets, Bunsen burners, hot plates, thermometers, filters, crucibles, evaporating dishes, wire gauze, test tube clamps, ring stands, centrifuge, tongs, scoops, pipettes, and any other equipment pertaining to lab exercises
Suggested Activities	There are also activities and labs in the textbook that are not listed here because of possible textbook changes in the next year. **H.C.1 Science and Engineering Practices (to be taught along with content and as you can fit it in)** • Accuracy vs. Precision http://www.learner.org/courses/learningmath/measurement/session2/part_c/accuracy.html • POGIL Fundamentals of Experimental Design • POGIL Significant Digits and Measurement • POGIL Significant Zeros Lab Safety • (how to pour a reagent from a stoppered flask, point test tube away from everyone, goggle, etc...?) $KClO_3$ + Gummy Bear (video on how to do demo: http://www.youtube.com/watch?feature=player_embedded&v=txkRCIPSsjM)
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Unit 1** **Intro to Periodic Table and Atomic Structure**
Pacing	4 days
Conceptual Understanding	**H.C.2A** The existence of atoms can be used to explain the structure and behavior of matter. Each atom consists of a charged nucleus, consisting of protons and neutrons, surrounded by electrons. The interactions of these electrons between and within atoms are the primary factors that determine the chemical properties of matter. In a neutral atom the number of protons is the same as the number of electrons.
SC Performance Indicators	**H.C.2A.1** Obtain and communicate information to describe and compare subatomic particles with regard to mass, location, charge, electrical attractions and repulsions, and impact on the properties of an atom.
Content Focus	• Identify groups and periods on the periodic table • Identify atomic number and atomic weight on the periodic table • Within an atom, Identify the location and charge of protons, neutrons, and electrons • Use atomic number to determine number of protons • Use atomic number to determine number of electrons in a neutral atom • Given mass number and atomic number, determine the number of neutrons • Given number of protons, neutrons, and electrons, determine atomic number and mass number • Explain the difference between mass number and atomic weight • Differentiate between isotopes and ions • Explain why atomic weight is not a whole number • Write and recognize the atomic number, mass number, and symbol for the nucleus of any isotope
Suggested Activities	2A.1 (Subatomic particles) • Atomic Basics: http://www.learner.org/interactives/periodic/basics.html Click through until Quiz • Video (1.5 minutes): World's Smallest Movie (atoms) http://iphone.sciencealert.com.au/features/20140107-25785.html Behind the Scenes at the bottom (5 minutes) • POGIL Isotopes • Isotopes, A Weighty Matter http://www.learner.org/interactives/periodic/isotopes.html • Junk drawer atoms- using things from a junk drawer, make a model of atom that represents the mass, location, charge, electrical attractions and repulsions of subatomic particles. • POGIL * activity on Coulombic Attraction
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition Chapter 6

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Unit 2 Nuclear**
Pacing	3 days
Conceptual Understanding	**H.C.2B** In nuclear fusion, lighter nuclei combine to form more stable heavier nuclei and in nuclear fission heavier nuclei are split to form lighter nuclei. The energies in fission and fusion reactions exceed the energies in usual chemical reactions.
SC Performance Indicators	**H.C.2B.1** Obtain and communicate information to compare alpha, beta, and gamma radiation in terms of mass, charge, penetrating power, and their practical applications (including medical benefits and associated risks). **H.C.2B.2** Develop models to exemplify radioactive decay and use the models to explain the concept of half-life and its use in determining the age of materials (such as radiocarbon dating or the use of radioisotopes to date rocks). **H.C.2B.3** Obtain and communicate information to compare and contrast nuclear fission and nuclear fusion and to explain why the ability to produce low energy nuclear reactions would be a scientific breakthrough. **H.C.2B.4** Use mathematical and computational thinking to explain the relationship between mass and energy in nuclear reactions ($E = mc^2$).
Content Focus	• Compare chemical to nuclear reactions • Illustrate the process of nuclear fission in words and/or with a diagram • Illustrate the process of nuclear fusion in words and/or with a diagram • Understand and calculate the relationship between mass and energy in nuclear reactions using Einstein's equation $E=mc^2$ • Differentiate the energy from fusion reactions, fission reactions, and chemical reactions in terms of reaction temperature and energy released per kg of fuel • Explain why low energy nuclear reactions would be a scientific breakthrough • Identify typical inputs for fission and fusion reactions • Write and balance equations for fission reactions • Write and balance equations for fusion reactions • Recognize the symbol for alpha, beta and gamma radiation • Explain the nature of each type of radiation including mass and charge • Compare the penetrating power of alpha, beta, and gamma particles and give examples of what will block each • Describe the effect of the release of the particles from the nucleus for each particle • Understand practical applications of radiation (including medical benefits and associated risks) • Know that there are no stable nuclei with an atomic number higher than 83 or neutron number higher than 126 • Radioactivity results from the random and spontaneous breakdown of the unstable nucleus

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Unit 2** **Nuclear**
Content Focus	• Define nuclear decay • Explain how decay rate is characteristic to an isotope • Perform calculations involving half-life and represent the concept of half-lives with a diagram • Understand how half-life of radioisotopes can be used to determine the age of materials
Suggested Activities	2B.1 (Alpha, Beta, Gamma Radiation and its practical applications) • Article: Fukushima studies are beginning to reveal the severe legacy of radiation leaks 2B.2 (Radioactive Decay and Half-Life) • Calculating half-life of Twizzler and M&M Half Life lab (Google Folder) • Online half-life simulation http://www.glencoe.com/sites/common_assets/science/virtual_labs/E18/E18.html 2B.3 (Fission and Fusion) • Fusion/ Fission modeling lab (Google folder) 2B.4 ($E=mc^2$) • 60-second explanation: http://www.symmetrymagazine.org/article/february-2005/explain-it-in-60-seconds • Nova Einstein's Big Idea http://www.pbs.org/wgbh/nova/physics/einstein-big-idea.html (especially beginning at minute 41)
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition Chapter 25

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Unit 3** **Periodic Table Trends including Electron Configurations**
Pacing	10 days
Conceptual Understanding	**H.C.2A** The existence of atoms can be used to explain the structure and behavior of matter. Each atom consists of a charged nucleus, consisting of protons and neutrons, surrounded by electrons. The interactions of these electrons between and within atoms are the primary factors that determine the chemical properties of matter. In a neutral atom the number of protons is the same as the number of electrons.
SC Performance Indicators	**H.C.2A.2** Use the Bohr and quantum mechanical models of atomic structure to exemplify how electrons are distributed in atoms. **H.C.2A.3** Analyze and interpret absorption and emission spectra to support explanations that electrons have discrete energy levels.
Content Focus	• Deduce the relationship between number of energy levels and period • Define "Valence Electron" • Given an element, represent the number of valence electrons by drawing a Bohr Diagram • Deduce the relationship between number of valence electrons and group • Recognize the similarity in chemical properties related to the number of valance electrons and the group on the periodic table • Given an element, draw the Lewis Dot structure • Identify the s, p, d, and f regions on the periodic table • Define atomic orbitals • Describe the basic shapes of s,p,d,f orbitals • Recall that each orbital of any shape can hold up to 2 electrons • Explain the "nesting" nature of principle energy levels, sublevels, orbital, spin---an analogy to an address or stadium might be used • State and apply Hund's Rule • State and apply the Aufbau Order • Recognize and explain exceptions to the Aufbau order for half full/full d sublevels • State and apply the Pauli Exclusion Principle • Understand what is meant by "ground state" electron configuration • Given an electron configuration of a neutral atom, identify the element • Given an element, determine the electron configuration diagrammatically with arrows • Given an element, determine the electron configuration using the periodic table

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Unit 3** **Periodic Table Trends including Electron Configurations**
Content Focus	• Given an electron configuration, determine the number of valence electrons • Explain how the electron configuration would change if electrons were lost or gained to form an ion • Explain and apply the octet rule and its exceptions • Explain the significance of a complete s and p orbital for noble gases • "Debunk" the common misconception that the 3rd energy level can only hold 8 electrons by outlining an example from the d block of elements • Recognize and describe the periodic trends associated with atomic radius • Define electronegativity • Recognize and describe the periodic trends associated with electronegativity • Analyze and interpret absorption and emission spectra to support that electrons have discrete energy levels
Suggested Activities	2A (Atomic Structure and the Periodic Table) • The New Periodic Table Song https://www.youtube.com/watch?v=zUDDiWtFtEM • The rarest metal on earth https://www.youtube.com/watch?v=3_7KYoO5qHk 2A.2 (Quantum Mechanical Model of the Atom) • It's Elementary: Building Atoms (Computer Interactive) http://www.learner.org/interactives/periodic/elementary_interactive.html • POGIL activity- Electron configuration • Pauli Exclusion Principle MinutePhysics video – https://www.youtube.com/user/minutephysics/videos?sort=p&view=0&shelf_id=2&app=desktop • POGIL Cracking the Periodic Table Code • Schrödinger's Cat explained in one minute https://www.youtube.com/watch?v=IOYyCHGWJq4&app=desktop 2A.3 (Emission spectra) • What Color is a Mirror? https://www.youtube.com/watch?v=-yrZpTHBEss&list=TL7uFzLEPPgsKoG4aYpWRc4J4_s40PdV_q • POGIL Electron Energy and Light • Minute video: "There is no pink light" https://www.youtube.com/watch?v=S9dqJRyk0YM&app=desktop • Chemistry of Fireworks explanation http://scifun.chem.wisc.edu/chemweek/fireworks/fireworks.htm • Flame test lab (Google Doc)
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition Chapters 4 and 6

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Unit 4 Bonding and Chemical Formulas**	
Pacing	14 days	
Conceptual Understanding	**H.C.3A**	Elements are made up of only one kind of atom. With increasing atomic number, a predictable pattern for the addition of electrons exists. This pattern is the basis for the arrangement of elements in the periodic table. The chemical properties of an element are determined by an element's electron configuration. Elements can react to form chemical compounds/molecules that have unique properties determined by the kinds of atoms combined to make up the compound/molecule. Essentially, the ways in which electrons are involved in bonds determines whether ionic or covalent bonds are formed. Compounds have characteristic shapes that are determined by the type and number of bonds formed.
SC Performance Indicators	**H.C.3A.1**	Construct explanations for the formation of molecular compounds via sharing of electrons and for the formation of ionic compounds via transfer of electrons.
	H.C.3A.2	Use the periodic table to write and interpret the formulas and names of chemical compounds (including binary ionic compounds, binary covalent compounds, and straight-chain alkanes up to six carbons).
	H.C.3A.3	Analyze and interpret data to predict the type of bonding (ionic or covalent) and the shape of simple compounds by using the Lewis dot structures and oxidation numbers.
	H.C.3A.4	Plan and conduct controlled scientific investigations to generate data on the properties of substances and analyze the data to infer the types of bonds (including ionic, polar covalent, and nonpolar covalent) in simple compounds.
	H.C.3A.5	Develop and use models (such as Lewis dot structures, structural formulas, or ball-and-stick models) of simple hydrocarbons to exemplify structural isomerism.
	H.C.3A.6	Construct explanations of how the basic structure of common natural and synthetic polymers is related to their bulk properties.
Content Focus	• Recognize stable electron configurations • Explain why the sum of the oxidation numbers in the formula of any neutral compound is zero • Predict whether an atom would gain or lose electrons and how many • Use Lewis Dot structures to represent ionic compounds • Use Lewis Dot structures to represent covalent compounds • Recognize when a single, double, or triple bond will be present in a covalent compound • Memorize oxidation numbers of group 1, 2, 16, and 17 elements • Understand that polyatomic ions are formed when a group of atoms are covalently bonded • Be able to draw the Lewis dot structure of a polyatomic ion and use it to explain the oxidation number	

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Unit 4** **Bonding and Chemical Formulas**
Content Focus	• Recognize that metals form positive ions (cations) by losing electrons • Recognize that nonmetals form negative ions (anions) by gaining electrons • Understand the significance of VSEPR in determining the shape of a molecule • Determine the shape of simple molecules such as water and carbon dioxide • Explain why an s and three p orbitals results in 4 possible bonding sites • Understand the tetrahedral bonding site structure • Identify ionic and covalent bonds • Realize that molecular compounds are also known as covalent compounds and one unit is a molecule • Realize that one unit of an ionic compound is a formula unit • Identify a substance as molecular or ionic • Compare properties of molecular and ionic compounds • Given the name of a binary ionic compound, write the correct formula with proper subscripts • Given the formula of a binary ionic compound, students should be able to write the correct name • Given a reference chart with names, formulas and charges of polyatomic ions, write the correct formula with proper subscripts and parenthesis for compounds containing polyatomic ions • Given a reference chart, students should be able to recognize and name ionic compounds containing polyatomic ions • Recognize compounds that require a roman numeral in the name and be able to determine the appropriate roman numeral • Given the name of a covalent compound, write the correct formula with proper subscripts • Given the formula of a covalent compound, write the correct name using the appropriate prefixes • Write the names and formulas of straight-chain alkanes up to six carbons • Introduce naming for acids and bases, but <u>do not test</u> until acids/bases are covered in unit 8 • Explain what is meant by ionic and covalent being "relative" terms • Given a compound and cutoffs values for polarity, students will describe percent ionic character • Recognize how electronegativity effects ionic character • Identify diatomic molecules as having 0 percent ionic character with equally shared electrons • Determine polarity based on electronegativity • Diagram metallic bonding and understand that a unit of a metal is an atom • Model simple hydrocarbons using Lewis dot structures, structural formulas, and ball and stick models • Define structural isomerism and give examples to illustrate it • Explain how the basic structure of common natural and synthetic polymers is related to their bulk properties

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Unit 4** **Bonding and Chemical Formulas**
Suggested Activities	Periodic Table Review ● Sweet 16 Periodic Table Tournament https://www.flinnsci.com/media/450889/cf10943.pdf ● What's in the Box http://www.learner.org/interactives/periodic/box.html ● Groups http://www.learner.org/interactives/periodic/groups.html ● Element quiz http://funbasedlearning.com/chemistry/elemQuiz/default.htm Trends ● It's Elementary http://www.flinnsci.com/media/1040012/cf10915.pdf ● POGIL Periodic Trends (Atomic Size and Electronegativity) 3A.1 (Covalent and Ionic Bonding explanations) ● POGIL Ions ● Demo: Pickle of Possible Death (YOU WILL NEED A CONDUCTIVITY TESTER) http://ncsu.edu/project/chemistrydemos/Electrochem/Glowing%20Pickle.pdf ● Demo: Conductivity of covalent (sugar) vs ionic (salt) solutions using a conductivity tester http://www.flinnsci.com/store/Scripts/prodView.asp?idproduct=15507 ● How polarity makes water behave strangely (TED talk) https://www.youtube.com/watch?v=PrVt6K75ADg 3A.2 (Formulas-binary ionic, binary covalent, straight-chain methane-hexane) ● POGIL Naming Ionic Compounds ● POGIL Polyatomic Ions ● Sweet 16 Chemical Formulas Tournament (Ionic) http://www.flinnsci.com/media/977017/cf11045.pdf ● POGIL Naming Molecular Compounds ● Naming in a nutshell (includes acids) (Google Doc) 3A.3 (Predict bonding type and shapes) ● Lewis Structures Review: I'm Too Sexy For This Lab http://mrstaylorssciworld.weebly.com/uploads/3/8/6/3/3863194/guided_inquiry_chem_7.pdf ● POGIL Molecular Geometry

Content Areas	Unit 4 Bonding and Chemical Formulas
Suggested Activities	3A.4 (Plan and do a lab about bonding) ● Some variation of: http://serc.carleton.edu/sp/mnstep/activities/35539.html 3A.5 (Models of simple hydrocarbons to show structural isomerism) ● Boiling points of simple alkanes and isomers. http://www.oakland.k12.mi.us/portals/0/learning/organicchemistry.pdf ● Use molecular model kits or candies and toothpicks to build the isomers in the activity above. 3A.6 (How structure of common natural and synthetic polymers relate to properties) ● Silicone Super Ball http://www.flinnsci.com/media/395431/cf0758.50.pdf
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition Chapters 7, 8, and 9

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	**Unit 5** **Moles and Mole Conversions**
Pacing	8 days
Conceptual Understanding	**H.C.3A** Elements are made up of only one kind of atom. With increasing atomic number, a predictable pattern for the addition of electrons exists. This pattern is the basis for the arrangement of elements in the periodic table. The chemical properties of an element are determined by an element's electron configuration. Elements can react to form chemical compounds/molecules that have unique properties determined by the kinds of atoms combined to make up the compound/molecule. Essentially, the ways in which electrons are involved in bonds determines whether ionic or covalent bonds are formed. Compounds have characteristic shapes that are determined by the type and number of bonds formed.
SC Performance Indicators	**H.C.3A.7** Analyze and interpret data to determine the empirical formula of a compound and the percent composition of a compound.
Content Focus	• Recall that a mole is $6.022X10^{23}$ of any unit (called a representative particle) • Define the molar mass of a pure substance as the mass in grams of one mole of the substance • Recognize that molar mass (in grams) is numerically equal to the atomic mass given on the periodic table • Define "formula mass" as a term used to describe the mass of one mole of an ionic substances • Identify one unit (representative particle) of an ionic substance as a "formula unit" • Given a periodic table and an ionic formula, students will be able to calculate the formula mass • Define "molecular mass" as a term used to describe the mass of one mole of a covalent substances • Identify one unit (representative particle) of a covalent substance as a "molecule" • Given a periodic table and a covalent formula, calculate the molecular mass • Understand the similarity in the process of calculating molar mass, formula mass, and molecular mass • If given the mass in grams of any substance, determine how many moles • If given moles of any substance, determine the mass (grams) • Define a hydrate and recognize the format used to write the formula of a hydrate • Calculate the formula mass of a hydrate • Calculate the percent water in a hydrate • Calculate the percent composition (by mass) of any chemical compound • When given the number of atoms of an element, calculate the number of moles • When given the number of molecules or formula units of a compound, calculate the number of moles • When given the number of moles of molecules or formula units, determine the number of molecules or formula units • When given the moles of a compound, determine the number of each atom present and the total number of atoms

CP Chemistry– Curriculum Pacing Guide – 2014-2015
First Half of Semester

Content Areas	Unit 5 Moles and Mole Conversions
Content Focus	• Memorize the molar volume of any gas at STP is 22.4 L • Understand that STP stands for standard temperature and pressure. In this unit only STP situations are used, but this is often seen in problems so can be confusing. • When given the volume of a gas, calculate the moles of gas • When given the moles of gas, calculate the volume of gas • When given the quantity, mass, or volume (of a gas) of any substance, be able to calculate the corresponding quantity, mass, or volume (of a gas) of the substance
Suggested Activities	3A.7 (Empirical Formulas and Percent Composition) • Bubble Gum Lab (Google Doc) • CSI Empirical and Molecular Formula http://filebox.vt.edu/users/slwood06/portfolio/DocumentsForLinks/moleunit/EmpiricalMolecularFormulaLesson.htm
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition Chapter 10

5 Flex Days/Midterm Exam

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 6** **States of Matter and Gas Laws**	
Pacing	7 days	
Conceptual Understanding	**H.C.4A**	Matter can exist as a solid, liquid, or gas, and in very high-energy states, as plasma. In general terms, for a given chemical, the particles making up the solid are at a lower energy state than the liquid phase, which is at a lower energy state than the gaseous phase. The changes from one state of matter into another are energy dependent. The behaviors of gases are dependent on the factors of pressure, volume, and temperature.
SC Performance Indicators	**H.C.4A.1** **H.C.4A.2** **H.C.4A.3**	Develop and use models to explain the arrangement and movement of the particles in solids, liquids, gases, and plasma as well as the relative strengths of their intermolecular forces. Analyze and interpret heating curve graphs to explain that changes from one state of matter to another are energy dependent. Conduct controlled scientific investigations and use models to explain the behaviors of gases (including the proportional relationships among pressure, volume, and temperature).
Content Focus	• Define the phase changes of melting, boiling, condensation, freezing, sublimation, and deposition • Explain how atmospheric pressure affects boiling point • Explain how atmospheric pressure changes with altitude • Analyze a phase diagram including identifying the phase changes occurring across each line and the phase of matter represented in each section of the graph • Provided with a phase diagram and given values for temperature and pressure, determine the phase of matter for a given substance • Locate and explain the triple point • Locate and explain the critical point • Analyze a heating or cooling curve • Explain the changes in kinetic energy, potential energy, and heat transfer of each phase • Understand phase changes in terms of Kinetic molecular theory (relationship between speed and distance of particles and temperature) • Explain the relationship between pressure and volume in a gas sample based on kinetic molecular theory • Explain the relationship between temperature and average kinetic energy • Explain the significance of the absolute temperature scale and absolute zero • Use models, graphs, and calculations to explain the relationship between temperature and pressure of a gas • Use models, graphs, and calculations to explain the relationship between temperature and volume of a gas • Use models, graphs, and calculations to explain the relationship between volume and pressure of a gas	

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 6** **States of Matter and Gas Laws**
Content Focus	• Complete calculations with changes in gas pressure, volume, and/or temperature • Convert between pressure units (atm, kPa) (Note: these values are provided on the ACS exam reference sheet) • Perform calculations using the ideal gas law (Note: The three gas constant values, R, are provided on the ACS exam reference sheet) • Differentiate between a real gas and an ideal gas • Explain the conditions of pressure and temperature in which a gas will behave most like an ideal gas • Memorize the conditions of STP • Explain the significance of hydrogen bonding • Explain how the intermolecular forces determine the state of matter at room temperature • Explain the relationship between intermolecular forces melting and boiling points
Suggested Activities	4A.1 (Particle Arrangement and Movement and Intermolecular Forces) ● Exploring Intermolecular Forces (In Google folder) 4A.2 (Heating Curve Graphs: changes of state are energy dependent) ● Vernier Activity record temp of melting ice and boiling water 4A.3 (Gas Laws) ● An Ideal Gas Simulation with changing variables http://www.freezeray.com/chemistry.htm ● POGIL Gas Variables (Ideal gas law) ● Vernier Gas Laws
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition Chapters 13 and 14

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	Unit 7 Solutions
Pacing	6 days
Conceptual Understanding	**H.C.5A** Solutions can exist in any of three physical states: gas, liquid, or solid. Solution concentrations can be expressed by specifying the relative amounts of solute and solvent. The nature of the solute, the solvent, the temperature, and the pressure can affect solubility. Solutes can affect such solvent properties as freezing point, boiling point, and vapor pressure. Acids, bases, and salts have characteristic properties. Several definitions of acids and bases are used in chemistry.
SC Performance Indicators	**H.C.5A.1** Obtain and communicate information to describe how a substance can dissolve in water by dissociation, dispersion, or ionization and how intermolecular forces affect solvation. **H.C.5A.2** Analyze and interpret data to explain the effects of temperature and pressure on the solubility of solutes in a given amount of solvent. **H.C.5A.3** Use mathematical representations to analyze the concentrations of unknown solutions in terms of molarity and percent by mass.
Content Focus	• Define the terms "solute" and "solvent" and give examples • Define solubility • Analyze solubility curves and solubility tables • Be aware that solubility curves and tables often use grams of solute per 100 grams of solvent, so be able to calculate solubility for varying amounts of solvent • Explain the effects of temperature on solubility of solids in a liquid • Explain the effects of temperature and pressure on solubility of a gas in a liquid • Distinguish among strong electrolytes, weak electrolytes, and nonelectrolytes • Describe and explain saturated, unsaturated, and supersaturated solutions • Use a solubility curve or table to determine if a given solution is saturated, unsaturated, or supersaturated at a given temperature • Understand the phrase "like dissolves like" • Give or recognize common examples of polar and nonpolar solvents • Explain the terms soluble vs insoluble and miscible vs immiscible • Define and identify colligative properties • Explain boiling point elevation, freezing point depression, vapor-pressure lowering qualitatively in terms of kinetic molecular theory • Give examples of practical uses for colligative properties

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 7** **Solutions**
Content Focus	• Define molarity • Perform calculations with molarity • Recall that if grams of solute are given, it must be converted to moles for molarity calculations. • Calculate percent by mass of solutions • Calculate percent by volume of solutions • Use $M_1V_1 = M_2V_2$ to perform dilution calculations
Suggested Activities	Saturation • POGIL Saturated and Unsaturated Solutions Definitions • POGIL Acids and Bases • Naming Acids Song (Google Doc) 5A.1 (Dissociation, Dispersion,or Ionization, and Intermolecular Forces) • IMF More reading: http://www.haspi.org/curriculum-library/Med-Chem-lessons/03%20Standard%202%20Chemical%20Bonds/Labs%20and%20Activities/IntermolecularForces.pdf 5A.2 (Effects of Temperature and Pressure on Solubility; Solubility Curves) • Solutions webquest (easy) (Google Doc) • Solutions webquest (more difficult) http://www.polk.k12.ga.us/userfiles/649/Classes/3188/solution%20webquest.pdf • Open Inquiry Lab- Factors that affect solubility (Google Doc) 5A.3 (Molarity and Percent by Mass and Percent by Volume and Dilutions) • POGIL Molarity • Molarity Lab – Murder Investigation (Google Doc)
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition Chapter 16

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 8** **Acids and Bases**
Pacing	4 days
Conceptual Understanding	**H.C.5A** Solutions can exist in any of three physical states: gas, liquid, or solid. Solution concentrations can be expressed by specifying the relative amounts of solute and solvent. The nature of the solute, the solvent, the temperature, and the pressure can affect solubility. Solutes can affect such solvent properties as freezing point, boiling point, and vapor pressure. Acids, bases, and salts have characteristic properties. Several definitions of acids and bases are used in chemistry.
SC Performance Indicators	**H.C.5A.4** Analyze and interpret data to describe the properties of acids, bases, and salts.
Content Focus	• Differentiate between Arrhenius, Bronsted-Lowery, and Lewis definitions of Acids and Bases • Recognize that the strength or weakness of an acid or base is determined by the degree to which it ionizes • Understand that the "strength" of an acid or base is not the same as the "concentration" • Identify the acid, base, salt, and water in a neutralization reaction • Describe the properties of acids and bases • Understand and interpret a pH scale • Given the formula of a common acid or base, give its name (Common acids include acetic acid, carbonic acid, phosphoric acid, hydrochloric acid, sulfuric acid, nitric acid. Common bases include calcium hydroxide, barium hydroxide, sodium hydroxide, potassium hydroxide, ammonia) • Given the name of a common acid or base, give its formula
Suggested Activities	5A.4 (Properties of Acids, Bases, and Salts; Intro to neutralization Ionization relates to strength; no pH calculations) • Neutralization lab - http://www.colinamiddle.net/dmatras/Chapter%207/pages/Neutralization%20Lab.pdf • Demo: Titration p 613 in TE • Virtual titration: http://lrs.ed.uiuc.edu/students/mihyewon/chemlab_instruction.html • Demo: Weak vs strong acids or bases using a conductivity tester (use a covalent compound, also, to reteach properties) http://www.flinnsci.com/store/Scripts/prodView.asp?idproduct=15507 • POGIL Strong vs Weak Acids • HONORS POGIL Calculating pH
Textbook Correlation	

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 9** **Chemical Reaction and Stoichiometry**
Pacing	15 days
Conceptual Understanding	**H.C.6A** A chemical reaction occurs when elements and/or compounds interact, resulting in a rearrangement of the atoms of these elements and/or compounds to produce substances with unique properties. Mass is conserved in chemical reactions. Reactions tend to proceed in a direction that favors lower energies. Chemical reactions can be categorized using knowledge about the reactants to predict products. Chemical reactions are quantifiable. When stress is applied to a chemical system that is in equilibrium, the system will shift in a direction that reduces that stress.
SC Performance Indicators	**H.C.6A.1** Develop and use models to predict the products of chemical reactions (1) based upon movements of ions; (2) based upon movements of protons; and (3) based upon movements of electrons. **H.C.6A.3** Plan and conduct controlled scientific investigations to produce mathematical evidence that mass is conserved in chemical reactions. **H.C.6A.4** Use mathematical and computational thinking to predict the amounts of reactants required and products produced in specific chemical reactions.
Content Focus	• When given a chemical equation, classify it as single replacement/displacement, double replacement/displacement, synthesis/composition/combination, or combustion • Predict the products of a single replacement reaction • Predict the products of a double replacement reactions • Predict the products of a synthesis reaction • Predict the products of a decomposition reaction • Recognize that the products of complete combustion of hydrocarbons are CO_2 and H_2O • Recognize that the products of incomplete combustion of hydrocarbons include CO • Identify the notations used for solid, liquid, gas, and aqueous solutions (s, l, g, aq) • Use an activity series to predict if a single replacement reaction will occur • Predict if a metal will replace hydrogen in an acid • When given a list of solubility rules, understand and apply the rules • When given a double replacement reaction, identify products as aqueous or precipitates • Give the formula equation, ionic equation and net ionic equation • Define "spectator ion" and recognize them in equations • Use an activity series to predict if a single replacement reaction will occur • Predict if a metal will replace hydrogen in an acid

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 9** **Chemical Reaction and Stoichiometry**
Content Focus	• Understand and apply the solubility rules • When given a double replacement reaction, identify products as aqueous or precipitates • Give the formula equation, deduce the ionic equation and net ionic equation • Define "spectator ion" and recognize them in equations • Understand and determine the mole ratio of any substances in a chemical equation • Recognize that the stoichiometric mole ratios are based on number of particles and NOT mass • When given moles, liters, grams, or particles of any substance in a chemical equation, determine the moles, liters, grams, or particles of any other substance • Define "limiting reactant/reagent" • Define "Excess reactant/reagent" • Given reactant quantities, determine the limiting and excess reactant • Given reactant quantities, determine how much of the excess reactant will be leftover • Given reactant quantities, determine how much product can be produced • Define theoretical yield and experimental yield • Use values of theoretical yield (given or calculated) and experimented (given or obtained via experimentation) to calculate the percent yield
Suggested Activities	Review types • POGIL Types of Chemical Reactions (but emphasize that Synthesis= Combination and introduce combustion at the end.) • Combustion demo (Google doc) Review balancing • Classic Chem Balancer: http://funbasedlearning.com/chemistry/chemBalancer/default.htm • Review ChemBalancer: http://funbasedlearning.com/chemistry/chemBalancer2/default.htm • Brain Boggler Balancer (Really tough ones) http://funbasedlearning.com/chemistry/chemBalancer2/default.htm 6A.1 (Predict Products of Chemical Reactions; Net Ionic Equations) • Demo: Water to wine to sprite to milk (ppt) http://www.flinnsci.com/Documents/demoPDFs/Chemistry/CF10210.pdf (Skip Pepto) • Sweet 16 Chemistry Ion Tournament http://www.flinnsci.com/media/446189/cf10510.pdf and write a net ionic equation for the final reaction. • POGIL Activity Series

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 9** **Chemical Reaction and Stoichiometry**
Suggested Activities	• Reactivity Series Simulation with Sumo Wrestlers http://www.freezeray.com/chemistry.htm • Article with discussion: Single Replacement (What happened when he added Mg to the SiO2?) http://www.gizmag.com/nano-silicon-anode-sand-lithium-ion-battery/32885/ • Precipitation reaction with net ionic equations (Google Doc) • Demo: (beginning of class and set in bright sunlight or dark with light behind it) Golden Rain Double replacement with PbI precipitate: http://iphone.sciencealert.com.au/features/20140507-25822-2.html and https://www.youtube.com/watch?v=TRq9hnOGvaE 6A.3 (Plan and do labs to prove conservation of mass) • Moles Lab Activity 8: Conservation of Mass—Reaction of Vinegar and Baking Soda: **Do as an inquiry lab** http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/sess_CH-4abcd1abcg.pdf (pp 38-40) 6A.4 (Moles and Stoichiometry) • How Many Packages (Google Doc) • Moles Lab Activity 2: Elements-Aluminum, Carbon (Charcoal), Copper, Silicon, Iron, and/or Sodium (Mass-Mole relationship): http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/sess_CH-4abcd1abcg.pdf (pp.12-18) • Moles Lab Activity 3: Compounds—H_2O, NaCl, Chalk, and/or "Candium" (Mole-Molecule relationship) http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/sess_CH-4abcd1abcg.pdf (pp 19-25) • Moles Lab Activity 4: Solutions—Aqueous Copper (II) Sulfate Pentahydrate and Alum (Mole-Atoms in a cpd/formula unit) http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/sess_CH-4abcd1abcg.pdf (pp 26-29) • Moles Lab Activity 5: Synthesis of an Oxide of Copper (Synthesis Reaction, % mass, calculating % error) http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/sess_CH-4abcd1abcg.pdf (p30-32)

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	Unit 9 Chemical Reaction and Stoichiometry
Suggested Activities	• Moles Lab Activity 6: Single Replacement and Percent Yield http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/sess_CH-4abcd1abcg.pdf (p 33-35) • Moles Lab Activity 7: Alka-Seltzer (Mass-Mole-Volume) http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/sess_CH-4abcd1abcg.pdf (p 36-37)POGIL Mole Ratios • Moles Lab Activity 9: Percent Water in a Hydrate (Stoichiometry-theoretical yield and % error) http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/lesson_plans/chemistry/molar_relationships/sess_CH-4abcd1abcg.pdf (pp 41-43) • S'mores Limiting Reactant Activity (Google Doc) • Limiting Reactant Candy (Google Doc) • Moles of Aluminum to Moles of Copper Lab (includes limiting reactants) (Google Doc)
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition Chapters 1, 11, and 12

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 10** **Chemical Equilibrium, Thermodynamics, and Kinetics**
Pacing	8 days
Conceptual Understanding	**H.C.6A** A chemical reaction occurs when elements and/or compounds interact, resulting in a rearrangement of the atoms of these elements and/or compounds to produce substances with unique properties. Mass is conserved in chemical reactions. Reactions tend to proceed in a direction that favors lower energies. Chemical reactions can be categorized using knowledge about the reactants to predict products. Chemical reactions are quantifiable. When stress is applied to a chemical system that is in equilibrium, the system will shift in a direction that reduces that stress. **H.C.7A** The first law of thermodynamics states that the amount of energy in the universe is constant. An energy diagram is used to represent changes in the energy of the reactants and products in a chemical reaction. Enthalpy refers to the heat content that is present in an atom, ion, or compound. While some chemical reactions occur spontaneously, other reactions may require that activation energy be lowered in order for the reaction to occur.
SC Performance Indicators	**H.C.6A.2** Use Le Chatelier's principle to predict shifts in chemical equilibria resulting from changes in concentration, pressure, and temperature. **H.C.7A.1** Analyze and interpret data from energy diagrams and investigations to support claims that the amount of energy released or absorbed during a chemical reaction depends on changes in total bond energy. **H.C.7A.2** Use mathematical and computational thinking to write thermochemical equations and draw energy diagrams for the combustion of common hydrocarbon fuels and carbohydrates, given molar enthalpies of combustion. **H.C.7A.3** Plan and conduct controlled scientific investigations to determine the effects of temperature, surface area, stirring, concentration of reactants, and the presence of various catalysts on the rate of chemical reactions. **H.C.7A.4** Develop and use models to explain the relationships between collision frequency, the energy of collisions, the orientation of molecules, activation energy, and the rates of chemical reactions.
Content Focus	• Define endothermic and exothermic • Explain how endothermic and exothermic reactions are perceived by the observer • Indicate whether energy is on the reactant or product side of an equation based on endothermic/exothermic properties • Define "heat of reaction" • Give units of heat of reaction as kJ/mole • Analyze an energy diagram for reactant energy, product energy, and activation energy

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 10** **Chemical Equilibrium, Thermodynamics, and Kinetics**
Content Focus	• When given an energy diagram determine if the reaction is endothermic or exothermic • Understand and apply the sign conventions (+, -) for ΔH of the reaction • Explain if a reaction is endothermic or exothermic in terms of changes in total bond energy • Describe the effect of a catalyst on activation energy and indicate this on an energy diagram • Explain the effects of temperature, particle size, stirring, concentration and catalyst on reaction rate • Understand the relationship between particle size and total surface area • Define molar enthalpy of combustion and be able to use a chart of molar enthalpies of combustion (note that most charts are in terms of 1 mole, so quantities other than 1 mole will need to be calculated from the given information) • Given molar enthalpies of combustion, write thermochemical equations for combustion of hydrocarbons and carbohydrates • Given molar enthalpies of combustion, draw energy diagrams for the combustion of hydrocarbons and carbohydrates • Explain and model the relationship between collision frequency, energy of collision, orientations of molecules, activation energy, and the rates of chemical reactions • Apply the concept of Le Chatelier's principle to predict shifts in chemical equilibria resulting from changes in concentration, pressure, and temperature • Recognize the difference between shifts in equilibrium and changes in reaction rate
Suggested Activities	6A.2 (Understand Le Chatelier's principle to predict shifts in chemical equilibria with changes in concentration, pressure, and temperature.) • POGIL Equilibrium • Simulation of the Haber Process (vary temp and pressure) http://www.freezeray.com/chemistry.htm • Control A Haber-Bosch Ammonia Plant http://www.learner.org/courses/chemistry/interactives/interactives.html 7A.1 (Energy Diagrams; Energy Released and Energy Absorbed Depends on Changes in Total Bond Energy) • (HONORS) POGIL Calorimetry • Endo Vs Exo simple lab http://www.cfep.uci.edu/cspi/docs/lessons_secondary/Endo%20vs%20Exo%20Lab.pdf • Endothermic, Exothermic, and Heat of Reaction (ΔH) http://highschoolenergy.acs.org/content/hsef/en/how-can-energy-change/exothermic-endothermic-chemical-change.html • POGIL Bond Energy

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	**Unit 10** **Chemical Equilibrium, Thermodynamics, and Kinetics**
Suggested Activities	7A.2 (Thermochemical Equations and draw energy diagrams for combustion, given molar enthalpies) ● Thermochemistry of Combustion Tutorial http://www.ausetute.com.au/combusta.html ● PRELIMINARY ACTIVITY FOR Enthalpy Changes (Inquiry Lab using vernier calorimeter) http://www2.vernier.com/sample_labs/CHEM-I-09-enthalpy_open.pdf ● Combustion Lab (Google folder "Malonecombustion" 7A.3 (Plan and do labs that show factors that affect the rate or chemical reactions) ● Demo: Elephant's toothpaste with and without catalyst. http://chemistry.about.com/od/chemistrydemonstrations/a/elephanttooth.htm ● Demo Iodine Clock http://www.flinnsci.com/media/395437/cf10245.pdf ● Rates of reaction simulations http://www.freezeray.com/chemistry.htm ● Demo: The Pink Catalyst http://www.flinnsci.com/Documents/demoPDFs/Chemistry/CF0255.01.pdf
Textbook Correlation	Prentice Hall, *Chemistry*, 2008 Edition Chapter 14

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Content Areas	End of Semester Activities
Suggested Activities	• The Chemistry of Running Interactive http://www.learner.org/courses/chemistry/interactives/interactives.html

Notes and Selected List of Materials Needed

*POGIL activities come from POGIL Activities for High School Chemistry, edited by Laura Trout and available from Flinn Scientific http://www.flinnsci.com/store/Scripts/prodView.asp?idproduct=22349

SOME OF MATERIALS/APPARATUS NEEDED
- Conductivity Meter and light bulb
- Vernier probes
- $KClO_3$ and a gummy bear

Unit 2 - Nuclear
Calculating half-life lab:
- Per student/group: 2 individually wrapped Twizzlers, 50 M&Ms, plastic cup, white paper, graph paper

Fission/Fusion modeling:
- Chocolate flavored cereal puffs
- Corn flavored cereal puffs
- Small paper cups to hold cereal
- Paper plates to place cereal pieces on during fusion/fission process

CP Chemistry– Curriculum Pacing Guide – 2014-2015
Second Half of Semester

Unit 3 – Periodic Table Trends including Electron Configurations
Flame test lab:
Wood splints or Q-tips
Flame test chemicals (5 or more of the following):

- NaCl
- $Ba(NO_3)_2$
- $Ca(NO_3)_2$
- LiCl
- $Cu(NO_3)_2$
- $CuCl_2$
- KBr
- NaBr
- KNO_3
- $CuSO_4$
- KCl
- $SrCl_2$

Unit 4 – Bonding and Chemical Formulas
Pickle of possible death: (pickle a week before demo)

- Large pickle
- Cucumbers to be pickled in different salts:
- LiCl, KCl, $SrCl_2$, and $BaCl_2$
- Vinegar
- H_2O_2

Conductivity of covalent (sugar) vs ionic (salt) solutions using a conductivity tester:

- Sugar
- Salt
- Sugar
- Salt
- (conductivity tester and lamp (Flinn AP 5355 and AP 5886 - around $50 for both)

Isomer models:

- Molecular model kits or candies and toothpicks

Silicone Super Ball:

- Ethyl alcohol, CH_3CH_2OH, 95%, 10 mL
- Latex gloves
- Sodium silicate solution, (water glass), 20 mL
- Paper or plastic cup, small
- Graduated cylinder, 25-mL
- Wooden splint

Unit 5 – Moles and Mole Conversion

Bubble Gum Lab:

- Enough samples of sugary bubble gum for each group to have a piece (or each student to have a piece.)

Unit 6 – States of Matter and Gas Laws

Intermolecular Forces Lab:

- 3 Erlenmeyer flasks with stoppers
- 3 petri dishes
- pepper shaker
- 3 plastic pipets
- 5+ paper clips
- liquid detergent
- wax paper or 3 pennies
- forceps
- 3 100 ml beakers containing: water, isopropyl alcohol and glycerol (aka glycerin)

Heating curves lab:

- 250mL Beaker
- Ring Stand
- Iron Ring
- Wire Gauze
- Bunsen Burner
- Vernier GoTemp
- Vernier LabQuest
- Ice
- Liquid Water
- Test Tube Clamp
- Stirring Rod

Vernier Gas Laws (CP and Honors)

- Vernier computer interface
- large-volume container for water bath (at least computer 10 cm in diameter and 25 cm high)
- Vernier Gas Pressure Sensor
- 125 mL Erlenmeyer flask
- Temperature Probe
- hot-water supply (up to 50°C) or hot plate
- 20 mL gas syringe ice
- plastic tubing with two Luer-lock connectors
- 100 mL graduated cylinder
- rubber stopper assembly with two-way valve

Vernier Gas Laws (Honors):

- Vernier computer interface
- Vernier temperature and pressure sensors (and accessories)
- TI-84 calculator
- Logger Pro 3.3 software (on computer in Room 242), for graphing results
- Water reservoir in plastic tub
- 125 mL Erlenmeyer flask
- 50 mL and 100 mL Beakers
- 100 mL graduated cylinder

Unit 7 - Solutions

FACTORS AFFECTING SOLUBILITY

- hot water (or access to a hot plate)
- cold water
- ice
- sodium chloride
- potassium nitrate
- test tubes
- beakers
- other?

Molarity Lab – Murder Investigation
ONE of these unknowns (or one for each group if you prefer):
- 0.20 to 0.30
- 0.05 M to 0.15 M potassium iodide solution
- 0.05 M and 0.15 M silver nitrate
- >0.20 M potassium iodide solution
- >0.30 M silver nitrate solution

Unit 8 – Acids and Bases
Neutralization lab
- 1 flask of 1M Hydrochloric Acid (HCl)
- 1 flask of 1M Sodium Hydroxide (NaOH);
- one pipette for each flask
- one evaporating dish
- phenolphthalien solution (indicator)
- tongs to handle the hot evaporating dish
- one hot plate
- distilled water
- 10 ml graduated cylinder

Demo: Weak vs strong acids or bases
- Conductivity tester (http://www.flinnsci.com/store/Scripts/prodView.asp?idproduct=15507)
- Weak and strong acids or bases
- Covalent compound and Water (for review)

Unit 9 – Chemical Reactions and Stoiciometry
Demo: Combustion
- Empty, dry 2 L soda bottle
- 5 mL of pure isopropyl alcohol.
- PPE
- Fire extinguisher handy!

Demo: Water to wine to sprite to milk (ppt)
- Barium nitrate solution, $Ba(NO_3)_2$, saturated, 8–10 mL
- Sulfuric acid solution, H_2SO_4, 9 M, 1.5 mL
- Phenolphthalein solution, 1%, 3–4 drops
- Water, distilled or deionized, 200 mL
- Sodium bicarbonate, $NaHCO_3$, 1 g
- Beral-type pipets, 5
- Sodium hydroxide solution, NaOH, 0.1 M, 10 drops
- Glasses or beakers, 400-mL, 6
- Sodium hydroxide solution, NaOH, 6 M, 5–6 mL

Precipitation Lab
- Na_2CO_3
- Na_3PO_4
- NaOH
- Na_2SO_4
- $BaCl_2$
- $Pb(NO_3)_2$
- $CaCl_2$

Demo: Golden Rain Double replacement
- KI
- $Pb(NO_3)_2$

Moles Lab Activity 8: Conservation of Mass
- Vinegar
- Baking Soda

How Many Packages?
- Various empty packages with nutritional information on the package (one per group)

Moles Lab Activity 2: Elements—Aluminum
- Empty aluminum can
- Balance
- Aluminum foil
- Safety goggles

Moles Lab Activities 3: Compounds—H_2O, NaCl, Chalk, and/or "Candium"

- Sample of sodium chloride
- Sample of calcium chloride
- Test tube
- Weighing dish
- Balance
- Sample of "candium" (mixture of 12 M&M's and 8 Skittles)
- 2 small paper cups
- Balance

Moles Lab Activity 4: Solutions—Aqueous Copper (II) Sulfate Pentahydrate

- Beaker or plastic cup
- Copper(II) sulfate pentahydrate ($CuSO_4 \bullet 5\ H_2O$) crystals
- Graduated cylinder
- Water
- Filter paper
- Funnel
- Ring stand and ring
- Watch glass or Petri dish

Moles Lab Activity 5: Synthesis of an Oxide of Copper

- Hot plate
- Evaporating dish
- Balance
- Granular or powdered copper

Moles Lab Activity 6: Single Replacement and Percent Yield

- Aluminum foil
- Beaker or plastic cup with 100 mL of 0.5 M aqueous copper(II) chloride [$CuCl_2(aq)$] (or an acidified copper(II) sulfate solution)
- 100-mL graduated cylinder
- Balance
- Thermometer
- Filter paper
- Funnel
- Funnel stand
- 250-mL or larger beaker

Moles Lab Activity 7: Alka-Seltzer (Mass-Mole-Volume)

- 250-mL beaker
- 100-mL graduated cylinder
- Water
- Thermometer
- Barometer
- Alka-Seltzer tablet
- Balance

Moles Lab Activity 9: Percent Water in a Hydrate

- Copper sulfate pentahydrate ($CuSO_4 \bullet 5\ H_2O$) crystals
- Hot plate
- Evaporating dish
- Crucible tongs
- Eye dropper
- Desiccator (if available)

S'mores Limiting Reactant Activity

- S'mores ingredients for each child, if you want to make them after the activity
- Bunsen burners to roast the marshmallows
- Sticks or skewers

Limiting Reactant Activity

- Peppermint
- Butterscotch
- Tootsie Rolls
- Gummie Bears
- Starburst
- Skittles
- Caramel
- Candy Corn

Moles of Aluminum to Moles of Copper Lab

- 250 ml beaker
- Scale
- Distilled water/water bottles
- Copper chloride crystals
- Aluminum wire
- Filter paper
- Spatula
- Tongs

Unit 10 – Chemical Equilibrium, Thermodynamics, and Kinetics

Endo Vs Exo simple lab

- 100 ml beakers or plastic cups
- 0.1 M CH_3COOH (acetic acid/Vinegar)
- H2O2 (Hydrogen peroxide)
- Yeast
- $NaHCO_3$ (Baking soda)
- Thermometer
- Graph paper

Endothermic, Exothermic, and Heat of Reaction (△H)

- Materials for Each Group
- Vinegar
- Baking soda
- Calcium chloride
- Water
- Thermometer
- 4 small clear plastic cups
- 1 cup measuring cup

PRELIMINARY ACTIVITY FOR Enthalpy Changes

- Temperature Probe
- Styrofoam cup
- 400 mL beaker
- 50.0 mL of ~1.00 M HCl
- 50.0 mL of 1.05 M NaOH solution

Malone Combustion

- Per Group:
- (2 per group) petri dish, a candle, and an inverted funnel
- lime-water (clear, calcium hydroxide solution)
- DI water
- litmus paper
- TONGS
- cobalt(II) chloride paper (filter paper which has been soaked in an aqueous solution of cobalt(II) chloride, and dried
- a few drops 6 M HCl
- drinking straw
- pinch of cobalt(II) chloride hexahydrate
- pinch of cobalt(II) chloride hydrate
- 12 mL of ethyl alcohol
- pinch of cobalt(II) chloride hexahydrate
- small piece of dry ice
- calorimeter
- stir bar
- stir plate
- copper wire igniter
- copper wire screen

Elephant Toothpaste Materials

- 50-100 ml of 30% hydrogen peroxide (H_2O_2) solution
- saturated potassium iodide (KI) solution
- liquid dishwashing detergent
- food coloring
- splint (optional)
- glow stick (optional)

Demo: Iodine Clock

- Potassium iodate solution, KIO_3, 0.20 M, 325 mL
- Starch solution, 2%, 180 mL
- Sodium metabisulfite, Na_2S_2O5, 3.8 g
- Sulfuric acid solution, H_2SO_4, 0.1 M, 10 mL

Demo: The Pink Catalyst

- Cobalt chloride solution, $CoCl_2$, 0.1 M, 15 mL
- Hydrogen peroxide solution, 6%, H_2O_2, 40 mL (from beauty supply store)
- Potassium sodium tartrate solution, 0.2 M, 100 mL

---

5 Flex Days/End of Course Exam
