AP CHEMISTRY 2017-2018 SYLLABUS
Mr. Daughety – Room SA-102

OVERVIEW

This course is designed to include all of the College Board's Description for AP Chemistry. My main goal of the class is to develop independent, critical and analytical thinkers. To accommodate their varied learning styles I provide various teaching styles. Lecture, discussions, open ended questioning techniques, various activities, labs associated with the concepts being taught, demonstrations, graphing calculators, Cornell two-column note taking, paired readings, problem solving and "what if" situations are provided to foster thinking and learning.

MATERIALS

1. Scientific calculator, labeled with your name. I recommend TI-30XA or TI-30XII for around $8. **I do not recommend a Casio or Sharp or TI-30XS** multiview calculator. A programmable, graphing calculator is not necessary but is acceptable for this class if you already have one. However, **many Arkansas colleges do not allow graphing calculators for Chem I**.
2. 1 ½" three-ring binder with table of contents and labeled dividers.
3. 14 tab dividers for binder; see chapter numbers below for labeling. The final tab should be labeled "Labs." Do not wait until you get to class to label the tabs.
4. Loose leaf paper in binder
5. Composition notebook for use as a lab notebook.

6. Signed safety contract and conduct contract

Recommended Materials/Software

- Tablet or computer with internet access (or time in library)
- Smart phone
- Smart phone apps: Remind, Quizlet, Google Classroom, Puffin Free
- Tablet Apps: Google Classroom, Educreations, Quizlet
- Working printer (or library printer) and paper

COURSE DESIGN

AP chemistry meets for five 50-minute periods per week. One section is taught. Labs are conducted on Tuesdays. Pre-lab discussions are done the day before for lab preparation and followed by a post lab discussion on the day after the lab.

This course is designed to provide a strong solid foundation for a first-year college chemistry experience both conceptually and in the laboratory. The labs serve to supplement the learning, thus providing a picture of the concepts being taught at the time. 25% of the time will be spent in laboratory analysis. Students will work in groups of two. In each laboratory experiment, students will physically manipulate equipment, materials and data in order to make relevant observations and verify hypothesis. The students will communicate through group collaboration, informally and in a formal written laboratory report. ***Lab procedures are required to be written up prior to the start of the lab.*** A lab notebook is required with all labs and the laboratory notebooks are due on Fridays for grading. About 40% of the labs/demonstrations are Calculator Based Labs (CBLs) with TI 82 calculators and TI84+ silver editions calculators. The probes that are used are pH, conductivity, temperature, colorimeter, and gas pressure. A class set of TI 84 + silver editions are used for graphical analysis problems and calculating the reactant orders of a reaction.

TEXTBOOKS USED

Student textbook:

Tro, Nivaldo J, **Chemistry: A Molecular Approach,** Fourth Edition, Pearson, Upper Saddle River, NJ, 2017

Brown, Theodore L., H. Eugene LeMay,Jr. and Bruce E. Bursten, **Chemistry: The Central Science**, Thirteenth Edition, Pearson, Upper Saddle River, NJ, 2015

Supplementary Textbook:

Barker, Brett, **Peterson's AP Chemistry Review,** First Edition: Lawrenceville, NJ, The Thomson Corporation, 2005

Chang, Raymond, and Brandon Cruickshank, **Chemistry**, Seventh Edition, McGraw Hill, New York, NY, 2002

Hewitt, Paul G., **Conceptual Physics**, Prentice Hall, Upper Saddle River, NJ, 2006

Hill, John W., Ralph H. Petrucci, Terry W. McCreary, and Scott S. Perry, **General Chemistry**, Fourth Edition, Prentice Hall, Upper Saddle River, NJ, 2005

Ragsdale, Ron, **Problem Solving in General Chemistry**, Saunders College Publishing, Philadelphia, 1990

Waterman, Edward L., **AP Chemistry, AP Test Prep Series**, Prentice Hall, Upper Saddle River, NJ, 2007

Zumdahl, Steven, S., and Susan A. Zumdahl, **Chemistry**, Sixth Edition, Houghton Mifflin Company, Boston, MA, 2003

Laboratory Work:

I use a collection of labs from various books:

Carmichael, Neal L., and David F. Haines, **Laboratory Chemistry**, Merrill Publishing Co. Columbus, Ohio,1987

Ealy, Julie B., James L. Ealy Jr., **Visualizing Chemistry**, American Chemical Society, Washington, DC, 1995

Ehrenkranz, David and John J. Mauch, **Chemistry in Microscale**, 1999.

Holmquist, Dan D, Jack Randall, and Don Volz, **Chemistry with Calculators**, Vernier Software & Technology, Beaverton, Oregon, 2000

Holmquist, Dan D, Jack Randall, and Don Volz, **Chemistry with CBL,** Vernier Software & Technology, Second Edition, Beaverton, Oregon, 1997

Shakhashiri, Bassam, **Chemical Demonstrations**, Volumes 1,2,3,4, University of Wisconsin Press, Madison, Wisconsin, 1985

Vonderbrink, Sally, **Laboratory Experiments for Advanced Placement Chemistry,** 2nd Edition, Flinn Scientific, Inc., 2006

Waterman, Edward, **Chemistry,Small-Scale Laboratory Manual**, Prentice Hall, Menlo Park, California, 2000

Collegeboard, **AP CHEMISTRY, GUIDED-INQUIRY EXPERIMENTS,** College Board, New York, 2013

Kits: obtained from FLINN, Carolina Biological and Wards Scientific.

Technology Use in the Class

We will be using Google Classroom, a secure, educational networking site. We have a wall where I will post class notes, assignments, videos lessons, reminders etc. and a class planner where you can see a class calendar. You can also message questions day or night with chemistry homework questions. **Quizzes, polls, and other assignments will be completed using this site.**

- The class code is _____**.**
- I can include you parents in Google Classroom if they wish to be added.

Video lessons will often be available on my Youtube channel.

Quizlet is another free app that you will need to use for this class. I may make several sets of flashcards for you to study. Review games and quizzes are also available on Quizlet.com.

Sign up for Remind notifications on your phone using the information given in class.

ASSESSMENT:

1. TESTS:
   Each unit test will consist of multiple choice questions and Free Response Questions from former years (or ones that I have put together) that are appropriate for that particular unit. Essay questions, graphing analysis, and equations may also appear on the test.
   For review purposes before the AP exam, three old AP exams will be given to the students over a period of four weeks. The tests will be scored just like an AP exam and gone over with the students.
2. QUIZZES: Quizzes will be given throughout a unit to test for understanding of the curriculum/concept.
3. HOMEWORK: Problems will be assigned at the beginning of a new chapter. The problems will be due close to the end of the chapter. At the start of each new chapter Cornell two column notes will be due. This allows the students to have read the chapter before commencing to do work and any open discussions that will occur during class time. Multiple-choice questions are used to supplement each chapter using Ragsdale's and Peterson's books.
4. LABORATORY NOTEBOOK: Labs are essential to understanding Chemistry. As always goggles must be worn at all times. No open toed shoes are allowed during lab.
   On Monday the calculations of the lab, chemicals, and procedure are gone over in class. Wednesday is the post lab discussion and if any necessary group data needs to be shared/compiled it is at this time. Friday all lab books are submitted for grading. The formal lab must be written in the following order:

LABS

Labs are done on Tuesday and are due on Friday. Lab reports are all formal labs and must be written in ink. The introduction and the procedure are due the day of the lab. This will help you and ultimately help me because you will understand the lab better. They must be written in your lab book before you start the lab. All pages will be numbered and leave the first two pages for **TABLE OF CONTENTS**. Labs must be written in the following manner and only on the right side of the page. The left side is reserved for mathematical and chemical calculations.

TITLE

I.**INTRODUCTION:** The introduction must contain information concerning the lab. Definitions, equations, statements and drawings are placed here. On the average this will contain at least three paragraphs. Do not shortchange this area. At the end of the introduction in bold letters will be the **Objective of the Lab**. You will find this stated somewhere within the lab.

II. PROCEDURE: In your own words rewrite the lab procedure. Brief statements are fine as long as they convey the meaning and you can follow along during the lab.

III. DATA: This is the area where tables and graphs will be placed. All graphs must be labeled with a title and x and y labeled appropriately. All calculations for any part of the lab is placed here and on the left side of the page. Calculations from a graph will be entered on the left side as well. If a chart is used, number the chart and then number your calculations to coincide with the table. All formulas, labels and significant figures must be used. Students will place pictures that are of the lab and drawings of beakers containing molecules at the molecular level at various stages throughout the experiment.

IV. QUESTIONS: All questions must be written out and the answers underneath them.

V. CONCLUSION: In one sentence, no more than two, what is the theme of the lab. What did you discover?

VI. GLOSSARY: Save the last four pages of the lab book for lab vocabulary terms. Your instructor will supply the vocabulary needed for each lab you perform.

BIG IDEA 1

The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions

- **Lab:**
  - Beer's Law I LO 1.16 SP1,2,5,6
  - Beer's Law II LO 1.16 SP1,2,5,6
  - **GUIDED INQUIRY**: How can color be used to determine the mass % of copper in brass? LO 1:16 SP,1,2,3,4,5,6,7
- **ACTIVITY:**
  - Students are to observe the animations of the Aufbau model from Oklahoma State. The students are to answer questions concerning why arrows are opposite each other, why the different levels of orbits and why more orbitals are at higher energy levels.
  - Students will take sample PES data, use that data to explain the energy levels of the atom under study, and then explain the systematics of the energy levels change with different atom types.
  - LO 1.9 Students are to construct a graph of first ionization energy levels verses atomic radius of the first 54 elements. Students are to predict and justify exceptions. From the data given students are to predict how the value would be affected for second ionization for each element.

BIG IDEA 2

Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.

- **LAB:**
  - **GUIDED INQUIRY**: Chromatography LO 2.10 2.7 SP 1,3,4,5,6,7
  - **GUIDED INQUIRY**: Which has the stronger attractive forces using temperature probes and allowing substances to evaporate LO 2.16 SP 1,2.5,6,7
- **ACTIVITY:**
  - Based on Kool Aid chromatography lab students are to write an analysis on the use of, chemical structure of and problems associated with food dyes
  - LO 2.17 Given a set of compounds the students are to identify the type of attractive forces present and which will have the higher boiling point.
  - Students are to view computer animation of London dispersion forces and link the process to more polarizable electron cloud

BIG IDEA 3

Changes in matter involve the rearrangement and /or reorganization of atoms and/or the transfer of electrons

- **LAB:**
  - Recycling Copper LO 3:10 SP 1,2,5,6
  - **GUIDED INQUIRY**: Vitamin C concentration LO 3.9 SP1,2,4,5,6,7

- Salt bridge and predicting EMF with CBL LO 3.11 SP 1,2,4,5,6

- **ACTIVITY:**
  - **LO 3.11** Students are to observe demonstration of electrolysis of water and KI and identify at a particulate level what is happening at each electrode
  - **LO 3.8** Students are given a series of equations to identify as redox reactions and justify the idea of electron transfer
  - Students are to identify from a series of equations the equations that represent acid rain. The students are then to research possible ways of minimizing the effects, what oxides are capable of producing acid rain and what other possible environmental issues can arise.

BIG IDEA 4

Rates of chemical reactions are determined by details of the molecular collisions

- **LAB:**
  - Factors Affecting Rates LO 4.1 SP 1,2,5,6,7
  - **GUIDED INQUIRY:** Crystal violet LO 4.2 SP 1,2,4,5,6,7

- **ACTIVITY:**
  - Students are to observe animation from Oklahoma State on concentration and temperature and their effect on rate. After calculations are made the students are to plot the relationship between temperature of reactants and rate of reaction
  - **LO4.5** Students view a computer animation and provide explanations for effective and ineffective collisions

BIG IDEA 5

The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.

- **LAB:**
  - HESS'S Law LO 5.6 SP 1,2,3, 5,6,7
  - **GUIDED INQUIRY**: Hand warmer LO 5.7 SP1, 2,3,4,5,6,7

- **ACTIVITY:**
  - LO 5.16 Students solve problems in which they qualitatively and quantitatively predict the signs for ΔG,ΔH and ΔS
  - Students are to observe animation from Oklahoma State web site concerning heat transfer. Students will calculate q from given set of metals and varying amounts of water in calorimeters
  - Students will use Le Chatelier principle to explain if reaction is exothermic or endothermic based solely on the color change of the compound when placed in hot water bath or ice

BIG IDEA 6

Any bond or intermolecular attraction that can be formed can be broken. These two processes are in **a dynamic competition, sensitive to initial conditions and external perturbations**

- **LAB:**
  - Determine the molecular mass of unknown Acid with titration LO 6.12 6.13 SP 1,2,5,6
  - **GUIDED INQUIRY**: Effect of Buffers and buffering capacity kit LO 6.18 SP 1, 2,3,4,6,7
  - Chemical Equilibrium kit (LeChatelier) LO 6.8 SP 1,4,5,6
  - Determine the Ka of an acid LO 6.5 SP1,2,5,6

- **ACTIVITY:**
  - **LO 6.20** students determine pH of various buffer solutions and describe the mechanism

that would occur within the buffer system upon the addition of an acid or a base o Students will identify in a series of titration curves the titrant, anlayte, equilvalence point, the pKa of the acid and also choose appropriate indicator to be used with each titration.

- *** ITEMS ARE INTRODUCED IN PRE-AP AND REINFORCED IN AP**
- **ALL LABS ARE STUDENT DIRECTED UNLESS OTHERWISE MENTIONED**

CHAPTER (Brown/ LeMay)	TIME	CONCEPT	LAB/ASSIGNMENTS
2	4-5 days **LO:** **1.1** **1.2** **1.3** **1.4** **1.17**	***ATOMS, MOLECULES AND IONS*** *Atomic theory and atomic structure ● *Evidence for the atomic theory ● *Atomic masses: determination by chemical and physical means ● *Atomic number and mass number; isotopes ● *Formula writing review ● % abundance ● Coulomb's law ● PES	LAB: Guided Inquiry chromatography ACTIVITY: ● Based on the Kool Aid Chromatography lab, students write an analysis on the requirements, the use of, the chemical structure of and problems associated with certain food dyes. Students are to reference the MSDS sheets ● Students will take sample PES data, use that data to explain the energy levels of the atom under study, and then explain the systematics of the energy levels change with different atom types. ASSIGNMENTS: ● Test over summer assignment of formula writing review ● Problems from chapter 2: page 70-73
3	5-6 days **LO:** **1.17** **1.18**	***STOICHIOMETRY: CALCULATIONS WITH CHEMICAL FORMULAS AND EQUATIONS*** ● *Ionic and molecular species present in chemical systems: net ionic equations ● *Balancing of equations ● Law of conservation of mass ● *Reaction types	**LAB:** Recycling of copper lab **Activity:** Students are to identify from a series of equations the equations that represent acid rain. The students are

	1.19 **3.1** **3.2** **3.3** **3.6** **2.10**	● *Stoichiometry: Mass and volume relations with emphasis on the mole concept, including empirical formulas and limiting reactants ● *Percent composition ● *Empirical/Molecular formulas ● Empirical formula from combustion	then to research possible ways of minimizing the effects, what oxides are capable of producing acid rain and what other possible environmental issues can arise. **ASSIGNMENTS:** ● Problems from chapter 3: pg 110-117 ● 40 equations: o predict products o balance o net ionic form ● discussion of acid rain and its effects
4	8-10 days **LO:** **2.8** **2.9** **3.3** **3.4**	***AQUEOUS REACTIONS AND SOLUTION STOICHIOMETRY*** ● *Types of solutions and factors affecting solubility ● Solution stoichiometry ● *Methods of expressing concentration o *Molarity o *Dilution o Mixing of solutions o *Electrolytic properties ▪ Weak, strong and non electrolytes ● Ionic and molecular species present in chemical systems: ● Net ionic equations ● % yield and theoretical yield	**LAB:** ● Beer's Law I (spectrophotometer) ● Pipetting lab (students are tested on their accuracy and precision using serological/volumetric pipettes. ● Beer's Law II (spectrophotometer) ● How can color be used to determine the mass % of copper in brass(inquiry) A**ctivity;** ● Students are to determine and explain in short answer essay why when a conductivity tester is placed in concentrated acetic acid the light is dim and when water is added to dilute the acid the light begins to burn brighter **ASSIGNMENTS:** ● Chapter 3 problems ● Worksheet on combining solutions and calculating ions in solution.
6 (5)	14-16 days **LO:** **5.1** **5.2** **5.4** **5.5** **5.6** **5.7**	***THERMOCHEMISTRY*** ▪ State functions ▪ First law: change in enthalpy; heat of formation; heat of reaction; Hess's law, heats of vaporization and fusion; calorimetry ▪ Hess's Law	**LAB:** ● Specific heat ● Hess's Law ● Hand warmer (inquiry) **Activity:** ● Students are to determine through a series of experiments if the reaction is exothermic or endothermic based on the

	5.8		temperature of the solution rising or falling ● Students are to observe animation from Oklahoma State web site concerning heat transfer. Students will calculate q from given set of metals and varying amounts of water in calorimeters **ASSIGNMENTS**: ● Book problems
12 (14)	11 days **LO:** **4.1** **4.2** **4.3** **4.4** **4.5** **4.6** **4.7** **4.8** **4.9** **5.1** **5.2** **5.3** **5.10**	***CHEMICAL KINETICS*** ▪ Concept of rate of reaction ▪ Use of experimental data and graphical analysis to determine reactant order, rate constants and reaction rate laws ▪ Effect of temperature change on rates ▪ Energy of activation; the role of catalysts ▪ The relationship between the rate-determining step and a mechanism ▪ Half-lifes ▪ Radioactive decay ▪ Collisions model; Maxwell Boltzman graph ▪ Mechanisms, intermediates	**LAB:** ● Factors affecting Rate (kit from FLINN) (inquiry) ● Crystal violet Lab with CBL ● (inquiry) o Determines order and activation energy **Activity:** ● Students are to observe animation from Oklahoma State on concentration and temperature and their effect on rate. After calculations are made the students are to plot the relationship between temperature of reactants and rate of reaction ● Students view a computer animation and provide explanations for effective and ineffective collisions ● Students are to determine the factors affecting rate when observing various metals reacting with 1.0M and 6.0M HCl and various sizes of metals. ● Students are to observe the difference between exothermic and endothermic reactions and internal energy. A demo of hot coffee with three different sizes of beakers to represent reactants and products will be provided for the visual effect. **ASSIGNMENTS:** ● Book problems ● Determine order of reaction through graphical analysis

			●
13 (15)	11 days **LO:** **6.1** **6.2** **6.3** **6.4** **6.5** **6.6** **6.7** **6.8** **6.9** **6.10**	***CHEMICAL EQUILIBRIUM*** ▪ Concept of dynamic equilibrium, physical and chemical, LeChatelier's principle; equilibrium constants ▪ Quantitative treatment o Equilibrium constants for gaseous reactions: Kp,Kc ▪ Quotient	**LAB:** ▪ Equilbrium (kit) (inquiry) **Activity:** ● Students will use Le Chatelier principle to explain if reaction is exothermic or endothermic based solely on the color change of the compound when placed in hot water bath or ice

SECOND SEMESTER

14 (16)	11 days **LO:** **3.7** **2.2** **4.8** **6.11** **6.12** **6.13** **6.14** **6.15** **6.16** **6.17** **6.19**	***ACID-BASE EQUILIBRIA*** ▪ Equilibrium constants for reactions in solution ▪ Constants for acids and bases: pK; pH, pKa ▪ Bronsted-Lowry Acids and Bases ▪ The auto-ionization of water ▪ PH scale ▪ Indicators ▪ Strong acids & bases compared to weak acids and weak bases ▪ Relationship between Ka and Kb ▪ Acid-Base properties of salt solutions ▪ Acid-Base behavior and chemical structure ▪ Triprotic acids; no calculation ▪ Lewis acids and bases	**LAB:** ▪ Calculation of Ka of an acid (indicator)

15 (17)	25days **LO:** **6.0** **6.11** **6.12** **6.13** **6.14** **6.15** **6.16** **6.17** **6.18** **6.19** **6.20** **6.21** **6.22** **6.23** **6.24**	***ADDITIONAL ASPECTS OF AQUEOUS EQUILIBRIA*** ▪ Common ion effect; buffers; hydrolysis ▪ Acid-base titration ▪ Solubility equilibria; solubility product constants and their application to precipitation and the dissolution of slightly soluble compounds ▪ Coordination complexes; amphoterism ▪ Precipitation reactions ▪ Qualitative analysis for metallic elements ▪ Descriptive chemistry o Relationships in periodic table	**LAB:** ▪ Titration of strong acid and strong base; standardization of a base ▪ Determination of molecular mass of a weak acid through titration ▪ Construction of a pH curve through titration ▪ Descriptive/qualitative analysis determination of unknown salts ▪ Effect of buffers and buffering capacity kit ▪ (inquiry) **Activity:** o students determine pH of various buffer solutions and describe the mechanism that would occur within the buffer system upon the addition of an acid or a base

			● Students will identify in a series of titration curves the titrant, anlayte, equilvalence point, the pKa of the acid and also choose appropriate indicator to be used with each titration. ● Students will observe a reaction of calcium metal and make the following observations: o Why is the solution hot pink when phenolphthalein is added but the solid is remains white in the same flask? o Calcium hydroxide stains the glassware cloudy. What chemical could be used and why to clean the glassware?
16 (18)	7 days **LO:** **5.1** **5.12** **5.13** **5.14** **5.15** **5.16** **5.17** **5.18** **6.25**	***CHEMICAL THERMODYNAMICS*** ▪ Second law: entropy; free energy of formation; free energy of reaction; ▪ Dependence of change in free energy on enthalpy and entropy changes and temperature changes ▪ Relationship of change in free energy to equilibrium constants and electrode potentials ▪ pH solubility	Activity: o Students solve problems in which they qualitatively and quantitatively predict the signs for ΔG,ΔH and ΔS o Students will observe the reaction of barium hydroxide octa-hydrate and ammonium thiocyanate and discuss delta G, H and S for the reaction based on observations only.
17 (20)	17days **LO:** **3.8** **3.9** **3.11** **3.12** **3.13**	***ELECTROCHEMISTRY*** ▪ Oxidation-reduction reactions; balancing equations ▪ Oxidation number ▪ The role of the electron in oxidation-reduction ▪ Electrochemistry' electrolytic and galvanic cells; Faraday's Law; standard half-cell potentials; Nernst equation; prediction of the direction of redox reactions ▪ Cell EMF under standard conditions ▪ Free energy and redox reactions ▪ Cell EMF under nonstandard conditions ▪ Electrolysis	**LABS:** ▪ The Potential of Electrochemical Cells(Salt bridge) ▪ Electrolysis of KI solution ▪ Titration of vitamin C (inquiry) Activity: o Students will observe the electroplating of a quarter with copper. o Students will observe a series of clock reactions that are based on redox (kit)
7 (6)	3days **LO:** **1.5**	***ELECTRONIC STRUCTURE OF ATOMS*** ● *Electron energy levels ● *Atomic spectra	**Activity:** o Students are to observe the animations of the Aufbau

	1.6 **1.7** **1.14** **1.8** **1.12** **1.15** **1.16**	● Planck's constant ● *Quantum numbers ● *Atomic orbitals ● *Aufbau, Pauli and Hund's Rule ● PES	model from Oklahoma State. The students are to answer questions concerning why arrows are opposite each other, why the different levels of orbits and why more orbitals are at higher energy levels.
7	3-5 days **LO:** **1.7** **1.8** **1.9** **1.10** **1.11**	***PERIODIC PROPERTIES*** ● *Relationships in periodic table ● *atomic and ionic radii, ionization energies, electron affinities, oxidation states, electronegativity ● *effective nuclear charge, shielding affect, metallic character	**Activity:** ● Students are to construct a graph of first ionization energy levels verses atomic radius of the first 54 elements. Students are to predict and justify exceptions. From the data given students are to predict how the value would be affected for second ionization for each element.
8	5 **LO:** **2.3** **2.10** **2.11** **2.13** **2.14** **2.17** **2.18** **2.20** **2.26** **2.27** **5.8** **5.9** **5.10** **5.11**	***BASIC CONCEPTS OF CHEMICAL BONDING*** ● *Binding forces o Ionic o Covalent o Metallic hydrogen bonding o Van der Waals o London dispersion forces ● *Relationships to states, structure, and properties of matter ● *Polarity of bonds ● *Electronegativity ● Resonance structures ● *Exceptions to the octet rule ● Strengths of covalent bonds o Bond energy o Bond length ● Bond breaking, bond forming	**Activity**: o Students are through a series of compounds determine which substance has the higher boiling point or lower point based on attractive forces or covalent network.
9	**5 days** **LO:** **2.21** **2.17** **2.18** **2.20** **2.21**	***MOLECULAR GEOMETRY AND BONDING THEORIES*** ● *Lewis structures ● Valence Bond: hybridization of orbitals, resonance, sigma and pi bonds ● *VSEPR ● Geometry of molecules and ions, structural isomerism of molecules and coordination complexes, dipole moments and relation of properties to structure	LAB: Molecular geometry structures with balls and sticks and Styrofoam for the expanded octets.

10 (11)	5-8days **LO:** **2.2** **2.7** **2.14** **2.15** **2.16** **2.19** **2.20** **2.21** **2.23** **2.24** **2.25** **2.26** **2.27** **2.28** **2.29** **2.30** **2.31** **2.32** **5.10**	***INTERMOLECULAR FORCES, LIQUIDS AND SOLIDS*** ● States of matter ● Liquids and solids from the kinetic-molecular viewpoint ● Changes of state, including critical points and triple points ● Structure of solids; lattice energies ● Intermolecular attractive forces ● Boiling points ● Viscosity, capillary action, surface tension ● Ionic, covalent network solids ● Heating and cooling curves ● Metallic bonding	**LAB:** ● Triple point of dry ice ● Evaporation and Intermolecular Attractions ● (inquiry)
11 (13)	5-8 days **LO:** **2.7** **2.8** **2.9** **2.10** **2.14** **5.9**	***PROPERTIES OF SOLUTIONS*** ● *Solution process ● *Saturated solutions and solubility ● *Factors affecting solubility ● *Ways of expressing concentration ● Raoult's Law and vapor pressure ● Nonvolatile compared to volatile solutes ● Osmosis ● Non-ideal behavior and quantitative methods ● Ideal solutions ● Ion dipole interactions	LAB: ● Using Conductivity to Find an Equivalence Point ● Vapor Pressure of Liquids ● Chromatography lab(inquiry) ● Distillation Lab **ACTIVITY:** ● Iodine crystals dissolving in water and benzene: predict why more soluble
5 (10)	5 days **LO:** **2.12** **2.13** **5.12** **2.3** **2.4** **2.5** **2.6**	***GASES*** ● *Characteristics of Gases ● *Gas Laws of ideal gases: Charles, Boyles, Grahams, Combined Gas Law, Daltons Law of Partial Pressures, Guy Lussac, and Graham's Law of Effusion ● *Equation of State of an Ideal Gas ● *Kinetic molecular theory of gases o Interpretation of ideal gas laws on the basis of kinetic theory ● *Molecular effusion and diffusion ● *Real Gases: deviations from ideal behavior ● *Dependence of kinetic energy of molecules on temperature ● *Avogadro's hypothesis and the mole concept ● Maxwell boltzman	**LABS:** ● Determination of molecular mass from a gas (butane)

18 (21)	2-3 days **LO:** **1.14** **1.17**	***NUCLEAR CHEMISTRY*** ● Nuclear equations ● Half-lives ● Radioactivity and chemical applications	