June 2014

Dear AP Chemistry Student:

This packet of materials supplements the reading in Chapters 1, 2, and 3. These chapters are a review of the basic chemistry concepts you learned in Chemistry. Along with the problems from these chapters listed at the bottom of the page, you are to work on the reading guides, exercises, and sample quizzes in this packet. Work on the materials in the order that they are given to you.

The colored pages at the end of the packet are the answers to the problems, exercises, and quizzes. Use these to check your understanding of the material. Be sure to bring your completed packet to the first class. We will go over any material on which you have questions at that time.

It is important that you memorize the list of polyatomic ions (there will be a quiz the first day of school) and the types of chemical reactions (there will be a quiz on Friday, September 5, 2014). Having this material memorized will make learning the new material much easier. The Mole Review, Equation Writing Exercise Part #1, and the Chapter 3 problems listed at the bottom of this letter will start you on the Chapter 3 material. We will cover the rest of Chapter 3 in class together in more detail before the first test on Thursday, September 11, 2014.

Enjoy your summer and don’t work too hard.

Sincerely,

Mrs. Ochoa

Chapter 1 Problems: Page 33 #25, 28, 31, 58, 75
Chapter 2 Problems: Page 74 #26, 27, 33, 41, 44, 47, 49, 53, 57, 67, 68, 70, 72, 81
Chapter 3 Problems: Page 123 #21, 23, 33, 35, 39, 43, 51, 53, 56, 57, 62, 68, 103
June 2014

Dear A. P. Chemistry Student:

My name is Noelle Ochoa and I am the teacher for Advanced Placement Chemistry next year. The A. P. Chemistry course is the equivalent to a college Freshman Chemistry course. You will be doing college-level work and can expect to do an average of an hour of homework every day once class starts. I assume you are planning on taking this course because you have a high interest in science and plan on taking the Advanced Placement Exam in the coming spring. This exam allows students the opportunity to earn college credit for Freshman Chemistry while in high school. One of my goals is to teach you the materials in this course so you are able to pass the exam.

To help ensure that we will cover all of the material that the College Board requires for the exam, you will need to start working on the beginning chapters of the text this summer. I have put together a packet of worksheets and practice quizzes for you to do. The material in the packet is a review of material you covered in your high school chemistry course. See me in Room 308 for the packet of materials and go to the Book Store for the textbook. Please let me know if you have any trouble receiving these materials. My e-mail address is ochoan@royaloakschools.org, or you can call/text me at 248-506-9184.

You will have a quiz covering the polyatomic ions on the first day of class, Tuesday, September 2, 2014, a quiz on equation writing on Friday, September 5, 2014, and you will have your first test covering Chapters 1, 2 and 3 on Thursday, September 11, 2014. Working on your packet will help you start the school year off right and make learning the new material that is presented much easier.

I look forward to working with you in the upcoming school year.

Sincerely:

Mrs. Ochoa
AP Chemistry
Syllabus

COURSE DESCRIPTION: Advanced Placement Chemistry is a college level general chemistry course. Advanced placement college credit can be earned by passing the AP Chemistry test given in May. The course is structured around the six big ideas articulated in the AP Chemistry curriculum framework provided by the College Board. College level laboratory work is emphasized and advanced instruments are used. Topics stressed include: B11- Structure of matter, B12 - Properties of matter-characteristics, states, and forces of attraction, B13 – Chemical reactions, B14- Rates of Chemical Reactions, B15 – Thermodynamics, B16- Equilibrium. This course is especially helpful to students interested in medicine, dentistry, pharmacy, nursing, mathematics, biology, chemistry, physics, engineering or related careers.


LAB MANUAL: The lab manual is a collection of labs from various sources

PREREQUISITE: Chemistry 1 & 2 and Algebra 2

REQUIRED CLASS MATERIALS:
2. Scientific calculator for use in class and at home.
3. An organized method for note taking.

HOMEWORK:
1. AP Chemistry is a college course for which you can earn college credit, so please expect college level work.
2. All work completed in class or at home must be written on standard size, loose-leaf paper. Sheets torn from a spiral notebook are not acceptable.
3. Homework is corrected and graded on a regular basis.

GRADES:
Your marking period grades will be based on the total number of points earned on tests, quizzes, lab reports, AP problems, and homework. Your semester grade is calculated from accumulated points in three marking periods and a comprehensive final examination. The material in this course is cumulative.
The grading scale is based on percent and calculated to the nearest 0.1%.
A = 100.0% – 90.0 %, B = 89.9% – 80.0%, C = 79.9% – 70.0%,
D = 69.9% – 60.0%, E = 59.9% and below.

LABORATORY:
A minimum of 25% of student contact time will be spent doing hands-on laboratory activities. 6 of these labs are guided inquiry based. See lab list provided for lab details. Students communicate and collaborate in lab groups, however, each student writes a laboratory report for every lab they perform. A specific format will be given to the student for each lab. Students must follow that and label all sections very clearly. AP Chemistry lab reports are much longer and more in depth than ones completed in the first year chemistry course. Late labs will not be accepted. Labs not completed in class must be done at lunch or after school by appointment. Lab reports must include the following:
1. Advanced Study Assignment/Pre-lab questions – questions or calculations related to the lab experience
2. Title – Names the experiment
3. Problem – States the objective of the experiment.
4. Discussion – Explanation of how to solve the problem. If doing a guided inquiry lab, then a procedure will be written.
5. Data/Results
6. Post-lab – includes calculations, graphs, conclusions, error analysis

COURSE OUTLINE

Unit 1: (Chapters 1 – 3) Big Ideas 1, 2, 3
Chemical Foundations – Significant Figures and calculations, dimensional analysis, etc
Atoms and Molecules, and Ions – Atomic Theory and Atomic Structure
Stoichiometry – The Mole, molar mass, percent composition and empirical formula, writing and balancing chemical equations, stoichiometric calculations

*Chapters 1, 2 and a portion of 3 are completed as a summer packet.

Assignments

Quiz - Polyatomic Ions
Equation Writing Exercise #2 (Overall equation)
Pg. 125 #67, 74, 78, 87
Review Summer Packet

Equation Writing Exercise #2 (Net Ionic Equation)
Pg. 125 #85, 88, 93, 118

Equation Writing Exercise #3
Pg. 125 #92, 97, 99, 113, 114

Quiz – Equation Writing
Pg. 125 #58, 86, 94, 117

Test – Chapter 3

Laboratory Experience: Experiment 1 “Chemical Reactions”
Unit 2: (Chapter 4) Big Idea 3
Types of Chemical Reactions and Solution Chemistry – Aqueous solutions, precipitation reactions, acid-base reactions, oxidation-reduction reactions

Assignments
Read Chapter 4, sections 4.1 and 4.2 (pg. 133 - 140)
Read Chapter 4, sections 4.3 – 4.5 (pg. 140 -154)
Pg. 180 # 12, 14, 15 a & b, 17 a & d, 24 a & b, 25
Read Chapter 4, sections 4.6 – 4.8 (pg. 154 - 164)
Pg. 180 # 29, 31, 35, 38, 40, 42
Pg. 180# 46, 47, 49, 52, 53
Read Chapter 4, sections 4.9 and 4.10 (pg. 164 - 179)
Pg. 180 # 58, 59, 60, 62, 64 a & b
Pg. 180 # 63 c&d, 66 a&c, 68, 81, 91
Pg. 180 # 41, 43, 63 a&b, 65 a&b, 79, 97

Test on Chapter 4

Laboratory Experience: Experiment 2 “Standardization of Sodium Hydroxide and Determination of the Molar Mass of a Solid Acid

Experiment 4 “Formula of a Hydrate”

Unit 3: (Chapter 5) Big Ideas 1 and 2
Gases – Gas Laws (Boyle, Charles, Gay-Lussac, Combined, Avogadro, Dalton, Ideal, and Graham), the kinetic molecular theory, real gases, van der waals equation

Assignments
Read Chapter 5, sections 5.1 – 5.2 (pg. 189-198)
Pg. 230 # 24, 32, 41, 43, 45

Read Chapter 5, sections 5.3 and 5.4 (pg. 198- 206)
Pg. 230 # 38, 39, 49, 50, 51

Read Chapter 5, section 5.5 (pg. 206 – 211)
Pg. 230 # 64, 65, 67, 70

Read Chapter 5, sections 5.6 and 5.7 (pg. 212 - 222)
Pg. 230 # 56, 60, 62, 71, 75

Read Chapter 5, sections 5.8 and 5.9 (pg. 222-230)
Pg. 230 # 19, 57, 75.5 (at the top of page 236 with no number), 79, 82, 85, 108

Pg. 230 # 87, 91, 92, 102, 103, 106

Pg. 230 # 44, 47, 54, 59, 61, 69, 78, 81,

**Test on Chapter 5**

**Laboratory Experience:** Experiment 3 “Empirical Formula”
Experiment 5 “Molar Volume of Oxygen Gas”

**Unit 4: (Chapter 6) Big Idea 5**
**Thermochemistry** – Enthalpy and calorimetry, Hess’s Law, thermochemical equations, heats of formation, bond energies, heats of reaction

### Assignments

<table>
<thead>
<tr>
<th>Read Chapter 6, section 6.1 and 6.2 (pg. 241-256)</th>
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<tbody>
<tr>
<td>Pg. 280 #9, 13, 21, 26, 27</td>
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</table>

Read Chapter 6, section 6.3 (pg. 256-260)

Pg. 281 #28, 30, 34, 38, 39

Read Chapter 6, section 6.4 (pg. 260-267)

Pg. 282 #43, 45, 50, 57

Pg. 283 #56, 59, 60, 62(Show all chemical equations)

**Laboratory Quiz**

Read Chapter 6, sections 6.5 and 6.6 (pg. 267-278)

Pg. 284 #66, 68, 76, 82, 87

Exercise Sheet on Enthalpy Change and Calorimetry

Pg. 281 #31, 36, 46, 55, 61, 80

Complete Review Sheet

**Test on Chapter 6**

**Laboratory Experience:** Experiment 6 “Calorimeter Investigation”
“The Hand Warmer Design Challenge”
Unit 5: (Chapter 7) Big Idea 1 and 2

Atomic Structure and Periodicity – Electromagnetic radiation, atomic spectrum, Bohr atom, quantum mechanical model of the atom, quantum numbers, electron configuration, periodic trends

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<thead>
<tr>
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<tbody>
<tr>
<td>Read Chapter 7, section 7.1 – 7.3 (pg 289-299) Pg. 336 #1, 39, 41, 45</td>
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<tr>
<td>Read Chapter 7, section 7.4 – 7.5 (pg. 299-307) Pg. 338 #51, 53, 57</td>
</tr>
<tr>
<td>Read Chapter 7, section 7.6 – 7.9 (pg 307-314) Pg. 338 #54, 56, 61, 62</td>
</tr>
<tr>
<td>Read Chapter 7, section 7.10-7.11 (pg. 314 - 324) Pg. 338 #64, 67, 70, 74, 77, 78</td>
</tr>
<tr>
<td>Read Chapter 7, section 7.12 (pg. 324-330) Pg. 339 #79, 80, 81, 84, 85, 87, 93</td>
</tr>
<tr>
<td>Read Chapter 7, section 7.13 (pg. 330-335) Pg. 336 #3, 4, 90, 92, 96, 126, 133</td>
</tr>
<tr>
<td>Pg. 336 #6, 12, 104 105, 110, 116 AP Problem</td>
</tr>
<tr>
<td>Review Sheet AP Problems</td>
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</tbody>
</table>

Test on Chapter 7

Laboratory Experience: Experiment 7 “Job’s Law”

Unit 6: (Chapters 8 and 9) Big Ideas 1 and 2

Bonding: General Concepts – Electronegativity, Bond polarity and Dipole Moments, ionic bonding, covalent bonding, covalent bond energies and chemical reactions, Lewis structures, octet rule and exceptions, VSEPR model, resonance, hybridization, local electron model

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<thead>
<tr>
<th>Assignment</th>
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<tbody>
<tr>
<td>Read Chapter 8, sections 8.1-8.3 (pg. 347-357) Pg. 403 #1, 22, 24, 26</td>
</tr>
<tr>
<td>Read Chapter 8 Sections 8.4-8.6 (pg. 357-367)</td>
</tr>
</tbody>
</table>
Read Chapter 8, section 8.7-8.10 (pg. 367-379)
Pg. 403 #30, 31, 36
Pg. 403 #14, 17, 34, 40
Pg. 404 #39, 42)
Read Chapter 8, sections 8.11 and 8.12 (pg. 389-397)
Pg. 402 #41, 46, 48, 50, 62
Read Chapter 8, section 8.13 (pg. 397-402)
Pg. 405 #61, 63
Pg. 405 #65, 72, 73, 77, 81
Pg. 405 #82, 83, 89, 90, 96, 108b

Test on Chapter 8

Read Chapter 9, Section 9.1 (pg. 413 – 426)

AP Problem
Pg. 442 # 21 a-l, 23, 25, 26, 34 (LE model only)
Pg. 442 # 22 e-i, 27, 51

Quiz on Chapter 9

Laboratory Experience: Experiment 8 “Molecular Weight By Gas Density”

Unit 7: (Chapter 10 and Organic Chemistry) Big Ideas 1 and 3
Liquids and Solids – Intermolecular forces, dipole-dipole interactions, hydrogen bonding, London dispersion forces, types of solids, structure and bonding in metals, types of solids, vapor pressure and changes of state, phase diagrams
Organic Chemistry – Nomenclature introduction

**Assignment**
Read Chapter 10, section 10.1 – 10.3 (pg. 449 - 460)
Pg. 500 # 12, 13, 14, 35, 38
Read Chapter 10, section 10.4 (pg. 461-468)
Page 500 #15, 21, 34, 37
Read Chapter 10, sections 10.5 - 10.7 (pg. 468-483)
Pg. 500 #36, 39, 52, 55, 68

Read Chapter 10, section 10.8-10.9 (pg. 483-499)
Pg. 500 #32, 33, 44, 49, 50, 67, 81

Pg. 500 #20, 43, 79, 80, 83

Pg. 500 #18, 77, 87, 88

Multiple Choice Review for Chapter 10

Test on Chapter 10

Read Organic Nomenclature Handout
Organic Nomenclature Exercise 6-1
Organic Nomenclature Exercise 6-2

Laboratory Experience: Silver Bottle Experiment
Experiment 9 “Paper Chromatography"
Experiment 10 “Spectrophotometric Analysis of a One Component Chromium Solution”

Unit 8: (Chapter 11) Big Ideas 1 and 2
Properties of Solutions – Electrolytes and non-electrolytes, molarity, molality, mole fraction, mass percent, factors affecting solubility, Raoult’s Law, colligative properties, freezing point depression, boiling point elevation, osmotic pressure

Assignment

Read Chapter 11, section 11.1 (pg 511-515)
Pg. 547 #9, 10, 11, 12

Read Chapter 11, section 11.2 (pg. 515-519)
Pg. 547 #14, 27(HNO₃), 29

Read Chapter 11, sections 11.3 and 11.4 (pg 519-531)
Pg. 547 #27(H₂SO₄)

Pg. 547 #4, 18, 30, 45, 48

Read Chapter 11, sections 11.5 and 11.6 (pg. 531-540)
Pg. 547 #19, 33, 39, 40, 49, 51

Read Chapter 11, sections 11.7 and 11.8 (pg. 540-546)
Pg. 547 #20, 41, 52, 57, 66
Pg. 547 #55, 69, 70, 71, 73, 81

Review Sheets

Chapter 11 Test

Laboratory Experience: Experiment 11 “Determine Molar Mass By Freezing Point Depression”

Unit 9: (Chapters 12 and 18) Big Idea 4
Chemical Kinetics- Reaction rates, rate law expressions, order of reactions, rate constant, integrated rate law, reaction mechanisms, half-life, radioactive decay, kinetics of radioactive decay, activation energy

Assignments

Read Chapter 12, section 12.1 - 12.3 (pg. 555-567)
Pg. 597 #9, 17, 18, 19, 21, 22

Read Chapter 12, section 12.4 (pg. 568-578)
Pg. 598 #23, 26
Read Chapter 18, sections 18.1-18.2 (pg. 877-886)
Pg. 906 #9, 10, 11, 12, 18

Read Chapter 12, sections 12.5 - 12.7 (pg. 578-588)
Pg. 600 #33 (graph)

Pg. 599 #29
Pg. 907 #22, 23

Pg. 599 #38, 39, 45, 46, 55, 56

Read Chapter 12, section 12.8 (pg 588-597)
Pg. 602 #49, 50, 53, 58, 61

AP Problems and Chemical Kinetics Worksheet

AP Problems
Review for Test

Test on Chapter 12
Laboratory Experience: Experiment 12 “Kinetics of the Reaction Between
Hydrogen Peroxide and the Iodide Ion”

Unit 10: (Chapter 13) Big Idea 6

Chemical Equilibrium - The equilibrium condition, the equilibrium constant,
equilibrium expressions involving pressures, heterogeneous equilibria, applications
of the equilibrium constant, solving equilibrium problems, Le Chatelier’s Principle

Assignments

Read Chapter 13, sections 13.1 – 13.3 (pg. 609-620)
Pg. 642 #11, 19, 20, 22, 25, 30

Read Chapter 13, sections 13.4-13.5 (pg. 620-631)
Pg. 644 #10, 13, 26, 27, 33, 34

Read Chapter 13, sections 13.6-13.7 (pg. 631-643)
Pg. 643 #1, 14, 39, 50a, 51a, 60, 62
Pg. 643 #6, 51 b and c, 53, 57, 64, 72, 73, 74

AP Problems #2, 3, 5, 6

AP Problems #4, 8

Test on Chapter 13

Laboratory Experience: Experiment 13 “Series of Copper Reactions”

Unit 11: (Chapter 14 and Equation Writing Review) Big Idea 6

Acids and Bases – Nature of acids and bases, acid strength, pH scale and calculations,
Ka and Kb, acid-base properties of salts, Arrenhius, Bronsted-Lowrey and Lewis acid
theories, review of equation writing

Assignments

Equation Writing Review #1-8
Equation Writing Review #9-17

Read Chapter 14, sections 14.1-14.3 (pg. 653-665)
Pg. 703 #16, 32, 33, 35, 36, 38

Quiz on Equation Writing
Read Chapter 14, sections 14.4-14.5 (pg. 665-676)
Pg. 703 #18, 30, 39, 43, 47, 53, 54, 72
Read Chapter 14, sections 14.6-14.7 (pg. 676-687)
Pg. 703 #21, 56, 61, 63, 73, 75

Read Chapter 14, sections 14.8-14.10 (pg. 687-696)
Pg. 704 #22, 84, 101, 103, 111, 113

Read Chapter 14, sections 14.11-14.12 (pg. 696-700)
Pg. 703 #17, 106, 117, 118, 119

AP Problems
Review Sheet

AP Problems
Review Sheet #2

Test on Chapter 14

Unit 12: (Chapter 15 – Part 1) Big Idea 6
Acid-Base Equilibria – Solutions of acids or bases containing a common ion, buffered solutions, buffer capacity, titrations and pH curves, acid-base indicators

Assignments

Reaction Predictions #1

Read Chapter 15, sections 15.1 – 15.2 (pg. 713 - 726)
Reaction Predictions #2

Pg. 774 # 13, 23, 27, 37 a & b
Read Chapter 15, section 15.3 (pg. 726 - 729)

Pg. 774 # 29, 38, 43, 47
Reaction Predictions #3

Read Chapter 15, section 15.4 (pg. 729 - 744)
Pg. 774 # 14, 16, 51
Reaction Predictions #4

Read Chapter 15, section 15.5 (pg. 744- 751)
Pg. 774 # 58

Pg. 774 # 61, 72
Review Sheet
Reaction Predictions #5
AP Problems
Review Problems

AP Problems

Test on Chapter 15 Part 1
Read Chapter 15, sections 15.6 – 15.7 (pg. 751 -766)
Pg. 777 #73, 74, 75, 77, 79 a&b, 85, 89

Laboratory Experience: Experiment 14 “pH Titrations – Strong Acid-Strong-
Base and Weak-Acid-Strong Base”

Unit 13: (Chapter 15 - Part 2) Big Idea 6
Solubility Equilibria – Solubility equilibria, solubility product, precipitation and
qualitative analysis, equilibria involving complex ions

Assignment

Read Chapter 15, sections 15.6 – 15.7 (pg. 751-766)
Pg. 777 #73, 74, 75, 77, 79 a&b, 85, 89

Read Chapter 15, section 15.8 (pg. 766-773)
Pg. 778 #93, 97b, 99, 100

Reaction Predictions #6 (for points)
Solubility Equilibrium Supplement

AP Problems

Test on Chapter 15 Part 2

Laboratory Experience: Experiment 15 “Solubility Product Constant for
Calcium Hydroxide”

Unit 14: (Chapter 16 and 17) Big Idea 5 and 3
Spontaneity, Entropy, and Free Energy—Spontaneous processes, entropy, second
law of thermodynamics, free energy, entropy changes and chemical reactions, free
energy and equilibrium
Electrochemistry – Oxidation and reduction half-cells and equations,
electrochemical cells, standard reduction potentials, Nernst equation

Assignment

“Read” Chapter 16 (pg. 783-814)
Laboratory Experience: Experiment 16 “Ten Solution Identification”
Experiment 17 “Radial Chromatography”

Laboratory Experiences
All labs are student conducted (hands-on) with a teacher led pre and post lab component. For each laboratory experience, students will complete a formal lab report that includes an advanced study assignment to be turned in prior to the experiment. Please note: 1 class period equals 60 minutes except on late start Wednesdays when class is 45 minutes.

Experiment 1 “Chemical Reactions”
Goal- Students will observe examples of: composition, decomposition, single replacement, double replacement, and oxidation-reduction reactions. They will write balanced equations (overall, ionic, and net ionic) for each reaction performed.
Time – 3 Class Periods

Experiment 2 “Standardization of Sodium Hydroxide and Determination of Molar Mass of Solid Acid” *
Goal- Students will determine the molarity of a sodium hydroxide solution by titrating against potassium acid phthalate, a common standard acid. Students will then determine the molar mass of the unknown acid. By titrating the standardized NaOH against a sample of the unknown acid, the number of moles of acid can be determined. Using the moles of acid and the mass of the sample, the molar mass can be calculated.

Experiment 4 “Formula of a Hydrate”**
Goal- Students will determine the percent by mass of water in a hydrate and also determine the correct empirical formula of the hydrate.
Time – 6 Class periods

Experiment 3 “Empirical Formula”
Goal – The students will determine the empirical formula of the copper iodide compound produced by the direct synthesis from the elements for the reaction

\[ \text{Cu(s)} + \text{I}_2(\text{g}) \rightarrow \text{Cu}_x\text{I}_y(\text{s}) \]
Experiment 5 “Molar Volume of Oxygen Gas”
Goal – The students will determine the molar volume of oxygen gas at ambient conditions by decomposing potassium chlorate and collecting the oxygen gas by water displacement. Students will then use this volume to calculate the molar volume at standard conditions.
Time – 6 Class Periods

Experiment 6 “Calorimeter Investigation” and “Hand Warmer Design Challenge”*
Goal - Students will determine the heat of formation for Mg$^{+2}$(aq) and MgO(s) calorimetrically, and design and execute an experimental procedure to determine which of three ionic compounds is most suitable for use in a hand warmer.
Time – 5 Class Periods

Experiment 7 “Job’s Law”
Goal – Students will combine two chemical reagents in various proportions. By noting which combination gives the greatest yield of precipitate, students will determine the proper stoichiometric coefficients of the reactants and hence, the entire balanced equation.
Time – 4 Class Periods

Experiment 8 “Molecular Weight By Gas Density”
Goal – Students will determine the molar mass of an unknown pure liquid by a simplified procedure similar to the Dumas method.
Time – 3 Class Periods

Silver Bottle Lab
Goal – Students will silver plate the inside of a glass bottle.
Time – 1 Class Period

Experiment 9 “Paper Chromatography”
Goal – Students will separate and identify some metal ions in solution by using paper chromatography.
Time – 3 Class Periods

Experiment 10 “Spectrophotometric Analysis of a One Component Chromium Solution”*
Goal – Students will determine the concentration of chromium (III) spectrophotometrically. Students will first determine the best wavelength to use by plotting absorbance versus wavelength of the colored solution. A Beer’s Law plot will then be determined using five different concentrations of chromium (III) nitrate at the best wavelength and the extinction coefficient calculated. The concentration of the unknown solution is then determined by measuring its absorbance at the best wavelength and using Beer’s Law: $A = kC$.
Time – 4 Class Periods
Experiment 11 “Determine Molar Mass By Freezing Point Depression”
Goal- Students will determine the molar mass of sulfur. They will first determine the freezing point for pure naphthalene and then for a solution of naphthalene and sulfur by plotting temperature versus time. Students will use this cooling curve to determine the freezing point depression. They will calculate the molal concentration of the solution and use this to determine both the molar mass and molecular formula of sulfur.
Time – 3 Class Periods

Experiment 12 “Kinetics of the Reaction Between Hydrogen Peroxide and the Iodide Ion”
Goal- Students will determine the rate law for the reaction between hydrogen peroxide and potassium iodide at an acidity less than 0.001M by doing two sets of experiments. In the first set, the rate of reaction will be measured for several mixtures containing a constant concentration of hydrogen peroxide and various concentrations of the iodide ion. The second set of experiments will have a constant iodide ion concentration and various concentrations of hydrogen peroxide. The rate constant for each trial will be calculated and the average value determined.
Time – 4 Class Periods

Experiment 13 “A Series of Copper Reactions”
Goal- Students will perform a sequence of chemical reactions involving copper to observe oxidation-reduction, double-replacement, decomposition, formation of a complex ion, and single-replacement reactions. They will write the correct overall, ionic, and net ionic equations for each reaction.
Time – 3 Class Periods

Experiment 14 “pH Titrations – Strong Acid-Strong Base and Weak Acid-Strong Base”
Goal- Students will determine the concentration of unknown hydrochloric acid and unknown acetic acid by titrating against a standardized solution of sodium hydroxide. Students will demonstrate a titration curve (pH versus mL titrant) for a strong base (NaOH) versus both a strong acid (HCl) and a weak acid (CH₃COOH).
Time – 6 Class Periods

Experiment 15 “Solubility Product Constant for Calcium Hydroxide”
Goal- Students will determine the Ksp for calcium hydroxide by titrating a saturated solution of calcium hydroxide against a known solution of hydrochloric acid. The concentration of the hydroxide ion and the calcium ion will be determined from the titration and the Ksp will be calculated.
Time – 3 Class Periods

Experiment 16 “Ten Solution Experiment”
Goal- Students will be given a set of bottles containing 10 listed solutions. The objective is to identify which solution is in which bottle by using reactions between members of the set and other chemical tests.
Time – 4 Class Periods

Experiment 17 “Radial Chromatography”
Goal – Students will make a t-shirt using radial chromatography. Isopropyl alcohol will be used as the solvent (mobile phase) and the t-shirt will be the stationary phase. Ink from various colored permanent markers will be separated.
Time – 2 Class Periods

*The laboratory experiences will be the guided inquiry labs.