

## 2023 Advanced Placement® Chemistry

### About the AP® Chemistry Summer Institute

The focus of the instructional time will be on the four major essay topics – kinetics, equilibrium (gaseous, acid-base, and limited solubility), electrochemistry, and thermodynamics - as they relate to the new AP curriculum. Mixed with the instruction will be a variety of lab activities with a focus on the guided inquiry method. Time permitting, secondary topics such as bonding, solutions, and lab procedures will also be covered. Successful strategies for covering the topics and for preparing the students for the AP Exam will be the underlying theme for the week. While this course is especially geared to help teachers get their program started, there is plenty for experienced teachers to do as well. With the major revisions to the chemistry curriculum, part of the week will be spent discussing these changes. Participants will receive a google drive link to the resources for both their AP program as well as first-year chemistry courses. Through this workshop, teachers will strengthen their professional skills and learn techniques to help students prepare and connect with college.

### Goals of the Institute:

- Learners will plan for implementing an AP Chemistry course, creating a year-long syllabus outlining topics to be covered and a laboratory schedule as well.
- Learners will demonstrate an understanding of the AP Chemistry concepts, as well as appropriate teaching and assessment strategies, by developing a unit plan with corresponding lesson plans.
- Learners will gain experience in setting up and performing the required laboratories.
- Learners will become familiar with the administration and evaluation of the AP Chemistry exam, developing, and scoring free response items.
- Learners will become more familiar with requirements and changes regarding the new AP Chemistry curriculum.

### Tentative Daily Schedule:

Morning Session: 8:00 am-12:00 noon (eastern)

Lunch: 12:00 noon-1:00 pm

Afternoon Session: 1:00 pm-5:00 pm

*\*Exact times are subject to change when the class begins*

### **Pre-Workshop Homework – Read the “Green Crystal Lab”**

#### Day 1: Monday

8:00 – 9:00	Introductions / Discussion of Itinerary & Objectives / Material on the flash drive Discussion of Course Updates – Key Takeaways <b>Takeaway Item #3 – Moving to Fall Registration</b>
9:00 – 10:00	Lab Safety Review / Review of use of Analytical Balances Locker inventory (check lab set-up) / Discussion of an iron complex salt lab <b>LAB:</b> Synthesis of iron complex crystal/drying crucibles & covers Discuss the “hydrate” part of the lab – options
10:00 – 10:15	<b>BREAK</b>
10:15 – 11:45	Discussion: Kinetics / Group work on Problem Set
11:45 - 12:30	<b>LUNCH</b>
12:30 – 1:15	<b>LAB:</b> Recrystallization of iron complex salt

1:15 – 2:00	Discussion: Gaseous Equilibrium – Le Chatelier’s Principle
2:00 – 2:30	Discussion: Gaseous Equilibrium - Sample Problems Input from teachers on Kinetics & Equilibrium – successful strategies/labs
<b>2:30 – 2:45</b>	<b>BREAK</b>
2:45 – 3:15	<b>LAB:</b> Prep column for Green Crystal Lab
3:15 – 4:15	<b>LAB:</b> Molar Volume of a Gas
4:15 – 4:30	<b>Demo: “Burning Hand”</b>

**Homework:** **A) Look through the CED Handbook**  
**B) Read Labs – (1) % Cu in Brass; (2) Heat of Rxn; (3) Iodine Clock Rxn**

Day 2: Tuesday

8:00 – 8:45	<b>Key Takeaway #1 – Contents of the CED</b>
8:45 - 9:15	<b>LAB:</b> Collecting iron complex salt crystals
9:15 – 9:45	Equity & Access Discussion
9:45 – 10:45	Discussion: Thermochemistry & Thermodynamics
10:45 - 11:00	<b>BREAK</b>
11:00 – 11:45	Work on Thermo FRQ (Free Response Questions)
11:45 – 12:30	<b>LUNCH</b>
12:30 – 1:00	Discussion of PES notes / Types of Spectroscopy
1:00 - 1:30	Discussion: New AP Exam / Discuss the Grading Process
1:30 - 2:15	<b>LAB:</b> Heat of Reaction – micro
2:15 – 2:30	<b>Demo</b> - Elephant Toothpaste
2:30 - 2:45	<b>BREAK</b>
2:45 – 3:30	<b>LAB:</b> Beer’s Law (Spec Lab)
3:30 - 3:45	<b>LAB:</b> Weigh iron complex salt crystals
3:45 – 4:30	<b>Lab – Iodine Clock Reaction (including calculations)</b>

**Homework:** **(A) Read the Titration Part of the Green Crystal Lab**  
**(B) Key Takeaway #2 Activity – Instructional Design – Read Lesson #12**  
**(C) Watch the video on the Percent Copper Lab – write down data!!!**

Day 3: Wednesday

8:00 – 9:30	Discussion: Acid-Base Equilibrium – Part I <ul style="list-style-type: none"> <li>▪ <math>K_w</math>, three acid-base theories, pH, pOH, strong vs weak</li> <li>▪ indicators, salt hydrolysis, polyprotic acids</li> <li>▪ work on a problem set</li> </ul>
9:30 – 10:00	Brainstorm Lesson #11 – Instructional Strategies
10:00 - 10:15	<b>BREAK</b>
10:15 - 11:00	Discussion: Acid-Base Equilibrium – Part II <ul style="list-style-type: none"> <li>▪ buffers, titrations &amp; titration curves</li> <li>▪ work on problem set(s)</li> </ul>
11:00 – 11:45	Work on Salt Hydrolysis / Buffer Problem Set
11:45 – 12:30	<b>LUNCH</b>
12:30 – 1:00	<b>Lab:</b> Run Green Crystals through Column/check pH meter
1:00 – 1:20	<b>LAB:</b> Percent Hydrate of Green Crystals – 1st drying
1:20 – 2:45	<b>LAB:</b> Determination of the Percentage of Potassium & Iron (Tab #3) <ul style="list-style-type: none"> <li>▪ collect titrant &amp; run titration</li> <li>▪ do a graphical analysis of the data</li> </ul>
2:45 – 3:00	<b>BREAK</b>
3:00 - 3:15	<b>LAB:</b> Percent Hydrate of Green Crystal –1 <sup>st</sup> weighing & 2 <sup>nd</sup> drying
3:15 - 4:00	<b>LAB: Determination of the Percentage of Oxalate in the Green Crystal</b>

4:00 - 4:30      **LAB:** Percent Hydrate of Green Crystal –2<sup>nd</sup> weighing & 3<sup>rd</sup> drying

**Homework:**      **Do all calculations for the “Green Crystal” Lab**

Day 4: Thursday

8:00 – 9:00      **Key Takeaway #4 – Online Resources for Teachers & Students**

9:00 – 9:45      Solubility Rules & Factoring Affecting Solubility

9:45 – 10:30      Limited Solubility &  $K_{SP}$  / pH &  $K_{SP}$  /  $Q_{IP}$  &  $K_{SP}$

10:30 – 10:45      **BREAK**

10:45 – 11:30      “Common Mistakes Students Make (from a Reader’s Perspective)”

11:30 – 11:45      “What can I do to be a more Effective AP Teacher?”

11:45 – 12:30      **LUNCH**

12:30 – 2:00      Discussion: Electrochemistry - Galvanic Cells vs. Electrolytic Cells & Electrolysis

2:00 – 2:30      Discussion: Green Crystal Calculations

2:30 – 2:45      **BREAK**

2:45 – 3:00      **Key Takeaway #5 – Becoming a Member of AP Community**

3:00 – 3:30      Ideas to Share / Reflection / Wrap up / Evaluation

If you need to reach me, my email is: [mike.arim0712@gmail.com](mailto:mike.arim0712@gmail.com)

**What to bring:**

Items you should have access to during the week include:

- A laptop computer/ tablet
- Closed-toe shoes for laboratory
- Calculator
- Safety goggles
- A favorite lesson, activity, or practice to share
- Lab coats/ apron/ gloves are optional

**Instructor:**



During his teaching career which spans over 40 years, **Mike Arim** has taught all levels of physics and biology, although his focus for the past three decades has been AP and Honors Chemistry. He has taught in both public and private schools as well as at the university level (UNC-Charlotte). Mike has served as an AP Table Leader & Reader as well as a College Board Consultant since the early 90s. He earned his degrees at the University of North Carolina in Chapel Hill (B.A., B.S., and MAT) and he is a National Board-Certified Teacher. Among his awards are the American Chemical Society’s (ACS) Outstanding H.S. Chemistry Teacher for the Southeast Region, the Time-Warner Cable Star Teacher Award, the Spratt Excellence in Teaching Award, and the Outstanding Science Teacher Governor’s Award. In 2015, he was selected by College Board to conduct a week-long workshop for chemistry teachers in China. Mike conducts workshops – weeklong Summer Institutes, 1-day, and 2-days - throughout the USA.