Supporting Information

Summer Science Academy in Chemistry as a Gateway to STEM for Matriculating First-Generation and Other Underrepresented Students

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SYLLABUS: CAAP CHEMISTRY (SAMPLE)

Instructor: …

TA: …

Class Hours: Monday & Friday 11:00 - 11:50 a.m.
Wednesdays 11:00 am - 12:50 p.m.

Office Hours: Tuesday, 5:30 - 6:30 p.m.
Friday, 12:00 - 1:00 p.m.

Office Hours: Mon. 12:00 - 1:00 p.m.
Wed. 1:00 - 2:00 p.m.

Discussion: Monday, 3:30 - 4:30 p.m.

INTRODUCTION:

This course offers an introduction to general chemistry, emphasizing the relationship between chemical concepts and experimental techniques in the laboratory. We will explore the fundamental aspects of many everyday chemical reactions and why they happen. The class starts with elements, atoms, and states of matter and eventually discusses acid/base, organic chemistry, and polymers.

Students will also learn the many aspects of chemistry experiments, including lab safety, lab techniques, experimental data analysis, and scientific reporting. The various class activities are designed to stimulate discussions and motivate students to ask questions through critical thinking.

HOMEWORK:

The homework is assigned to provide students with some realistic practices to understand the chemistry concepts better and for mastering problem-solving techniques. It is more important to put a reasonable effort into completing the problems than to get the correct answer. All homework is due one week after a specific assignment is assigned.

LABORATORY ASSIGNMENTS:

A laboratory is equipped with various safety items for use in case of an emergency. With good judgment, the chance of an accident in a laboratory with good safety culture is slight. Nevertheless, some of the materials used in the laboratories can be dangerous if mishandled, so the following safety protocols and the class rules are essential.

Experiments must never be left unattended. Students must wear safety goggles during experiments in the chemistry laboratory, even if not working on experimentation. Clothing must cover the entirety of the legs, arms, and shoulders; and must not be loose or flowing to avoid contact with hazardous chemicals or mechanical equipment. Shoes with open toes or other exposed skin, e.g., sandals, are prohibited in the laboratory.

ACADEMIC HONESTY:

Even though students may work with a partner in the general chemistry laboratory, students are expected to work independently to make experimental observations, do final calculations, provide interpretations, and write final lab reports. Conversations with other students about chemistry concepts applied in the experiments, laboratory techniques, preliminary data interpretations, etc., are strongly

encouraged. Going through such discussions will sharpen your understanding of chemical concepts and gain experience in collaborative learning. *Students must write their independent lab reports.*

TENTATIVE TOPICS:

Week 0	CAAP Summer Academy Activities
Week 1	*Safety training and related practical safety issues*
	Measurement, significant figures
	The atom in modern chemistry
Week 2	Chemical formulas, chemical equations
	Atomic shells and chemical bonding
	Gas-Phase Chemistry
	Lab: Measurement Activities
Week 3	Solutions
	Chemical equilibrium
	Lab: Oxygen Contents of Air
Week 4	Acid/base equilibria
	Lab: Flame Test
Week 5	Acid/base equilibria
	Solubility equilibria
	Lab: Acid/Base Universal Indicator
Week 6	Solubility equilibria/Intro to OChem/Polymers
Week 7	End of the CAAP Summer Academy Activities

DEMO LIST:

1. Cathod Ray Tube
2. Water Reacitve Materials (e.g., Alkali Metals: Na, K, …)
3. Catalyst – Hydrogen Decomposition (H_2O_2+KI, H_2O_2+MnO_2)
4. Collapsing Tank – Gas Law
5. Electrolyte – Conducting Device
6. Sblimation – Dry Ice (Co_2), Solid Iodine

7. Supercooled Water
8. Hot Ice – Sodium Acetate
9. Electric Pickle – Conductivity (Electrolyte)
10. Universal Acid/Base Indicator – Purple Cabbage Indicator
11. Acid Rain (Dry Ice, Indicator, Neutalization,…)
12. Precipitation, Dissociation, Equilitrium: Silver Chloride and Ammonia - (KCl, $AgNO_3$, NH_4OH, HCl)
13. Gravity Cell – Battery
14. Fruit Battery
15. Polymer – Slime
16. Superconductivity – Low Temperature Superconductivity