

# Campus Chemistry



Chemistry is the foundation of everything in our lives. The food we eat, the water we drink, the air we breathe, . . . even our bodies themselves and everything we can see or touch are all defined by chemistry. Chemistry is such a large body of science; it's been subdivided into categories such as organic, inorganic, biochemistry, analytical, theoretical, and physical. The chemistry researched and studied at colleges and universities is of a higher level than most of us encounter in our own kitchens or even high school labs. Work together with the Alpha Chi Sigma chapter (national chemistry fraternity) of your local college or university or a similar group. Put on your goggles and get a hands-on experience in a laboratory setting in "campus chemistry."

## Skill Builders

### 1. The Organic Chemistry of

#### *Perfume: The Notes of Perfume*

Perfumes are a combination of scents in an alcohol solvent. These scents are divided into three groups called notes: top, middle, and bottom. Evaporation rates and volatility determine the notes. Place 6 ml of cologne in a small test tube and add one to two boiling stones. Place a cotton ball in the top of the test tube and place the test tube in a hot water bath. When the volume is reduced by one third, remove the cotton ball with forceps and place the cotton ball into a vial marked "top". Replace the cotton ball with a new one and continue heating until the volume is one third of the original column. Label this cotton ball "middle". Repeat the process until the volume is less than 1 ml and label the last cotton ball "bottom". After the vials have cooled, take them to an area where the perfume smell is not strong. One at a time, open and smell each vial. Describe the differences in the various notes. What was the purpose of the hot water bath?

### 2. The Organic Chemistry of

#### *M&M's: Paper Chromatography*

Liquid chromatography is a separation technique using solvent solution that will climb up silica on a plastic plate. Using two thin layer chromatography strips, setup an experiment to see what colors make up the candy coating of different colors of M&M's. What do the different colored candies have in common?

### 3. The Inorganic Chemistry of *Homemade Ice Cream: Using Liquid Nitrogen*

Learn about the properties of liquid nitrogen. Mix together a batch of ice cream solution for a traditional ice cream freezer (recipe provided). Instead of using ice and rock salt in a ice cream freezer, pour liquid nitrogen over the ice cream solution in the metal bowl to freeze the ice cream solution. Keep stirring. Describe the chemistry that created your dessert.

### 4. The Physical Chemistry of

#### *Sunlight, Candlelight, and other Light Sources; Atoms and Light*

Use a diffraction grating and observe the colors of different light sources. Observe the colors of light emitted from excited items and relate these wavelengths to the energy changes in the electrons within the atom. This would include candlelight, incandescent light, discharged gases, various metal salts as they are placed into a flame by the college chemist. Record your observations. How could knowing the colors of different elements be used in chemistry? What other fields could use this information?

### 5. The Organic Chemistry of

#### *Nylon: Making Nylon Thread*

Place a hexamethylenediamine solution in a 250 ml beaker. Slowly pour a sebacoyl chloride solution as a second layer on top of the diamine solution. With forceps, grasp the polymer film that forms at the interface and pull it carefully from the center. Wind the polymer thread on a stirring rod. From your observations, do you think nylon is a monopolymer or a copolymer? How do you know?

# Campus Chemistry

## 6. *The Organic Chemistry of Soap:*

### *Making Old Fashioned Soap*

Use fat (lard or cooking oil), water, and NaOH to make soap the old fashioned way. After heating this solution, a solid will be formed that can be used as a bar soap. What materials could American pioneers have used to form this same soap? What usually happens to most liquids when they are heated? What chemistry caused this reaction to be different?

## 7. *The Inorganic Chemistry of the*

### *Keys to your House (or Car): Copper Plating Keys*

Weigh your key to the nearest 0.01g. Wrap a copper wire around a small glass rod and support your key in a solution of copper plating solution. Hook up a variable power DC power supply and turn on the power supply for 30 minutes. What observations suggest that chemical reactions occurred? Use the mass of copper deposited on the key to determine the moles of copper ions deposited on it.

## Technology

1. Theoretical Chemistry is known as the “cleanest” branch of science. Meet a theoretical chemist and see a demonstration of the technology they use in their careers.

2. Temperature changes are an important part of the study of chemistry. In most laboratories, extreme temperature changes are studied. Observe the technology used to create extremely cold temperatures in a chemistry lab. How does it work? How much

does it cost? What kind of training is required to use it?

## Service Projects

1. Batteries! Could we live without them? Learn about the chemistry behind two different types of batteries (lithium, alkaline, nickel-cadmium . . .). If possible, try building your own potato battery or citrus battery. Next learn what happens when batteries are not properly disposed after they “run out”. Research the best ways to recycle batteries in your neighborhood. Talk to your local government as well as stores that sell batteries and any environmental awareness groups. Once you know all about batteries, find a way to share your new knowledge with your community, help others build a potato battery or citrus battery to understand the chemistry, set up a community collection of old batteries and dispose of them properly, etc.

learned, what they hope to discover. How do they tell others about their findings? How to graduate students help them? Make notes about the interview in a journal.

2. Graduate students in chemistry usually have a two-fold career. In addition to being students and learning about chemistry in the classroom using lab equipment and textbooks, they also assist professors with their research. How do you pick a scientist to work with? How do you balance school demands with research demands? Make notes about the interview in a journal.

## Career Exploration

1. Chemistry professors have a two-fold career. Each one has an area of research in which she/he is trying to create new knowledge in the field. In addition she/he usually carries a teaching load, teaching one, two, three or four chemistry classes a semester, plus mentoring graduate students. What is a typical day in the life of a chemistry professor? Interview at least two or more professors about their research field. Find out how long they have been studying this, what they have