The 3rd Belt and Road Teenager Maker Camp & Teacher Workshop

COLORFUL CHEMISTRY

SEPTEMBER 24-30,2019

GUANGXI · CHINA

Chemistry and Life

Chemical reactions happen inside your body all the time. For example, that's how foods are broken down inside your stomach in order to digest them, and how your body makes heat to stay alive. But chemistry is also everywhere around you. An appetizing brownie would not be so delicious without a whole lot of chemistry that must take place within the ingredients. It is certain chemicals in foods that make things taste sour, sweet, salty, and so on. Chemistry is also what provides energy for the batteries that power the electronic devices you use. This chapter will explore some basic ideas in chemistry that will help you gain a glimpse of how chemistry is such an integral part of daily life.

What are we going to learn in this course?

Printing art is an ancient art form. Characters and illustrations in ancient engraving books are the same engraving method. What we will learn and experience in the following courses are:

- Basic concepts of Chemistry
- Basic Principles of Chemical Reactions
- Basic Methods of Operational Chemistry Experiments
- Methods for controlling chemical reactions
- Chemical Principles behind Common Things in Life

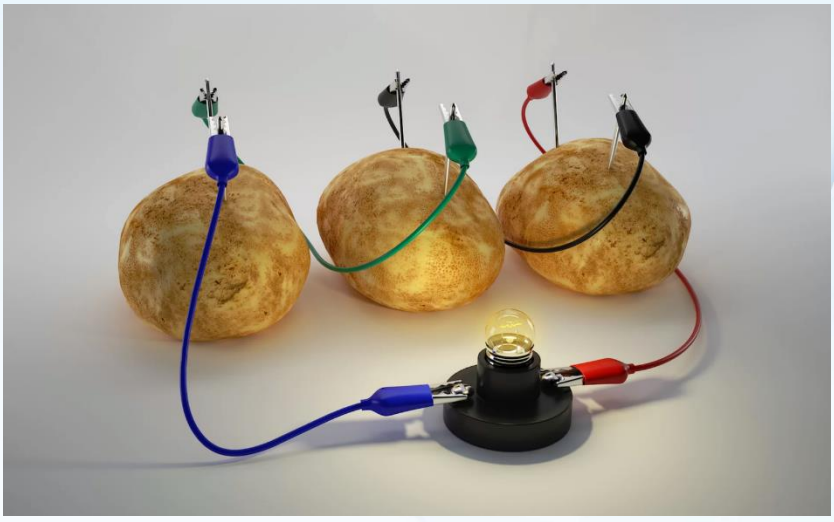
Activity 1: Fruit Battery Production

Material:

- Fresh potatos
- Knife
- Copper sheet
- Zinc sheet
- wires with clamps
- LED
- Clock
- neon light

Technological process:

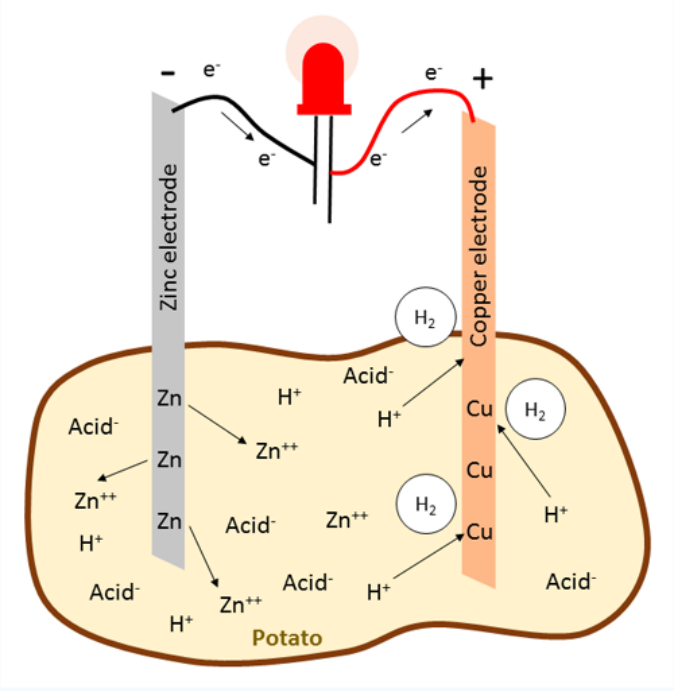
1. Use the knife on the surface of potato stick to open two small incitions
2. Insert the copper and zinc respectively
3. Use wires attach the LED
4. Connect the wires to the clock battery tablet
5. use the same way to make other fruit battery



	Evaluation item	scores	points
1	Complete the production of the battery within the specified time	40	
2	The line connection is reasonable and can generate current	20	
3	The battery works properly.	20	
4	The shape of fruit battery is unique and the design is novel.	20	

Principle: Copper-zinc galvanic battery

Zinc carbon cells have a short shelf life as the zinc is attacked by ammonium chloride. The zinc container becomes thinner as the cell is used, because zinc metal is oxidized to zinc ions. When the zinc case thins enough, zinc chloride begins to leak out of the battery.



Activity 2: Magic Bottle

By learning the acid-base indicator, we can experience the diverse colors of chemistry.

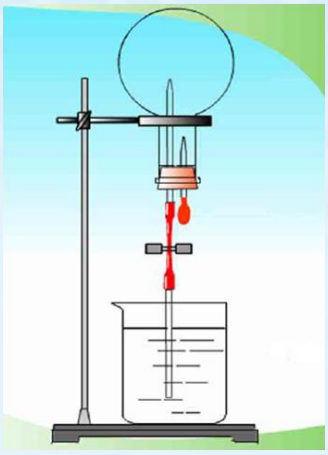
Material:

- conical flask, glucose solution
- methylene-blue
- sodium hydroxide solution
- tubes, conical flask

Technological process		The color you observe	
		While shaking /oscillating	After standing
1. Add 100ml of water and 10ml 10% glucose solution to the conical flask, and drop 15 drops of 0.1% methylene-blue into the solution until the solution emerged in a blue state. Shake it and let it stand.			
2. Add 100ml of water and 10ml 10% glucose solution to another conical flask, and drop 15 drops of 0.1% methylene-blue into the solution until the solution emerged in a blue state. Add 3ml 30% sodium hydroxide solution into the conical flask, shake it and let it stand.			
3. Pour the solution from the conical flask in the step 2 into two tubes: the No. 1 tube is full (no bubbles in the tube), and the No. 2 tube is only filled with half tubes, all of which are stuffed with rubber plugs. Shake them and let them stand.	①		
	②		
4. Divide the solution in the No.1 tube into the No.3 tube, add 2ml of water to the No.1 tube, add 2ml 10% glucose solution to the No.3 tube, and stuff the two tubes. Shake them and let them stand.	①		
	③		
5. Take a half cup of hot water at 40℃ in a 100ml beaker, place the No.1 and No.3 test tubes in water-bath in a beaker with hot water. After about 2 minutes, shake and let stand.	①		
	③		

Activity 3: Music Fountain

Mastering the essence of music fountain by learning the principal of the experiment. To further learn about the principl of PH indicator by doing the experiment.



Material:

- Ammonia
- Beaker
- Phenolphthalein
- glue head of dropper
- wire

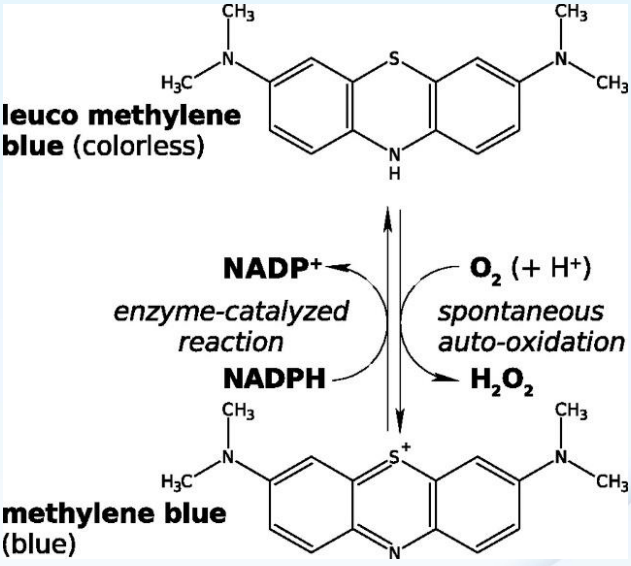
Technological process:

1. Please collect a bottle of ammonia and connect the device.
2. Please fill the beaker with water and add two to three drops of phenolphthalein.
3. Please open the water stopper
4. Please squeeze the glue head of dropper and let the water into the flask.
5. Please observe the experiment phenomenon.
6. At the end of the experiment, please .connect the battery with a wire and o bserve the phenomenon.

Examination item		Score	Grade
1	Capable of making homemade indicators	20	
2	The magic bottle is made successfully and the colors are bright	10	
3	Students can explain the principle of generating a fountain	10	
4	Fountain experiment succeeded	20	
5	According to the experimental principle of the fountain, students can create individually and make music fountains, etc.	40	

Principle:

Methylene blue and methylene white were transformed into each other under certain conditions.



Activity 4: Handmade Soap

Material:

- Soap base, essence, pigment, heating furnace, mold, knife

Technological process:

1. Cut soap. Take out the soap base, visually measure the amount of manual soap to be done, and cut it with a knife in place. Regardless of the cut shape, it is recommended that each piece be of the same size so that no part of the soap base is overheated while the other part is not melted.
2. Heating and melting of soap base. Transparent soap groups begin to melt at about 45 degrees C. It is usually melted by water insulation or microwave oven heating. When heating, try not to stir the soap liquor, otherwise it will produce a lot of unnecessary bubbles.
3. Addition. Additives are often required in the production of functional hand

soap, and can be added to the soap solution at this time.

4. Color matching. Use liquid color mixing, the concentration of liquid color is very high, so one drop at a time is enough, mix it evenly, if the color is not deep enough, add one drop, do not squeeze many drops at a time, so that the color is easy to be too dark, once the color is too dark, only a lot of soap base can be used to melt with it to make the color pale. If you want to make colorless or white soap, you don't need to add color solution. This step can be omitted.
5. Flavor. The flavor of hand soap is usually derived from flavors or essential oils. Essential oils are expensive and lose their flavor quickly. Some essential oils change their flavor when soap is added, but essential oils are effective. Flavor is cheaper and tastes longer, but it has no effect. This step can be omitted if you want to make natural odorless soap. For sensitive skin soaps, it is recommended not to add fragrance, and preferably not to add pigments, because these things will bring some irritation to the skin.
6. Mold insertion. Pour the color liquid with good color and taste into the mold, and fill it with about eight or nine points, or the desired height. If it is too full, it will not be easy to demoded. The mold must be washed and dried beforehand.
7. After pouring the soap solution, the soap can be placed next to cool, about an hour later, the soap will solidify, and then it can be packaged or used directly after remolding. If you want these soaps to solidify quickly, you can put them in the refrigerator for refrigeration or freezing. They can solidify in about 15 minutes to half an hour. Clean the utensils and environment while the solidification time is in neutral. Small steel cups and stirring rods can be washed initially with warm water in the water dish. Warm Water speeds up the melting of soap and can be washed more relatedly and pleasantly.
8. Demolding. The hand soap can be demoulded after it has been completely solidified. When demoulding, the first step is to pull the die mouth aside, let the air enter between the soap and the mould, and let the air enter all the edges. Conversely, press the bottom of the mould so that air can enter the bottom. When the air completely enters the bottom, the soap will be detached from the model, and then the soap can be buckled out.

9. Modification. If there are many bubbles on the hand soap, or there are other reasons to modify, you can use the back of the wash-free plastic knife or dry rag, toilet paper modification. Scrape the ugly part with a plastic knife, then wipe it with a dry rag and toilet paper to soften the lines of the soap. If soap is beautiful enough or advocates natural beauty and is unwilling to waste any little soap, this step can be omitted.
10. Packaging and Storage. If the hand soap is put in the air, there will be small droplets on the surface of the soap every other day or a few days, like sweating. This is because the glycerol in the hand soap attracts moisture from the air and condenses on the surface of the soap. This does not affect the essence of the soap, but it will affect the appearance. In order to avoid or reduce the production of small droplets, hand soap needs to be wrapped with fresh-keeping film or PE film, stored in a cool and dry place.

Safety Warning: Hands without carving knives must wear protective gloves to avoid injury!

Evaluation item		scores	points
1	Handmade soap was made successfully	20	
2	Soap color was matched brightly and reasonably	20	
3	The soap has a unique shape and is designed in accordance with the theme of Belt and Road Initiative.	60	

STEM Project: The Water Garden

Quiet bottom of the sea and gray-black rocks on the growth of colorful undersea plants, which just like a quiet, beautiful garden in the water. Do you want to have such a beautiful "garden"? Let's use chemical methods to make gardens in water.

Material:

- Sodium
- silicate solution
- hydrochloric acid solution
- phenolphthalein reagent
- ferric chloride
- aluminum sulfate
- calcium chloride
- cobalt chloride
- copper sulfate
- nickel sulfate,
- manganese sulfate

Technological process:

1. Take the sodium silicate solution about 4 milliliter, add the phenolphthalein reagent, and then drip the 1:3 hydrochloric acid into it slowly, shake it softly while dripping, finally observing the formation of the gel.
2. Add about 200 milliliter sodium silicate solution to the beaker; Then adding crystals (selected several kinds from ferric chloride, aluminum sulfate, calcium chloride, copper sulfate, cobalt chloride, nickel sulfate, manganese sulfate.);
3. After that, adding 2 or 3 spoons of each crystal; Adding phenolphthalein reagent, then the growth process and phenomenon of "flowers and plants" were observed and recorded.

Evaluation item		scores	points
1	The gel was made successfully and brightly colored	30	
2	The experimental phenomenon of Water Garden is obvious.	30	
3	The crystal of Water Garden experiment grows rapidly, the color collocation of it is reasonable and full of creativity.	40