

Students learn and implement science experiments

WOW!: Students present their experiments.

People

[1-15] Citizen Teachers

[1-5] guests

1 Citizen Schools team leader

Materials provided

10-Week Plan

- 1 Safety rules, polymers and recycling.
- 2 Chromatography
- 3 Chemical and Physical Reactions
- 4 Density
- 5 Animal adaptations
- 6 Freezing point depression
- 7 Surface tension and surfactant
- 8 Students finish speeches and begin rehearsing.
- 9 Complete WOW! Boards
- 10 WOW! Presentations

Apprenticeship: **Science Experiments**

Team Leader:

Lesson: 1

Date: 9/27

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Describe safety rules
- Define/describe a polymer
- Describe recycling and why it is important

21st Century Skills:

(Please post so students know the skill they will work on.)

Advanced Literacy - Polymers

Reason Effectively – Safety/Polymers

1. Opening Ritual:

(Activity at the beginning of the lesson that happens every week)

- None this week, in general Pictionary with science vocabulary

2. Agenda: (List ALL the components of the lesson)

- Introduction
- Ice Breaker
- 10 week plan visual + student demo choice
- Expectation Setting
- Safety
- Polymer Milk Jug Balloon Demo

3. Activity 1- Introduction to New Material – 30 min

(What new material are students learning and how will students receive this information?)

- Introduction – lecture – 5 min
- Ice Breaker – Go around with favorite food, each student repeating all of the other students' answers – 10 min
- 10 week plan visual + student demo choice – 15 min

4. Activity 2 – Safety – 15 min

(Include step by step instructions)

- Go over safety rules for the semester, have students fill out worksheet
- Give examples of when safety rules are important

Materials/ Classroom set up or space Needed:

- Empty milk jugs
- Heat Gun
- Safety Worksheet
- Safety Poster
- 10 week visual poster

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- 10 week visual
- Demonstration overview
- Go over what makes a good presentation

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Life at a large state school and MIT
- Careers in science – polymer research

5. Activity 3 Polymer Milk Jug Balloon Demo – 20 min

(Include step by step instructions)

- Grasp milk jug in one hand, heat gun in other
- Turn the heat gun onto heat and slowly wave in on one side of the milk jug
- When the plastic on that side becomes clear, turn off the heat gun, give the heat gun to your partner, he/she should run it on cold until it reaches a safe temperature
- Quickly blow into the top of the milk jug, the melted side should blow up like a balloon
- If the milk jug is cool enough, you can have the kids feel both the regular milk jug and the side that has been melted.

6. Check for understanding/ closing: (How will you check for students understanding and mastery of objectives? Exit ticket, thumbs up or down, verbal CFU) – **5 min**

Verbal checking for understanding of safety rules and of polymer demonstration

Lesson One Implementation

The structure of the first lesson is a bit different because you need to spend some time introducing yourself, becoming familiar with each other, setting classroom expectations and culture, and revealing the plan for the apprenticeship and WOW!. It is suggested that the TL take the lead on many first lesson components in order to help the CT see how a Citizen Schools lesson is structured and different teaching techniques that can be used to work a classroom.

Use the prompts below to think about the additional components you will add in a first lesson.

Introduction: Briefly share your story. What were you like when you were in middle school? How did you get into the profession or passion that you will be teaching, i.e., goals, your college or career pathway, interests, etc.

Review the agenda so that the students know what they can expect to do.

1. Curious, liked Star Trek, loved to read, played soccer
2. Had an amazing HS Chem teacher, went to MSU for Chemistry, then grad school at MIT, so many things you can do as a scientist

Icebreakers: How are you going to get to know your students? How are you going to start learning names? What do you want your students to know about you? College and career connections?

1. Go around with names and favorite food, each student repeats all of the others' names and favorite foods
2. MSU, MIT, chemistry

Expectation Setting: How will you introduce expectations and procedures that encourage student engagement and develop a positive learning environment? How will you build the classroom and apprenticeship culture?

I want the students to know that this semester will be really fun, but only if they follow the safety rules. I will go over all of the safety rules and emphasize how important they are. I will tell them about laboratory safety in a research lab.

10 Week plan visual: The students want to know what they will be doing. How will you show the students visually what they will accomplish over the course of the 10 weeks? How will you show students a Road to WOW! so they can understand where they are heading and what they will be able to do at the end?

I will have a large poster with the different topics we will cover each week on it. I will also give them a handout to put in their folder. We will go over all of the demonstrations that they will be doing for their WOW! Project.

Apprenticeship: Science Experiments

Team Leader:
Washington

Lesson: 2 **Date:** 10/4

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Describe chromatography
- Describe how chromatography can be used

21st Century Skills:

(Please post so students know the skill they will work on.)
Advanced Literacy, Reason Effectively

1. Opening Ritual: Pictionary 5 minutes

(Activity at the beginning of the lesson that happens every week)

- Pictionary game with words from last week: polymer, safety, thermoplastic, nylon, styrofoam

2. Agenda: (List ALL the components of the lesson)

- Opening Ritual
- Introduction to Chromatography
- Skittle Chromatography
- Ink Chromatography
- Chocolate Taste Test

3. Activity 1- Introduction to New Material – Introduction to Chromatography, Skittle Chromatography 20 min

(What new material are students learning and how will students receive this information?)

- Students will learn the basics of chromatography via a short lecture with a guided worksheet.
- Students will separate the dyes in Skittles and record their observations

4. Activity 2 – Marker Chromatography 25 minutes

(Include step by step instructions)

- Students will place dots of black markers on paper and separate the dye by placing the paper in water
- Student will write down and share their observations

Materials/ Classroom set up or space Needed:

- Centrifuge Tubes (or other container for developing chromatograms) – 2 per group
- Skittles
- Vials
- Water
- Rubbing Alcohol
- Aluminum Oxide or Silica TLC Plates
- Coffee Stirrers
- Filter Paper cut into strips to fit in centrifuge tube
- Assortment of Black Markers
- Nitrile Gloves
- Tweezers (not essential, but helpful when removing TLC plates or paper from centrifuge tubes.
- Chocolate

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- Students will learn about chromatography and perform an experiment that is part of the WOW! Project.

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Chromatography is used by scientists in many fields – food science, crime scene investigation, chemists, environmental scientists

5. Activity 3: Chocolate Taste Test IF THERE IS TIME 15 minutes

(Include step by step instructions)

- Students will taste different types of chocolate and determine which type they like best
- We will discuss what makes chocolate tasty, how it is made, and what affects our opinion of chocolate

6. Check for understanding/ closing: (How will you check for students understanding and mastery of objectives? Exit ticket, thumbs up or down, verbal CFU) **5 minutes**
Exit Ticket on Chromatography

Vocabulary

- Chromatography – A way to separate mixtures of substances
- Hydrophobic – Substances that do not like to interact with water
- Hydrophilic – Substances that do like to interact with water
- Stationary – Something that doesn't move
- Mobile – Something that moves

Apprenticeship: **Science Experiments**

Team Leader:
Washington

Lesson: **3** Date: **10/12**

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Differentiate between a chemical and physical reaction
- Define catalysis

21st Century Skills:

(Please post so students know the skill they will work on.)

Advanced Literacy
Reason Effectively

1. Opening Ritual 10 minutes

(Activity at the beginning of the lesson that happens every week)

- Pictionary with last weeks' key words

2. Agenda: (List ALL the components of the lesson)

- Opening Ritual
- Introduction to Chemical vs. Physical Reactions

3. Activity 1- Introduction to New Material, 10 minutes

(What new material are students learning and how will students receive this information?)

- Lecture with Guided Notes
- We will cover the differences between a chemical and physical reaction and some examples of each.

4. Activity 2 – Elephant Toothpaste, 15 minutes

(Include step by step instructions)

- Describe catalysis
- Give analogies to catalysis – tunnel vs. going over a hill
- Perform demonstration
- Have students critique my presentation and write down what are some important features of a good presentation

Materials/ Classroom set up or space Needed:

- Small Graduated Cylinder
- Concentrated Hydrogen Peroxide
- Dish Soap
- Food Coloring
- Cardboard Boxes
- Small bottles of Diet Coke
- Mentos

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- Students will practice one of the WOW! demonstrations
- Students will also critique my demonstration to get an understanding of what makes a good presentation

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Catalysis is used in my industrial applications that chemists use every day, it is still under extensive study by graduate students at many universities

5. Activity 3 – Exploding Soda, 15 minutes

(Include step by step instructions)

- Ask the students who has seen/done this demonstration before, if someone has done it before have them describe what happens
- Explain how to put in the Mentos – emphasize SAFETY
- After having all of the students perform the demo, have them make observations on guided notes

6. Check for understanding/ closing: (How will you check for students understanding and mastery of objectives? Exit ticket, thumbs up or down, verbal CFU)

Exit Ticket

Chemical vs. Physical Reactions

- A chemical reaction is one in which the identity of the substance _____ change.
- A physical reaction is one in which the identity of the substance _____ change.

Chemical Reactions	Physical Reactions

Elephant Toothpaste

- A catalyst _____ a reaction.
- It is like a _____ through a mountain.
- This is a _____ reaction.

Examples of things made using catalysts include:

Evaluating the Presentation

Eye Contact:

Voice:

Explanations:

Visuals:

What was the best thing about this presentation?

What was the worst thing about this presentation?

Exploding Soda

- This is a _____ reaction.

Draw a picture of the surface of a Mentos if you were able to magnify it.

How do the tiny features on a Mentos help the reaction happen?

Do we know exactly what happens in this reaction?

How would you explain this demonstration to a friend?

1.

2.

3.

4.

5.

6.

7.

8.

Exit Ticket

- The first reaction (Elephant Toothpaste) we did is a chemical/physical reaction. (Circle one)
- Exploding Soda is a chemical/physical reaction. (Circle one)

Define catalyst:

List three things that make a presentation engaging:

1.

2.

3.

Apprenticeship: **Science Experiments**

Team Leader:
Washington

Lesson: 4 Date:10/12

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Define Density
-

21st Century Skills:

(Please post so students know the skill they will work on.)

Advanced Literacy
Reason Effectively

1. Opening Ritual:

(Activity at the beginning of the lesson that happens every week)

- Pictionary with last week's words

2. Agenda: (List ALL the components of the lesson)

- Opening Ritual
- Introduction to Density
- Sugar Density Rainbow
- Bouncing Raisins

3. Activity 1- Introduction to New Material

(What new material are students learning and how will students receive this information?)

- Students will be learning about density
- Lecture with guided notes
- We will define density and give examples of when density is used and why it is important

4. Activity 2 – Sugar Density Rainbow

(Include step by step instructions)

- Students will mix 3 different amounts of sugar with the same amount of water to create 3 solutions each with a different density, students will then layer these solutions on top of each other in order to create a rainbow of densities

Materials/ Classroom set up or space Needed:

- Sugar
- Clear Plastic Cups
- Food Coloring
- Raisins
- Vinegar
- Baking Soda

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- Both demonstrations are possible WOW! projects
- Students will also think about how to present a demonstration

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Density is a key concept in college level chemistry courses

5. Activity 3 – Bouncing Raisins

(Include step by step instructions)

- Students will mix vinegar and baking soda, add raisins, and then watch as the raisins bounce up and down
- Students will fill in guided notes about the demo. They will also do a Think, Pair, Share about how they would demonstrate this to someone else

6. Check for understanding/ closing: (How will you check for students understanding and mastery of objectives? Exit ticket, thumbs up or down, verbal CFU)

Exit Ticket

Vocabulary –

Density – mass divided by volume

Dissolve – when a substance gets incorporated into a liquid to form a solution

Carbon Dioxide – a compound found as a gas in the atmosphere

Density

Density =

- Objects that are less dense than water will _____ when placed in water.
- Objects that are denser than water will _____ when placed in water.
- No matter how much volume something takes up if it is REALLY massive it will always sink – true or false? Explain.

Sugar Density Rainbow

Volume of water in each solution:

Density of water: 1.00 g/mL

Grams of water in each solution:

Density =

Solution	Color	Mass of Sugar Added	Density Calculations
1			Total mass of solution: Density of solution:
2			Total mass of solution: Density of solution:
3			Total mass of solution: Density of solution:

What solution is the densest? Where should the densest solution be placed?

What solution is the least dense? Where should the least dense solution be placed?

Bouncing Raisins

REVIEW: The reaction between baking soda and vinegar is a chemical/physical reaction? (Circle one)

Draw a diagram depicting what happens to the raisins when they are placed in the baking soda and vinegar mixture:

THINK: How would you describe this demonstration to a friend?

PAIR: Is there anything your partner had in their description that you would like to add to yours?

SHARE: What is your final description of the demonstration after talking to your partner?

EXIT TICKET

Define density –

Why do the raisins rise in the baking soda and vinegar mixture?

Apprenticeship: Science Experiments

Team Leader:
Washington

Lesson: 5 Date: 10/12

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Students will be able to describe animal adaptations
- Students will be able to describe the difference between structural color and pigments

21st Century Skills:

(Please post so students know the skill they will work on.)
Advanced Literacy
Reason Effectively

1. Opening Ritual: Pictionary (5 minutes)

(Activity at the beginning of the lesson that happens every week)

- Pictionary with words from last week

2. Agenda: (List ALL the components of the lesson)

- Opening Ritual – Pictionary
- Introduction to Animal Adaptations
- Predator Prey
- Structural Color

3. Activity 1- Introduction to New Material (10 minutes)

(What new material are students learning and how will students receive this information?)

- Students will learn about animal adaptations via lecture with guided notes.

4. Activity 2 – Predator Prey (25 minutes)

(Include step by step instructions)

- Students will be broken up into two groups that compete to see who can collect the most poker chips with foggy goggles on
- Students will then compare the number of each type of poker chip collected
- Students will describe this demonstration

Materials/ Classroom set up or space Needed:

- Poker Chips
- Goggles with plastic covering them
- White Poster Board
- Vegetable Oil
- Glass Beaker
- Glass Test Tube

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- Predator Prey is a demonstration that will be performed at the WOW!

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Animal adaptations are very important in introductory college level courses

5. Activity 3: Structural Color (25 minutes)

(Include step by step instructions)

- A pyrex test tube will "disappear" in a beaker of vegetable oil because of the similar refractive indices
- We will discuss how refractive index allows certain animals to have iridescent colors
- Guided notes

6. Check for understanding/ closing: (How will you check for students understanding and mastery of objectives? Exit ticket, thumbs up or down, verbal CFU) (5 minutes)

Exit Ticket

Animal Adaptations

Animals better suited to their environment _____ longer.

Animal	Adaptation
American Alligator	
Camel	
Koala	
Sea Otter	
Giraffe	
Polar Bears	
Mountain Goat	
Platypus	
Python	

Predator Prey

Number of blue chips collected:

Number of red chips collected:

Number of white chips collected:

Create a bar graph for this data:

THINK: How would you describe this demonstration to a friend?

PAIR: Is there anything your partner had in their description that you would like to add to yours?

SHARE: What is your final description of the demonstration after talking to your partner?

Structural Color

- There are two types of color in the animal kingdom - _____ and _____ colors.
- We are familiar with _____ in our everyday lives, because our clothes are dyed this way.

- Pigments are _____ that exhibit a certain color.
- Most _____ in the animal kingdom come from structural color.
- _____ is also an effect of structural color.
- Structural color comes from the REALLY TINY _____ structure of an animal's body covering and the way the light _____ and _____ off of it.
- Reflection is the _____ off of light from a surface.
- Refraction is the _____ of light as it encounters a surface.
- The boundary between the glass and oil is special, because the light doesn't _____ much, making the glass _____.
- In the same way we can play with _____ to make our glass disappear, animals can make beautiful _____ and _____.

Exit Ticket

Name one animal and an adaptation it has:

Reflection is light _____.

Refraction is light _____.

Apprenticeship: Science Experiments

Team Leader:
Washington

Lesson: 6 Date:2012

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Define freezing point depression
- Explain what freezing point depression can be used for

21st Century Skills:

(Please post so students know the skill they will work on.)

Advanced Literacy
Reason Effectively

1. Opening Ritual: 5 minutes

(Activity at the beginning of the lesson that happens every week)

- Hangman with last week's words

2. Agenda: (List ALL the components of the lesson)

- Hangman
- Short Lecture on Freezing Point Depression
- Ice Cube Lifter
- Make Ice Cream

3. Activity 1- Introduction to New Material 10 minutes

(What new material are students learning and how will students receive this information?)

- Students will learn the basics of freezing point depression and what it useful for via a lecture with guided notes
- I will also briefly introduce our guest during this time

4. Activity 2 – Ice Cube Lifter 25 minutes

(Include step by step instructions)

- Give each group of students a glass of water with an ice cube in it.
- Show students the salt shaker and the thread and ask: "How can we lift the ice cube out of the water without getting under the cube?"
- Collect ideas, give hints about what they just learned about freezing point depression
- Let the thread lie on the ice cube and sprinkle salt on it -- especially close to the thread.
- Wait a minute or so, lift the thread slowly to check whether the water above it is frozen; if so, lift both ends of the thread and lift the ice cube out of the water.

Materials/ Classroom set up or space Needed:

- Ice Cubes
- Ice
- Sugar
- Milk
- Cream
- Vanilla Extract
- String
- Glasses
- Water
- Masking Tape

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- Ice cube lifter is a demonstration that will be one of the WOW! options

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Freezing point depression is a key concept in intro level college chemistry courses
- Guest week! A Harvard astronomer will be visiting to talk about his college and career experience
-

5. Activity 3: Making Ice Cream 25 minutes

(Include step by step instructions)

- Add sugar, milk, cream, and vanilla to quart bag and seal (add tape for more security if desired)
- Place quart bag inside gallon bag, add ice and salt, seal (add tape for more security if desired)
- Gently shake the bag for 10-15 minutes (will have guest talk during this time)
- Ice cream should form in the inner bag

6. Check for understanding/ closing: 5 minutes(How will you check for students understanding and mastery of objectives?)

Exit ticket, thumbs up or down, verbal CFU)

Exit Ticket

Vocabulary

Freezing Point Depression – the lowering of a liquid's freezing point by the addition of a dissolved material

Melting – going from a solid to a liquid

Freezing – going from a liquid to a solid

Sodium Chloride – table salt

Solute – A substance that gets dissolved in another substance

Solvent – A substance that dissolves another substance

Freezing Point Depression

- The freezing point of pure water is _____ degrees Celsius which is _____ degrees Fahrenheit.
- You can lower the freezing point of water (or any liquid) by adding something that _____ in the liquid.
- Something that dissolves in another substance is called a _____.
- The substance that a solute dissolves into is called the _____.
- Combined they are called a _____.
- In a salt water solution the salt is the _____ and the water is the _____.
- If we add a solute to our water it will lower the water's freezing point – a mixture of ice, salt, and liquid water will be _____ than 0 degrees Celsius.

Ice Cube Lifter

What happens when we put the salt on the ice cube?

Why does the melted part of the ice cube then refreeze?

Why do we put salt on icy roads?

Exit Ticket

Draw a line between each word and its definition.

- | | |
|---------------------------|-------------------------------------------------------------------------------------|
| Freezing Point Depression | • Going from a solid to a liquid |
| Melting | • Table salt |
| Freezing | • The lowering of a liquid's freezing point by the addition of a dissolved material |
| Sodium Chloride | • A substance that gets dissolved in another substance |
| Solvent | • A substance that dissolves another substance |
| Solute | • Going from a liquid to a solid |

What is a practical use of freezing point depression?

Apprenticeship: **Science Experiments**

Team Leader:
Washington

Lesson: **7** Date: **2012**

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Define surfactant
- Give examples of why surfactants are useful

21st Century Skills:

(Please post so students know the skill they will work on.)

Advanced Literacy
Reason Effectively

1. Opening Ritual: 10 minutes

(Activity at the beginning of the lesson that happens every week)

- Hangman using last week's words

2. Agenda: (List ALL the components of the lesson)

- Hangman
- Introduction to Surfactants
- Tie-Dye Milk
- WOW! Preparation
- Exit Ticket

3. Activity 1- Introduction to New Material: 10 minutes

(What new material are students learning and how will students receive this information?)

- Students will learn the basics about surface tension and surfactants and what surfactants can be used for via a lecture with guided notes

4. Activity 2 – Tie Dye Milk (20 minutes)

(Include step by step instructions)

- Each pair of students will be given a plate with a small layer of milk in it. They will also be given a cup with a small amount of dish soap and a toothpick. I will place a couple drops of food coloring in the milk.
- Students will dip their toothpick in the soap and then gently place it in one spot in the milk and watch what happens.
- Students will fill out guided notes.

Materials/ Classroom set up or space Needed:

- Milk
- Food Coloring
- Dish Soap
- Small Plastic Plates with Lips or Plastic Petri Dishes
- Toothpicks
- Cups

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- Tie Dye Milk is one of the demonstrations for the WOW!
- We will also be spending some time preparing their boards for the WOW!

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Students will learn how surfactants are used in the chemical industry

5. Activity 3: WOW! Preparation: 35 minutes

(Include step by step instructions)

- I will discuss what needs to go on the board and what makes a good board.
- Students will make titles and images for their board

6. Check for understanding/ closing: 5 minutes (How will you check for students understanding and mastery of objectives?)

Exit ticket, thumbs up or down, verbal CFU)

Exit Ticket

Vocabulary

Surfactant – A material that is both hydrophilic and hydrophobic, breaks the surface tension of a liquid.

Hydrophobic – Substances that do not like to interact with water

Hydrophilic – Substances that do like to interact with water

Surface Tension - the property of a liquid to “like” other molecules of itself and “stick” together.

Surface Tension and Surfactants

- _____ is the property of a liquid to “like” other molecules of itself and “stick” together. This is why water beads on a surface.
- We can use a material called a _____ to break the surface tension of a liquid.
- Surfactants are both _____ and _____!
- Hydrophilic things _____ to interact with water.
- Hydrophobic things _____ to interact with water.
- _____ is a surfactant - it interacts with the oils on your hands and also interacts with the water from the sink, so it can wash off the oils.

Tie Dyed Milk

Draw a diagram showing what you saw when you added the soap to the dish of milk and food coloring.

The surface tension of the milk keeps the food coloring from dispersing in the milk. What happened to the surface tension of the milk when you added the soap?

The dish soap is a _____.

WOW! Project Board

Labels you will need to have on your board:

Title

Background

Materials

Procedure

What is happening?

Real-World Connections

What images would help you explain your demonstration?

Exit Ticket

Draw a line between each word and its definition.

- | | |
|-----------------|------------------------------------------------------------------------------------------------|
| Surfactant | • Substances that do like to interact with water. |
| Hydrophilic | • The property of a liquid to “like” other molecules of itself and “stick” together. |
| Hydrophobic | • A material that is both hydrophilic and hydrophobic, breaks the surface tension of a liquid. |
| Surface Tension | • Substances that do not like to interact with water. |

What titles and images do you have left to make for your WOW! board?

Apprenticeship: Science Experiments

Team Leader:
Washington

Lesson: 8 Date: 2012

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Students will be able to define acid, base, and indicator
- Students will be able to give some examples of common acids and bases

21st Century Skills:

(Please post so students know the skill they will work on.)

Advanced Literacy
Reason Effectively

1. Opening Ritual: 5 minutes

(Activity at the beginning of the lesson that happens every week)

- Hangman using last week's words

2. Agenda: (List ALL the components of the lesson)

- Hangman
- Introduction to Acids and Bases
- Investigation of pH using Red Cabbage Indicator
- WOW! Preparation
- Exit Ticket

3. Activity 1- Introduction to New Material - 10 minutes

(What new material are students learning and how will students receive this information?)

- Students will learn basic information about acids and bases through a lecture with guided notes.

4. Activity 2 – Investigation of pH using Red Cabbage Indicator – 10 minutes

(Include step by step instructions)

- Students will use red cabbage juice to investigate the pH of common household items

Materials/ Classroom set up or space Needed:

- Red Cabbage Extract (boil red cabbage for an extended period of time in copious amounts of water)
- Lemon Juice
- Baking Soda
- Vinegar
- Drain cleaner, lye, or ammonia
- Cups
- Dry Ice

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- The red cabbage demonstration is one that will be presented at the WOW!
- Students will also be working on their boards and presentations for the WOW!

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Acids and bases are a key component of an introductory college chemistry course.

<p>5. Activity 3: WOW! Preparation – 30 minutes (Include step by step instructions)</p> <ul style="list-style-type: none">• Student will work on the scripts and boards for their WOW! presentation	
<p>6. Check for understanding/ closing: 5 minutes (How will you check for students understanding and mastery of objectives? Exit ticket, thumbs up or down, verbal CFU) Exit Ticket</p>	

Vocabulary

Acid – A substance that can give away hydrogen ions.

Base – A substance that accept hydrogen ions.

pH Indicator – A substance that can be used to determine the pH of a solution

pH scale – used to determine how acidic or basic a liquid is

Acids and Bases

- Scientists have many _____ for acids and bases.
- Generally, acids are things that _____ hydrogen ions, while bases are things that _____ hydrogen ions.
- In foods, acids taste _____, while bases taste _____.
- Bases often feel _____.
- An _____ can tell us if something is an acid or a base.
- We use the _____ to describe how acidic or basic something is.
- The pH scale typically goes from _____ to _____, with _____ being more acidic, _____ being more basic, and _____ being neutral.

Common Acids	Common Bases

Exit Ticket

Match each word to its definition.

Acid

This is used to determine how acidic or basic a liquid is.

Base

A substance that accept hydrogen ions.

pH indicator

A substance that can give away hydrogen ions

pH scale

A substance that can be used to determine the pH of a solution.

What sections of your WOW! board do you still have to create?

Apprenticeship: **Science Experiments**

Team Leader:
Washington

Lesson: **9** Date: **2012**

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Have their WOW! Boards finished

21st Century Skills:

(Please post so students know the skill they will work on.)
Teamwork

1. Opening Ritual:

(Activity at the beginning of the lesson that happens every week)

- Hangman with last week's vocab words

2. Agenda: (List ALL the components of the lesson)

- Hangman
- WOW! Preparation – Boards
- WOW! Preparation - Scripts
- Exit Ticket

3. Activity 1- Prepare for WOW!

(What new material are students learning and how will students receive this information?)

- Students will work on their WOW! Boards

4. Activity 2 Prepare for WOW!

(Include step by step instructions)

- Students will work on their scripts for the WOW!

Materials/ Classroom set up or space Needed:

- Board Materials

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- Students will prepare their boards and scripts for the WOW!

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Students will be practicing their public speaking skills

5. Activity 3: Prepare for WOW!

(Include step by step instructions)

- Students will practice their scripts for the WOW!

6. Check for understanding/ closing: (How will you check for students understanding and mastery of objectives? Exit ticket, thumbs up or down, verbal CFU) Exit Ticket

Apprenticeship: **Science Experiments**

Team Leader:
Washington

Lesson: **10** Date: **2012**

Lesson Objectives: (What will students be able to do by the end of the lesson)

- Present their WOW! demonstration

21st Century Skills:

(Please post so students know the skill they will work on.)
Teamwork

1. Opening Ritual:

(Activity at the beginning of the lesson that happens every week)

- Hangman with all of the semester's vocab words

2. Agenda: (List ALL the components of the lesson)

- Hangman
- WOW! Preparation – Practice their presentation in their own groups
- WOW! Preparation – Practice presentation for another group
- WOW! Preparation – Show me their WOW! presentation

3. Activity 1- Prepare for WOW!

(What new material are students learning and how will students receive this information?)

- Students will practice their speech for their WOW!

4. Activity 2 Prepare for WOW!

(Include step by step instructions)

- Students will practice their speech for their WOW! in front of another group

Materials/ Classroom set up or space Needed:

- Board Materials
- All of the materials for the experiments

WOW! Connection:

(How is this class directly connected to the WOW!, has the WOW! been modified, what needs to be done next class to keep on track to WOW! What activity will you make connections to the WOW?)

- Students will prepare presentations for the WOW!

College to Career Connections:

(How does this lesson connect to college and or career, what activity will you explicitly make C3 connections?)

- Students will be practicing their public speaking skills

5. Activity 3: Prepare for WOW!

(Include step by step instructions)

- Students will practice their WOW! presentations and experiments in front of me

6. Check for understanding/ closing: (How will you check for students understanding and mastery of objectives? Exit ticket, thumbs up or down, verbal CFU) verbal