PRESENTER'S GUIDE

CHEMISTRY'S RAINBOW

NEUTRALIZE AN ACID AND A BASE

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PLAN FOR SUCCESS

Thank you for volunteering to share chemistry with students. They will definitely enjoy their time with you. Some will excitedly tell their parents all about you and the experiments as soon as they get home. Many will give their families and friends a quick science lesson whenever they see or hear about something you mentioned. Your short visit will definitely make an impact!

The teacher will appreciate your efforts too. After all, your visit gives students the opportunity to learn chemistry concepts from a real chemist! In order to make your visit as beneficial as possible, be sure to discuss the following issues with the teacher before your visit. Also, give the teacher the Teacher's Guide included in this kit. It contains this and other useful information. Planning together will ensure that you, the teacher, and the students all have a positive experience.

Learning objectives

Teachers must make sure that their students have a variety of experiences with a list of concepts outlined by their district. It is best if your lesson introduces, reinforces, or relates to one or more of these required concepts. The teacher will be pleased to know that as a result of the Chemistry's Rainbow lesson, students will accomplish the following learning objectives:

- Categorize a substance as an acid or a base by interpreting the characteristic color changes of universal indicator solution.
- Neutralize an acid and a base using the characteristic color changes of universal indicator solution.
- Describe the relative amount of acid or base in a solution during a chemical reaction based on the color changes of universal indicator solution.

Vocabulary words

After completing this lesson, students will be very familiar with the meaning of the following terms.

- Chemistry
- Indicator
- Acid
- Base
- Control
- Neutralize

Ask the teacher to…

- Place students in groups of 3 or 4 around a shared workspace.
- Provide a space where you can set up the demo immediately before your presentation.
- Provide access to water before your presentation. Each student group will need about a half cup of water.
- Provide one sheet of white paper or notebook paper for each group.
- Provide safety goggles for each student and adult. (You may need to help with this.)
- Arrange to have all students wash their hands and desks after your visit.

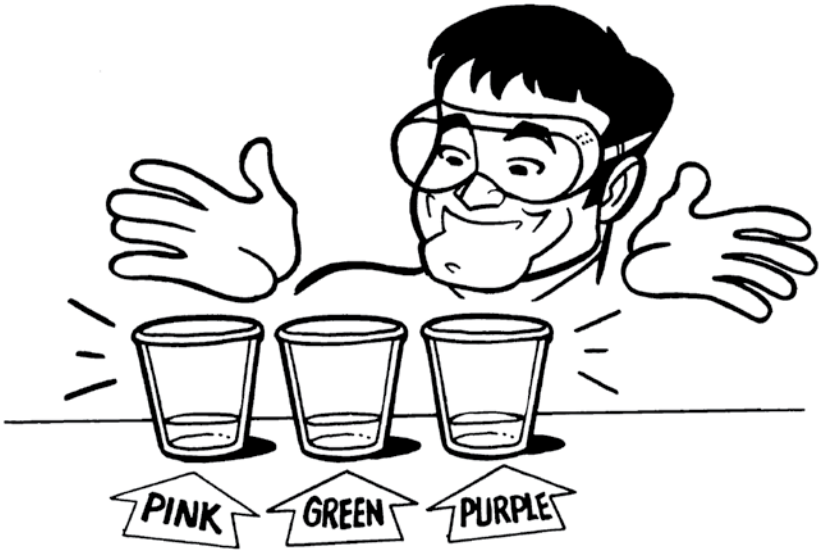
Safety plan

- Let the teacher know that the activities in this kit have been reviewed by the ACS Committee on Chemical Safety.
- Tell the teacher that Alka-Seltzer® tablets are used in the Grand Finale activity. Recommend that the teacher check with the school nurse to make sure that you follow the school district's policy for handling medications.
- Review the MSDSs (pages 18 and 19) for citric acid, sodium carbonate, and universal indicator.
- Students must wear safety goggles during the activities. They may take "goggle breaks" between activities as they answer questions in the Student Lab Guide, but they should take care not to place their hands on their faces or in their mouths at this time.
- Take all waste with you so that students are not tempted to play with the materials in the trash can after you leave. The used chemicals can be poured down a sink followed by water.
- The cups and droppers used in this kit may be reused, recycled, or placed in the trash. However, the cups should never be reused with food or drinks!
- Any paper towels used can be disposed of with the regular trash.

Bring

- Kit with all materials
- Waste container for each group
- Bucket
- Roll of paper towels

Most importantly… have fun! When students experience your enthusiasm for science, they can't help but enjoy science, too. After your presentation, please send a quick e-mail to the staff in the Kids & Chemistry Office at *kids@acs.org* to let us know what you did and how it went. We'd love to hear from you!



THE DAZZLING DEMO

1. Prepare for the demonstration before you meet the students.

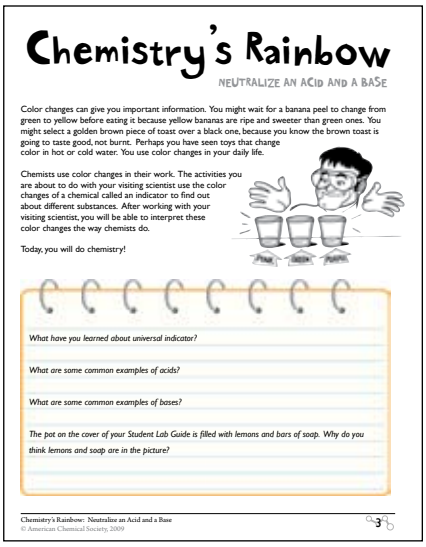
If possible, set this demonstration up immediately before your presentation. Be sure that students do not see what you are up to. They should think that you have two empty cups and one cup filled with water.

- Add 2 scoops of citric acid and 2 scoops of sodium carbonate to 2 separate clear plastic cups.
- Place about 60 mL of water in a third empty clear plastic cup.
- Fill 8 plastic cups (9-ounce size) a little more than halfway with water. These cups of water are for the student groups.

2. Introduce yourself, chemistry, and the activity.

Introduce yourself and let students know that you like doing experiments and making discoveries. Tell students that today they will do some chemistry. *Chemistry* is the study of matter on a very small scale. Chemists try to understand what substances are made of and figure out what happens when substances react with each other. Explain that you will introduce students to a special chemical that chemists use. By the end of the period, they will know how to use this chemical to learn about other substances.

Distribute the Student Lab Guide and have students read the first two paragraphs on page 3. When students finish reading, they may flip through the Student Lab Guide to get a quick overview of the lesson. During this time, move your cups so that all students can see them. They will answer the questions on page 3 after you discuss what happened in the demonstration.



Chemistry's Rainbow

NEUTRALIZE AN ACID AND A BASE

Color changes can give you important information. You might wait for a banana peel to change from green to yellow before eating it because yellow bananas are ripe and sweeter than green ones. You might select a golden brown piece of toast over a black one, because you know the brown toast is going to taste good, not burnt. Perhaps you have seen toys that change color in hot or cold water. You use color changes in your daily life.

Chemists use color changes in their work. The activities you are about to do with your visiting scientist use the color changes of a chemical called an indicator to find out about different substances. After working with your visiting scientist, you will be able to interpret these color changes the way chemists do.

Today, you will do chemistry!

What have you learned about universal indicator?

What are some common examples of acids?

What are some common examples of bases?

The pot on the cover of your Student Lab Guide is filled with lemons and bars of soap. Why do you think lemons and soap are in the picture?

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Student Lab Guide, Page 3

3. Conduct a demonstration to show that similar-looking substances can cause very different color changes.

Tell students that the special chemical they will work with is called universal indicator. It starts out green but can change color.

- Add about 20 drops of universal indicator to the water and stir until there is a green color throughout.
- Tell students: Think about the color you want to see. If you concentrate enough, you just might see that color!
- Pour about ⅓ of the indicator solution into the citric acid cup and ⅓ into the sodium carbonate cup. Leave ⅓ in the indicator cup.

Expected results
The citric acid turns the indicator from green to red. The sodium carbonate turns the indicator from green to purple.

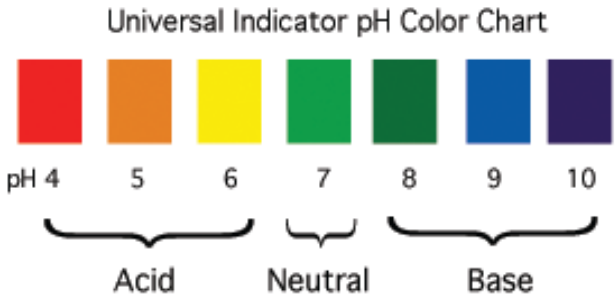
4. Discuss student observations.

Share your secret
Ask students to raise their hands if they saw the color they were hoping for.

- Did hoping to see a certain color make the indicator change color?
- What probably caused the color change?
- If there were something in the cups to begin with, would you say that these substances are the same or different? Why?

Admit that you placed different substances in each cup. Explain that both are similar-looking white powders, but are different chemically.

5. Introduce the Universal Indicator pH Color Chart.



Distribute one Universal Indicator pH Color Chart to each group. Explain that the chart shows the wide range of color changes for universal indicator. Point out that the colors have a number associated with them and beneath these numbers are words.

Have students use the chart to answer the following questions:

- Why do you think the title of your Student Lab Guide is Chemistry's Rainbow?
- What does the color of the liquid in each cup tell you about the powder I placed in it?
- Is the green indicator solution left in the cup I poured from an acid or a base?

The range of colors of universal indicator is the same as the colors of a rainbow. Students should realize that one cup contained an *acid* and the other contained a *base*. Students should also realize that the green indicator left in the cup is *neutral*.

Explain that before meeting them, you placed 2 scoops of citric acid in the cup that turned red and 2 scoops of sodium carbonate in the cup that turned purple.

6. List common examples of acids and bases.

Explain that *citric acid* is the acid in citrus fruits like lemons, limes, and oranges.

- What are some other common examples of acids?
- What colors would you expect to see if you placed any of these substances in universal indicator?

Students might say that vinegar is an acid. You could share that there are also stronger acids like sulfuric acid used in car batteries. Students should realize that the color may change to yellow, orange, or red for these acids.

Explain that *sodium carbonate* is commonly used in detergents made for dishwashing machines.

- What are some other common examples of bases?
- What colors would you expect to see if you placed any of these substances in universal indicator?
- Students might say that other soaps and cleaners are bases. Students should realize that the color may change to dark green, blue, and purple for any of these bases.

Conclude this conversation by telling students that acids and bases interact with water in different ways and that *indicators*, like the green liquid used in the demonstration, are special chemicals that change color to show this difference. Tell students that next they will have the opportunity to explore the color changes of universal indicator with small amounts of citric acid and sodium carbonate.

7. Distribute materials as students answer questions about the demonstration.

Have students answer the questions on page 3 of the Student Lab Guide as you distribute one cup of water and one bag of materials to each student group. Also distribute 2 citric acid labels and 2 sodium carbonate labels to each group. These sticky labels can be hung on the edge of the desk or tabletop until students are ready to use them. To speed things up, ask the teacher help you.

When you are finished distributing materials and students appear to have finished reading, ask students the last question from page 3 of the Student Lab Guide. Explain that they will not use a lemon or bar of soap in the set of activities they will do with you.

- The pot on the cover of your Student Lab Guide is filled with lemons and bars of soap. Why do you think lemons and soap are in the picture?

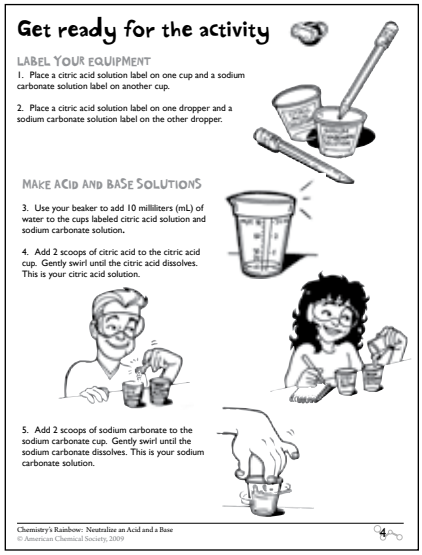
Students should realize that the lemon is an example of an acid and the soap is an example of a base. This set of activities has to do with acids and bases.

GET READY FOR THE ACTIVITY

1. Have students remove everything from the materials bag, label equipment, and make solutions.

Tell students that everyone should wear their goggles during the hands-on activities. A goggle icon will let them know when it's time to put their goggles on. After completing the procedure, students may remove their goggles and answer the questions in the Student Lab Guide.

Explain to students that they will first make their solutions to prepare for the activity. You may go through each step with them, or have them follow the procedure described on pages 4 and 5 of the Student Lab Guide. When students finish preparing for the activity, they should answer the questions at the bottom of page 5.


Get ready for the activity

LABEL YOUR EQUIPMENT

1. Place a citric acid solution label on one cup and a sodium carbonate solution label on another cup.

2. Place a citric acid solution label on one dropper and a sodium carbonate solution label on the other dropper.

MAKE ACID AND BASE SOLUTIONS

3. Use your beaker to add 10 milliliters (mL) of water to the cups labeled citric acid solution and sodium carbonate solution.

4. Add 2 scoops of citric acid to the citric acid cup. Gently swirl until the citric acid dissolves. This is your citric acid solution.

5. Add 2 scoops of sodium carbonate to the sodium carbonate cup. Gently swirl until the sodium carbonate dissolves. This is your sodium carbonate solution.

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Label your equipment

1. Place a citric acid solution label on one cup and a sodium carbonate solution label on another cup.
2. Place a citric acid solution label on one dropper and a sodium carbonate solution label on the other dropper.

Make acid and base solutions

3. Use your beaker to add 10 mL of water to the cups labeled citric acid solution and sodium carbonate solution.
4. Add 2 scoops of citric acid to the citric acid cup. Gently swirl until the citric acid dissolves. This is your citric acid solution.
5. Add 2 scoops of sodium carbonate to the sodium carbonate cup. Gently swirl until the sodium carbonate dissolves. This is your sodium carbonate solution.

Make universal indicator solutions

6. Use your beaker to add 20 mL of water to each of 3 clear plastic cups.
7. Line the cups up on a piece of white paper.
8. Add 10 drops of universal indicator to each cup.

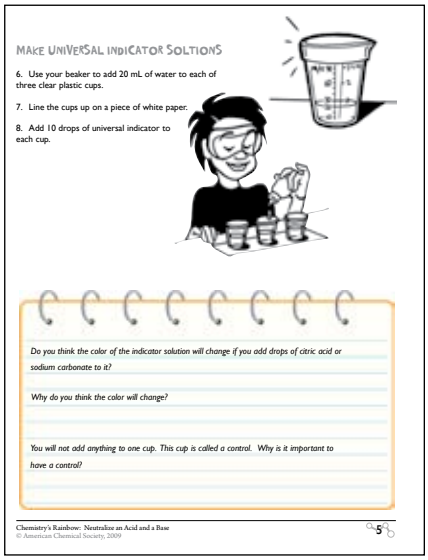
The 3 cups of universal indicator solution should all be green. If they are not, you might explain what this reveals about the tap water.

2. Discuss the purpose of a control in the next activity.

Explain to students that they will test the acid solution in one cup and the base in another. They will not put anything in the third cup because this is the *control*. Go over student responses to the following questions from page 5 of the Student Lab Guide.

- Do you think the color of the indicator solution will change if you add drops of citric acid or sodium carbonate?
- Why do you think that?
- You will not add anything to one cup. This cup is called a control. Why is it important to have a control?

Students should realize that a control is left alone and not changed so that any color changes can be compared to the original.


MAKE UNIVERSAL INDICATOR SOLTIONS

6. Use your beaker to add 20 mL of water to each of three clear plastic cups.

7. Line the cups up on a piece of white paper.

8. Add 10 drops of universal indicator to each cup.

Do you think the color of the indicator solution will change if you add drops of citric acid or sodium carbonate to it?

Why do you think the color will change?

You will not add anything to one cup. This cup is called a control. Why is it important to have a control?

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Student Lab Guide, Page 5

3. Practice skills needed in the activities.

Have students place the Universal Indicator pH Color Chart in front of their cups containing green universal indicator solution.

Practice using a dropper
Demonstrate how to use a dropper and explain the difference between one drop and one squirt. In the activity, students will use single drops. You may give students a moment to practice picking up citric acid or sodium carbonate and releasing single drops back into the source cup.

Practice swirling
Show students how to gently swirl the contents of the cup. Require them to keep the bottom of the cup on the table as they move the cup in a circular motion.

TEST YOUR SOLUTIONS

1. Have students add single drops of each solution and interpret the color changes.

Guide students through each step of the procedure as they follow along on pages 6 and 7 of their Student Lab Guide. Ask students the suggested questions to guide their thinking.

Citric acid

1. Add 1 drop of citric acid to the cup on the left. Gently swirl the liquid in the cup and observe.
2. Compare the color of the liquid to the control and to the Universal Indicator pH Color Chart.
3. Continue to add a single drop, swirl, and compare until you have added a total of 5 drops.

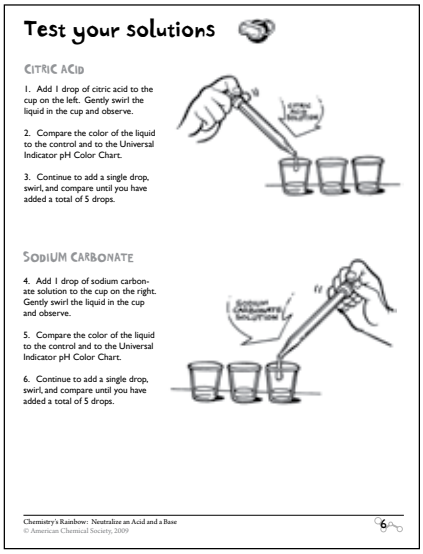
Expected results

The color changes from green to yellow, orange, and finally red as more drops of acid are added to the cup.

Ask students questions such as the following:

- How does the color change after the addition of each drop of citric acid?
- What do these color changes tell you about the amount of acid in the cup?

Students should realize that more drops of citric acid make the indicator solution more acidic.



Test your solutions

CITRIC ACID

1. Add 1 drop of citric acid to the cup on the left. Gently swirl the liquid in the cup and observe.

2. Compare the color of the liquid to the control and to the Universal Indicator pH Color Chart.

3. Continue to add a single drop, swirl, and compare until you have added a total of 5 drops.

SODIUM CARBONATE

4. Add 1 drop of sodium carbonate solution to the cup on the right. Gently swirl the liquid in the cup and observe.

5. Compare the color of the liquid to the control and to the Universal Indicator pH Color Chart.

6. Continue to add a single drop, swirl, and compare until you have added a total of 5 drops.

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Sodium carbonate

4. Add 1 drop of sodium carbonate to the cup on the right. Gently swirl the liquid in the cup and observe.
5. Compare the color of the liquid to the control and to the Universal Indicator pH Color Chart.
6. Continue to add a single drop, swirl, and compare until you have added a total of 5 drops.

Expected results

The color changes from green to dark green, blue, and finally purple as more drops of base are added to the cup.

Ask students questions such as the following:

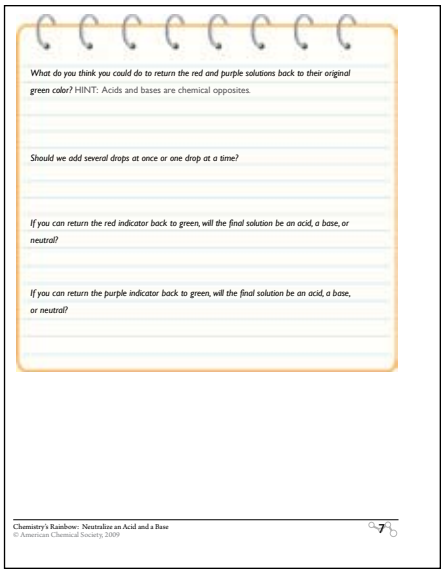
- How does the color change after the addition of each drop of sodium carbonate?
- What do these color changes tell you about the amount of base in the cup?

Students should realize that more drops of sodium carbonate make the indicator solution more basic. As students finish testing the solutions, they can begin to answer the questions on page 7 of the Student Lab Guide.

2. Discuss how students might neutralize each solution.

Explain that acids and bases are chemical opposites. Then discuss student responses to the following questions from page 7 of the Student Lab Guide.

- What do you think you could do to return the red and purple solutions back to their original green color?
- Should we add several drops at once or one drop at a time?
- If you can return the red indicator back to green, will the final solution be an *acid*, a *base*, or *neutral*?
- If you can return the purple indicator back to green, will the final solution be an *acid*, a *base*, or *neutral*?


What do you think you could do to return the red and purple solutions back to their original green color? HINT: Acids and bases are chemical opposites.

Should we add several drops at once or one drop at a time?

If you can return the red indicator back to green, will the final solution be an acid, a base, or neutral?

If you can return the purple indicator back to green, will the final solution be an acid, a base, or neutral?

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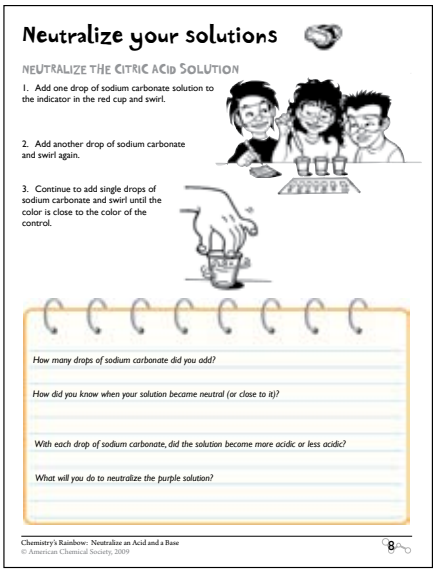
Student Lab Guide, Page 7

Students should suggest adding sodium carbonate to the red cup and adding citric acid to the purple cup. They should agree that it's best to add one drop, swirl, and compare the color of the solution to the control before adding another drop. They will know when to stop adding drops when the solution appears green like the control. At this point, the solution is neutral or close to it.

NEUTRALIZE YOUR SOLUTIONS

1. Neutralize the citric acid solution and discuss observations.

Guide students through each step of the procedure as they follow along on pages 8 and 9 of their Student Lab Guide. Ask students the suggested questions to guide their thinking.



Neutralize your solutions

NEUTRALIZE THE CITRIC ACID SOLUTION

1. Add one drop of sodium carbonate solution to the indicator in the red cup and swirl.

2. Add another drop of sodium carbonate and swirl again.

3. Continue to add single drops of sodium carbonate and swirl until the color is close to the color of the control.

How many drops of sodium carbonate did you add?

How did you know when your solution became neutral (or close to it)?

With each drop of sodium carbonate, did the solution become more acidic or less acidic?

What will you do to neutralize the purple solution?

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Student Lab Guide, Page 8

1. Add one drop of sodium carbonate solution to the indicator in the red cup and swirl.

Expected results
The solution changes from red to orange/yellow.

Ask students:
- What do you notice about the color?
- What direction do the color changes seem to be going?
- Does it seem to be moving toward neutral or away from neutral?

2. Add another drop of sodium carbonate and swirl again.

3. Continue to add single drops of sodium carbonate and swirl until the color is close to the color of the control.

Expected results
The solution changes from orange/yellow to yellow/green.

Explain that the solution will get close to the green color of the control, but will probably not be exact. This is because the acidity or alkalinity of the original water varies and so does the drop size of the citric acid and sodium carbonate solutions. As long as students see a trend toward neutral, that is good enough. If they go past neutral they may understand that the solution switched from being acidic to being basic and want to try adding another drop of citric acid. You can decide how far you want this to go. Getting a greenish color is fine.

Once students neutralize the citric acid solution, have them answer the questions on page 8 of the Student Lab Guide.

2. Help students interpret their observations.

When many appear to be finished, go over the answers to the questions on page 8 of the Student Lab Guide.
- How many drops of sodium carbonate did you add?
- How did you know when your solution became neutral (or close to it)?
- With each drop of sodium carbonate, did the solution become more acidic or less acidic?
- What will you do to neutralize the purple solution?

Students should know that the greenish color means the solution is close to neutral. Each drop of sodium carbonate made the solution less acidic. Students will want to add drops of citric acid to the indicator solution containing sodium carbonate.

3. Neutralize the sodium carbonate solution (base) and discuss student observations.

1. Add one drop of citric acid to the indicator in the purple cup and swirl.

Expected results
The color of the solution does not change much, if at all.

Ask students:

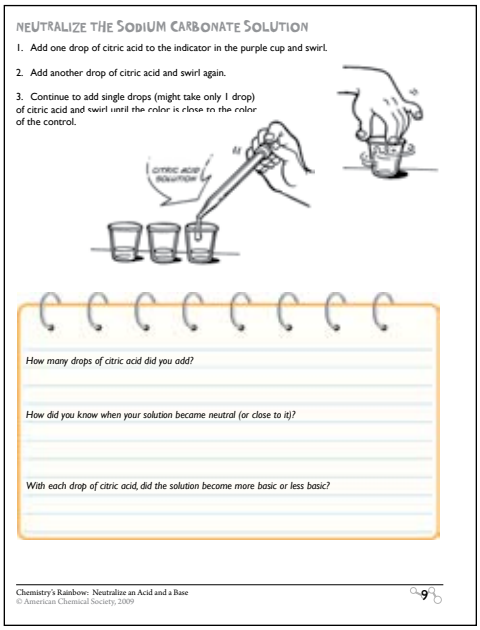
- What do you notice about the color?

2. Add another drop of citric acid and swirl again.

Expected results
The color of the solution changes from purple to blue.

Ask students:

- What do you notice about the color?
- What direction do the color changes seem to be going?
- Does it seem to be moving toward neutral or away from neutral?



NEUTRALIZE THE SODIUM CARBONATE SOLUTION

1. Add one drop of citric acid to the indicator in the purple cup and swirl.
2. Add another drop of citric acid and swirl again.
3. Continue to add single drops (might take only 1 drop) of citric acid and swirl until the color is close to the color of the control.

CITRIC ACID SOLUTION

How many drops of citric acid did you add?

How did you know when your solution became neutral (or close to it)?

With each drop of citric acid, did the solution become more basic or less basic?

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Student Lab Guide, Page 9

3. Continue to add single drops (might take only 1 more drop) of citric acid and swirl until the color is close to the color of the control.

Remind students that they do not have to match the color of the control exactly. Once students neutralize the sodium carbonate solution, have them answer the questions on page 9 of the Student Lab Guide.

4. Help students interpret their observations.

When many appear to be finished, go over the answers to the questions on page 8 of the Student Lab Guide.

- How many drops of citric acid did you add?
- How did you know when your solution became neutral (or close to it)?
- With each drop of citric acid, did the solution become more basic or less basic?

Students should realize that the solution became neutral when the color of the solution was close to the color of the control. Each drop of citric acid made the solution *less basic*.

1. Introduce the grand finale and have students prepare their bags.

Explain that effervescent antacid and pain relief tablets like Alka-Seltzer® contain powdered acids and a base. The acids are citric acid, which tastes a little sour, and salicylic acid, which is aspirin. The base is baking soda, which is also known by its chemical name sodium bicarbonate. Sodium bicarbonate and the sodium carbonate students worked with today have similar names, and both are bases, but they are different chemicals with different uses.

Tell students that they will observe an Alka-Seltzer tablet in water with universal indicator solution. Then they will use what they know about universal indicator and its color changes to describe the relative amount of acid or base in the solution as the tablet reacts.

1. Add 20 mL of water to a snack-sized zip-closing plastic bag.
2. Add 10 drops of universal indicator solution.
3. Seal the bag.

The grand finale

In this activity, you will apply what you have learned about universal indicator's amazing color changes to a chemical reaction. You will find out what happens when you place an Alka-Seltzer tablet in universal indicator solution!

First, you should know a little bit about Alka-Seltzer. These tablets contain powdered acids and a base. The acids are citric acid, which tastes a little sour, and salicylic acid, which is aspirin. The base is baking soda, which is also known by its chemical name sodium bicarbonate. Sodium bicarbonate and the sodium carbonate you worked with today have similar names, and both are bases, but they are different chemicals with different uses. Now that you have the background, let's get started!

ALKA-SELTZER IN UNIVERSAL INDICATOR SOLUTION

1. Add 20 mL of water to a snack-sized zip-closing plastic bag.
2. Add 10 drops of universal indicator solution.
3. Seal the bag.
4. Either your teacher or the visiting scientist will place an Alka-Seltzer tablet in the bag and quickly reseal it.
5. Take turns shaking the sealed bag and observe all the changes.

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2. Add an Alka-Seltzer tablet to each group's bag.

For safety purposes, you and the teacher should place an Alka-Seltzer tablet in each group's bag. Students must not handle the Alka-Seltzer tablets!

4. Open the corner of the bag just enough so that the tablet can fit through.
5. Remove as much air as possible and drop the Alka-Seltzer tablet through the small opening.
6. Seal the bag and hand it to one of the students. Instruct them to shake the bag and pass it around so that each group member has an opportunity to hold the bag.

Expected results
As soon as the Alka-Seltzer tablet is placed in the bag, the color of the indicator solution changes to red. Bubbles appear in the solution and the bag inflates. The solution also becomes cold. Over time the solution becomes orange, yellow, and finally returns to green.

As the colors are changing and the bags are inflating, ask students:

- What changes do you observe?
- What do the color changes tell you about the amount of acid or base in the solution?
- How are the color changes like the activity you did today?

Students should conclude that the acid and base ingredients in the tablet neutralized one another.

3. Clean up from the activities.

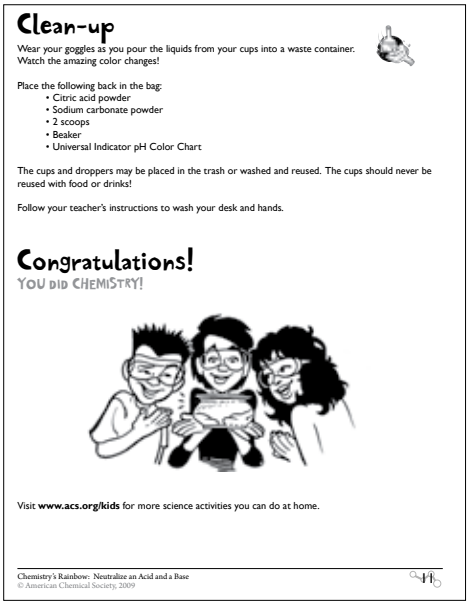
Leave the inflated bags intact to allow the solution to return to the original green color of the indicator solution.

Have students wear goggles as they pour liquids from the cups directly into the waste container you provided. With the help of the teacher, collect the liquid from the waste containers in a bucket. The combination of citric acid solution, sodium carbonate solution, and indicator solution may all be poured down an ordinary sink followed by water. However, it is best if you can remove these liquids from the school and dispose of them in your home or work sink.

Have students place these items back in the materials bag and seal it:

- Citric acid powder
- Sodium carbonate powder
- 2 scoops
- Beaker
- Universal Indicator pH Color Chart

Take the cups and droppers with you. They may be disposed of with the regular trash. If you decide to clean and reuse the cups, be sure they are never used with food or drinks.



Clean-up

Wear your goggles as you pour the liquids from your cups into a waste container. Watch the amazing color changes!

Place the following back in the bag:
- Citric acid powder
- Sodium carbonate powder
- 2 scoops
- Beaker
- Universal Indicator pH Color Chart

The cups and droppers may be placed in the trash or washed and reused. The cups should never be reused with food or drinks!

Follow your teacher's instructions to wash your desk and hands.

Congratulations!
YOU DID CHEMISTRY!

Visit **www.acs.org/kids** for more science activities you can do at home.

Chemistry's Rainbow: Neutralize an Acid and a Base
© American Chemical Society, 2009

Student Lab Guide, Page 11

4. Reinforce the science concepts presented.

Ask students:

- What does an indicator do?
- If you add a substance to universal indicator and it turns red, what can you say about the substance?
- If you add a substance to universal indicator and it turns purple, what can you say about the substance?
- How can you neutralize an acid?
- How can you neutralize a base?

Explain that like chemists, students used an indicator to test different solutions, neutralize them, and interpret a chemical reaction. They just did chemistry!

5. Conclude the lesson.

If time allows, give students the opportunity to ask you questions. They may ask you about the activities or they may choose to ask about you and your work. Students are always curious about visitors and getting to know you will give them a positive view of chemists and chemistry.

Let the teacher know that after you leave students may answer the questions on page 12 of the Student Lab Guide as an assessment.

MATERIALS LIST FOR CHEMISTRY'S RAINBOW

This kit is designed for up to 32 students working in groups of 4 and contains:

- 1 Presenter's Guide
- 1 Teacher's Guide
- 32 Student Lab Guides
- 1 bag of materials for the presenter
- 8 bags of materials for the students

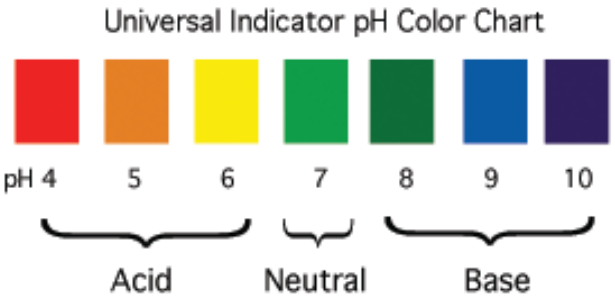
Download and copy additional Presenter's Guides, Student Lab Guides, and Universal Indicator pH Color Charts from the Kids & Chemistry pages of *www.acs.org/education*.

Materials for the presenter

- Citric acid powder
- Sodium carbonate powder
- Universal indicator in dropper bottle
- 3 small clear plastic cups
- 4 packets of effervescent antacid and pain relief tablets like Alka-Seltzer®
- 2 small scoops
- 1 coffee stirrer
- 8 plastic cups (9-ounce size) for water
- 16 citric acid labels
- 16 sodium carbonate labels

Materials for each student group

- Citric acid powder
- Sodium carbonate powder
- Universal indicator in dropper bottle
- 5 small clear plastic cups
- 2 scoops
- 2 droppers
- 1 beaker
- 1 snack-sized zip-closing plastic bag
- Universal Indicator pH Color Chart



Goggles are not included in this kit but must be worn when conducting these activities.

MATERIAL SAFETY DATA SHEETS

Universal Indicator Solution

Universe of Science
6079 Brushy Mountain Rd.
Moravian Falls, NC 28654
(336) 667-9397

Material Safety Data Sheet
MSDS # 6002-1
EMERGENCY ASSISTANCE CALL
CHEMTREC 800-424-9300

Hazard Rating

Health	2
Fire	1
Reactivity	1

Least	Slight	Moderate	High	Extreme
0	1	2	3	4

Chemical Name & Synonyms
indicator solution

Formula mixture
Unit Size 15 milliliters
CAS No. none established

Health Hazards
May cause skin and eye irritation.
Slightly toxic by ingestion.

Physical Data
Colored liquid, changes with pH. Rubbing alcohol odor.

Components
bromothymol blue (CAS # 76-59-5) <0.1 %,, methyl red (CAS # 493-52-7) < 0.1 %,
phenolphthalein (CAS # 77-09-8) < 0.1 %,
2-propanol (CAS # 67-63-0) 50 %, water (CAS # 7732-18-5) 49 %.

Incompatibility (Materials and Conditions to avoid)
Keep away from flames and heat

Reactivity
Stable

D.O.T.
Not regulated

Fire Hazards
Flammable. Use dry chemical fire extinguisher.

Spills and Leaks and Disposal Method
Absorb with suitable material and dispose of in trash.
Wash remaining material with water.

Special Precautions
None needed. Prudent laboratory practices should be observed.

First Aid
Wash with large amounts of water.
Eye contact: Wash with water for 15 minutes. See a physician.
If swallowed: Give water or milk to drink. Call a physician.

Sodium Carbonate

Universe of Science
6079 Brushy Mountain Rd.
Moravian Falls, NC 28654
(336) 667-9397

Material Safety Data Sheet
MSDS # 6002-3
EMERGENCY ASSISTANCE CALL
CHEMTREC 800-424-9300

Hazard Rating

Health	1
Fire	0
Reactivity	1

Least	Slight	Moderate	High	Extreme
0	1	2	3	4

Chemical Name & Synonyms
sodium carbonate, soda ash

Formula Na_2CO_3
Unit Size 5 grams
CAS No. 497-19-8

Health Hazards
May cause skin and eye irritation.
Harmful if swallowed.

Physical Data
White powder.

Incompatibility (Materials and Conditions to avoid)
Acids cause decomposition releasing carbon dioxide.

Reactivity
Stable

D.O.T.
Not regulated

Fire Hazards
None

Spills and Leaks and Disposal Method
Wash with large amounts of water.

Special Precautions
None needed. Prudent laboratory practices should be observed.

First Aid
Wash with large amounts of water.
Eye contact: Wash with water for 15 minutes. See a physician.
If swallowed: Give water or milk to drink. Call a physician.

Citric Acid

Universe of Science
6079 Brushy Mountain Rd.
Moravian Falls, NC 28654
(336) 667-9397

Material Safety Data Sheet
MSDS # 6002-2
EMERGENCY ASSISTANCE CALL
CHEMTREC 800-424-9300

Chemical Name & Synonyms
citric acid

Formula C_6H8O7
Unit Size 5 grams
CAS No. 5959-29-1

Hazard Rating

Health	0
Fire	1
Reactivity	0

Least	Slight	Moderate	High	Extreme
0	1	2	3	4

Health Hazards
Not considered hazardous.
May be skin or eye irritant to some people.

Physical Data
White crystals

Incompatibility (Materials and Conditions to avoid)
Strong oxidizing agents and reducing agents. Bases.

Reactivity
Stable

D.O.T.
Not regulated

Fire Hazards
Not flammable

Spills and Leaks and Disposal Method
Wash with large amounts of water.

Special Precautions
None needed.
Prudent laboratory practices should be observed.

First Aid
Wash with large amounts of water.
Eye contact: Wash with water for 15 minutes. See a physician.
If swallowed: Give water or milk to drink. Call a physician.