ACS
Chemistry for Life®

Celebrating Chemistry

CHEMISTS CELEBRATE EARTH DAY APRIL 22, 2013
AMERICAN CHEMICAL SOCIETY

Taking Care of Our Earth

By Al Hazari

The first Earth Day was celebrated about 40 years ago. The exact birthday of this modern environmental movement was April 22, 1970. Its founder, Gaylord Nelson, then a U.S. Senator from Wisconsin, came to realize something very important. He believed that everyone needs to be concerned about the effects of the various human activities on the "health and well-being" of the planet that we call home, Earth.

Earth Day celebrates the Earth, and strongly encourages all people to help take care of it so that we can continue to enjoy its beauty, gifts, and many invaluable resources. On Earth Day, people all over the world participate in "green" or "environmentally-friendly" events and learn just how important and easy it is to handle our earthly home with care and preserve it for future generations as well!

The members of the American Chemical Society (ACS) join in this celebration through an event called Chemists Celebrate Earth Day, or CCED. This year marks the 10th anniversary of CCED, and the theme is "Our Earth: Handle with Care!" Since 2003, themes have rotated through the topics of water, atmosphere, plants/soil, and recycling. Additionally, the 2011 celebration featured the topic of energy.

In this 2013 CCED issue of Celebrating Chemistry, we highlight the BEST of the many articles and activities presented over the past ten years. Enjoy the information and the hands-on activities as you learn about: water, its sources, and the importance of water purity; recycling and properties of materials; climate science and change; and the impact of chemical sciences on the world as it relates to nutrition, hygiene, and medicine.

So here are two questions for discussion with your classmates, teachers and relatives:

1. What could happen if we did not take care of our Earth?
2. What's one simple thing you can do today to help take care of the Earth? You may be surprised to find out that sometimes simple, small acts can make a BIG difference!

Best wishes for a happy 10th CCED anniversary to all chemists, present and future scientists. And, please continue to handle our Earth with extra care!

Al Hazari, Ph.D., *is Director of Laboratories and a Lecturer in Chemistry at the University of Tennessee, Knoxville. He is very involved in science and chemistry outreach for everyone. He is an ACS Chemistry Ambassador, a popular speaker, and a Fellow of the ACS. He enjoys traveling and photography.*

Where to Find More Information

http://www.epa.gov/earthday
www.earthday.org
http://www.epa.gov/gateway/science/water.html
http://kids.niehs.nih.gov/recycle.htm
www.ars.usda.gov/is/kids
http://www.more4kids.info/634/earth-day-and-kids

Recycling: San Francisco Style!

By Lynn Hogue

What if you could do something good for nature and the environment? What if this "something" took very little effort? What if all your school friends were doing it ... would you do it too? Kids all over San Francisco are doing something every day that's making a world of difference. Through a city-wide school recycling program, these kids are reducing the garbage from their school that goes to landfills by up to 90%! They are the first kids in the nation to participate in a wide-spread recycling program of this type.

If the school garbage isn't going into a landfill, what happens to it? Every school in San Francisco (along with all the residents and businesses) recycle and compost most of their garbage. Special bins are placed in the school cafeteria — green bins for food scraps and dirty paper; blue bins for recyclable materials like hard plastics, metal, and glass; and black bins for everything else. When they are done eating, kids separate their trash into the proper bins. Older students in orange aprons supervise the sorting and help younger ones get waste into the correct bin.

So what happens to the stuff in each bin? The contents of the green bins go to a special center to be composted. Composting just means that the stuff taken from the bin rots and decomposes (breaks down) into material that makes soil much better for growing plants. This compost is sold to area farmers, especially organic farmers who use a lot of compost. If a school has its own garden, it can get the compost back for free.

The contents of the blue bins go to a recycling center to be separated and then sold to companies that will turn the material into new products. The properties of the materials, such as whether they sink or float or if they can be picked up by magnets, determine how they are separated. Only the garbage in the black bins has to go to the landfill.

San Francisco's strong recycling program is only a first step in protecting the environment. Tamar Hurwitz, Environmental Education Manager for San Francisco, wants people to be aware of all the stuff we use and the materials used to make those things. Tamar says, "Everything we use comes from something originally found in nature. It's important to think about where materials come from and the impact that has on nature and our health. Today everyone has a role in changing things for the better. We can explore the world of plants to provide us with substitutes to chemicals that are made from petroleum or oil. Examples include biodiesel fuel made from leftover french fry grease, compostable plastics made from corn, and even skin lotion made from coconuts. Plant-based chemistry offers us a great opportunity for being smarter about how we make things!"

San Francisco is a great example of a community that is making a difference and helping the environment and the planet. Currently, the people of San Francisco are keeping 78% of their garbage out of landfills. Their goal is to have zero waste by 2020. If they can do it, we all can. Just remember these four essential R's: *reduce, reuse, recycle, and rot!*

We encourage you to visit **www.sfenvironmentkids.org** for lots of information about recycling and composting. There is even a "teacher's lounge" section of the website with activities that can be used in the classroom.

The Adventures of Meg A. Mole, Future Chemist

Tamar Hurwitz, Environmental Education Manager

After learning about the amazing recycling program in San Francisco, I decided I had to travel there and meet Tamar Hurwitz, who works in the Department of the Environment for the City and County of San Francisco, California.

In addition to organizing a large recycling event, Ms. Hurwitz explained her other roles as manager. "I teach kids simple things they can do to help protect nature. I teach about not littering, about reducing, reusing, recycling and composting, and about why it's important to conserve (or save) water." She also told me that she works to create programs for schools: "I give class presentations, speak at school assemblies, and create teaching materials for teachers to use in the classroom." She also told me about Phoebe the Phoenix. Phoebe is a "big, orange, magical bird who shows up at school assemblies. She reminds us that we all have the power to change our world for the better!"

Ms. Hurwitz told me she became interested in science after "seeing the movie 'Jaws' when I was 9 years old. I fell in love with sharks and wanted to be an oceanographer." Unfortunately, she later found out she would have to scuba dive for the job, so she decided she didn't want to do that anymore! When she was 27, she began volunteering with the Rainforest Action Network. Six months later, they hired her as their Education Director.

So what does Ms. Hurwitz enjoy the most about her position? She explained, "I love giving assemblies to hundreds of students at once. I do my best to make it interesting, and it's so nice to see all the students really listening to what I'm telling them. Sometimes they come up to me afterwards to say 'thank you' and that really makes me happy!"

Ms. Hurwitz grew up in the desert, where she enjoyed seeing how the natural environment, plants, and animals all seemed to fit together like a kind of puzzle. She liked learning about the science of ecology, she says, and "loved learning about local desert animals like the fringe-toed lizard and the kangaroo rat." One thing she remembers as a child is "mixing vinegar and baking soda to watch it bubble." She explained that she still mixes "vinegar and backing soda when baking cakes."

I really enjoyed my visit with Ms. Hurwitz. As I was leaving, she told me everything she does impacts kids! Her "job is to teach kids why it's important to protect nature and how our actions, like composting and recycling, can make a big difference in protecting nature!"

Personal Profile

FAVORITE COLOR?
Pale pink, like the inside of a seashell!

FAVORITE HOBBY? I love antique shopping! It really "takes me back in time" and I can buy beautiful things for my home that are "reused."

ACCOMPLISHMENT YOU'RE PROUD OF?
I'm most proud of a short film I created for kids called "Forest Family Forever." It won many awards and has been sent to schools all around the world. You can watch it on YouTube at http://www.youtube.com/watch?v=A14OM-H-hBU!

Milli's Super Sorting Challenge

Materials can be grouped or separated by how they look and/or by the material of which they are made. These qualities are called properties of the materials. Some recyclers use special properties of materials to group recyclable materials. In this activity, you will figure out a way to separate materials based on their special properties.

Materials

- Plastic straw
- Blunt-end scissors
- Metric ruler
- 1 latex balloon
- 1 magnet
- 1 square piece of paper towel (5 x 5 cm or about 2 in. square)
- 5 metal paper clips (small ones, about 3 cm or 1 in. long)
- A sieve or a colander
- Rectangular cake pan (about 32 x 23 x 5 cm or about 9 x 12 in.) or a deep bowl
- Any other materials you want to use during your separation

NOTE: A coffee stirrer could be used in place of a drinking straw.

SAFETY!

Be sure to follow Milli's Safety Tips and do this activity with an adult!
Do not eat or drink any of the materials used in this activity.

Making your mixture for separation:

1. Cut the plastic straw into five pieces (any size) using the scissors.
2. Cut or tear the aluminum foil and the paper towel into 5 pieces each (any size).
3. Roll each piece of paper towel into a ball between your thumb and index finger.
4. Place the pieces of straw, aluminum foil, paper towel, and the paper clips together in a pile.

Start Separating!

Think about all the things in your mixture. Your job is to plan a way to separate each thing out of the pile. Use the properties of the materials to help you decide what to do. You can use the things listed in the materials section and/or anything else you have around your house. The only rule is you cannot separate things using your fingers. As you separate out items, put them in their own separate pile. This is exactly what they do at recycling plants.

Thoroughly clean the work area and wash your hands. Reuse/recycle as many of the materials as possible! Check your reuse/recycle options with your adult lab partner first.

Where's the Chemistry?

Materials have different chemical and physical properties that make them easy to separate. Recycling plants use machines that vibrate to sort paper from wood and cardboard. They use magnets to pull out steel that is mixed with aluminum and plastic. Paper, glass, plastic, and metal each has its own chemical make-up and its own way of being recycled. It is important that each is separated from the other items before recycling.

Some metals can be picked up by magnets and other metals cannot. Some materials are attracted to each other because of static electricity, which involves positive and negative charges. The hollow plastic straw pieces float because they spread their weight out and can float on the water's "skin." This skin forms because water tends to stick to itself, which is called cohesion.

Materials with properties that are alike get cleaned, cut up, melted down, and then made into new products. For example, paper is cut up, bleached, and pulped. Some recycling plants are starting to use these different properties to help them sort out materials. They make machines to separate out recyclable materials just like you did … but they do it on a much larger scale!

Taking Care of the Earth at School


Did you know that a car idling for 10 seconds uses more fuel than turning off the engine and restarting it? When you think about all the cars and buses waiting at all the different schools, the pollution from the exhaust adds up fast! Ask your parent to turn off the car while they're waiting, so the exhaust doesn't go into the air.
When you are not at school, classroom computers still use electricity if they're left on. Talk to your teacher for their rules about turning off the computers when school is closed. This will help reduce the energy they use and the amount of heat they produce, helping to keep the temperature of the building lower when no one is using it!
Be careful what you put down the drain! Follow your teacher's instructions to make sure any materials you are using for your labs are disposed of properly and don't end up in a stream near your school.
OFF
OFF
Mr. Molé
Safety First!
SCIENCE LAB
100% Recycled Playground Mulch

Review of the ACS Climate Science Toolkit

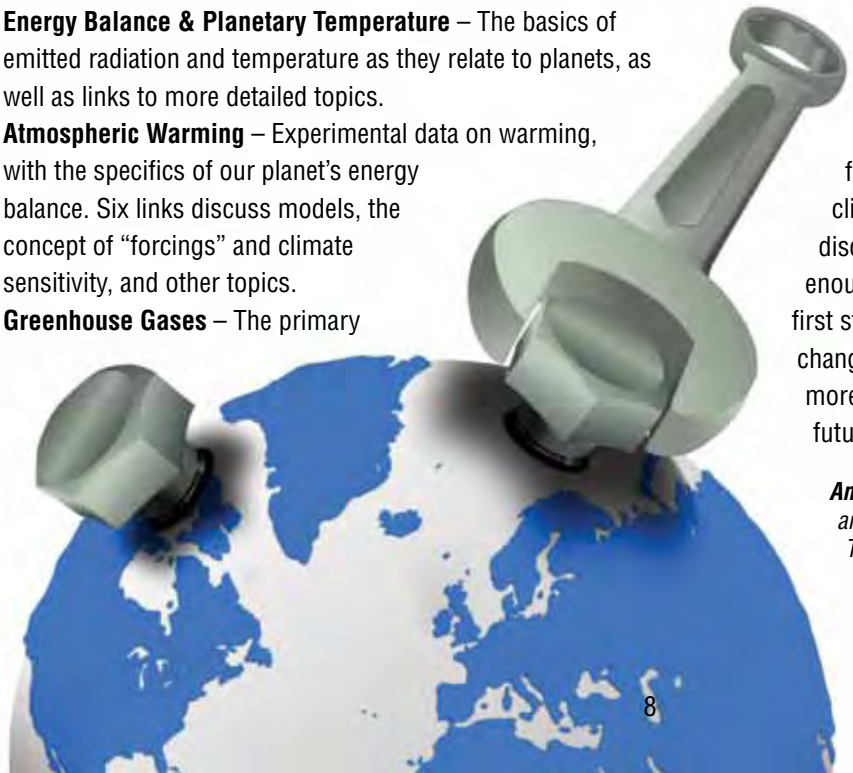
By Andy Jorgensen

ACS's 2012 President Dr. Bassam Shakhashiri commissioned a group of scientists to create a Climate Science Toolkit to enable Society members and others to have fact-based conversations with their friends and neighbors. This is an extremely important topic that can have major consequences for humans, plants, and animals everywhere.

The toolkit, which can be found at www.acs.org/climatescience, provides facts about climate science that can be used in public discussions and decision-making. The material takes an objective view of the topic, rather than offering suggestions for particular actions.

The toolkit is organized into seven main sections and lots of subsections. Many of the subsections are linked to each other, which provides an excellent way to see the connections among the scientific principles involved. The categories are:

- **Getting Started** – A list of central FAQs (frequently asked questions), including such questions as "What is the evidence that the Earth is warming?"
- **Energy Balance & Planetary Temperature** – The basics of emitted radiation and temperature as they relate to planets, as well as links to more detailed topics.
- **Atmospheric Warming** – Experimental data on warming, with the specifics of our planet's energy balance. Six links discuss models, the concept of "forcings" and climate sensitivity, and other topics.
- **Greenhouse Gases** – The primary principles of the greenhouse effect and related issues, including historical variation of the gases, and the roles of aerosols and water vapor.
- **Oceans, Ice & Rocks** – The effects of climate change on the water-based parts of our planet, including both physical changes of temperature, and chemical changes due to the acidic nature of carbon dioxide (CO_2).
- **References & Resources** – A large number of sources, including some from the National Research Council, the Intergovernmental Panel on Climate Change, National Aeronautics and Space Administration, and National Oceanic and Atmospheric Administration, as well as links to the RealClimate and Skeptical Scientist websites, which have lively discussions on the topic.
- **Climate Science Narratives** – Easy-to-understand explanations that address eight common arguments against climate change, including "Can humans be changing the climate?" and "Could extra CO_2 be produced by other natural processes?" These explanations can be very useful when talking with people about the topic, and provide fact-based answers to common questions.



This kit is an extremely valuable resource for anyone who wants more information on climate change and to take part in important discussions about it. The information is detailed enough for any curious scientist, and provides the first step in dealing with the consequences of climate change that we are already seeing — and also, the more extreme changes we expect to see in the future.

Andy Jorgensen *is an associate professor of chemistry and environmental sciences at the University of Toledo, as well as Director of General Chemistry. He is a past member of ACS's Committee on Community Activities. In 2012 he was named an ACS Fellow.*

What's in a Cloud?

When you look up in the sky on most days, you are likely to see some kind of cloud. Think about the different appearances of clouds. Some are puffy, and others are thin. Some look like a flat blanket across the sky, where others float along by themselves. In this article, you will read about the location and shape of clouds, and their chemical makeup. Also, you will read how clouds function as part of the water cycle.

Location and Shape

Clouds appear in different layers of the atmosphere and come in many sizes and shapes. There are three general categories of clouds: cirrus, cumulus, and stratus. These names come from the Latin words describing their shape: "wispy"/"curl of hair" (cirrus), "layer" (stratus), and "lump"/"heap" (cumulus).

Cirrus clouds are the clouds highest up in the sky. They appear wispy and thin. Stratus clouds are lowest in altitude, meaning they are closest to the ground. They tend to form a "layer" across the sky, and when they are present we often say that the day is "overcast." Cumulus clouds usually have a flattened base and seem to grow upwards. These clouds tend to be "lumped" together in patches and can look like big puffs of cotton or pieces of cauliflower.

Chemical Makeup of Clouds

Did you know that you have something in common with clouds? Just like humans, clouds are mostly made of water. The location of the clouds in the atmosphere determines whether the water in the cloud is a solid (ice), liquid (water drops), or a gas (water vapor). For example, a cirrus cloud is made mostly of ice crystals. This is because cirrus clouds are high up in the atmosphere where the air is very cold.

Cumulus clouds are made of ice crystals and some water vapor. If you have ever seen steam rising from a hot pot on the stove or seen your breath on a cold morning, then you have seen condensed water vapor.

Because cumulus clouds are in the middle layers of the atmosphere, the air is cold, but not as cold as higher up. The water may form into ice crystals, or it may remain as water vapor. Because these clouds can contain water vapor, cumulus clouds are mostly associated with rain.

Stratus clouds are mostly made up of water droplets, as they are closest to the ground where the air is generally the warmest.

Using Chemistry to Make Rain

Have you ever heard of "cloud seeding?" Scientists have actually figured out a way to make it rain, using a chemical called silver iodide (AgI) or dry ice (CO_2). A scientist in an airplane can spray a specific amount of silver iodide onto an existing cloud. The chemical freezes the water that is in the cloud, making it collect together, and become too heavy to stay in the cloud. Therefore, the water must come out ... in the form of rain!

Clouds and the Water Cycle

Did you know that there is the same amount of water on planet Earth today as there was millions of years ago? It's true — and it is all because of the water cycle.

Clouds function as one of three parts of the water cycle. Water can be found in one of three places: on land, in the air, or in the clouds. On land, water is found in places like oceans, lakes, rivers, and streams, to name a few. Water evaporates as water vapor and becomes part of the air.

Once it is part of the air, the water vapor is pulled upward where the air is cooler. In the cool air, the water vapor forms tiny water droplets, which we see as clouds. Clouds become very full of water droplets, and eventually "empty" themselves through precipitation (that is, as rain, snow, or other forms of water). The cycle of water moving from one place to the other (land, air, and clouds) by changing from a gas to a liquid to a solid has continued for millions of years, and is happening right now.

The next time you go outside, look up in the sky and try to identify the types of clouds you see. Can you determine how the clouds formed? What form of water is likely to be in those clouds?

Lynn Hogue *has more than 40 years of experience in chemistry education. She recently retired after 16 years as the Associate Director of Miami University's Center for Chemistry Education. She is co-author of 14 teacher resource books.*

Word Search

Try to find the words listed below — they can be horizontal, vertical or diagonal, and read forward or backward!

L	X	Z	E	A	A	E	C	R	P	R	T	N	L	J
I	E	C	M	G	T	L	U	P	E	F	O	O	K	E
Q	Q	E	M	A	O	S	Z	R	G	T	J	B	Z	L
U	K	Y	M	U	A	M	C	U	E	M	A	U	T	C
I	N	I	D	G	S	F	L	W	L	D	X	W	Y	Y
D	L	S	W	M	B	C	T	X	W	O	U	U	Q	C
C	E	F	L	F	B	B	Q	R	V	M	I	C	Z	E
G	P	H	L	Y	U	K	M	C	S	D	R	S	E	R
S	C	I	E	N	C	E	M	L	B	I	E	P	U	D
V	E	S	U	E	R	D	Y	I	H	C	T	M	D	Y
U	I	R	E	V	I	P	V	W	T	A	E	Z	C	F
N	A	Y	W	G	Y	D	U	I	R	G	M	B	C	L
A	N	V	G	Y	A	Q	Y	U	C	X	W	R	J	L
J	G	C	L	I	S	O	S	X	J	A	H	L	C	U
D	P	L	L	H	C	O	O	V	Y	S	K	T	X	V

ACID	CLOUDS	LIQUID	REDUCE	SCIENCE
CLIMATE	GAS	RECYCLE	REUSE	WATER

Pour CO_2

Introduction

You probably blow out candles every year on your birthday. Here is a different way to put candles out using a chemical reaction. During a chemical reaction, new substances are produced that are different than the chemicals you started with. Here are the items you will use:

Materials

- Tea candle
- Foil cupcake wrapper or sheet of aluminum foil. Do NOT use paper-lined wrappers.
- Vinegar
- 1- or 2-liter soda bottle. Have someone help to cut the top off the bottle to provide a wide opening.
- Baking soda
- Teaspoon (tsp)

***CAUTION:* You should wear splash protective goggles and do this activity with an adult!**

Procedures

Pour 1/3 cup vinegar into the 1-L bottle. Although the bottle now contains a little liquid, it is mostly filled with the gases that make up air.

1. Place the tea candle in the foil cup. If you do not have a foil cupcake cup, make one from aluminum foil. Light the tea candle.
2. Gently tilt the bottle over the lit tea candle. Do not allow any vinegar to pour out of the bottle. What happens?
3. Put 2 tsp of baking soda into the bottle containing the vinegar. Swirl the bottle to make sure the liquid and powder are mixed together. What do you observe?
4. When the reaction dies down, tilt the bottle over the lighted candle, just as you did before. Do not allow any liquid to pour out of the bottle. What happens now?

Claims and Evidence

Do you think a chemical reaction has occurred? What is your evidence that a new substance was produced? Make a guess as to what the new invisible substance you poured from your bottle is. Why could you pour it?

Where's the Chemistry?

A chemical reaction occurred and one of the new substances produced was carbon dioxide. Carbon dioxide is a nonflammable gas. It can be poured downward through the air and collected in the aluminum foil cup where the candle sits, because CO_2 is more dense than the air. As CO_2 collects in the cup, the air in the cup is pushed up and out by the denser CO_2 gas. As CO_2 collects around the flame, the flame loses its oxygen supply, which is necessary for it to continue to burn. So the flame goes out. CO_2 is the gas that is used in fire extinguishers.

Milli's Safety Tips Safety First!

ALWAYS:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Use all materials carefully, following the directions given.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

NEVER eat or drink while conducting an experiment, and be careful to keep all of the materials away from your mouth, nose, and eyes!

NEVER experiment on your own!

Exploring the Acid in Acid Rain

By Lynn Hogue

You have probably heard of acid rain … but what exactly is it? In fact, what is an acid? Are acids dangerous? Will they burn your skin?

You will first make a special paper that will allow you to test things from around your house. This indicator paper will let you discover if a product or food is an acid, a base, or neutral.

CAUTION! HEALTH & SAFETY: *Be sure to use Milli's Safety Tips and do this activity with an adult!*

Materials

- Red cabbage
- Knife
- Blender or food processor
- Strainer
- Bowl
- White coffee filters or white paper towels
- Medicine dropper or toothpick
- A series of household items to test:
  - fruit juice: lemon, lime, orange, apple
  - soda pop (light-colored sodas work best)
  - vinegar
  - milk
  - yogurt
  - water
  - liquid cleaning products (Don't use bleach!)
  - solution made by dissolving a solid such as baking soda, detergent, antacid tablets, or baking powder in water

Procedures

1. Shred ½ cup of red cabbage.
2. Add ½ cup water to the red cabbage and smash it together for 1-3 minutes.
3. Place a strainer over a collection bowl and pour the mixture through the strainer to remove the pieces of cabbage.
4. You should have a dark blue or purple liquid.
5. Dip coffee filters or strips of white paper towels into the cabbage juice, then remove them and spread them out to dry. This will be your indicator paper.
6. Next test your various household solutions. Use a clean toothpick or eyedropper to place a drop of each test solution on the indicator paper. Record the color the drop immediately turns the paper. You can test several different solutions on different spots on the same piece of indicator paper.
7. The color of the cabbage indicator paper will change to red or pink if the solution you are testing is an acid, and green or yellow if it is a base. It will remain purple or blue if the test solution is neutral.
8. Record each item, the color the paper turns, and whether you think it is an acid, base, or neutral in your data table.

Item	Color	Acid/base/neutral
Vinegar		
Baking soda solution		

References

Fun With Chemistry: Volume 1, edited Sarquis, M., Sarquis, J., "Cabbage Patch Detective," Institute for Chemical Education, 1991, Madison, Wisconsin

Chem Camp handbook, Institute for Chemical Education, 1992, Madison, Wisconsin

Where's the Chemistry?

Substances can be classified according to their properties. Acids are a class of substances that have similar properties. Acids dissolve metals, and fizz when they react with limestone. They can be strong or weak, concentrated or dilute. For this reason, some can be dangerous, while others can be found in food. Bases are another class of substances that have similar properties. One of the properties of bases is they react with vegetable oils and fats to make soap.

When you mix an acid and base together in the proper amounts, they neutralize each other. How do you tell if something is an acid or a base? Acids and bases can change the color of some materials called indicators. Indicators can be extracted from many different sources, including the pigment of many plants, such as the red cabbage in this investigation.

Vocabulary Words

Water Vapor – water in the form of a gas; water in this form condenses to form clouds.

Condensation – when molecules or atoms change from the gas to the liquid state.

Water Recycling – the reuse of treated wastewater for purposes other than drinking, such as irrigation and manufacturing.

Climate Change – a long-term significant change in the temperature or precipitation of a region or the Earth as a whole.

Hazardous Waste – waste that could harm human health or the environment when it's improperly treated, stored, or disposed of.

Recyclable – material that still has useful physical and chemical properties after its original purpose has been served and that can be reused or made into new products.

Recycle – collecting unwanted materials for later processing to make new materials.

Reduce – limiting the amount you throw away by buying items that can be used more than once, making your own things, and choosing items with less packaging.

Reuse – finding new ways to use something again.

What is the American Chemical Society?

The American Chemical Society (ACS) is the largest scientific organization in the world. ACS members are mostly chemists, chemical engineers, and other professionals who work in chemistry or chemistry-related jobs. The ACS has more than 163,000 members. Most ACS members live in the United States, but others live in different countries around the world. Members of the ACS share ideas with each other and learn about important discoveries in chemistry during meetings that the ACS holds around the United States several times a year, through the use of the ACS website, and through the journals that ACS publishes.

The members of the ACS carry out many programs that help the public learn about chemistry. One of these programs is Chemists Celebrate Earth Day, held annually on April 22. Another of these programs is National Chemistry Week, held annually the fourth week of October. ACS members celebrate by holding events in schools, shopping malls, science museums, libraries, and even train stations! Activities at these events include carrying out chemistry investigations and participating in contests and games. If you'd like more information about these programs, please contact us at outreach@acs.org!

Celebrating Chemistry

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The center spread was written by **Analice Sowell**.

The activities described in this publication are intended for elementary school children under the direct supervision of adults. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.