GSK Science in the Summer™

Be a Chemist!

This summer, your child is invited to play the role of a scientist—a water chemist—to explore basic concepts of chemistry and solve a real-world problem.

Welcome to *GSK Science in the Summer*, brought to you at home this year in partnership between GSK and The Franklin Institute!

This free summer science program aims to inspire the next generation of scientists and engineers by inviting children to experience real science careers by practicing science skills and using real science tools—all while having fun!

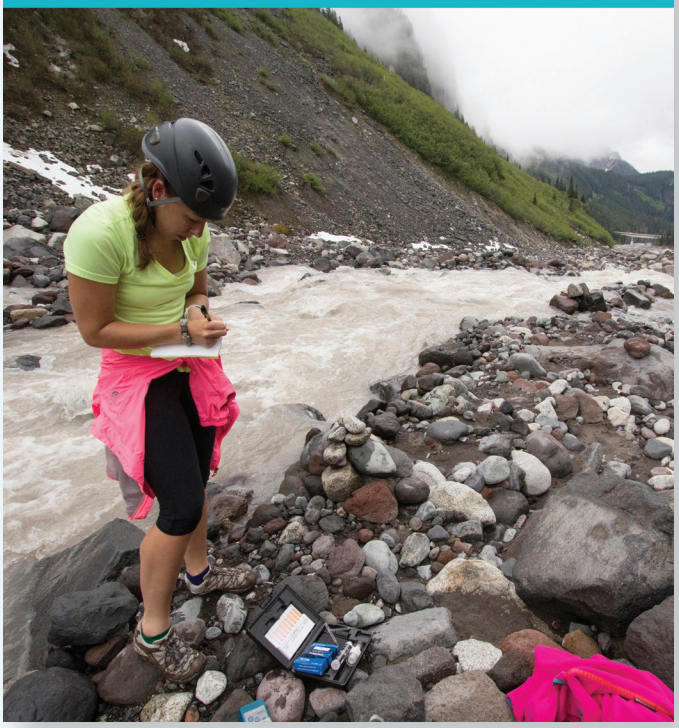
This at-home science activity is supported by a series of online resources, including videos and a live, interactive virtual experience with a Franklin Institute science educator.

Here is the recommended sequence for your *GSK Science in the Summer Be a Chemist* experience:

1. Start by watching **short introductory videos** to help your child set up their lab and learn about their research project. Find these videos at scienceinthesummer.fi.edu by clicking on the "Medicinal Chemist" image.
2. Do your **at-home experiments**, using the guide in this booklet and the provided science materials. Remember to follow the safety guidelines during all activities.
3. Join a live **Water Chemist Team Meeting** to share the results of your research with a Franklin Institute educator and other *GSK Science in the Summer* participants. Information for how to register will be sent via email. For more information, visit scienceinthesummer.fi.edu/phila.

Are you ready to be a chemist? It's time to set up your lab and get started on your research!

WATER CHEMIST



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Water Chemist

You are a **water chemist** working for a government agency that makes sure the rivers and lakes in your area are clean and healthy. Your job is to test a polluted water sample and find ways to remove or change the pollution to make the water safer.

MATERIALS

Water Chemist Materials:

- Lab notebook
- Pencil
- Vegetable oil
- Potting soil
- Coffee filters
- Tissue paper
- Paper towel
- Funnel
- Small paper cups
- Acidity (pH) test strips
- Plastic spoon
- Well plate (plate with circular indentations)
- Pipettes
- Vinegar
- Baking soda

Additional Materials:

- Table or other flat place to work
- (Optional) Tray or table covering to protect your workspace from spills
- Small bowl or container
- Water
- (Optional) Scissors

Lab Safety

1. All the chemicals you will use in this activity are safe to touch and can be washed down the sink drain or thrown in your regular trash when you are finished.
2. While the chemicals aren't harmful, you should still follow these lab safety rules:
   - **Don't touch your face or eyes** with hands that have touched the materials. Some of the materials could irritate your eyes.
   - **Wash your hands** with soap when you finish, or whenever you take a break to do something else.
   - **Don't taste the materials** or put them in your mouth for any reason.

Lab Prep

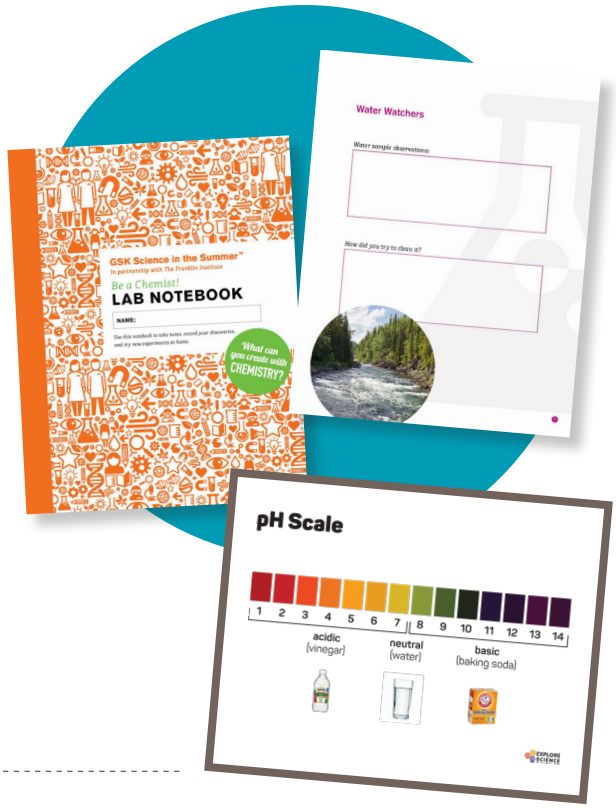
1. Gather your supplies. Make sure you have all your science tools and materials from the list above in one place.
2. Set up your lab space. Find a table or other flat surface that you can safely work on. If you have something like a baking sheet or school lunch tray with raised sides, that makes a good "lab station" to do your experiments on and contain any spills. If not, you may want to cover your lab surface with paper or plastic, or keep some towels handy to wipe up spills.
3. Label your tools. You will use pipettes to measure the baking soda and vinegar mixtures. To keep the chemicals from accidently getting mixed together, you should **use a separate pipette for each material.** Mark or label each one (like "B" for baking soda, and "V" for vinegar) so you don't mix them up.
4. Practice using your science tools to measure precisely. Try using the pipette and the spoon a few times until you can easily measure the same amount each time:
   - Squeeze the bulb of the pipette, put the tip of the pipette in the liquid, and let go of the bulb to let it fill up. Then, squeeze the bulb gently to let one drop at a time come out of the tip.
   - Scoop up a dry material or liquid with the spoon and hold the spoon straight to check the amount in it. The substance should fill the spoon all the way to the top edge, without being rounded or dripping over.
5. In this experiment, you will make a model of a polluted river sample by using dirt, oil, and vinegar. Mix together three spoonfuls of potting soil and three spoonfuls of vegetable oil in a small bowl or container until it makes a thick paste. Add about three spoonfuls of vinegar and about one cup of water to the paste and mix it all together.

6. Prepare your vinegar and baking soda mixtures. Put about one spoonful of baking soda into a small paper cup. In a separate paper cup, add about six spoonfuls of vinegar. Mark the cups to help you remember what is in each one (like “B” for baking soda and “V” for vinegar). Add water to both cups until they are about half full. Stir or gently swirl each cup to mix the baking soda or vinegar into the water.
7. Look at the water chemist picture on page 14 in your lab notebook and read about what water chemists do. What do you think you will do in this activity that is like what a real water chemist does?

Part 1: Research

Observe and test your model water sample to find out what types of pollution need to be removed or changed.

1. Make some observations about your water sample and draw or write them on page 7 of your lab notebook.
   - *What does the sample look like? What does it feel or smell like?*
   - *How does the sample compare to clean water?*
2. Test the acidity of your water sample using one of the paper acidity (pH) test strips. Dip one end of the test strip into the water until about half of the strip is in the water. Remove it and wait for a few seconds; then notice whether the strip has changed color. Use a new test strip to do the same thing with some clean water from your faucet. Do the test strips look the same?
3. Compare the colors of both test strips to the chart on pages 8 and 9 in your lab notebook. Is your polluted water sample neutral, like it should be, or is it too acidic or too basic? How can you tell? Mark the dry end of each strip so you can tell them apart (like “P” for polluted water and “C” for clean water) and set them aside to compare with later.



Part 2: Filter

Experiment to find the best method for filtering, or separating, the pollution from the water in your sample.

1. Brainstorm different ways you could use the materials you have to separate the pollution from the water. Which tools or materials might catch the pollution but let the water through?
2. Choose the idea you think will work best and try it; then observe how the water sample looks, feels, and smells. Is it cleaner than it was before? How can you tell? How does it compare to completely clean water?
3. Think about ways to improve your separating method. What might filter even more of the pollution out? Try some other ideas until you have made the water as clean as you can. Write or draw your best method on page 7 of your lab notebook.
4. Use a new paper test strip to test the acidity of your filtered water sample. What color does the test strip turn? What does that tell you about how clean the water is? Mark this test strip (something like “F” for filtered) and set it aside with the two strips from Part 1.

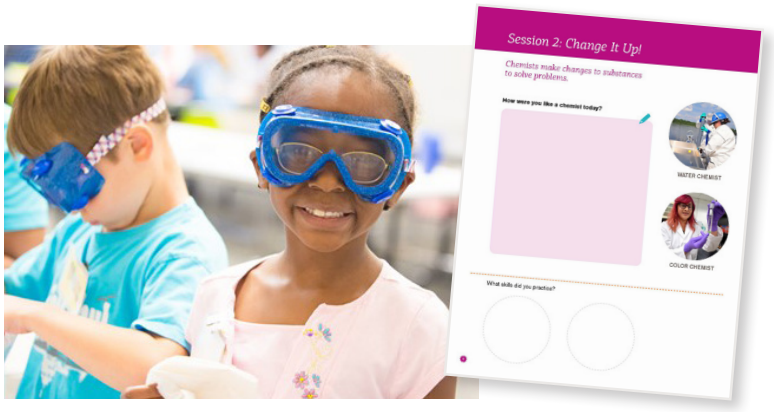
Part 3: Change

Some kinds of pollution are hard to separate from water, but they can be changed to make the water safer. Test ways to change the acidity of the water sample to make it closer to neutral, like clean water.

1. (Optional) Cut some of the paper test strips you have left in half. This will give you more individual strips for testing (but they will be shorter and a little bit harder to hold).
2. Add a small amount of your filtered water sample to one of the wells (indentations) in your well plate. Choose one of the chemical mixtures you prepared earlier (vinegar or baking soda) to test. Use a pipette to add a drop or two of the chemical to the well with the water sample.
3. Now use a paper test strip to test the acidity of the water in the well. Did the chemical you added change the acidity? How can you tell? Did it make the water neutral, like clean water should be? Compare the test strip to the one from clean water, or use the chart on page 8 of your lab notebook to help you decide.
4. Try another test by adding some of your filtered water sample to a new well in the well plate. Add a different kind or amount of chemicals to this well. For example, if you added two drops of vinegar the first time, you might add either one drop or four drops this time, or you might try the baking soda instead. Use a new test strip to test the acidity of the mixture in this well and see how it compares to the clean water test strip from Part 1.
5. Keep testing, using a new well on the well plate for each test, until you find the right amount of chemicals to make the acidity of your water sample close to neutral, like clean water. Which chemical worked the best? How much did you need to add? Record your results in your lab notebook.

Part 4: Reflect

1. Think about the results of your experiments to filter pollution from the water and change its acidity back to normal. What report would you give to the government agency about this water sample? What recommendations would you give them for how to clean a river with water like this? How could they remove the pollution or change it to make it safer?
2. Think about how you were like a water chemist in this activity. What did you do that might be like what a water chemist does? What science skills did you use? Use page 6 in your lab notebook to draw or write about your ideas. Add some skill stickers from the sticker sheet to show some of the science skills you used in this activity.
3. Find out more about being a chemist! Try out the three other chemist activities featured in your lab notebook using the other *Be a Chemist* videos and activities found at scienceinthesummer.fi.edu. Or, check out some of the books and websites listed on the back of your lab notebook.



Want even more science? The Franklin Institute has created Franklin@Home (fi.edu/franklin-at-home), a series of science videos, do-at-home experiments, and live virtual science experiences that allow you and your family to continue discovering, exploring, and experimenting at home all summer long!