

Material Madness

OVERVIEW

Mix various kitchen chemicals to see what reacts!

WHAT ARE WE LEARNING?

This activity helps us understand that materials have different properties, and that these properties are not always visible by just "looking." We also practice conducting an investigation, recording data, and analyzing data!

Materials

There are a variety of materials that can be used for this activity! See what you have around your kitchen and house.

- A variety of kitchen or grocery store "chemicals."
 - At least one acid. Examples are: vinegar, lemon juice, lime juice, cream of tartar, citric acid
 - At least one base. Examples are: baking soda (recommended), antacids (like Alka-Seltzer), certain chalks that include calcium carbonate (like Crayola's anti-dust chalk)
 - At least one neutral material. Examples are: salt, flour, sugar
- Water
- Bowls - to put your materials in
- Cups - to put your liquids in
- Ice cube tray or series of bowls/cups/condiments cups to make your mixtures in
- Spoon(s)
- (Optional) Pipette or straw to transfer liquids*
- (Optional) Washable liquid watercolors or food dye
- (Optional) Whisk - to help dye powders
- Printed worksheet or piece of paper to take notes (+ pencil)
- Rags or paper towels for spills and clean up

**Pipettes can be ordered from Amazon - for older kids 2 mL works well, for preK the 5 mL is better for their smaller hands. Straws can also transfer liquids, see "Notes" below. If you don't have straws or pipettes, just have children carefully pour small amounts of liquids from small cups.*

INSTRUCTIONS

1. Pick your kitchen chemicals. Make sure you have at least one acid, one base, and one neutral chemical. Our favorite acids are vinegar and citric acid, our favorite base is baking soda, and an easy to clean neutral is salt.
2. Prep your materials. Put your different materials into bowls for the powders and put the liquids in cups. Set out your spoons, pipettes, rags, worksheet, and any other materials you are using.

Working with preK kids?
See how to modify this activity in "Notes" below

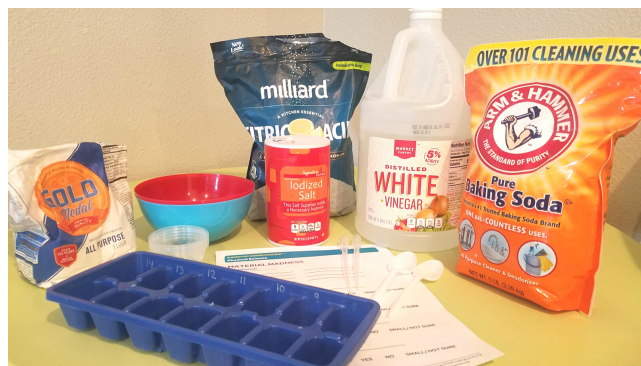


Image 1: Photos of supplies we choose to use - you might choose others!

INSTRUCTIONS (CONT)

3. LABEL EVERYTHING! We wrote the material names on a piece of paper and stuck it in the bowl for the powders (see image 2). We used a sharpie to write on the plastic cups for the liquids. Scientists must **always** label their materials
4. (Optional) Use your washable liquid watercolor or food dye to color the materials. This will help you tell them apart, both before and after you make your mixtures! We recommend using a whisk to mix the dye into the powders. If using food dye, it can be easiest to put a few drops of dye into ~2 tablespoons of powder, mix that with a whisk or fork, then add and mix the dyed powder into the bigger bowl. Not all powders will dye easily; for instance, flour does not. We also recommend adding dye to vinegar to differentiate it from the water.
5. Now that you are set up, choose what you will mix first and write it on your worksheet and piece of paper! Look at the notes below for more thoughts on this step.
6. Make your first mixture based on what you wrote in step 5! Use a spoon to transfer the powders and pipette or straw for liquids. If you are using an ice cube tray start in the top left corner for your first mixture.
7. Observe what happens to your mixture. Did it start to bubble, or "react?" Record what happened on your worksheet or paper! If you have further observations there is space to write them toward the end of the worksheet.
8. Decide what you want to mix for mixture number 2 and repeat steps 6-7. ****NOTE:** Make sure spoons and pipettes are **clean** for each mixture and not contaminated!
9. Continue making mixture and recording your data. You can make as many mixtures as you'd like!
10. When you have completed making mixtures and recording your data, answer the questions at the end of the worksheet.



Image 2: Bowls of flour, salt, and baking soda. We dyed the salt green and the baking soda a light orange.



Image 3: Experimenting and taking down data!

NOTES

- The downloadable worksheet has space for three materials in each trial, but you can mix 2, 3, 4 or as many as you'd like on each trial!
- This is a really fun activity for the preK set. You might choose to select only 2-3 materials with this age group. We recommend something like baking soda, vinegar, and salt, or citric acid, baking soda and water.
- There are a lot of different approaches to this activity. For older children, you might try to work with them to determine just **which** materials are needed for a reaction. For example, you might ask them to mix first, Salt, baking soda and vinegar second, salt and vinegar and third, baking soda and vinegar. Help them reason out that the salt is **not** necessary for the reaction but also doesn't block the reaction.

NOTES (CONT)

- To get a reaction, you need an acid and a base. You might occasionally see weak reaction, but be careful not to confuse air bubbles with a reaction!
- Be careful to use clean spoons, pipettes etc. for each mixture. You might choose to have a dedicated spoon for each bowl. Also be careful that your mixing wells are clean to avoid contamination with other materials.
- You can use a straw to transfer liquids with these steps: 1. Stick the straw in the liquid, 2. Cover the top of the straw completely with your finger, which will trap the liquid inside, 3. Move the straw, keeping the top covered with your finger, 4. When you are ready to release the liquid, remove your finger.
- If you don't have a pipette or straw, just help your child pour small amount of liquid at a time to do their mixtures.

THE SCIENCE

There are a lot of things to learn about in this activity! You may want to discuss how materials have different *properties*. Often, we can identify these properties by looking or touching. For example, bananas are yellow and have a smooth, firm peel. Grass is green, and each blade is roughly rectangular.

As we have seen here however, materials have properties beyond those ascertained by look or touch. For example, the chemical properties of a material can only be found through interaction with other chemicals! One example of a chemical property is whether the material is acidic, basic, or neutral. In this activity we explored materials that fit in each of these categories. You might have realized that when acids and bases are mixed, they will create a chemical reaction!

Chemical reactions cause chemical changes in the materials, which are distinct from physical changes of materials. The difference is that in a chemical change, the molecules themselves making up the materials have been altered, while in a physical change the molecules remain the same. For example, when baking soda and vinegar mix (a chemical reaction) molecular bonds are broken and the molecules rearrange to form the new substances sodium acetate, water, and carbon dioxide. An example of a physical change would be ice melting, or sugar being dissolved in water.

This activity also help children learn about the importance of taking down data, and gives them a chance to practice their analytical skills. We suggest taking the time to talk through with your child what they observed, what conclusions they can draw from their data, and what further experiments they would be interested in doing!

This activity goes with the several Next Generation Science Standards (used in many states) including second grade: 2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties, and 5th grade 5-PS1-3: Make observations and measurements to identify materials based on their properties.

ADVICE FOR DOING SCIENCE WITH YOUR KIDS

- Encourage exploration and curiosity - science is about a lot more than facts and content (although these things are important too!)
- Consider writing down your child's questions and ideas during the activity. You may be able to turn these into a future research project or activity!
- You might consider getting a dedicated science journal for your child where they can keep all their thoughts and ideas and notes on their experiments.
- Do not worry about not knowing the answer to questions. 1. Many "simple" kids science activities have very complicated, or even unknown(!), science behind them. 2. Even scientists will often not know the answers to questions outside their field. No one knows everything! Be honest about not knowing the answer and suggest trying to figure it out together.
- Deviations from exact instructions can often be fruitful - especially if the child has been inspired and wants to try out another line of investigation.
- In many states, the science standards are called the "Next Generation Science Standards," or "NGSS." They are a little complicated to parse through but in essence they want student to learn not only content (called "Disciplinary Core Ideas" or "DCI") but also the practices scientists and engineers use ("scientific and engineering practices, or "SEP") and also concepts that cut across all fields ("crosscutting concepts" or "CCC").

