Science Action
2nd Grade Lab #2: Chemistry for Kids—Interactions

Activity #1: Fizzy Fun

Materials:
- Plastic cups, 1 per station
- Hydrogen Peroxide (3%), 2 oz. per student (about 2 bottles per class)
- Yeast, one 4 oz. container per class
- Plastic spoons, 1 per student
- Thermometer, 1 per station

Introduction

What are some of the ways we know that there is a chemical interaction? *Color change, formation of a gas, temperature change, dissolving of a solid*

We are going to mix a clear liquid called Hydrogen Peroxide – this is sometimes used to clean cuts on our skin - and a beige powder called yeast – this is what makes bread dough rise and get fluffy while it's baking. What do you think will happen when we mix these? *(Let the kids give a few answers…)*

Let's find out.

Procedure:

1. Fill each child's **cup** with about 2 ounces (1/4 cup) of **Hydrogen Peroxide**
2. Distribute the **thermometers** and ask if anyone remembers them from Science Action in first grade; quickly review how to read a thermometer
3. Ask kids to read the temperature of the peroxide
4. Instruct students to scoop one spoonful of **yeast** (only need about 1 teaspoon so it doesn't have to be heaping), pour into the peroxide and stir with the spoon
5. Instruct students to watch the thermometer and ask if the temperature is changing (*it should go up considerably*)

- ***What did you observe?*** *The mixture fizzes, gets warmer, and the powder dissolves.*
- ***What are the interacting substances?*** *Hydrogen peroxide and yeast powder.*
- ***What evidence of an interaction do you see?*** *Formation of a gas, temperature rises, and dissolving of a solid.*

Explanation:

The yeast breaks down the peroxide into water and oxygen, which is a gas. The oxygen gas is released and makes bubbles. When this interaction is happening, the molecules get excited and produce energy! This energy is released as heat – which is why we saw the temperatures go up.

Record results on the data sheet**.**
DUMP mixture into slop bucket; toss cups. WIPE off thermometers to reuse for next group.

Activity #2:
Acids and Bases

A. BTB plus VINEGAR

Materials:
- BTB solution, 1 bottle per group for refills
- 6 small plastic cups for BTB, 1 per work station
- Vinegar, 1 bottle per group for refills
- 6 small squeeze bottles filled with vinegar, 1 per work station
- Baking soda solution, 1 bottle per group
- 6 plastic cups/bowls for Baking Soda Solution, 1 per work station
- Disposable transfer pipettes, 1 per Baking Soda Solution bowl
- Slop bucket

Introduction
BTB is a chemical (indicator) that will change color in slightly acidic or slightly basic environments. It's full name is bromothymol blue, but we call it BTB for short.

Procedure:
1. Pour approximately 1/4-cup **BTB solution** in the **small plastic cups**.
2. Distribute **squeeze bottles of vinegar** to each student
3. Instruct students to add a few squirts of **vinegar** into the cup with BTB (until color changes from blue to yellow).

- ***What did you observe?*** *Color changes from blue to yellow*
- ***What are the interacting substances?*** *Vinegar and BTB*
- ***What evidence of interaction do you see?*** *Color change to yellow*

Explanation: ***Vinegar*** *is an* ***acid****. When an* ***acid*** *is added to BTB, the color will turn* ***yellow****.*

Record results on the data sheet**. Keep the BTB/vinegar cups as is.**

B. Now let's try adding some **BAKING SODA** solution to the cup and see what happens.

Procedure, continued:

4. Place **Baking Soda Solution bowls** and **pipettes** around the table
5. Instruct students to use pipettes to add Baking Soda Solution to the cups of BTB and vinegar (try to make sure pipettes don't actually touch the BTB/vinegar solution; if so just replace that pipette for the next group)

- ***What did you observe?*** *Color changes back to blue*
- ***What are the interacting substances?*** *Baking soda and BTB*
- ***What evidence of interaction do you see?*** *Color change to blue*

Explanation*:*

Baking soda** is a **base**. A chemical that is slightly **basic,** such as **baking soda**, will turn BTB solution **blue.

Record the results on the data sheet.

DUMP solution in slop bucket.

C. VINEGAR plus BAKING SODA

Materials

- Plastic bowls*,1 per work station
- Baking Soda powder, 1 container per group for refills
- 3 plastic cups/bowls for Baking Soda powder
- Spoon, 1 per Baking Soda container
- (Keep the Vinegar bottle & the 6 small squeeze bottles of vinegar for this part)

Procedure, *continued*

6. Give each student a **plastic bowl** and set out the **Baking Soda containers**.
7. Instruct students to **spoon** two scoops of **Baking Soda** powder into their bowl.
8. Instruct students to squeeze some **vinegar** into the bowl.
9. The mixture will start fizzing, the baking soda will "disappear"
10. Have the students hold the cup in their hand so that they can feel the cup getting colder as the vinegar and baking soda react.

- ***What did you observe?***
  1. *a white solid plus a colorless liquid are mixed and it produces fizzing*
  2. *the white solid "disappears"*
  3. *the resulting solution gets colder*

- ***What are the interacting substances?*** *vinegar and baking soda*

- ***What evidence of interaction do you see?***
  1. *fizzing (formation of a gas)*
  2. *disappearance of a solid*
  3. *temperature change (it drops)*

Explanation*:*

When vinegar and baking soda are mixed, they react to form carbon dioxide gas, which we see as bubbles (fizzing) in solution (the other product is sodium acetate solution). As the baking soda reacts, it "disappears" as the reactants are consumed and the products of the reaction (a gas and a solution) are formed. The temperature of the products decreases because the reaction is endothermic (the reaction absorbs energy in the form of heat from its surroundings - which we observe as the system getting colder).

Record results on data sheet.

DUMP each solution and put bowls* aside to rinse between classes.

Activity #3
Chemical Indicators & Invisible Ink

Materials
- Goldenrod Paper, cut into strips, 1 per student
- Baking Soda Solution, 1 bottle per table
- 1 plastic cup/bowl for Baking Soda Solution
- White Paper, cut into 4"x4" inch squares, 1 per student
- 6 black pens
- Q-Tips, 1 per student
- Foam Plate, 1 per work station
- Corn Starch solution, 1 bottle to share
- 6 cups/bowls for Cornstarch solution
- Popsicle sticks
- Iodine solution, 1 bottle to share
- 4 bowls for Iodine solution
- 6 small sponge brushes
- Ziptop bags, 1 per student

Introduction
What are some things you can observe to let you know that there has been a chemical interaction? *Color change, formation of a gas, temperature change, dissolving of a solid*

If you have a swimming pool, you might have seen chemical indicator strips like these. (show pool tester strips) **There are chemicals on the paper that mix with the chemicals in the pool water to change color and let you know if the water is safe to swim. There is a chemical interaction right on the paper!**

Let's try a different type of indicator paper right now.

Procedure**:**
1. Give each child a piece of **goldenrod paper**
2. Place the **Baking Soda Solution** in the middle of the table
3. Instruct students to dip part of the paper into the solution

- ***What did you observe?*** *At first the paper just looks wet, but then the message turns red.*
- ***What are the interacting substances?*** *Baking soda solution and goldenrod paper.*
- ***What evidence of an interaction do you see?*** *Color change – the yellow paper turns red.*

Explanation: The dye in goldenrod paper is an acid-base indicator. It will turn red when it interacts with a base like baking soda, and will turn back to yellow if it interacts with an acid.

DUMP paper; set aside Baking Soda Solution.

Now we will use another type of chemical indicator to write an invisible message!

Procedure:

1. Give each child a piece of **white paper** and a **pen** to write their name
2. Instruct students to place the paper on the **foam plate** (to contain any excess liquid).
3. Parent Volunteer: Pour **Cornstarch Solution** into cups/bowls (about half full; if solution is clumpy, use **Popsicle sticks** to stir); pass out **Q-Tips**
4. Instruct students to dip Q-tip into the Cornstarch Solution and then write a message (initials or a shape are easiest) with the wet Q-tip on the white paper.
5. Have the students lightly dip a **sponge brush** in the **iodine solution** and gently rub over their secret message. The message will show up in dark purple on a light purple background.

Safety Tip: Iodine can be used on cuts to kill germs because it is poisonous to living things. Drinking or eating iodine could make you sick.

- **What did you observe?** At first paper looks white
- **What are the interacting substances?** Corn starch solution and Iodine
- **What evidence of interaction do you see?** Color change-dark purple on a light purple background

Explanation: Iodine interacts with starch. Since the cornstarch message has a lot of starch, it turns purple. The paper has some starch in it also, so it turns color too.

Record results on data sheet

Place the wet secret message in a ziptop bag; Students may take home their paper

WIPE plates off between groups and reuse the plates.

Activity #4:
Making Slime

Materials
- Diluted Elmer's Original All-Purpose Glue Solution, 1 bottle per group
- 6 plastic bowls/cups for Glue Solution
- Foam bowls, 1 per student
- Spoons, 1 per student
- Borax Solution, 1 bottle per group
- 6 plastic bowls/cups for Borax Solution
- Disposable Transfer pipettes, 1 per student
- Food coloring, 3-4 colors per group
- Ziploc bags, 1 per student
- Paper towels
- Baby wipes

Introduction

We are going to mix two different liquid chemicals together. When they interact, they form a new chemical called a polymer. The liquids that we are going to mix together are a glue solution and Borax solution.

Procedure

1. Pass out **bowls** and **spoons** – one each per child.
2. Set up **containers of glue** at each work station.
3. Have each child place 2 spoonfuls of glue solution into the foam bowl.
4. Now add **1 drop** of **food coloring** and instruct students to stir. (Let them pick which color they want but parent should add the drop.) ***It is important to use only ONE drop of food coloring, as more will stain their hands, clothes and also furniture at home!!***

Let's look at the glue mixture, and describe it.

- ***Is it a solid or liquid?*** Liquid
- ***Is it thick or runny?*** Thick
- ***What color is it?*** White, then the color of the food coloring
- ***Did the glue and food coloring interact?*** Yes
- ***What evidence of interaction do you see?*** Color change

Let's look at the Borax solution and describe it.

- ***Is it a solid or a liquid?*** Liquid
- ***Is it thick or runny?*** Runny
- ***What color is it?*** Colorless

5. Place **Borax Solution** containers at each work station along with one **pipette** per container.
6. Instruct students to use **pipettes** to add 2 droppers of **Borax Solution** to the glue solution in the bowl and stir with **spoon**. You will begin to feel the slime forming as you stir. Continue to add borax – a little at a time - until the slime has formed and is no longer runny. Once it is a solid material, students can shape it with their hands to squeeze out any excess liquid and make it more uniform. The more borax solution you add, the thicker your slime will be. You should be able to get a nice, bounceable ball of slime.

Hints:
- If it is too sticky, add a little more borax solution.
- If it is too wet, knead it with your hands to squeeze out the extra borax solution.
- The more borax solution you add, the thicker your slime will be.

Ask the kids to describe their new compound.

- ***Is it a solid or liquid****?* It is actually something in between
- ***Is it thick or runny?*** Very thick, not sticky anymore
- ***What color is it?*** Color of the food coloring
- ***Is this putty different from the glue and borax?*** Yes
- ***Did the glue and borax interact?*** Yes
- ***What evidence of interaction did you see?*** Formation of a new material.

*The glue and the borax **interacted** when they were mixed together and formed a new chemical that is **different** than the two materials that we started with.*

Put the slime into a **Ziploc bag** so the kids can take home their own slime. Pass out baby wipes and be sure the kids wipe their hands.

DUMP bowls and spoons.

Interactions Data Sheet

Experiment	What is interacting?		Before Interaction	After Interaction - What is the evidence of interaction?
Activity #1 Fizzy Fun	Hydrogen Peroxide	Yeast	Colorless Liquid + Beige Solid Powder	☐ Color change ☐ Formation of gas ☐ Temperature change ☐ Dissolving of solid
Activity #2 A Acids & Bases	BTB	Vinegar	Blue Liquid + Colorless Liquid	☐ Color change ☐ Formation of gas ☐ Temperature change ☐ Dissolving of solid
Activity #2 B Acids & Bases	BTB/Vinegar	Baking Soda Solution	Yellow Liquid + Clear Liquid	☐ Color change ☐ Formation of gas ☐ Temperature change ☐ Dissolving of solid
Activity #2 C Acids & Bases	Baking Soda Powder	Vinegar	White Solid Powder + Colorless Liquid	☐ Color change ☐ Formation of gas ☐ Temperature change ☐ Dissolving of solid
Activity #3 Invisible Ink	Iodine	Cornstarch Solution	Dark Purple Liquid + White Liquid	☐ Color change ☐ Formation of gas ☐ Temperature change ☐ Dissolving of solid
Activity #4 Slime	Glue	Borax Solution	White Liquid + Colorless Liquid	☐ Color change ☐ Formation of gas ☐ Temperature change ☐ Dissolving of solid