Lesson Plan: The Potion Master's Chemistry Lab

Materials Needed

- Safety goggles (essential!)
- A tray or baking sheet to contain spills
- Clear cups or small glass jars (3-4)
- A small, sealable plastic bag (like a Ziploc sandwich bag)
- Measuring spoons (tablespoon, teaspoon)
- A small notebook and pen/pencil for the "Potion Master's Logbook"
- Baking soda
- White vinegar
- Water
- Red cabbage (a few leaves)
- Lemon juice
- Optional: A few other safe household liquids for testing (e.g., clear soda, milk, dish soap solution)

Learning Objectives

By the end of this lesson, the student will be able to:

- Identify at least two signs of a chemical reaction (gas production, color change, temperature change).
- Follow a multi-step procedure to conduct a safe chemical experiment.
- Record scientific observations clearly in a logbook.
- Apply their observations to creatively design a new "potion" and predict its reaction.

Lesson Activities

Part 1: The Potion Master's Challenge (5 minutes)

1. **Introduction:** Present the challenge! "Welcome, Apprentice Potion Master! Today, your task is not just to follow recipes, but to understand the magic—the *science*—behind what makes potions bubble, fizz, and change color. We are going to explore the world of chemical reactions. A chemical reaction is what happens when you mix different substances together and they change to create something new!"
2. **Set Up Your Lab:** Have the student put on their safety goggles and set up their workstation on the tray. Open the notebook to a fresh page and title it "Potion Master's Logbook."
3. **Ask a Guiding Question:** "What are some signs that a 'magical' reaction might be happening in a potion?" (Guide them toward ideas like bubbling, fizzing, changing color, getting hot or cold). Explain that these are the clues we'll be looking for today.

Part 2: Activity 1 - The Self-Inflating Potion (15 minutes)

This experiment demonstrates gas production and temperature change.

1. **Logbook Entry:** In the logbook, have the student write the title "Potion 1: The Self-Inflating Bag." Have them create two sections: "Prediction" and "Observation."
2. **Prediction:** Ask the student, "What do you think will happen when we mix baking soda (a solid) and vinegar (a liquid) inside a sealed bag?" Have them write or draw their prediction.
3. **Procedure:**

    - Pour about a quarter cup of vinegar into the sealable plastic bag.
    - Carefully add one tablespoon of baking soda into the bag, trying to keep it in one corner, away from the vinegar for now.
    - Squeeze most of the air out of the bag and seal it completely. **Double-check that it is sealed!**
    - Now, let the student mix the baking soda and vinegar together by squishing the bag.
4. **Observation:**
    - Ask prompting questions: "What do you see? What do you hear? What do you feel?" (The bag will inflate with gas, it will fizz, and it will feel cold).
    - Have the student record their findings in the "Observation" section of their logbook. They should note the bubbling (fizzing), the bag filling with air (gas production), and the cold feeling (a temperature change called an endothermic reaction).

Part 3: Activity 2 - The Chameleon Potion (20 minutes)

This experiment demonstrates how an indicator can show a chemical change through color.

1. **Prepare the Indicator:** Before the lesson, an adult should chop a few red cabbage leaves and place them in a heat-proof bowl. Pour about one cup of boiling water over them and let them steep for 10 minutes. Strain the beautiful purple liquid into a jar. This is your "Chameleon Potion" base (a pH indicator).
2. **Logbook Entry:** Have the student title the next section "Potion 2: The Chameleon Potion."
3. **Procedure:**
    - Line up two clear cups. Pour a small amount of the purple cabbage juice into each cup.
    - **Cup 1:** Add a teaspoon of lemon juice.
    - **Cup 2:** Add a small pinch (about half a teaspoon) of baking soda and stir.
4. **Observation and Discussion:**
    - Ask: "What happened to the color in each cup?" (The lemon juice, an acid, turns it pink. The baking soda, a base, turns it blue-green).
    - Explain that the cabbage juice is a special liquid that can reveal the secret identity of other liquids—whether they are an "acid" or a "base." This color change is another sign of a chemical reaction.
    - Have the student record the color changes in their logbook, perhaps using colored pencils to draw the results.

Part 4: The Potion Master's Design Lab (15 minutes)

This is the creative application and assessment part of the lesson.

1. **The Challenge:** "You've proven you can follow a recipe. Now, it's time to create your own! Your challenge is to design a new potion using any of the ingredients we have here today (vinegar, baking soda, lemon juice, water, cabbage juice)."
2. **Design and Predict:**
    - On a new logbook page titled "My Master Potion," have the student give their potion a creative name (e.g., "The Bubbling Sunset Potion").
    - Have them write down the "ingredients" they will mix.
    - Most importantly, have them write a prediction: "Based on what we learned, I predict my potion will _____ because _____." (e.g., "...will bubble and turn pink because I'm mixing an acid with the cabbage juice and also adding baking soda.")
3. **Create and Observe:** Let the student mix their designed potion in a clean cup. Have them record the final result and compare it to their prediction.

Conclusion & Assessment (5 minutes)

- **Share and Reflect:** Ask the student to present their "Master Potion." Did it do what they

expected? Why or why not? What was the most surprising discovery today?
- **Review Objectives:** Casually ask, "So, if you wanted to tell someone if a chemical reaction happened, what are two clues you would tell them to look for?" (Answer: gas/bubbles, color change, temperature change).
- **Cleanup:** All materials are safe to be poured down the sink. Clean the lab station together.

Differentiation and Extension

- **For Support:** Provide a pre-printed logbook page with prompts like "I see...", "I feel...", "I hear...", and boxes for drawing.
- **For an Advanced Challenge (Extension):** Introduce more household items to test with the cabbage juice indicator. Have the student create a chart ranking the items from most acidic to most basic based on the color changes. Research the actual chemical equation for the reaction between baking soda ($NaHCO_3$) and vinegar (CH_3COOH).