Lesson Plan: The Great Change-Up! A Hands-On Investigation of Physical and Chemical Changes

Materials Needed:

- **For Observation & Recording:**
  - Science notebook or plain paper
  - Pencils, colored pencils, or markers
  - "Scientist's Observation Log" printable (or a sheet of paper with columns for: Experiment, Prediction, Observation, and Type of Change)
  - Venn Diagram printable or a blank sheet of paper
- **For Physical Change Stations:**
  - Ice cubes in a small bowl or plate
  - A piece of paper
  - A small cup of water and a teaspoon of salt
  - Modeling clay or Play-Doh
- **For Chemical Change Stations:**
  - A small bottle or cup
  - Baking soda (sodium bicarbonate)
  - White vinegar (acetic acid)
  - A balloon (optional, to capture the gas)
  - An apple slice
  - A small bowl, glue (like Elmer's), contact lens solution (containing boric acid), and a small amount of baking soda for making slime

---

1. Learning Objectives (The Goal)

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

- **Define** and **provide examples** of both physical and chemical changes.
- **Observe** experiments and correctly **classify** the changes they see as either physical or chemical, justifying their reasoning.
- **Compare and contrast** the key characteristics of physical and chemical changes using a Venn diagram.
- **Demonstrate understanding** by creating a comic strip or short story that illustrates an object undergoing both types of changes.

2. Instructional Strategies & Activities (The Fun Part!)

Part 1: The Hook - A Mysterious Reaction (10 minutes)

1. **Start with a "Wow!":** Place the small bottle on a tray. Add 2 tablespoons of baking soda to it. Stretch the balloon over the mouth of the bottle, but don't let the vinegar inside it pour in yet. (If not using a balloon, just have the vinegar ready to pour).
2. **Ask a Question:** "I have baking soda in this bottle and vinegar in this balloon. What do you predict will happen when I mix them?" Record the prediction.
3. **The Reaction:** Lift the balloon so the vinegar pours into the bottle. Observe the fizzing, bubbling, and the balloon inflating.
4. **Spark Curiosity:** Ask probing questions: "What did we see? Hear? Feel? Is this the same stuff we started with? Do you think we could easily separate the vinegar and baking soda back out

now? Why or why not?" This sets the stage for the concept of irreversible changes.

Part 2: What's the Difference? - Guided Learning (15 minutes)

1. **Introduce Vocabulary:** Explain that scientists have names for what just happened. Introduce the terms **"Physical Change"** and **"Chemical Change."**
2. **Create an Anchor Chart:** On a large piece of paper or whiteboard, create a T-chart.
    - **Physical Change:** A change in the form or appearance of a substance, but not its chemical identity. It's still the same "stuff." (Examples: ice melting into water, tearing paper, dissolving sugar). Key idea: Often reversible.
    - **Chemical Change:** A change where a new substance with new properties is formed. (Examples: wood burning into ash, metal rusting, baking a cake). Signs of a chemical change include: gas production (bubbles), light/heat, color change, or forming a precipitate (a solid). Key idea: Not easily reversible.
3. **Connect to the Hook:** Ask, "Based on our definitions, what kind of change was our baking soda and vinegar reaction?" (Chemical, because it produced a gas and is not easily reversed).

Part 3: The Science Lab - Hands-On Stations (25-30 minutes)

Set up several "stations" for the student to explore. For each station, the student should use their "Scientist's Observation Log" to predict, observe, and classify the change.

- **Station 1 (Physical): Tear It!** Tear a piece of paper into small pieces. *(Question: Is it still paper?)*
- **Station 2 (Physical): Melt It!** Observe an ice cube melting in a bowl. *(Question: Is melted ice still water? Can you reverse this by freezing it again?)*
- **Station 3 (Physical): Dissolve It!** Stir a teaspoon of salt into a small cup of water until it dissolves. *(Question: Is the salt still there? How could we prove it? Hint: evaporation).*
- **Station 4 (Chemical): Brown It!** Look at a freshly cut apple slice. Check on it again at the end of the lab time. *(Question: What happened to the color? Is this a new substance forming on the surface?)*
- **Station 5 (Chemical): Slimy Change!** In a bowl, mix about 1/4 cup of glue with a tablespoon of contact lens solution and a pinch of baking soda. Stir until slime forms. *(Question: Did you create a new substance with totally different properties than the original glue?)*

Part 4: Making Sense of It All - Discussion & Comparison (10 minutes)

1. **Review the Log:** Go over the "Scientist's Observation Log" together. Discuss why each change was classified as physical or chemical.
2. **Venn Diagram:** Using a Venn Diagram, compare and contrast physical and chemical changes.
    - **Physical Only:** Changes shape/size/state, reversible, still the same substance.
    - **Chemical Only:** Forms a new substance, signs like bubbles/light/heat, not easily reversible.
    - **Both:** Both are types of changes to matter, both involve energy.

3. Assessment & Creative Synthesis (The Grand Finale!)

Project: The Comic Strip of Change (20-30 minutes)

To show true understanding, the student will create a short, 4-6 panel comic strip titled "The Adventures of an Ice Cube" (or a character of their choice, like a piece of paper or a log of wood).

- **The Challenge:** The main character must go through at least ONE physical change and ONE chemical change in the story.
- **Example for "The Adventures of an Ice Cube":**
    1. **Panel 1:** An ice cube is sitting happily in the freezer. (State: Solid)

2. **Panel 2:** Someone takes the ice cube out and puts it in a glass. It starts to melt. (Physical Change: melting)
3. **Panel 3:** The water is now in a glass. Someone drops an effervescent tablet (like Alka-Seltzer) into the glass.
4. **Panel 4:** The water starts bubbling and fizzing as it reacts with the tablet. The water molecule says, "Whoa! I'm part of a chemical reaction now!" (Chemical Change: new gas formed).

- **Evaluation:** The assessment is based on whether the comic accurately depicts and labels one physical and one chemical change, showing the student can apply the concepts creatively, not just memorize them.

4. Differentiation and Inclusivity (Making it Work for YOU)

- **For Extra Support:** Provide a pre-drawn comic strip template with empty speech bubbles. Offer a "word bank" with terms like "melting," "fizzing," "new substance," and "same substance" to help with labeling.
- **For an Extra Challenge:** Ask the student to create a more complex story involving a chain of reactions (e.g., a tree is physically changed when cut into logs, then chemically changed when burned, and the resulting ash is physically changed when scattered by the wind). They could also research and include the simple chemical formulas (H_2O for water, CO_2 for carbon dioxide).

5. Wrap-Up and Reflection (5 minutes)

Have a brief chat about the lesson. Ask questions like:

- "What was the most surprising change you saw today?"
- "Can you think of a physical and chemical change that happens in the kitchen when we cook dinner?"
- "What's the one big difference you'll remember between a physical and a chemical change?"