5th Grade - Lesson 3.3 **Name: _____**
Activity Sheet
Forming a Precipitate **Date: _____**

Safety: Wear safety goggles and be sure to follow all safety instructions given by your teacher. Wash your hands after completing the activity.

DEMONSTRATION

As a demonstration, your teacher mixed two clear colorless liquids and a white substance formed which did not dissolve in the liquid.

1. Do you think mixing the two liquids caused a chemical reaction to occur? Why or why not?
   Yes, a chemical reaction happened because something new was made.

ACTIVITY

Question to investigate

What happens when soap is mixed with "hard" water?

Materials

- Water
- Epsom salt
- Piece of Ivory® soap
- Paper towels
- 2 Popsicle sticks
- 2 empty disposable water bottles (8-oz) with caps
- 4 Clear plastic cups
- 1 Small cup
- 1 Tablespoon
- 1 Teaspoon
- Paper
- Sink or plastic container or bucket filled with water (to wash out and reuse the cups)

Procedure

1. Label 3 plastic cups **Soap**, **Water**, and **Hard Water**.
2. Hold a piece of Ivory soap on a piece of paper. Use a popsicle stick or plastic spoon to scrape some soap flakes onto the paper.

Making the soap solution

3. To make a soap solution, place ¼ cup of water in the **Soap** cup and add about 1 tablespoon of soap flakes to the water. Stir, mix or swirl the solution about 1 minute until the water is cloudy white.

Making the hard water

4. To make hard water, place ¼ cup of water in the **Hard Water** cup and add 2 teaspoons of Epsom salt to the water. Swirl or mix the solution until no more Epsom salt will dissolve.

Adding the soap solution to water and hard water

5. Place ¼ cup of water in the cup labeled **Water.**

6. Add 1 tablespoon of soap solution to both the Water and the Hard Water cups.

7. Look at both cups from the top and the side.

2. Describe what you observed in each cup when you added the soap solution to water and to hard water.
When soap was mixed with water, the water turned a kind of grayish cloudy color. When the soap was mixed with hard water, white chunks of stuff was formed.

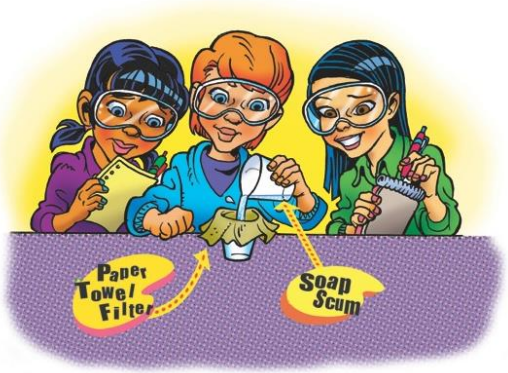
3. Assume that you could separate the solid soap scum from the liquid in the **Hard Water** cup. How could you test the resulting solid to see if it has the same properties or different properties than the original soap that you dissolved in water?
You could test them to see how well they clean or maybe how much they bubble.

Comparing soap scum and soap

Filter the soap scum precipitate

Procedure

1. Place a paper towel on the top of a plastic cup as shown.
2. Hold the paper towel filter in place as you pour the soap scum mixture from the **Hard Water** cup into the filter. Allow the water to drip through the filter. You will use the dried precipitate tomorrow or the next time your class meets.



Prepare the cups for the next day

While you let the water drip through the paper towel, begin setting up for the next part of the experiment, which will happen during the next class period.

3. Thoroughly wash out and dry the cups you used for the soap and the Epsom salt solutions.
   You will reuse the cup labeled **Soap** and re-label the other cup **Soap Scum**.

NEXT DAY

Collecting the soap scum

4. Carefully lift the paper towel filter from the cup and lay it down as shown. Use a popsicle stick or plastic spoon to scrape the solid from the towel and collect the dried soap scum. Expect to get about 1/4 teaspoon of precipitate.

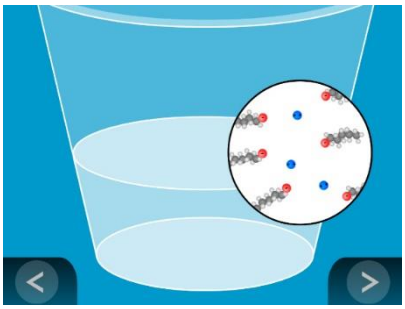
Adding soap scum and soap to water and testing for bubbling

5. Add about 3 tablespoons of water to the cups labeled **Soap** and **Soap Scum**.
6. Look at the amount of soap scum you have. Then place a similar amount of soap flakes into the cup labeled Soap and stir gently.
7. Add the soap scum to its labeled cup and stir gently.
8. Carefully pour the solution from each cup into a separate small bottle.
9. Put the cap on each bottle and be sure it is fastened tightly. Shake both bottles for a few seconds and compare the amount of bubbles in the two bottles.

4. When you shook the bottles containing the soap and soap scum, which mixture produced more bubbles?
   When we shook the bottles with the sop and soap scum, it was the soap that made more bubbles.

5. Based on your observations, do you think that soap and soap scum are the same substance, or different substances? Explain.
   Since the soap and the soap scum acted differently, they are probably different substances.

EXPLAIN IT WITH ATOMS & MOLECULES



6. You saw an animation of soap molecules interacting with dissolved magnesium sulfate molecules. What happened when magnesium ions interacted with a soap molecule?
The magnesium ion joined two soap molecules together.

TAKE IT FURTHER

Materials

- Ivory soap
- 2 clear plastic cups
- Water
- Salt
- Plastic spoon
- Waste container or sink
- Paper towel

Procedure

1. Label one cup **Saltwater** and the other cup **Fresh water**. Place about ½ cup of water into each labeled cup.
2. Add about two teaspoons of salt to the water in the **Saltwater** cup and stir until most or all the salt dissolves.
3. Hold your hands over a sink or waste container and have your partner pour some fresh water onto your hands.
4. Move a piece of soap in your hands like you would if you were washing your hands.
5. Use water to rinse your hands over the waste container or rinse them at a sink. Dry your hands thoroughly using a paper towel.
6. Hold your hands over the waste container again and now have your partner pour some saltwater onto your hands.
7. Move a piece of soap in your hands like you would if you were washing your hands.
8. Use water to rinse your hands off over the waste container or rinse them at a sink. Dry your hands.

7. Describe any differences between the way it felt when you tried to wash your hands with soap using water and salt water.
With water, the soap felt slippery and smooth like it usually does. But with salt water, the soap felt kind of rough and didn't move as easily between your hands. It also didn't make as much lather as it did with regular water.

8. Regular or “table” salt is similar to the magnesium sulfate in Epsom salt in that both substances contain both positively charged and negatively charged ions.

   What do you think might be happening when the positive ions in salt water mix with the soap molecules to cause the soap to feel different and behave differently in salt water versus in plain water?
   Maybe one of the ions in the salt is connecting the soap molecules together.