

Chemical and Physical Changes: A Unit Review and Summary Activity

The following activity was designed to sum up all of the different aspects of chemical and physical changes that the students have been studying over the past couple of months. This section of material was one of the lower scored sections on their midterm science exams. I wanted to prepare something fun and educational that they could use to refresh their memory, as well as, better understand the processes and characteristics of chemical and physical changes. The lesson includes independent reading, watching a video, taking notes from the video and lecture, two demonstrations, and two hands-on science experiments. The students took notes on the scientific method and experimental methods. I wanted to use these experiments to help the students better understand what scientists in the lab do during experimentation. They wrote down reagents, volumes, directions, hypotheses and results.

This lesson plan was designed for a fifth grade class with 24 students. This lesson took about 2 class hours to go through including a fifteen minute period at the end of the school day to look at an experimental change. The following materials listed are for the demonstrations and for each student to complete both experiments with his/her own reagents.

Materials:

- Two part vinegar and one part baking soda for the CO₂ synthesis demonstration

For elephant toothpaste:

- 1 empty 16 oz. bottle
- ½ cup 6% hydrogen peroxide (I used 3% and doubled the quantity)
- One packet of dry yeast
- Dawn dish soap
- Food coloring
- One small cup
- 45 mL of warm water
- Bin for the reaction to take place
- Safety goggles

For the potato chemical change experiment:

- One averaged-sized russet potato
- 24 small cups
- Knife
- Iodine
- Plastic disposable pipette
- Disposable gloves
- Paper towels

For the penny chemical reaction experiment:

- 24 dirty pennies
- 24 new long nails
- 24 small cups
- Salt – (1 teaspoon for student)
- Vinegar – (5 mL per student)

Activity:

This lesson plan follows lessons from both Heather and myself on the differences and fundamental properties of chemical and physical changes. The students did extremely well on their mid-year science exam, but I wanted to touch up on some of the lower sections. Physical and chemical changes seem to give some students some confusion. So I created this lesson to be sort of a multidirectional approach to review and to introduce some new activities to get the students thinking.

We first just talked about chemical and physical changes. We listed the traits of a chemical reaction, color change, heat release, etc. I then asked for examples of different chemical and physical changes. Some answers included tearing paper, states of matter change, and breaking glass for physical changes, and burning paper, vinegar/baking soda reaction, and dissolving of drink mix for chemical changes. The students had a worksheet that I had given them in the past, and some of the students used it for guidance during this review discussion.

I then moved on to a 10 minute video full of demonstrations of physical and chemical reactions (<http://www.youtube.com/watch?v=NHmt0xa6qCg>). The scientist on the video presented about seven different kinds of demonstrations and allowed time for the students to write-down which whether the demo was a physical or chemical change and why. At the end of the video, the scientist reviewed and discussed which type of change each experiment was demonstrating. There were lots of “yes” and “alright” from the students as he gave the answers. At the end of the video, we talked a little about each demonstration. The only confusing one was the Mentos/Diet Coke demo. Most students thought it was a chemical reaction because of the bubbling, but this case is one of the few where the bubbling is not a sign of a chemical reaction.

When we were done talking about the video, I decided to show them the vinegar and baking soda reaction again as some of the students are new and missed the experiment in the beginning of the year. After the demo, we talked about exactly what was happening. I did not spend too long on this as we had discussed much about this at the end of the video.

Next, I wanted them to see the elephant toothpaste demo from the video with their own eyes. This demo is one of the coolest to explain chemical reactions and new products. I had a cart at the front of the room where I set up the demo so everyone could see. In the front of the room, I poured 1 cup of hydrogen peroxide in to a 16 oz. bottle. We voted on the food coloring, and purple and blue won. I added the food coloring to the bottle. I then squirted some Dawn soap in the bottle and mixed it around. In a separate cup, I mixed one packet of dry yeast and 45 mL of warm water for 30 seconds. Everyone surrounded me, and I used a funnel to pour the cup mixture into the bottle. The reaction occurred and a deep shade of purple elephant toothpaste slowly erupted out of the bottle and into the bin the bottle was sitting in. We then discussed the chemical change and what they thought happened.

Next, we moved onto the hands-on experiments. For the first experiment, I passed out small cups with precut pieces of potato in each cup. Each student also received a pair of disposable gloves and paper towel mat for their desk. They kept out their worksheets to notate potato color and what they thought may happen with the addition of the orange/brown iodine that they could see through the clear bottle. After they had time to write down their hypotheses and notes, I came around and dropped a couple of drops of iodine onto each student’s potato. I told them to notate what happens over the next minute or two. They took notes on the reaction, and we talked about the chemical change that took place.

Lastly, I gave each student a small cup with vinegar. I passed out a dirty penny, a clean nail, and a teaspoon of salt. The students poured the salt in the vinegar and mixed. I encouraged them to notate particular spots and level of dirtiness of their pennies and what the nails looked like. They put the penny and nail in the mixture, and we let it sit for two hours. Afterwards, each student took their cup back to their desk and wrote notes on the changes that had occurred. We then talked as a group what happened. We left the penny and nail in the cup to see what happened over the weekend.