Alchemy: Can you turn a penny into gold?

In this lab, you will be converting a regular penny into a "gold" penny! In doing so, you are following a tradition that dates back to the earliest days of chemistry.

Before people knew much about atomic structure and bonding, there was a group of pseudo-scientists called Alchemists. They mixed chemicals in an attempt to create new substances. This is similar to chemistry except that they didn't base their experiments on scientific reasoning. One of the goals of many alchemists was to turn ordinary metals like lead (Pb) into gold (Au). They did not know that gold was an element and therefore cannot be created by a chemical reaction. The only known way to create one element out of another is through a nuclear reaction.

In this practical, you will perform one of the experiments that were attempted by Alchemists hundreds of years ago and in so doing you will be making an alloy. Just like the alchemist you will mix zinc with copper and make brass, it will appear to be gold. Since gold is an element on the periodic table we cannot really make gold, but we can combine elements into compounds through chemical reactions or combine elements physically into mixtures.

The zinc will dissolve in the sodium hydroxide and attaches to the penny. It forms a thin layer over the outside of the penny, this process if referred to as plating. You may be familiar with silver plated jewelry, which is usually stainless steel with a thin outer coating of silver. In other words it is not solid silver. When the zinc plated penny is heated over the Bunsen burner, the silvery zinc coating melts along with the copper metal forming a new metal, brass that appears "gold" in color.

Brass is a metal alloy that has frequently been confused for gold, especially by people who don't see gold often.

Safety:

- Follow Bunsen burner safety
- Tie back your hair & roll up your sleeves
- Wear closed toed shoes
- Wear goggles (we're using corrosive chemicals)
- Keep your ring stand below eye level.
- If chemicals get in your eye rinse at the eye wash station for 15 minutes and notify Mr. Tremblay right away.
- Rinse clothing if you get chemicals on your clothing.

Procedure:

Step 1: Clean pennies using steel wool, rinse with water and dry completely. Record observations.

Step 2: Mix chemicals:

- Place 5 grams of Zinc (dust or Mossy) in evaporating dish; distribute to cover the bottom of dish.
- Add 3 pipettes of 1M NaOH to evaporating dish and stir with the wooden splint.

Step 3: Light the Bunsen burner according to directions. Keep the burner on throughout the experiment. Turn off the gas when you are completely finished.

Step 4: Place evaporating dish with sodium hydroxide and zinc mixture on ring stand over Bunsen burner. **Never allow the mixture to boil**, it should remain at a simmer.

Caution: Never allow your chemicals to boil, raise your hand to ask for assistance if your chemicals are boiling. Do not allow the evaporation dish to go dry, add 1 pipet of NaOH when necessary before adding your pennies.

Step 5 Plating process:

Using tweezers take two pennies and submerge them into the sodium hydroxide so they sit on top of the zinc mixture.

- Allow the pennies to “plate” for about two minutes. Then using the tweezers turn the pennies over until both pennies are completely plated with the Zn. It will appear silver in color.
- Remove pennies one at a time using the tweezers and run under water until the slimy coating is removed. Blot dry with a paper towel.

Step 6 making an alloy:

Using the tweezers, one penny at a time, hold the penny at its edge and place it in the flame flipping the penny over so both sides are heated equally. After approximately 4 seconds remove penny from flame and cool with water. Your penny should appear gold in color.

Chemical disposal – DO NOT handle hot chemicals. When they are cool Mr. Tremblay will dispose of them properly.

Alchemy Penny Lab Follow-up questions:

Define the following:

1. Alloy:

2. *Pseudo*-:

3. Alchemy:

4. Solution:

5. Corrosive:

6. Catalyst:

7. Caustic:

8. The penny doesn't really turn into silver, or gold. What are they really? Explain.

9. Why is it impossible for us to create gold out of other metals? Where does gold come from?

10. Research three alloys, what metals do they contain, and what properties make them useful:

Name of Alloy:	***Contains:***	***Useful properties:***

11. Would an alloy be considered a compound or a mixture? Why?