Demonstration: First Day Review

FOR THE TEACHER

Summary
In this demonstration, students see evidence of a chemical reaction. Usually done on the first day of school, this activity gets AP Chemistry students back into chemistry mode.

Grade Level
High school

AP Chemistry Curriculum Framework
This demonstration supports the following unit, topics and learning objectives:

- **Unit 4: Chemical Reactions**
  - **Topic 4.1:** Introduction for Reactions
    - **TRA-1.A:** Identify evidence of chemical and physical changes in matter.
  - **Topic 4.4:** Physical and Chemical Changes
  - **Topic 4.5:** Stoichiometry
    - **SPQ-4.A:** Explain changes in the amounts of reactants and products based on the balanced reaction equation for a chemical process.
  - **Topic 4.7:** Types of Chemical Reactions
    - **TRA-2.A:** Identify a reaction as acid-base, oxidation-reduction, or precipitation.

Objectives
By the end of this demonstration, students should be able to

- Identify signs of a chemical change.
- Recognize a single replacement reaction.

Chemistry Topics
This demonstration supports students’ understanding of

- Chemical change
- Limiting reagents
- Classification of reactions
- Percent yield

Time
**Teacher Preparation:** 10 minutes
**Lesson:** 30 minutes

Materials
- Copper wire
- Known concentration of silver nitrate
- Graduated cylinder
- Beaker

Safety
- Always wear safety goggles when handling chemicals in the lab.
- Students should wash their hands thoroughly before leaving the lab.
When students complete the lab, instruct them how to clean up their materials and dispose of any chemicals.

**Teacher Notes**

- Record the mass of Cu before the experiment. Note the volume and molarity of the AgNO₃ solution.
- The teacher can instruct students to answer questions 1 through 4 during the first class. Then, filter and dry the silver after class and have students finish calculations on day 2 when the mass of silver is available. Alternatively, the teacher could perform the reaction in advance of the first day of class, collecting and drying the silver before class starts. The teacher can then show students the demo using the same amounts of reactants and students can use the data from the teacher’s earlier trial for their calculations.

**Analysis Answers**

- Evidence of a chemical reaction: Copper wire gets “furry” and solution turns blue.
- Type: single replacement
- Why: copper ionizes (aq/blue) and silver ions become silver metal (solid)
- Remaining answers are dependent on mass of copper and molarity and volume of AgNO₃ used. Note: this is a limiting reagent problem.

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**FOR THE STUDENT**

**Lesson**

**Background**
Your teacher will place copper wire into a silver nitrate solution.

**Prelab question**
Will a reaction occur and how do you know?

**Analysis**

1. Will a reaction occur and how will you know if it has?
2. What kind of reaction took place?
3. What is happening on the molecular level that causes these macroscopic changes?

\[ \text{Cu(s)} + 2\text{AgNO}_3(aq) \rightarrow \text{Cu(NO}_3)_2(aq) + 2\text{Ag(s)} \]

4. Find out the molarity and volume used of silver nitrate and the mass of copper. What mass of silver should form?
5. What is the mass of the solid silver that was produced?
6. What is the percent yield?