

## Hi Ho Silver

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**Grade Level and Subject:** 10<sup>th</sup> and 11<sup>th</sup> grade Chemistry

**Teaching time:** 1-2 lab periods (60-90min)

### **Student Learning Objectives:**

1. Students know how to properly mix chemicals.
2. Students know how to write a balanced chemical equation.
3. Students can identify when a reaction has occurred.
4. Students will know the difference between a chemical reaction and a physical change.
5. Students can name the chemicals they are mixing.

### **National Science Standards addressed:**

Chemistry:

Nomenclature

Balancing equations

Identifying a chemical reaction vs. a physical change

### **California State Standards addressed:**

- Chemistry 3a. Students know how to describe chemical reactions by writing balanced equations.

### **Inquiry Components:**

- Students are able to interpret their data through a series of guided questions
- Students are able to make and record careful observations.
- Students are able to make predictions on the products formed in the reaction.

**Assessment:**

Students will answer a series of questions based on the lab. They will have to identify if a reaction is physical or chemical in nature. They will name the chemicals used in the lab and balance chemical equations. They will also record their observations and explain why they think a reaction is physical or chemical.

**Activity Overview:**

- This activity will demonstrate the difference between a physical change and a chemical reaction. Students will be asked to write down the criteria by they will use to judge if a reaction is physical or chemical. Nomenclature will be introduced and students will either give the chemical name or the chemical formula for all compounds used in the lab. For some reactions, students will predict the products formed and write out a balanced equation describing the reaction. This lab is best introduced after a lecture on nomenclature and balancing reactions. Students should be assigned a HW assignment before the lab on nomenclature, balancing reactions and predicting the products based on the reactants used. The HW should be discussed at least a day before lab to answer any questions the students may have.
- A pre-lab lecture on safety is essential to prevent accidents. Students should be warned not to get silver nitrate on their skin or it will discolor. Proper eyewear should also be worn at all times. This lab can be done in well plates instead of test tubes. This will help conserve chemicals and make cleanup more efficient.
- Dropper bottles, if available, should be used so that students do not waste or contaminate any of the chemicals. It is best to provide a set of bottles for each group so that the chemicals can be distributed efficiently and with little waste. Silver nitrate is photosensitive and should be kept in amber bottles or bottles which have been duct-taped. All other chemicals listed below can be stored in clear bottles. Silver nitrate is very expensive so it may not be possible to have a 1M solution. A lower concentration may be used but you must test out the reactants (NaBr, NaCl, KBr, KCl) to see how many drops of each will be necessary to precipitate out the silver salt.

**Directions: material required**

- 8 – dropper bottle (duct-taped or amber) of 1 M to 0.1M AgNO<sub>3</sub> (one per lab group)
- 8 – dropper bottle of 1 M NaBr (one per lab group)
- 8 – dropper bottle of 1 M NaCl (one per lab group)
- 8 – dropper bottle of 1 M KBr (one per lab group)
- 8 – dropper bottle of 1 M KCl (one per lab group)
- 8 – dropper bottle of vinegar or acetic acid (one per lab group)
- 8 – sample of solid NaCl (one per lab group)
- 8 – sample of NaHCO<sub>3</sub> (one per lab group)
- 8 – well plate with 6 holes or more (one per lab group)
- 8 – spatula (one per lab group)
- 8 – 50mL beaker (one per lab group)
- 8 – glass or wood stir rod (one per lab group)
- 8 – plastic pipette (one per lab group)

| <b>Teacher Tasks</b>   | <b>Student Tasks</b>  |
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| Lecture on nomenclature, balancing reactions and predicting products of a reaction.<br><br>Assign HW on material covered in lecture.   | Listen and take notes.<br><br>Do HW.  |
| Go over HW in class and discuss. Answer any questions the students may have.   | Ask questions on the HW.  |
| Prepare solutions and pour them into labeled, 2 oz dropper bottles. Set out the rest of the lab supplies.                              |   |
| Photocopy lab HO and question HO. You can reuse the lab HO.  |   |
| Lecture to students about safety. Warn them that Silver Nitrate will stain the skin and that safety eyewear must be worn at all times. | Listen, observe and take notes.   |
| Pass out lab HO and have one member for each lab group get the reagents and equipment.   | Read HO and get supplies.   |
| Walk around the room and help answer questions.  | Mix solutions and observe what happens. Determine if the observation is chemical or physical in nature. |

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| Stop the class with a minimum of 10min left to facilitate clean up. | Clean the beakers and well plates. Put back all supplies. |
| Post-lab discussion on the students' observations from the lab.     | Participate in discussion and take notes.                 |

**List of Resources:**

<http://www.fishersci.com> and <http://www.vwrsp.com>

These are the largest lab suppliers for bottles. We recommend dropper bottles with either a screw on cap or an attached cap. Simple press-on or flip-top caps are cheaper but will leak. We recommend Nalgene dropper bottles with the attached cap. These bottles are guaranteed to be “leak proof” and give very consistent drops. Fishersci has an education division to handle sales to K-12 schools. Catalogs can be ordered via their website.

**Acknowledgements:**

The “Hi Ho Silver” lab was adapted from “Chemical Reaction Stoichiometry,” a lab taught in first semester general chemistry at San Francisco State University.

This lab was developed in consultation with Dacotah Swett, a Chemistry teacher at Lowell High School, part of the San Francisco Unified School District.