

Alkali Metals Demonstration for Periodic Trends

Summary

Students will watch a demonstration of the reaction of alkali metals in water.

Time Frame

1 class periods of 60 minutes each

Group Size

Large Groups

Materials

- [student sheet](#)

(attached)

6 large beakers (600 mL will work)

Lithium, Sodium, Potassium: (these three kept under oil), Magnesium, Calcium and Aluminum pieces

Universal indicator (about 20 mL total)

Acid (6 M HCl, about 20 mL total)

Sharp knife

Cutting board

Forceps

Appropriate safety equipment

Background for Teachers

Lithium, Sodium and Potassium make an excellent demonstration of the periodic trend for ionization energy going down a group. One of the chemical properties that the alkali metals share is that they react violently with water:



The fact that they produce hydroxides when reacted with water is what gives them their name (alkali). In order for the reaction to happen, the alkali metals must become ions, losing an electron (ionization energy). Since Potassium's ionization energy is the lowest, the reaction will be most vigorous for Potassium. Likewise, since Lithium's ionization energy is the highest, the reaction will be least vigorous for Lithium. (I like to pull this out of the kids using questions.)

Instructional Procedures

Before class:

Fill each of the beakers about halfway with water, enough indicator to make a nice, bright color, and a few mL of acid (optional but makes the reaction more exciting).

Get samples of metal, NO MORE than 1 cubic centimeter in size. You may want to put them in small beakers instead of bringing the stock bottles out, but make sure that they are covered in oil if you do that.

You can set this up in the hood (which is a good idea because a significant amount of hydrogen gas will evolve) or you can do it at the front of the room, but make sure that the kids in the front are wearing goggles if you do that (it's a little bit excessive, but an appropriate safety precaution).

If you have a document reader or other small video camera to display the metals on the screen, this will help students in the back see better.

In Class:

Use the knife to slice into the metals so they can see how soft they are, and that it's shiny right when you cut it but immediately oxidizes and becomes dull (again, because of the periodic trend, potassium will oxidize the most rapidly).

Use the forceps to put the Lithium in the first beaker and watch it react. It bubbles (producing Hydrogen gas) but is not that exciting. It will produce lithium hydroxide so the solution will turn dark blue or purple.

Repeat for Sodium. This reaction will be more violent and usually will have some sparks or a flame. Note that the sparks/flames are the characteristic yellow-orange color for sodium.

Repeat for Potassium. This will be the most violent and can be quite impressive. Usually it will make a flame, which will be the characteristic violet color for potassium.

Repeat for calcium, magnesium and aluminum.

After Class:

Solutions should be neutralized with vinegar or another weak acid, and then can be washed down the sink.

Bibliography

Lesson Design by Jordan School District Teachers and Staff.

Authors

[Utah LessonPlans](#)