Burning Money Lesson

Plan

Amount of time Demo takes: 3-4 mins.
Don’t try this at home!

Materials

- Solution of 100 mL 91% isopropanol alcohol and 100 mL water. (200 mL/day)
  - Note: Alcohol evaporates. You may need to remake solution after a few hours.
- Dollar bills (2-4/day)
- Tongs
- Matches (1/8 large box/hr)
- Salt (1 tbsp/day)
- 250 ml beaker
- Glass Pie plate

Set-up Instructions

1. Prepare the solution (100 mL of isopropanol and 100 mL of water).
2. Add the salt to the alcohol/water solution in the beaker (this helps to produce a visible flame).
3. Soak the dollar bill in the solution so it is thoroughly wet.
4. Use the tongs to pick up the bill from the solution.
5. Move the 50:50 alcohol solution away from where you are going to light the dollar bill.
6. Light the bill on fire over the plate and let it burn until the flame goes out.

SAFETY!

- Fire is hot. Handle matches and flaming dollars with appropriate care; do not give matches to students or let them handle the flames.
- Make sure to move the solution away from where you are lighting the bill on fire!

Lesson’s Big Idea

- When you soak the dollar in the water-alcohol solution, the water molecules soak into the bill. Meanwhile, the alcohol molecules remain on the surface. Alcohol is highly flammable; when the match is brought near
the money, the alcohol burns. Additionally, the dollar remains damp because the temperature at which alcohol burns is not hot enough to evaporate the water or scorch the money. Once the alcohol has burned off, the dollar is left slightly damp but unharmed.

- The **combustion reaction** is \( C_2H_5OH + 4 \text{O}_2 \rightarrow 2 \text{CO}_2 + 3 \text{H}_2\text{O} + \text{heat} \)

  
  energy:

  \[
  \text{alcohol} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water} + \text{heat}
  \]

- This combustion reaction involves a reaction with alcohol and oxygen which gives rise to carbon dioxide and water. Combustion is the reaction between a fuel and oxygen. Other compounds can be produced from combustion reactions (i.e. pollution from coal and oil). Heat is a result of combustion reactions; reactions that release heat are called **exothermic reactions**.

- A real-world example of burning things without harming them is in cooking with wines and other alcohols as part of a sauce. One example is a popular flambéed dish at Greek restaurants called saganaki (known as “flaming cheese”).

**Clean Up**

- Clean up between demos if needed. When completely finished gather all materials listed for this demonstration and make sure everything is accounted for. If something was used up, broken or damaged, let someone know so it can get replaced or fixed.

- Dispose of waste solution and clean out the beaker, pie pan, tongs, etc.

**References**


- [http://www.naturalgas.org/environment/naturalgas.asp](http://www.naturalgas.org/environment/naturalgas.asp) Natural Gas.org

**Next Generation Science Standards**

- K-5
  - 2-PS1-2
  - 5-PS1-3

- 6-8
  - MS-PS3
● 9-12
  ○ HS-PS1
  ○ HS-PS3