Blue Bottle Lesson Plan

Amount of time Demo takes: 2-3 mins.
Don't try this at home!

Materials

- Warm Tap water
- Two 1-liter Erlenmeyer flasks, with stoppers (2 of each)
- 3 tsp glucose
  - a. 1 tsp (2.5 g) for one flask
  - b. 2 tsp (5 g) for the other flask
- 3 tsp sodium hydroxide NaOH
  - a. 1 tsp (2.5 g) for one flask
  - b. 2 tsp (5 g) for the other flask
- 0.1% solution of methylene blue (1 ml for each flask) (2 ml/demo)
- Spoons (2)
- Latex gloves (10/day)
- Funnel
- Electric kettle to heat water
- Vials to pre-measure ingredients

Set-up Instructions

1. Denote one flask as “flask A” and the other as “flask B”.
3. Dissolve 1 tsp of glucose in flask A.
4. Dissolve 2 tsp of glucose in flask B.
5. Dissolve 1 tsp of sodium hydroxide (NaOH) in flask A.
6. Dissolve 2 tsp of NaOH in flask B.
7. Use teaspoon to measure ingredients, fill vials use funnel.

SAFETY!

- Avoid skin contact with the solutions which contain caustic chemicals. The reaction neutralizes the solution, which can be disposed of by pouring it down the drain.
Lesson’s Big Idea

- Oxidation is the result of interactions between oxygen molecules and the other substances they contact. A cut apple turning brown and rust/pennies turning green are examples of oxidation occurring over time. When oxidation occurs electrons are being lost.
- In this particular reaction, the oxidation of glucose turns the solution from blue to clear.
- When you shake the solution, more oxygen is added to the solution and the blue color is restored.

Instructional Procedure

1. Add ~1 ml of 0.1% methylene blue to each flask.
2. Stopper the flasks and shake them to dissolve the dye. The resulting solution will be blue.
3. Set the flasks aside (this is a good time to explain the chemistry of the demo).
4. The liquid will gradually become colorless as glucose is oxidized by the dissolved dioxygen.
5. The effect of concentration on reaction rate should be obvious. The flask with twice the concentration uses the dissolved oxygen in about half the time as the other solution. A thin blue boundary can be expected to remain at the solution-air interface, since oxygen remains available via diffusion.
6. Restore the blue color by swirling or shaking the contents of the flask.
7. The reaction can be repeated several times (limit 8/hr.).

Clean Up

- Clean up between demos if needed. When completely finished gather all materials listed for this demo 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.

References

- [http://chemistry.about.com/od/chemistrydemonstrations/ss/bluebottle_3.htm](http://chemistry.about.com/od/chemistrydemonstrations/ss/bluebottle_3.htm)

Next Generation Science Standards

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