

The Magic Jug

A colorless solution is poured from a jug into five empty glasses, giving red, purple, brown, blue, and colorless solutions. The glasses are tipped into an empty beaker and the whole mixture is colorless again.

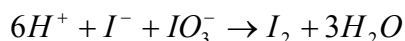
Procedure

1. Take 5 mL of the stock solution and mix with 600 mL of water in the jug.
2. Place 8 drops of solution from bottle 1 into beaker 1 and similarly for the other 4 bottles.
3. Pour the stock solution from the jug into each glass to get the colors described above.
4. Tip the numbered beakers into the 800 mL beaker in the following order, 5-4-3-2-1, and the solution turns colorless.

Discussion

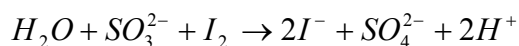
On the addition of alkaline solution from the jug into glasses 1 and 2, the acid/base indicators change color from colorless in neutral solution to the colors observed in the basic solution.

In glasses 3 and 4, the excess acid neutralizes the alkalinity of the solution from the jug and, in acid solution, the following reaction occurs:



The starch in glass 4 reacts with the iodine to give a deep blue color.

The sodium sulfite in glass 5 gives no color and, when the solutions are recombined, reduces the iodine to iodide



The acid in glasses 3 and 4 neutralizes the alkaline solutions in glasses 1 and 2 as they are poured into the beaker. Hence, all solutions give rise to a colorless solution as they are poured into the large beaker.

Solutions & Materials

1. Stock Solution (2.5 g NaOH, 0.5 g KI and 0.5 g KIO₃ dissolved in 50 mL H₂O)
2. Dropper bottles labeled 1-5 and filled with the following
 1. 1% phenolphthalein
 2. 1% thymolphthalein
 3. 25% H₂SO₄
 4. 25% H₂SO₄+Starch
 5. 20% Na₂SO₃

SOURCE:

Rook, T; (July 3, 1997) Department of Applied Chemistry, Royal Melbourne Institute of Technology.
<http://www.rmit.edu.au/departments/cm/eag/eagagric.html>