Ammonia Fountain

Purpose

To demonstrate the solubility of a gas and the effect of a gas pressure difference.

Materials

A large glass container   stopper assembly

1 liter round bottom flask   2 hole stopper to fit round bottom

phenolphthalein   glass tube

ring stand and iron ring   disposable pipet bulbs (2)

ammonia gas   disposable pipet

Procedure

1. The set-up for the apparatus is sketched below: (the disposable pipet must be fine tipped and the flask dry.)
2. Fill the beaker three-quarters with water and add a few drops of phenolphthalein indicator.
3. Fill the dropper with water and insert it into the stopper assembly.
4. Invert the flask and fill the flask with ammonia gas.
    a.   Use a lecture bottle of ammonia gas.
    b.   Alternative: React and equal amount of $NH_4Cl_{(5)}$ and $NaOH_{(5)}$ in a dray flask fitted with a one hole stopper and glass tube.
5. Collect enough gas to turn red litmus paper blue at the mouth of the inverted round bottom flask.
6. Seal the round bottom flask with the stopper assembly. Seal the long glass tube with a disposable pipet bulb.
7. Place the stopper assembly extending from the flask into the beaker. Make certain the glass tube is just above the bottom of the beaker.
8. To begin the reaction remove the pipet bulb from the glass tube while it is submerged. Squirt water from the dropper into the flask.
9. The water will rise in the tube and will spray into the flask as a pink fountain.

Labels: NH₃ gas; Dropper filled with water; Water
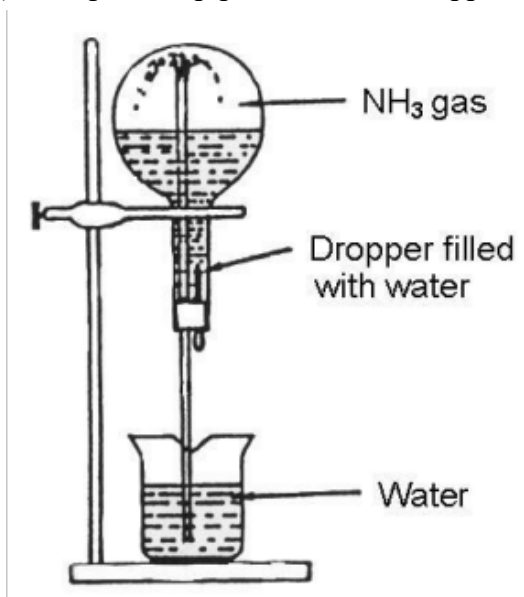
Additional Information

For a Holiday (red & green) version, add the following to the water:

10 mL bromothymol blue

5 mL methyl red

5 drops 6M HCl

Questions for the Students

1. What is the pressure of the ammonia in the flask before the water is added? How do you know?
2. What happens to the pressure of the ammonia gas when the water is added? Why?
3. At the end of the demonstration was the flask filled completely with water? What does this tell you?
4. Why is the water pink when it enters the flask?

Disposal

Solution can be poured down the drain.