Boyle's Law Lab

Introduction:

The relationship between the pressure and the volume of a gas sample was first studied and stated by Robert Boyle in the late 1600's. Using textbooks to produce pressure, you can study and graph the relationship between the pressure and the volume of a gas. It is assumed that the temperature and the quantity of the gas sample remain constant.

Chemistry Concepts:

Boyle's Law

Materials Needed:

- Thin-stem Beral pipet
- Hoffman clamp (screw-type)
- Colored water
- 50-mL beaker
- Metric ruler
- 6-8 textbooks

Procedure:

1. Fill a thin-stem pipet completely full of colored water. To get the pipet completely filled, fill the pipet as usual. Then, hold the pipet with the bulb down and the stem pointing up. Bend the stem over and place it into the beaker of colored water. Squeeze the bulb and fill with water.

2. Now, the stem of the pipet needs to be emptied. Carefully squeeze the bulb and release 5 or 6 drops of water. It is important to retain a small bit of water in the stem, and to have the stem mostly empty. If you make a mistake, refill the pipet and start again.

3. Place the screw clamp over the open end of the pipet and tighten it down tightly. You should now have a pipet with colored water completely filling the bulb and a small drop in the stem and a trapped column of air in the remainder of the stem. Make sure that there are no separated droplets of water in the stem and that the air column is continuous.

4. Place the filled pipet on the table. Measure the length of the air column with no books on the bulb. Record the data in your table.

5. Carefully place a book on the bulb of the pipet. Release the book onto the bulb slowly to avoid jarring the water in the pipet. Watch the column of air in the stem. If it continues to move, your clamp is not tight enough and you must start all over. If the column of air is stable, record the length of the air column.

6. Carefully continue adding one book at a time, placing them on the first book, and keeping the books centered on the bulb of liquid. After each book is added, record the length of the air column. Continue adding books and recording data until there are between six and eight books on the pipet.

7. Remove the books. Release the clamp from the end. Dispose of the colored water as instructed.

8. Graph the lab data you obtained. Record the pressure (measured in books) on the y-axis and the length of the air column (measured in mm) on the x-axis. Connect the points with a continuous smooth, predictable curve.