Buret Kinetics

Description: In this demonstration water is released from a 50 mL buret and the time required to release incremental volumes is measured. This experiment demonstrates a system with first order kinetics. Therefore, a graph of ln (V) vs. time will yield a straight line.

Materials:

- Water w/ food coloring
- 50 mL buret w/ ring clamp
- Tygon tubing (1/4”, 1 ft.)
- Tubing clamp
- Ring stand and clamp
- 50 mL graduated cylinder
- 600 mL beaker
- Lab jack
- Timer
- Disposable pipette tip

Procedure:

1. Setup the apparatus as shown in the figure below. Fit one end of the tubing around the pipette and attach the other end to the tip of the buret. Fill the entire apparatus (including tubing and pipette) with water and remove any air bubbles. Make sure the tip of the pipette is level as depicted (demonstration works best if pipette is clamped at a height close to the 47 mL mark).

2. Apply a slight amount of pressure using the tubing clamp (do not stop the flow of water). Place the graduated cylinder inside the evaporating dish and use the lab jack to adjust the height of the dish. The graduated cylinder should be adjusted to a 1/2” in front of the pipette tip so that the ejected water runs down the cylinder and into the dish below.

3. Adjust the apparatus and clamp pressure so that 10 mL of water will drain from the buret in 35-40 seconds. Be sure to test the setup prior to use. Upon performing the demonstration, add food coloring for better visibility.

4. Prior to the demonstration, fill the buret to the top, open the stopcock and begin timing when the water reaches the 0 mL mark. Record the time for 5 mL increments. Stop after passing 40 mL. Graph the volume of water in the buret vs. time (at time = 0, the volume in the buret = 50 mL). Using this data, graph ln (volume) vs. time to generate a first-order kinetics plot.
Safety: Care should be taken when inserting a glass pipette into rubber tubing. Do not apply too much pressure as the pipette may break and cut the hand.

Reference:

