**Plastic Density Determination by Titration**

Using titration, the end point is reached when a solution of the two liquids has a density equivalent to the plastic of the barrel. At this point, the plastic just becomes buoyant. The solution’s mass and density can be calculated since the solution volume and the volumes of both liquids at the end point of titration are known. The following procedure is used to determine density of the two liquids. Density of the plastic barrel is then determined utilizing titration and ethanol displacement. Sample data and calculated results are provided in the table.

**Procedure A:**

Density of ethanol and water

1. Fill two 50-mL burets, one with water and one with ethanol
2. Label two 100 (or 150) mL beakers #1 and #2
3. Mass beaker #1 and run 15.00 mL of ethanol into it from the buret
4. Mass the beaker and the ethanol. Save this for procedure B.
5. Repeat the above procedure using water and beaker #2. Save this for procedure B.

**Procedure B:**

1. Remove and discard from the barrel the inside ink cartridge and the end caps of a Bic Round Stic Pen
2. Use a sharp blade with caution to cut off two 3-4 mm pieces of the barrel. Save the remainder of the barrel for procedure C.
3. Drop one piece into beaker #1. Observe if the plastic sinks or floats.
4. Place beaker #1 containing ethanol and plastic under the buret with water. While stirring vigorously, titrate with water until the plastic just becomes buoyant.
5. Record the volume of water required to reach the endpoint.
6. Remove the plastic carefully from the solution and use a **graduated cylinder** to determine the solution’s volume.
7. Drop the plastic piece into beaker #2 and repeat steps 3-6 using ethanol.

**Procedure C:**

1. Determine the mass of the remaining (large piece) of Bic Round Stic pen barrel saved from procedure B.
2. Record the volume of ethanol remaining in the buret.
3. Drop the barrel into the ethanol buret and record the new volume.
4. Carefully turn buret upside down over sink to remove pen. If it becomes stuck, rinse with water.

**Calculations:**

1. Calculate the density of the two liquids from the Procedure A data.
2. Calculate the mass of both liquids (M=dV) in the titration using the densities obtained in Procedure A. Add the masses of water and ethanol to determine the solution’s mass at the end point.
3. Calculate the density of the plastic by using the solution’s mass and volume (from graduated cylinder). At the end point, the solution’s density is equivalent to that of the plastic.
4. Calculate the plastic density again, this time using the barrel mass and volume displacement of ethanol obtained in procedure C.

Percent Error

Calculate your percent error for water using 1.00g/ml

Calculate your percent error for ethanol using 0.789g/ml  
Calculate your percent error for plastic using the density from part C as the actual

In your conclusion

Be sure to indicate your answers by titration, answer by displacement and percent errors for the densities. Comment on if your densities of the plastic seem to be appropriate answers. Comment on the volume reduction of your titrated solutions. Include sources of error.