Density of Liqueurs—or, How to Prepare a Pousse Cafe

Pousse Cafe is a colorfully striped after-dinner drink usually sipped with coffee, thus called Pousse (pushing, "down") Cafe. It is prepared by slowly pouring successive layers of liqueurs, so that each ingredient floats on the preceding one.

The purpose of the experiment is to calculate the density of liqueurs from the equation, *density = mass/volume;* to show that the successive layers in Pousse Cafe are due to density differences; to determine the order in which different liqueurs should be added to prepare a Pousse Cafe; to show that a simple experiment in "chemistry" can be meaningful and fun; and, to bring some "culture" or "sophistication" to chemistry laboratory experiments.[1]

Experimental

The following apparatus and materials are required: 6 ml of the following liqueurs to each student; Grenadine (d = 1.18);[2] Parfait Amour (d = 1.13); Creme de Menthe, white (d = 1.10); Yellow Chartreuse (d = 1.05); Green Chartreuse (d = 0.99); Brandy (d = 0.95); a 5-ml volumetric flask (for Procedure A); an analytical balance; 10- or 25-ml volumetric or Erlenmeyer flask (for Procedure B); and a 5-ml pipet (for Procedure B).

Other interesting recipes of liqueurs to prepare "Around-the-World Pousse Cafes."[3] And given in order of decreasing densities are:

U. S. A.-England-France-Netherlands-Luxembourg-Liberia-Cuba: Blue—Blue Curacao; White—Maraschino; Red—Red Anisette.
U.N.-Finland-Scotland-Greece-Israel-Honduras-Guatemala: White—Triple Sec; Blue—Blue Curacao.
Austria-Denmark-Switzerland-Peru-Poland-Japan-Indonesia: White—Triple Sec; Red—Red Anisette.
Ireland: Green—Creme de Menthe, Green; White—White Anisette; Orange—Creme de Banana.
Sweden: Yellow—Liqueur Monastique; Blue—Blue Curacao.

Procedure A—Clean, then dry with acetone a 5-ml volumetric flask. Weigh the empty volumetric flask and stopper on an analytical balance. Fill the volumetric flask, with the liqueur(s) assigned to you by your Instructor, to the mark. Now, weigh the volumetric flask, stopper, and the liqueur on the analytical balance. Determine the density of the liqueur(s) from the equation, $d = mass/volume$.

Procedure B—Clean, then dry with acetone a small volumetric or Erlenmeyer flask (10 or 25 ml). Weigh an empty flask and stopper on an analytical balance. Transfer a sample of liqueur with a 5-ml pipet to the flask. Now weigh the flask, stopper, and the liqueur on the analytical balance. Determine the density of the liqueur(s) from the equation, $d = mass/volume$.

After determining the densities of the various liqueurs, list them according to decreasing densities.

Now, to prepare the Pousse Cafe, place a glass stirring rod in a 10-ml test tube, or a Pousse Cafe glass if available, and starting with the liqueur having the highest density and working your way down to the one with the lowest density, pour equal amounts of each slowly down the rod so that each liqueur floats on the preceding one.

Another method to accomplish this is to pour each ingredient slowly over a teaspoon held bottom side up. The inverted surface of the spoon will spread each layer slowly and evenly over the layer below without mixing.

At the conclusion of the experiment, sip it slowly.

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[1] The procedure was worked out during an NSF-Cooperative Science Improvement Project in Chemistry, at Rennsselaer Polytechnic Institute, Troy, N. Y., during Summer, 1972. Simultaneously, it was tested by Fundamentals of Chemistry students at Fulton-Montgomery Community College, Johnstown, N. Y., with quite a success.

[2] Density values given in paranthesis were determined experimentally and should be considered approximate, as values will vary from one distiller's product to another.

[3] Reproduced from "Mixologist's Manual for Perfect Pousse Cafe" of Bols Distilling Co., Louisville, Ky.

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