3.11.5: Lecture Demonstration

Volumes are not Additive

Demo: Add 50.0 mL (about 39.5 g, 1.23 mol) of Methanol (CH_3OH) to one 50 mL volumetric flask and 50.0 mL (50 g, 2.77 mol) of water to another, then combine in a 100.0 mL volumetric flask[1]. When solids and liquids are mixed, the total volume may be more than or less than the sum of the volumes (whether they're pure or solutions).

This demonstration allows a graphic introduction to concentration terms:

1. What is the molar concentration? Note that additional solvent must be added to the 100 mL volumetric flask to allow accurate determination of the solution volume.

2. Which is the solvent?

3. What is the molal concentration? Note: the molal concentration must be calculated before the volume is brought up to 100 mL, or the mass of additional water must be determined by weighing the flask.

4. What is the percent by mass and Volume?

References

1. ↑ J. Chem. Educ., 1997, 74 (11), p 1357