

Nine Bottles

Introduction

You will be given nine bottles numbered 1 through 9. Each bottle contains an aqueous solution of one of the following substances: $\text{Al}_2(\text{SO}_4)_3$, AgNO_3 , BaCl_2 , HCl , $\text{Pb}(\text{NO}_3)_2$, NaI , NaOH , Na_2S , or $(\text{NH}_4)_2\text{CO}_3$. You are to determine the identity of the chemical in each bottle by mixing small amounts of the contents from each bottle and observing the reactions that occur.

Pre-Lab

Before coming to lab, write the net ionic equation for the reaction that can occur when any two of these solutions are mixed (if a combination gives no reaction, write NR as the product in the net ionic equation). To predict the products of the reactions, see sections 5-2 and 5-3 in your textbook [Petrucci *et al*, General Chemistry: Principles and Modern Applications, 10th ed., ©2011].

<http://vpultz.sites.truman.edu/files/2021/01/Solubility.pdf> gives additional hints about solubility. When you write these reactions, organize them by reactant in the following order: $\text{Al}_2(\text{SO}_4)_3$, AgNO_3 , BaCl_2 , HCl , $\text{Pb}(\text{NO}_3)_2$, NaI , NaOH , Na_2S , $(\text{NH}_4)_2\text{CO}_3$. Note that you do not need to consider the reaction of a substance with itself, nor do you need to consider the reaction between two substances more than once (e. g., mixing $\text{Al}_2(\text{SO}_4)_3$ with AgNO_3 is the same as mixing AgNO_3 with $\text{Al}_2(\text{SO}_4)_3$). It would also be wise to prepare a table in the Results section of your notebook to help organize your observations.

Procedure

You will be provided with **three** 12-well well strips, which are just enough wells for you to perform the required reactions. The solutions will be provided to you in dropper bottles. Carefully dispense three drops each of the two reagents to be tested into a well and note any precipitation, gas formation, or color change that occurs. Record your observations in your notebook. It is a good idea to hold the bottle upright directly over the well into which you want to deliver the solution.

When you have run all of the necessary reactions, dispose of the solutions in the well-strips in the hazardous waste container that your instructor will point out to you. Rinse the empty well plates with a small amount of water and discard the rinse water in the waste container. Discard the rinsed well strips in a laboratory garbage can.

Analysis

Using your observations and the reactions that you predicted, assign the identity of each of the solutions. Rationalize any observations that are not consistent with your predictions (you may have to rewrite your chemical equations).