

Pd lab- finding unknown salt essay



**ASSIGN
BUSTER**

LAB#: 20 SKILL: Planning and Designing OBSERVATIONS: A student is given a small beaker containing an unknown salt, x. The salt is crystalline, deliquescent and colorless. The student is asked to perform test and observation on the salt to determine the cation and anion present.

HYPOTHESIS: Perhaps by using the flame test or reacting salt x with NaOH, or NH₄OH the cation could be distinguished by observing the color changes or solubility while reacting salt x with H₂SO₄ or a mixture of copper turnings and concentrated sulphuric acid the anion of the salt could be found.

AIM: To determine the constituents of salt x. APPARATUS/MATERIALS: * Salt x

* Concentrated hydrochloric acid * Concentrated sulphuric acid * Platinum wire * Bunsen burner * 2 test tubes * Universal pH paper * Water * 4

Droppers * Dilute sodium hydroxide * Ammonium hydroxide (ammonium solution) * Copper turnings * Ammonium salt (NH₄Cl) * Alkali (Ca(OH)₂)

METHOD: 1.) Moisten a small amount of the solid with concentrated hydrochloric acid and dip a piece of platinum wire into the mixture and heat strongly in a Bunsen's flame. 2. Observe and record the color of the flame produced. 3.) If no color changes during the flame test then place an adequate amount of salt x in a test tube and prepare a solution of it by adding water. 4.) Using the dropper, add 10 drops of dilute NaOH solution to the solution of the sample and look for a precipitate. 5.) Add excess NaOH solution and look for the precipitate re-dissolving. 6.) If no precipitate is formed, heat the test tube gently over a Bunsen's flame and test for Ammonia by using a universal pH paper 7. Record relevant observations. 8.) If the precipitate is white in color and is soluble in excess NaOH then carry out procedure 9. 9.) Repeat procedures 3 to 7 with NH₄OH and record

relevant observations. 10.) To test for the cation Observe and record the color of the salt. 11.) Place an adequate amount of salt x in a dry test tube and add concentrated sulfuric acid and copper turnings then warm gently. 12.) If a blue solution is not formed and nitrogen dioxide is not evolved then, take a small sample of the salt and add concentrated sulphuric acid.

Warm if no reaction occurs. Record the odor of the gas. 13.) Test the gas evolved by reacting it with ammonia gas. Ammonia gas is produced by heating its salt and an alkali together ($\text{NH}_4\text{Cl} + \text{CaOH}$). 14.) Observe and record the color the gas produced and tested. 15.) A table of observations was made. VARIBALES: i. Things to be kept constant 1. Salt x ii. Responding Variable 1. Colors and texture of precipitate iii. Manipulated variable 1.

Chemicals DATA DISPLAY:

Testing for:	Tests done	Observations recorded	Cation present
Appearance		Flame Test	
Flame Test		Cation	NaOH
NaOH		NH ₄ OH	
Anion present	Anion	Appearance	
NO ₃ test		H ₂ SO ₄	

TREATMENT OF RESULTS: Using the observation recorded; try to eliminate cations and anions that do not correspond to the colors or texture of the precipitate that was observed. EXPECTED RESULTS: The salt, being deliquescent and colorless it contains either the anion Chloride or Nitrate.

After performing the flame test, if the color of the flame observed was neither lilac (to indicate the presence of potassium ions), orange-yellow (for sodium ions), brick red (for Calcium ions), Bluish (for Lead ions), or blue-green (for copper ions) then the cations are either Aluminum(III), Zink(II), Iron(II), Iron(III) or Ammonia. To further distinguish between these cations,

the addition of sodium hydroxide solution is performed. During this procedure if the salt produced a white precipitate that is soluble in excess NaOH then there are three possibilities, in which one was already eliminated during the flame test (Pb^{2+}).

The salt would either be Aluminum(III) or Zinc(II). If other precipitates of different colors are formed, the cation could be easily identified since there is only one possible cation. If no precipitate and ammonia gas evolved when heated then it contains ammonia. To distinguish between the Al^{3+} and the Zn^{2+} , dilute ammonia solution (Ammonium Hydroxide) is added. If the white precipitate formed is insoluble in excess NH_4OH then there are 2 likely cations in which one was already eliminated using the flame test, that is Pb^{2+} , then the one left would be Al^{3+} .

If the white precipitate is soluble in excess NH_4OH then the cation present is Zn^{2+} . It is recognized that the anion of the salt is either a chloride or a nitrate. By adding sulphuric acid and copper turnings to the solid, the solution would turn blue and nitrogen dioxide would be evolved if nitrate ions are present. If when concentrated sulphuric acid is added to a sample of the solid the vapor evolved has a sharp acid smell and forms dense white fumes with ammonia then chloride ions were present.

SOURCES OF ERRORS/LIMITATIONS: i. The salt and chemicals were not clearly labeled therefore there is a confusion in the identity of the chemicals and they were wrongly used ii. There was a large concentration of the salt and made it hard for the NaOH or NH_4OH solutions to dissolve the precipitate, making experimenters think it is insoluble. ASSUMPTIONS: * The

salts, water and solutions did not contain impurities * The Dropper and test tube was clean and did not have impurities * The ch