Exp. No. 3	Experiment/Subject Qualitative Analysis of cations	Date 9/25/2023	
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Qualitative Analysis of Cations

Reference: "An Experiments in thinking scientifelly," D.J Sasdella J Chem Ed 69 933 (1992)

Purpose: Analyze unknown solution that may contains three number ions in solution.

Purpose: analyze known and unknown solution may react differtly experiment so we can be precaution such reaction.

Material: Fe^{3+}, Ni^{2+}, Mg^{2+}, Cu^{2+}

Procedure: In each experiment, arrage four test according to the lab manual picture.

First row of tubes will correponds to rows on table.

First column of test tube is corrponding to column A on the data tables

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Produces

Known solution

1- Put 20 drops of the ($Fe(No_3)_3$) in the first four tables.

2. do the same for anther test tubes (5-16)

With solution.

3- put 4 drops of (NaI) in the first test tube of caution solution repat the same for another test tubes (5-16) with solution.

4. Write down the observe of reation in the table record the color and amount of an precipitates.

Unknown Solution -

1- Try find the cations in the unknown Solution in the vial.

2. Repeat same step as the known solution. for 2 to 3.

3- Clean up - carefully pour all solution in the ~~Sodium~~ waste container, then dry and clean test tube and rise of Soap or acetone to remove residue.

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	A	B	D	E
	7.5% NaI	0.25M NaFe(CN)$_2$	0.25M Dimethylyloxim	1M NaOH
1. 0.25M $Fe(NO_3)_3$	mix little yellow and orange. clear.	~~mix little yellow … but~~ ~~[illegible]~~ blue and little partical	~~dark~~ yellow ~~[illegible]~~ with ~~clear~~ midamount of particles	little dar orage. clear.
2. 0.1M $Ni(NO_3)_2$	Clear/No color	very little green with some particles.	pink but little amount of particles	clear but mor particle that sticked in the tuble
3. 0.1M $Mg(NO_3)_2$	Clear/No color	~~yellow~~ white color but no particles	clear, nonparticles	fizzy with lot particles no color
4 0.1M $Cu(NO_3)_2$	brown ~~clear~~/ bitts of particles sticwith tube.	dark brown with high particles.	clear ~~brown~~ but some particles	little blue little particles
5 Unknown	mud brown with more particals	dark brown with higher particles	clear non particles	mid blue and ~~large~~ higher particle amount

Signature	Date	Witness/TA ND	Date

Discussion: Cu (NO3)2 is the unknown liquid that was given to my instructor. I was able to identify the unknown chemical through the similar types of reactions that occurred in the five known chemicals, such as Fe (NO3)3, Ni (NO3)2, Mg (NO3)2, and Cu (NO3)2, which are reacted based on different chemicals that were added. Unknown and Cu(NO3)2 have similar reactions with other chemicals such as 7.5% NaI will react and form a yellowish liquid with some precipitate, Na4Fe(CN)6 is reacted and forms dark brown with a higher amount of precipitate, Dimethylglyoxime doesn't change it apprentices or create precipitate, and 1 M NaOH reacts and changes its color of light blue with no precipitate. These are reactions that include the unknown chemical CU(NO3)2.

Conclusion: The experiment's purpose is to deter the known and unknown ions so that precautions can be performed before the experiments. Gones were achieved by observing serval types of chemicals react to the known to determine the unknown. And see if it can be a precaution before an experiment that will be conducted in the future. Expect that chemicals can change their physical appearance and form some or higher level of precipitation. The most of solutions reacted and changed their colors but some of them were clear when they reacted with 0.25 Dimethylglyoximes. The Unknown had related the same types of reaction as CU(NO3)2 which has been predicted as the unknown solution. In future experiments, there Needs to be careful and mindful about the types of chemicals that react and strictly follow the table content.

1. Balance and classify the following reactions: combination (C), decomposition (D), single replacement (SR), double replacement (DR) or combustion (CB).

Classification

a. $\_1\_ C_3H_8\ (g) + \_5\_ O_2\ (g) \rightarrow \_3\_ CO_2\ (g) + \_4\_ H_2O\ (l)$ CB

b. $\_2\_ K\ (s) + \_2\_ H_2O\ (l) \rightarrow \_2\_ KOH\ (aq) + \_1\_ H_2\ (g)$ SR

c. $\_1\_ MgSO_4\ (aq) + \_1\_ Na_2CO_3\ (aq) \rightarrow \_1\_ MgCO_3\ (s) + \_1\_ Na_2SO_4\ (aq)$ DR

d. $\_1\_ Cl_2\ (g) + \_2\_ NaI\ (s) \rightarrow \_2\_ NaCl\ (s) + \_2\_ I_2\ (s)$ SR

e. $\_2\_ NaNO_3\ (s) \rightarrow \_2\_ NaNO_2\ (s) + \_1\_ O_2\ (g)$ D

f. $\_1\_ H_2\ (g) + \_1\_ Cl_2\ (g) \rightarrow \_2\_ HCl\ (g)$ C

g. $\_3\_ Ca(C_2H_3O_2)_2\ (aq) + \_2\_ H_3PO_4\ (aq) \rightarrow \_1\_ Ca_3(PO_4)_2\ (s) + \_6\_ HC_2H_3O_2\ (aq)$ DR

h. $\_2\_ H_2O_2\ (l) \rightarrow \_2\_ H_2O\ (l) + \_1\_ O_2\ (g)$ D

i. $\_2\_ Na\ (s) + \_1\_ S\ (s) \rightarrow \_1\_ Na_2S\ (s)$ C

j. $\_1\_ BaCl_2\ (aq) + \_1\_ K_2CrO_4\ (aq) \rightarrow \_1\_ BaCrO_4\ (s) + \_2\_ KCl\ (aq)$ DR

2. Balance each of the following equations. Then write the total (complete) ionic equation for each reaction. Finally write the net ionic equation for each reaction. ***Remember: insoluble substances are not present as separate ions in solution.***

a. 1 $Pb(NO_3)_2$ (aq) + 2 NaOH (aq) → 1 $Pb(OH)_2$ (s) + 2 $NaNO_3$ (aq)

Complete Ionic equation: Pb+2(aq)+2NOs-(aq)+2O-2(aq)+2h+(aq) ---> Pb(OH2)(s)+ 2Na+ +2No-3

Net ionic equation:

b. 2 Na_3PO_4 (aq) + 1 $Ca(NO_3)_2$ (aq) → 1 $Ca_3(PO_4)_2$ (s) + 1 $NaNO_3$ (aq)

Complete Ionic equation: 2Na+3+2PO-3 4+ 3Ca+2+3NO-3--->CA3(PO4)2+6Na+6NO3-

Net ionic equation: Cl- + Ag +--> AgCl

c. 1 NaCl (aq) + 1 $AgNO_3$ (aq) → 1 AgCl (s) + 1 $NaNO_3$ (aq)

Complete Ionic equation: Na+ + Cl- + Ag+ + NP-3---> AgCl + Na+ + NO-3

Net ionic equation: Cl- + Ag--> AgCl

d. 1 Na_2SO_4 (aq) + 2 $AgNO_3$ (aq) → 1 Ag_2SO_4 (s) + 2 $NaNO_3$ (aq)

Complete Ionic equation: Na2+ + SO4 -2 + 2Ag+ + 2NO3- --> AgCL+ NA+ + No3-

Net ionic equation: SO4 -2 + 2Ag+--> Ag SO4

e. 1 Na_2CO_3 (aq) + 1 $BaCl_2$ (aq) → 1 $BaCO_3$ (s) + 2 NaCl (aq)

Complete Ionic equation: Na2+ + CO3-3 + Ba+2 + Cl2- ---> BCO3+ 2NA+ 2Cl-

Net ionic equation: Co-2 3 + Ba +2 --> BaCO3

f. 1 Na_2CO_3 (aq) + 2 HCl (aq) → 2 NaCl (aq) + 1 H_2O (l) + 1 CO_2 (g)

Complete Ionic equation: Na2+ + C03-2 + 3H+ 2Cl---> 2NA+ 2Cl- + H20 + CO2

Net ionic equation: CO3-2 + 2H+ --> H2O+ CO2