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CH201
Lab 6

Lab 6: Ionic Compounds

Data:

Data Table 1. Conductivity of Solutions

Sample	Conductivity (µS/cm)
0.10 M NaCl	10400.0
Saturated $Ca(OH)_{2(aq)}$	5000.0
0.10 M HCl	23900.0
0.10 M H_2SO_4	24017.0
0.10 M $HC_2H_3O_2$	402.0
0.10 M $NaC_2H_3O_2$	5497.5
0.10 M $C_{12}H_{22}O_{11(aq)}$ (dextrose)	2.5

Data Table 2. Relative Hardness, Solubility, and Melting Point

Sample	Relative Hardness	Relative Solubility	Relative Melting Point
Compound 1	Hard/Granular	Completely Soluble	High
Compound 2	Soft/Powdery	Completely Soluble	Low
Compound 3	Very Hard/Granular	Completely Soluble	High

Concentration of $AgNO_3$: 0.1 M

Data Table 3. Solution Reaction to $AgNO_3$

Sample	Drops $AgNO_3$ Trial 1	Drops $AgNO_3$ Trial 2	Drops $AgNO_3$ Trial 3
$NaCl_{(aq)}$	28	29	20
Tap Water	1	1	1
Ocean Water	46	38	28

Calculations:

Part C: Calculations for Trial 1 of $NaCl_{(aq)}$

Water Volume (L) = 21 drops * (1 ml/ 20 drops) * (1 L/ 1000mL) = 0.0011 L

Volume $AgNO_3$ (L) = 28 drops * (1 mL/ 20 drops) * (1 L/ 1000mL) = 0.0014 L

Moles $AgNO_3$ = 0.1 mols $AgNO_3$/L * 0.0014 L = 0.00014 mols $AgNO_3$

Moles Ag^{+1} = Moles $AgNO_3$

Moles Cl^{-1} = Moles Ag^{+1}

Molarity Cl^{-1} = 0.00014 mols Cl^-/ 0.0011 L $NaCl_{(aq)}$ = 0.13 mols Cl^- / L $NaCl_{(aq)}$

Results:

Results Table 1. Part A

Sample	**Electrolyte Type**	**Dissociation**
0.10 M NaCl	Strong Electrolytes	$NaCl_{(s)} \rightarrow Na^+_{(aq)} + Cl^-_{(aq)}$
Saturated $Ca(OH)_{2(aq)}$	Strong Electrolytes	$Ca(OH)_{2(s)} \rightarrow Ca^{2+}_{(aq)} + 2OH^-_{(a)}$
0.10 M HCl	Strong Electrolytes	$HCl_{(s)} \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$
0.10 M H_2SO_4	Strong Electrolytes	$H_2SO_{4(s)} \rightarrow 2H^+_{(aq)} + SO_4^{-2}{}_{(aq)}$
0.10 M $HC_2H_3O_2$	Weak Electrolytes	$HC_2H_3O_{2(s)} \longleftrightarrow C_2H_3O_2^-{}_{(aq)} + H_3O^+_{(l)}$
0.10 M $NaC_2H_3O_2$	Strong Electrolytes	$NaC_2H_3O_{2(s)} \rightarrow Na^+_{(aq)} + C_2H_3O_2^-{}_{(aq)}$
0.10 M $C_{12}H_{22}O_{11(aq)}$ (dextrose)	Non-electrolytes	

Part B:

Compound 1: Ionic

Compound 2: Covalent

Compound 3: Ionic

Results Table 2. Part C

Sample	Test Tube	Water Volume (L)	Volume $AgNO_3$ (L)	Moles $AgNO_3$ (mols)	Moles Ag^{+1} (mols)	Moles Cl^{-1} (mols)	Molarity Cl^{-1} (M)
$NaCl_{(aq)}$	1	0.0011	0.0014	0.00014	0.00014	0.00014	0.13
$NaCl_{(aq)}$	2	0.0011	0.0015	0.00015	0.00015	0.00015	0.14
$NaCl_{(aq)}$	3	0.0011	0.001	0.0001	0.0001	0.0001	0.095
Tap	1	0.0011	0.00005	0.000005	0.000005	0.000005	0.0048
Tap	2	0.0011	0.00005	0.000005	0.000005	0.000005	0.0048
Tap	3	0.0011	0.00005	0.000005	0.000005	0.000005	0.0048
Ocean	1	0.0011	0.0023	0.00023	0.00023	0.00023	0.2
Ocean	2	0.0011	0.0019	0.00019	0.00019	0.00019	0.18
Ocean	3	0.0011	0.0014	0.00014	0.00014	0.00014	0.13

Discussion and Conclusion:

This lab's aim was to test various compounds in solid and aqueous states to understand the nature of how the elements are bonded and test the theoretical qualities of such bonds. In Part A various solutions were tested for their conductivity, ionic compounds are understood to dissociate in a solution and the aqueous ions make the solution conductive. In Part B three compounds were tested for hardness, solubility and melting point. In Part C the molarity of Chloride in a solution was estimated using the theoretical understanding of how Ag^+ and Cl^- will react and form AgCl when dissociated in a solution. Part C demonstrates a method for estimating other ions in a particular solution.

In Part A, the solutions made from ionic compounds showed greater conductivity when compared to covalent compounds in solution. In Part B, the compound-type identification was based on the trend that ionic compounds tend to have higher melting points when compared to covalent compounds. In Part C, the difference between the average molarity of Cl^- calculated between Tap Water and Ocean Water is about .1652, with Ocean Water having the larger molarity. The molarity of chloride in potable water is approximately 0.0014 M, the value found in this lab was 0.0048 M, the tap water is likely potable. The molarity of chloride in ocean water is approximately 0.479 M, this is 2.8 times larger than the average found in this lab.

Supplementary Problems:

A.

1. $NaC_2H_3O_2$
2. CoO
3. $ZnCrO_4$
4. HI
5. $Ca(OH)_2$
6. $Ba(NO_2)_2(H_2O)_8$
7. $AuCl_3$
8. $CdO(H_2O)_6$
9. H_2CO_3
10. HNO_2
11. $Pb(CN)_2$
12. Li_2S
13. $Ag_2Cr_2O_7$
14. $Sn(HSO_4)_2$
15. $ZnSO_3$
16. $P(BrO_4)_3$
17. $FrMnO_4$
18. $Al(ClO_3)_3$
19. CuF_2
20. $Be(ClO_2)_2$
21. $Pt(NO_3)_4$
22. Ag_2HPO_4
23. $Mn(NO_2)_4$
24. NaH_2PO_4

B.

1. Chloric Acid
2. Manganese (II) Carbonate
3. Lithium Hydroxide
4. Rubidium Fluoride
5. Zinc (II) Perchlorate
6. Nickel (IV) Sulfite
7. Strontium Phosphate
8. Ammonium Hypochlorite
9. Bromic Acid
10. Silver Permanganate Hexahydrate
11. Beryllium Chloride
12. Strontium Iodide
13. Chlorous Acid
14. Gold (III) Phosphide

15. Nickel (II) Sulfate
16. Lithium Dichromate
17. Cesium Hydrogen Phosphate
18. Ammonium Sulfate
19. Zinc (II) Acetate
20. Silver (I) Phosphate
21. Lithium Dihydrogen Phosphate
22. Potassium Hypobromite Heptahydrate
23. Tin (II) Fluoride
24. Hydrogen Monobromide