

Solutions & Solubility: Net Ionic Equations (9.1 in MHR Chemistry 11)

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Solubility vs. Temperature



Friday, April 5, 2013

Solubility Table



Solubility Table Create soluble and insoluble compounds using OH-



Friday, April 5, 2013

Writing Net Ionic Equation

- 1. Write the overall balanced chemical equation.
- 2. Write the total ionic equation.
 - Break all aqueous compounds into constituent ions using solubility information (page 363).
 - Leave solids, liquids and gases alone.
- 3. Write the net ionic equation.
 - Identify and cancel spectator ions in the total ionic equation.
 - Reduce coefficients if necessary.

Sample Problem 1 – Net Ionic Equation

Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride. 6

Writing Net Ionic Equation

1. Write the overall balanced chemical equation.

Step 1 - Overall balanced chemical equation

Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride.

> $AgNO_{3 (aq)} + NaCI_{(aq)}$ $\rightarrow AgCI_{(?)} + NaNO_{3 (?)}$

Writing Net Ionic Equation

- 1. Write the overall balanced chemical equation.
- 2. Write the total ionic equation.
 - Break all aqueous compounds into constituent ions using solubility information (page 363).
 - Leave solids, liquids and gases alone.

Step 1 - Overall balanced chemical equation

Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride. AgNO_{3 (aq)} + NaCl (aq)

 \rightarrow AgCl (?) + NaNO_{3 (?)}

Check solubility information (page 363)



Check solubility information (p. 363)

$NaNO_{3(?)} \Rightarrow NaNO_{3(aq)}$

SOLUBILITY Table 5, page 324		Anions							
		Cl ⁻ , Br ⁻ , l ⁻	S ²⁻	OH-	SO ₄ ²⁻	CO ₃ ²⁻ , PO ₄ ³⁻ , SO ₃ ²⁻	C ₂ H ₃ O ₂ -	NO ₃ ·	
Cations	High solubility (aq) ≥ 0.1 mol/L at SATP	Most	Group 1, NH,⁺. Group 2	Group 1, NH₄ ⁺ , Sr ^{∠+} , Ba ²⁺ TI ⁺	Most	Group 1, Most		All	
		All Group 1 compounds, including acids, and all ammonium compounds are assumed to have high solubility in water.							
	Low solubility (s) < 0.1 mol/L at SATP	Ag ⁺ , Pb ²⁺ , Tl ⁺ , Hg ₂ ²⁺ , (Hg ⁺), Cu ⁺	Most	Most	Ag⁺, Pb²+, Ca²+, Ba²+, Sr²+, Ra²+	Most	Ag⁺	None	

Step 1 - Overall balanced chemical equation

Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride. AgNO_{3 (aq)} + NaCl (aq)

 \rightarrow AgCl (s) + NaNO₃ (aq)

Writing Net Ionic Equations Step 2 – Total ionic equation

Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride. NaCl (aq) AgNO_{3 (aq)} $Ag^{+}_{(aq)} + NO_{3}^{-}_{(aq)} + Na^{+}_{(aq)} + Cl^{-}_{(aq)}$ \rightarrow AgCl (s)+ $Na^+_{(aq)}$ + $NO_3^{-}(aq)$ NaNO_{3 (aq)} Do not dissociate into 14 ions

Writing Net Ionic Equations Step 2 – Total ionic equation

Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride.



Writing Net Ionic Equation

- 1. Write the overall balanced chemical equation.
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Writing Net Ionic Equations Step 3 – Net ionic equation

Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride.

$$Ag^{+}_{(aq)} + Cl^{-}_{(aq)} \rightarrow AgCl_{(s)}$$

Spectator ions: $NO_3^{-}(aq)$, $Na^{+}(aq)$

Complete Solution

Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride.

Step 1. Complete Balanced Chemical Equation AgNO_{3(aq)} + NaCl _(aq) → AgCl _(s) + NaNO_{3 (aq)}

Step 2. Total lonic Equation $Ag^{+}_{(aq)} + NO_{3}^{-}_{(aq)} + Na^{+}_{(aq)} + CI^{-}_{(aq)} \rightarrow AgCl_{(s)} + NO_{3}^{-}_{(aq)} + Na^{+}_{(aq)}$

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Step 3. Net Ionic Equation $Ag^{+}_{(aq)} + CI^{-}_{(aq)} \rightarrow AgCI_{(s)}$

Spectator ions: NO₃⁻ (aq), Na⁺ (aq)

Sample Problem 2 – Net Ionic Equation

Write the net ionic equation for the reaction between aqueous lithium carbonate & aqueous calcium acetate 19

Step 1 - Overall balanced chemical equation

Write the net ionic equation for the reaction between aqueous lithium carbonate and aqueous calcium acetate.

 $Li_2CO_3_{(aq)} + Ca(C_2H_3O_2)_2_{(aq)}$ $\rightarrow 2 LiC_2H_3O_2_{(?)} + CaCO_3_{(?)}$

Check solubility information (p. 363)

$LiC_2H_3O_{2(?)} \Rightarrow LiC_2H_3O_{2(aq)}$

SOLUBILITY Table 8.3 page 363 in MHR		Anions							
		Cŀ, Br, ŀ	S ²⁻	OH-	SO ₄ ²⁻	CO ₃ ²⁻ , PO ₄ ³⁻ , SO ₃ ²⁻	C ₂ H ₃ O ₂ ·	NO ₃ -	
Cations	High solubility (aq) ≥ 0.1 mol/L at SATP	Moot	Group 1,	Group 1, NH₄+, Sr ²⁺ , Ba ²⁺ , TI⁺	Moot	Group 1, NH₄⁺	Most	All	
		All Group 1 compounds, including acids, and all ammonium compounds are assumed to have high solubility in water.							
	Low solubility (s) < 0.1 mol/L at SATP	Ag⁺, Pb²+, Tl⁺, Hg₂²+, (Hg⁺), Cu⁺	Most	Most	Ag⁺, Pb²+, Ca²+, Ba²+, Sr²+, Ra²+	Most	Ag⁺	None	

Check solubility information (p. 363)

Ca		(?)		CaC	CO _{3 (}	s)				
SOLUBILITY Table 8.3 page 363 in MHR		Anions								
		Cŀ, Br, ŀ	\$ ²⁻	OH.	SO ₄ ²⁻	CO PC SC	2- 3-, 4-, 2-	C ₂ H ₃ O ₂ -	NO ₃ -	
0	High solubility (aq) ≥ 0.1 mol/L at SATP	Most	Group 1, NH ₄ +, Group 2	Group 1, NH ₄ +, Sr ²⁺ , Ba ²⁺ , TI+	Most	Grou Nł	ip 1, I ₄ +	Most	All	
Cation		All Group 1 compounds, including acids, and all ammonium compounds are assumed to have high solubility in water.								
	Low solubility (s) < 0.1 mol/L at SATP	Ag ⁺ , Pb ²⁺ , Tl ⁺ , Hg ₂ ²⁺ (Hg ⁺), Cu ⁺	Moot	Moot	Ag ⁺ , Pb ²⁺ , Ca ²⁺ , Pa ²⁺ , Sr ²⁺ , Ra ²⁺	Mc	ost	Ag⁺	None	

Step 1 - Overall balanced chemical equation

Write the net ionic equation for the reaction between aqueous lithium carbonate and aqueous calcium acetate.

 $Li_2CO_3_{(aq)} + Ca(C_2H_3O_2)_2_{(aq)}$ $\rightarrow 2 LiC_2H_3O_2_{(aq)} + CaCO_3_{(s)}$

Writing Net Ionic Equations Step 2 – Total ionic equation

Write the net ionic equation for the reaction between aqueous lithium carbonate and aqueous calcium acetate.

 $i_{(aq)} + CO_3^{2-} + Ca^{2+} + Ca^{2+} + 2 C_2 + 3O_2^{-} + Ca^{2+}$ $\rightarrow 2 \operatorname{Li}_{(aq)} + 2 \operatorname{C}_{2} \operatorname{H}_{3} \operatorname{O}_{2}_{(aq)} + \operatorname{CaCO}_{3} ($

Writing Net Ionic Equations Step 3 – Net ionic equation

Write the net ionic equation for the reaction between aqueous lithium carbonate and aqueous calcium acetate.

$$Ca^{2+}_{(aq)} + CO_3^{2-}_{(aq)} \rightarrow CaCO_3_{(s)}$$

Spectator ions: $C_2H_3O_2^{-}$ (aq), Li^+ (aq)

Complete Solution

Write the net ionic equation for the reaction between aqueous lithum carbonate and aqueous calcium acetate.

Step 1. Complete Balanced Chemical Equation $Li_2CO_{3(aq)} + Ca(C_2H_3O_2)_{2 (aq)} \rightarrow 2 LiC_2H_3O_{2 (aq)} + CaCO_{3 (s)}$

Step 2. Total lonic Equation $2 \operatorname{Li}_{(aq)}^{+} + \operatorname{CO}_{3}^{2-}_{(aq)}^{+} + \operatorname{Ca}_{(aq)}^{2+} + 2 \operatorname{C}_{2} \operatorname{H}_{3} \operatorname{O}_{2}^{-}_{(aq)}^{-} \rightarrow 2 \operatorname{Li}_{(aq)}^{+} + 2 \operatorname{C}_{2} \operatorname{H}_{3} \operatorname{O}_{2}^{-}_{(aq)}^{+} + \operatorname{CaCO}_{3 (s)}^{-}$

Step 3. Net Ionic Equation $Ca^{2+}_{(aq)} + CO_{3}^{-}_{(aq)} \rightarrow CaCO_{3}_{(s)}$

Spectator ions: $C_2H_3O_2^{-}$ (aq), Li^+ (aq)



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