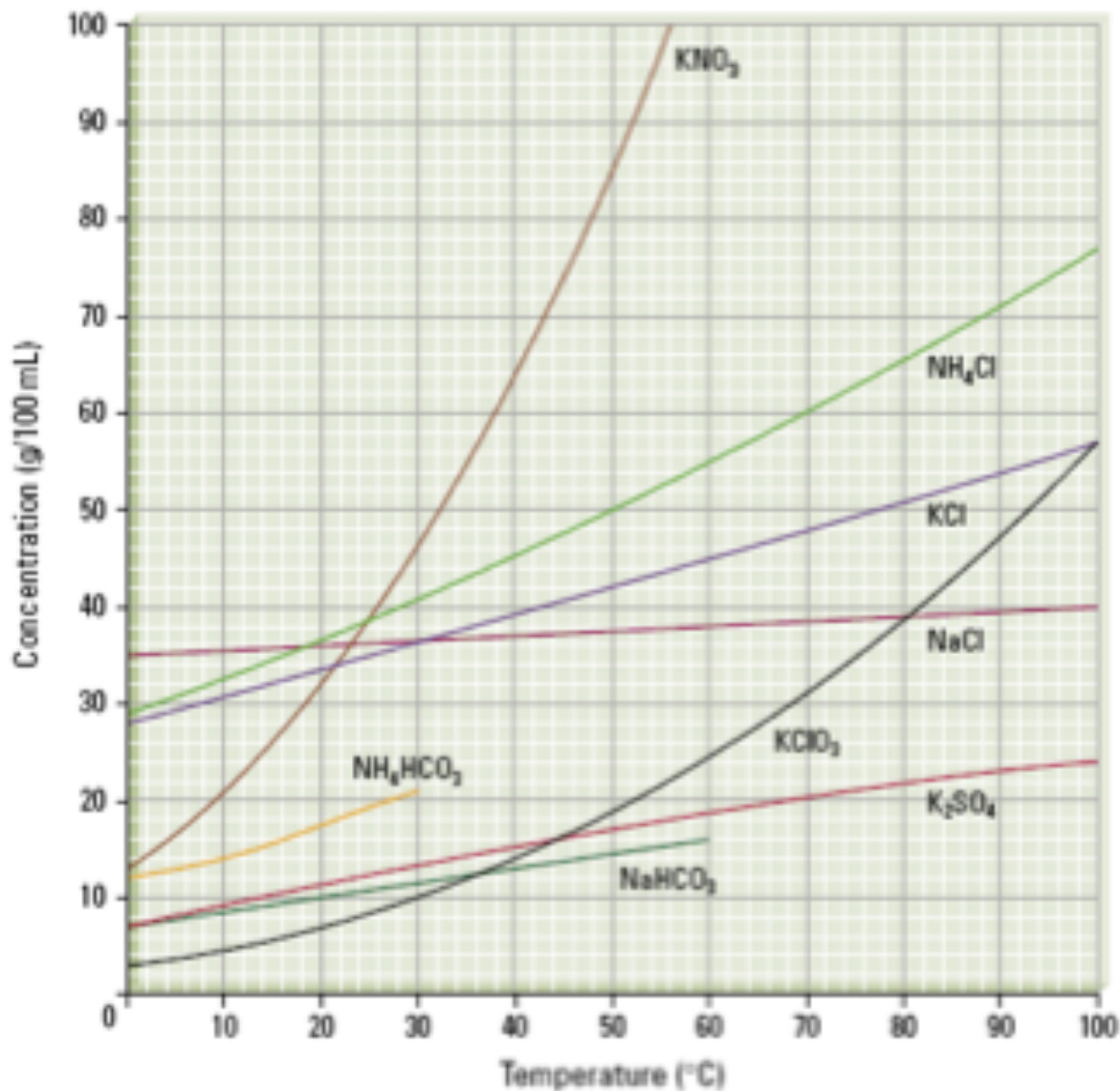




Solutions & Solubility: Net Ionic Equations

(9.1 in MHR Chemistry 11)

Solubility vs. Temperature



Solubility Table

SOLUBILITY Table 8.3 page 363 in MHR		Anions						
		Cl ⁻ , Br ⁻ , I ⁻	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 ₄ ⁺ , Group 2	Group 1, NH ₄ ⁺ , Sr ²⁺ , Ba ²⁺ , Tl ⁺	Most	Group 1, NH ₄ ⁺	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 ⁺ , Pb ²⁺ , Ca ²⁺ , Ba ²⁺ , Sr ²⁺ , Ra ²⁺	Most	Ag ⁺	None

Solubility Table

Create soluble and insoluble compounds using OH^-

SOLUBILITY Table 8.3 page 363 in MHR		Anions						
		Cl^- , Br^- , I^-	S^{2-}	OH^-	SO_4^{2-}	CO_3^{2-} , PO_4^{3-} , SO_3^{2-}	$\text{C}_2\text{H}_3\text{O}_2^-$	NO_3^-
Cations	High solubility (aq) $\geq 0.1 \text{ mol/L}$ at SATP	Most	Group 1, NH_4^+ , Group 2	Group 1, NH_4^+ , Sr^{2+} , Ba^{2+} , Tl^+	Most	Group 1, NH_4^+	Most	All
	All Group 1 compounds, including acids, and all ammonium compounds are assumed to have high solubility in water.							
	Low solubility (s) $< 0.1 \text{ mol/L}$ at SATP	Ag^+ , Pb^{2+} , Tl^+ , Hg_2^{2+} , (Hg^+), Cu^+	Most	Most	Ag^+ , Pb^{2+} , Ca^{2+} , Ba^{2+} , Sr^{2+} , Ra^{2+}	Most	Ag^+	None

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.

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.



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.

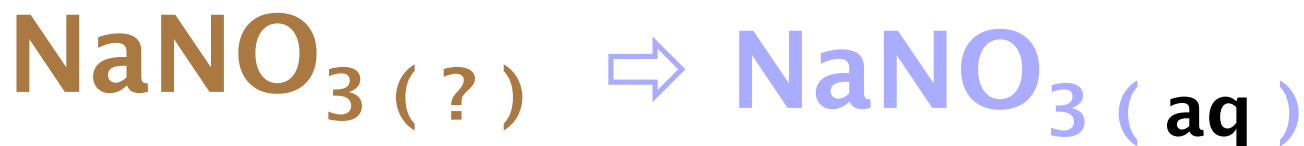


Check solubility information (page 363)



SOLUBILITY Table 5, page 324		Anions							
		Cl ⁻ , Br ⁻ , I ⁻	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 ₄ ⁺ , Group 2	Group 1, NH ₄ ⁺ , Sr ²⁺ , Ba ²⁺ , Tl ⁺	Most	Group 1, NH ₄ ⁺	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 ⁺ , Pb ²⁺ , Ca ²⁺ , Ba ²⁺ , Sr ²⁺ , Ra ²⁺	Most	Ag ⁺	None	

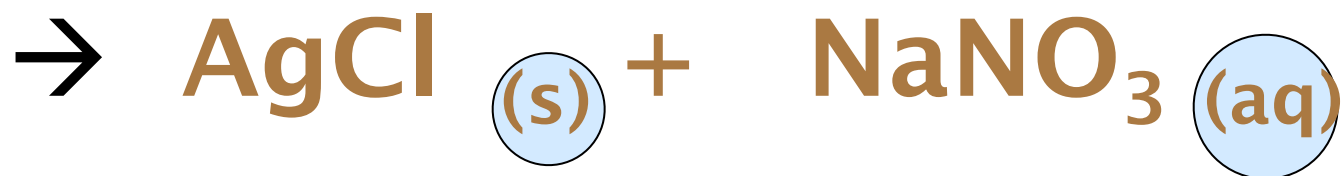
Check solubility information (p. 363)



SOLUBILITY Table 5, page 324		Anions						
		Cl ⁻ , Br ⁻ , I ⁻	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 ₄ ⁺ , Group 2	Group 1, NH ₄ ⁺ , Sr ²⁺ , Ba ²⁺ , Tl ⁺	Most	Group 1, NH ₄ ⁺	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 ⁺ , Pb ²⁺ , Ca ²⁺ , Ba ²⁺ , Sr ²⁺ , Ra ²⁺	Most	Ag ⁺	None

Step 1 – Overall balanced chemical equation

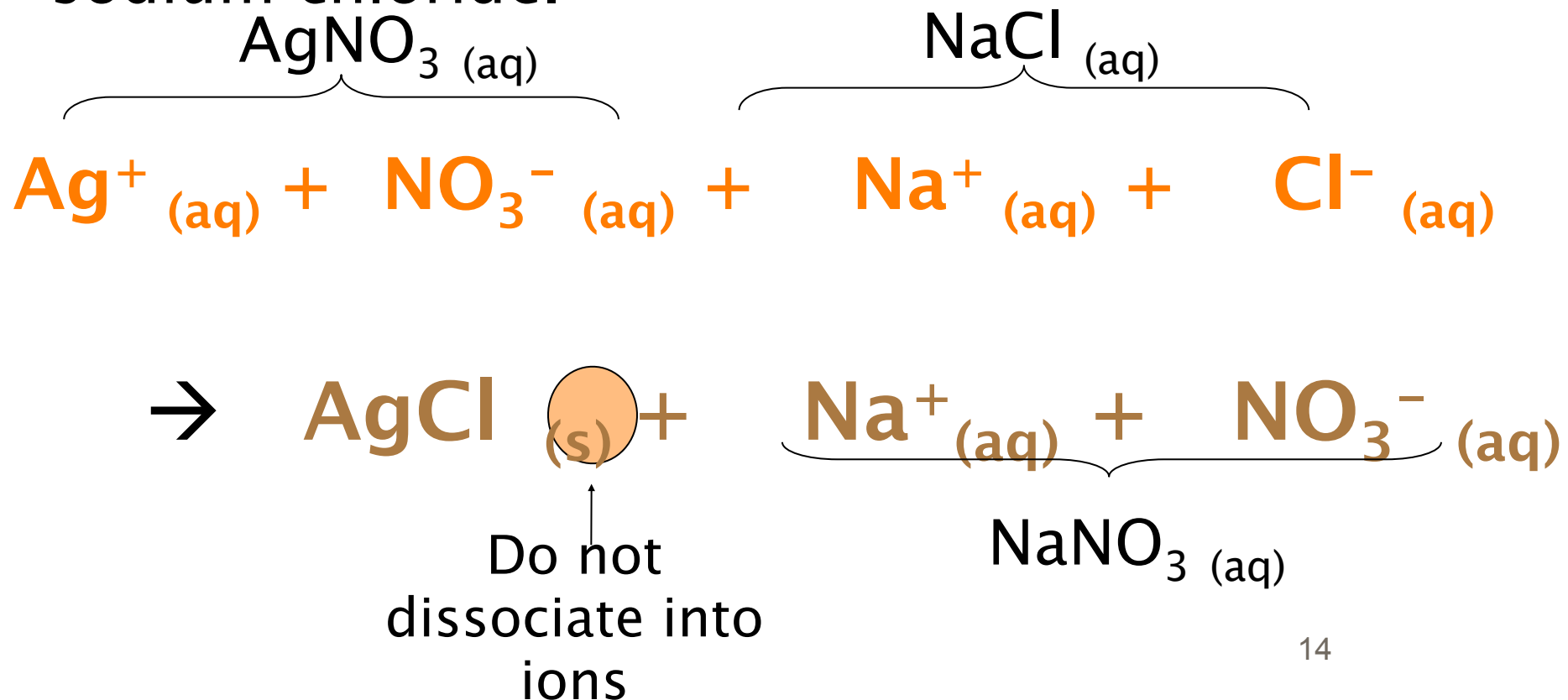
Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride.



Writing Net Ionic Equations

Step 2 – Total ionic equation

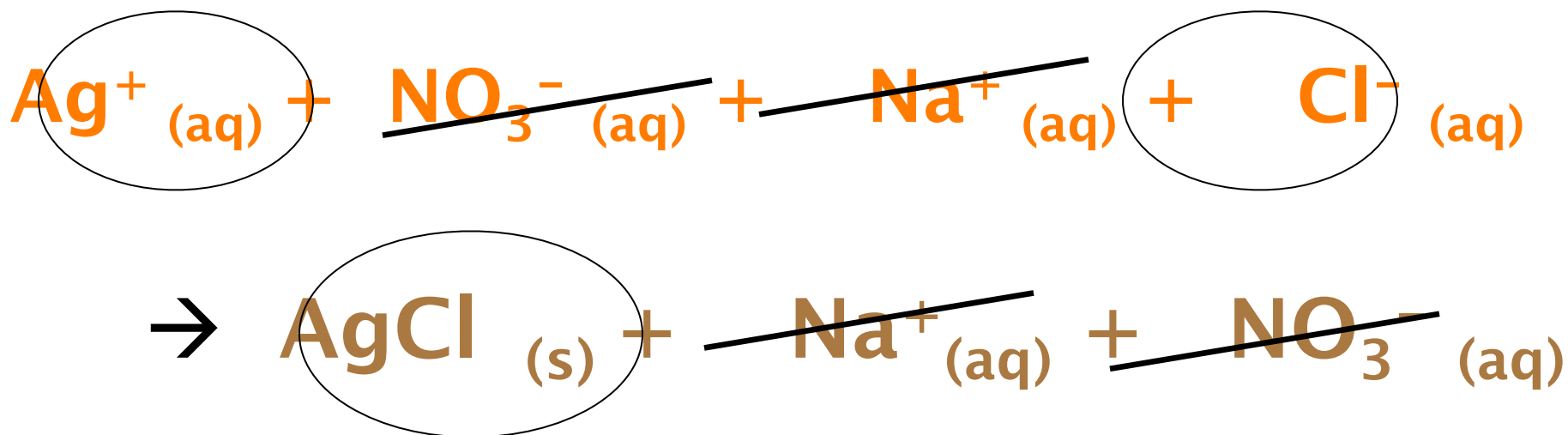
Write the net ionic equation for the reaction between aqueous silver nitrate and aqueous sodium chloride.



Writing Net Ionic 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.
2. Write the total ionic equation.
 - Break all aqueous compounds into constituent ions using solubility information (p. 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.

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.



Spectator ions: $\text{NO}_3^-_{(\text{aq})}$, $\text{Na}^+_{(\text{aq})}$

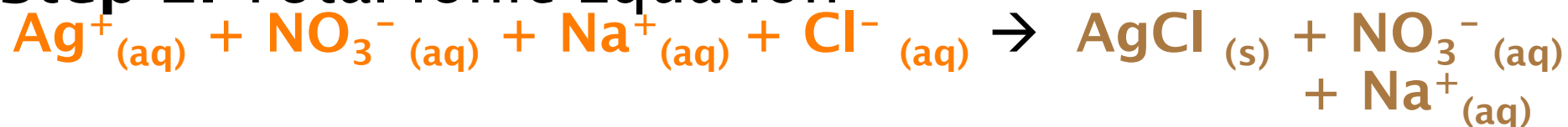
Complete Solution

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

Step 1. Complete Balanced Chemical Equation



Step 2. Total Ionic Equation



Step 3. Net Ionic Equation



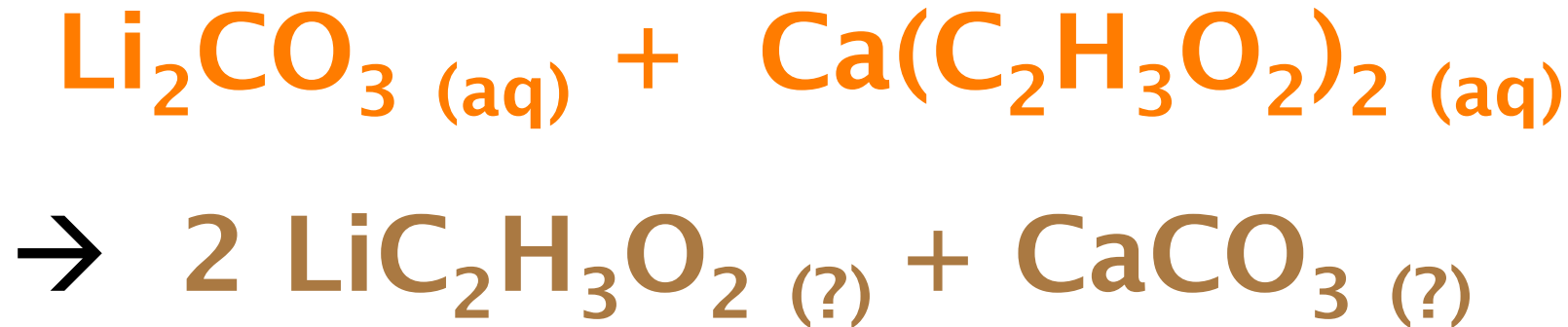
Spectator ions: $\text{NO}_3^-(\text{aq})$, $\text{Na}^+(\text{aq})$

Sample Problem 2 – Net Ionic Equation

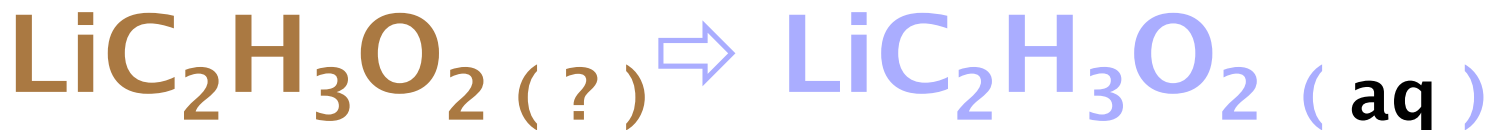
Write the net ionic equation for the reaction between aqueous lithium carbonate & aqueous calcium acetate

Step 1 – Overall balanced chemical equation

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



Check solubility information (p. 363)



SOLUBILITY Table 8.3 page 363 in MHR		Anions						
		Cl ⁻ , Br ⁻ , I ⁻	S ²⁻	OH ⁻	SO ₄ ²⁻	CO ₃ ²⁻ , PO ₄ ³⁻ , SO ₃ ²⁻	C₂H₃O₂⁻	NO ₃ ⁻
Cations	High solubility (aq) ≥ 0.1 mol/L at SATP	Most	Group 1, NH ₄ ⁺ , Group 2	Group 1, NH ₄ ⁺ , Sr ²⁺ , Ba ²⁺ , Tl ⁺	Most	Group 1, NH ₄ ⁺	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 ⁺ , Pb ²⁺ , Ca ²⁺ , Ba ²⁺ , Sr ²⁺ , Ra ²⁺	Most	Ag ⁺	None

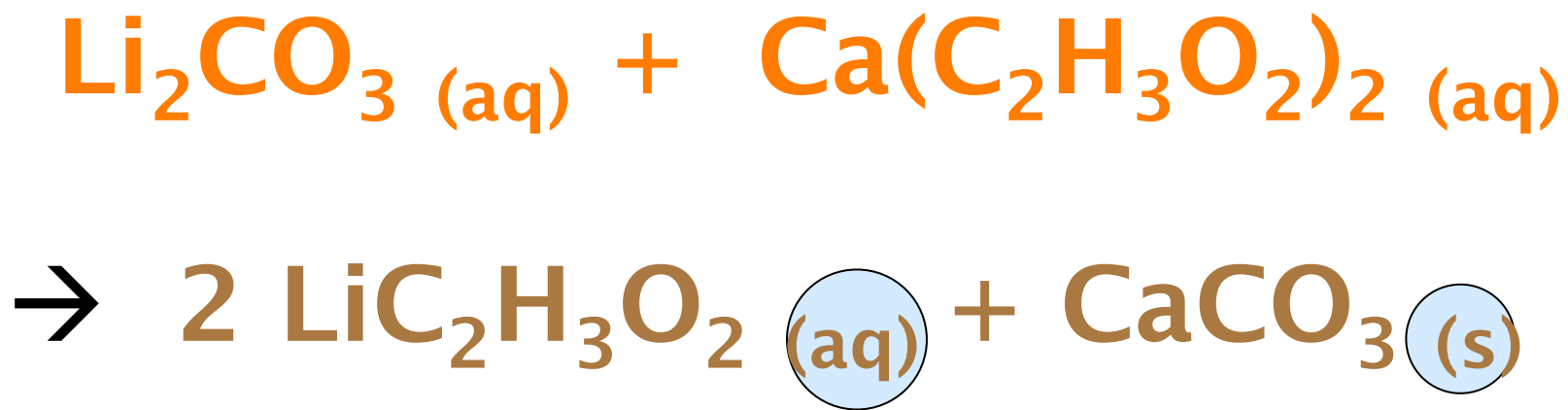
Check solubility information (p. 363)



SOLUBILITY Table 8.3 page 363 in MHR		Anions						
		Cl ⁻ , Br ⁻ , I ⁻	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 ₄ ⁺ , Group 2	Group 1, NH ₄ ⁺ , Sr ²⁺ , Ba ²⁺ , Tl ⁺	Most	Group 1, NH ₄ ⁺	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 ⁺ , Pb ²⁺ , Ca ²⁺ , Ba ²⁺ , Sr ²⁺ , Ra ²⁺	Most	Ag ⁺	None

Step 1 – Overall balanced chemical equation

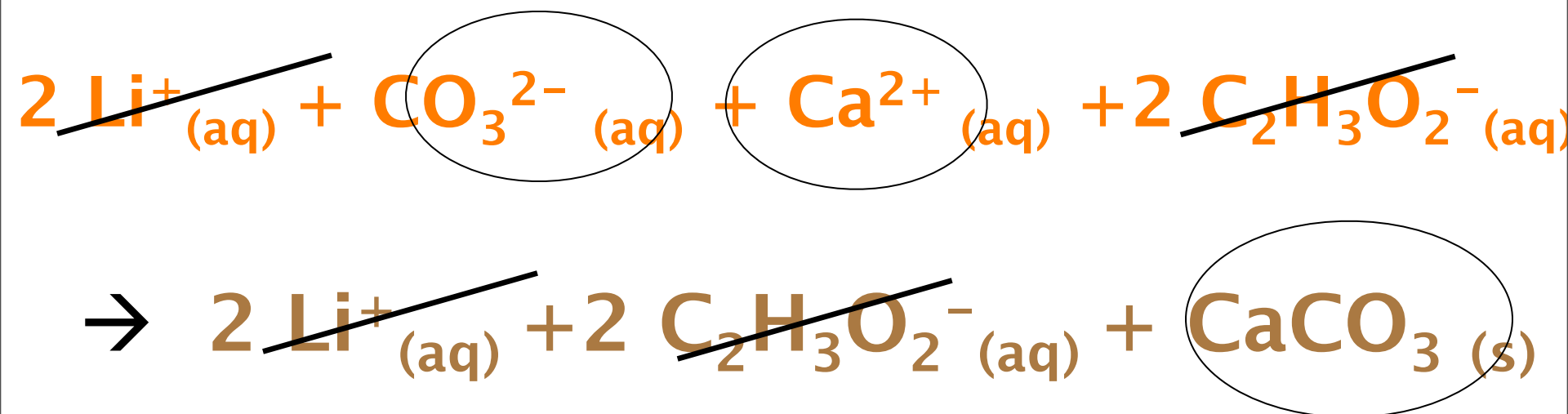
Write the net ionic equation for the reaction between aqueous lithium carbonate and aqueous calcium acetate.



Writing Net Ionic Equations

Step 2 - Total ionic equation

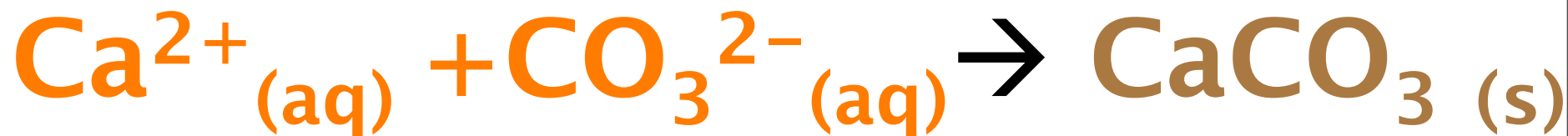
Write the net ionic equation for the reaction between aqueous lithium carbonate and aqueous calcium acetate.



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.



Spectator ions: $\text{C}_2\text{H}_3\text{O}_2^{-}_{(\text{aq})}$, $\text{Li}^{+}_{(\text{aq})}$

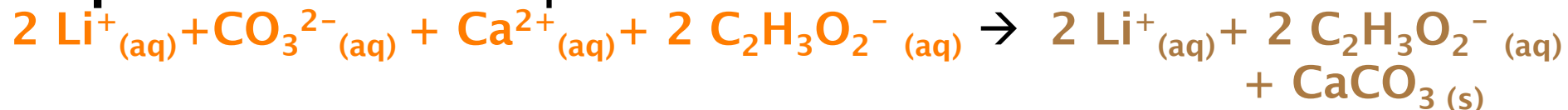
Complete Solution

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

Step 1. Complete Balanced Chemical Equation



Step 2. Total Ionic Equation



Step 3. Net Ionic Equation



Spectator ions: $\text{C}_2\text{H}_3\text{O}_2^-_{(aq)}$, $\text{Li}^+_{(aq)}$

Try it!



z p. 410 # 2,4,6,8,10