Announcements – Lecture XIX – Thursday, June 19th

1. **Final Lab:** **Tuesday, June 25th, ISB 155 (A-C)**
   (Pre-Lab Quiz – TA Evaluation in Class Owls)

Quiz 15 Class #: ____ Last Name: _____

Write the net ionic equation for the reaction that takes placed when aqueous solutions of calcium chloride and ammonium carbonate are combined?

Soluble Ionic Compounds	***Exceptions***
Sodium (Na^+), potassium (K^+), and ammonium (NH_4^+) salts	
Nitrate (NO_3^-), acetate ($CH_3CO_2^-$), chlorate (ClO_3^-), and perchlorate (ClO_4^-) salts	
Chloride (Cl^-), bromide (Br^-), and iodide (I^-) salts	Pb^{2+}, Ag^+, Hg_2^{2+}
Fluoride (F^-) salts	Ca^{2+}, Sr^{2+}, Ba^{2+}, Pb^{2+}
Sulfate (SO_4^{2-}) salts	Ca^{2+}, Hg_2^{2+}, Sr^{2+}, Ba^{2+}, Pb^{2+}

Insoluble Ionic Compounds	***Exceptions***
Hydroxide (OH^-) and oxide (O^{2-}) compounds	Na^+, K^+, Ba^{2+}
Sulfide (S^{2-}) salts	Na^+, K^+, NH_4^+, Ba^{2+}
Carbonate (CO_3^{2-}) and phosphate (PO_4^{3-}) salts	Na^+, K^+, NH_4^+

Quiz 15 -- Solution:

Write the net ionic equation for the reaction that takes placed when aqueous solutions of calcium chloride and ammonium carbonate are combined?

$CaCl_2(aq) + (NH_4)_2CO_3(aq)$

$[Ca^{2+}, Cl^-] \quad [NH_4^+, CO_3^{2-}]$

$NH_4Cl(aq) \quad CaCO_3(s)$

$$CaCl_2(aq) + (NH_4)_2CO_3(aq) = CaCO_3(s) + 2\,NH_4Cl(aq)$$

$$CaCl_2(aq) + (NH_4)_2CO_3(aq) = CaCO_3(s) + 2\,NH_4Cl(aq)$$

$$Ca^{2+} + 2Cl^- + 2NH_4^+ + CO_3^{2-} = CaCO_3(s) + 2NH_4^+ + 2Cl^-$$

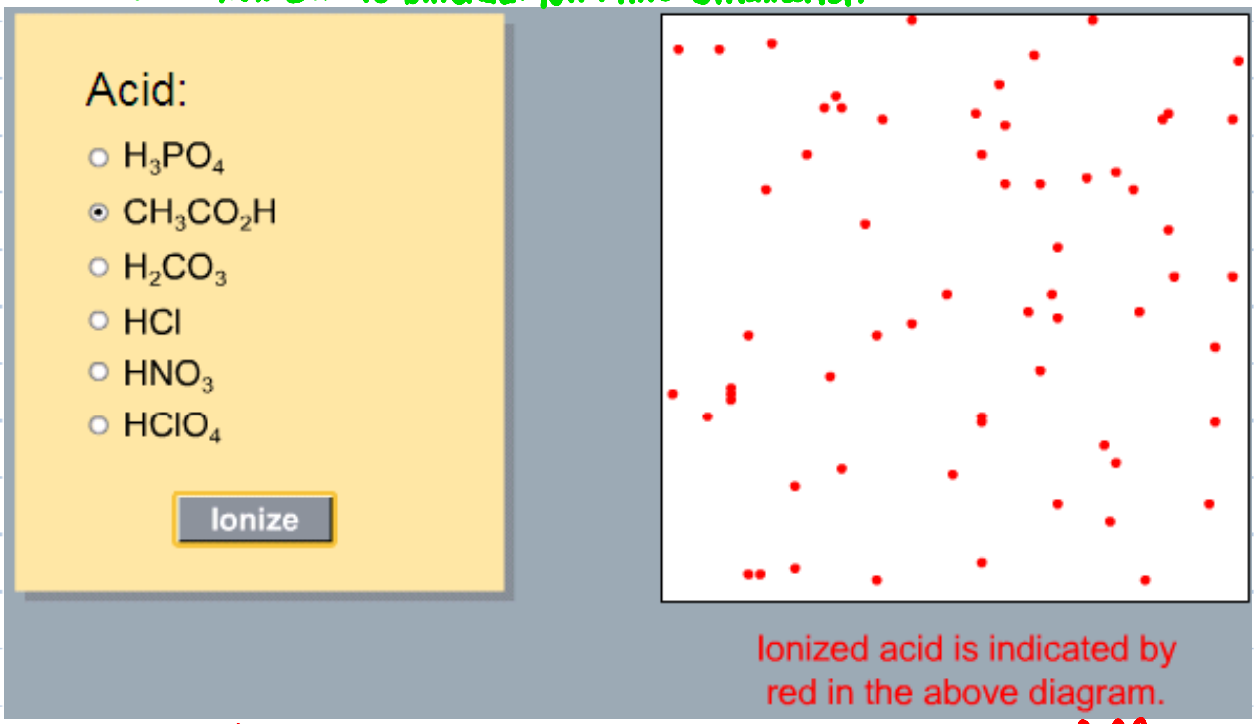
$$\boxed{Ca^{2+} + CO_3^{2-} = CaCO_3(s)}$$

NIE

4.3 Reactions in Aqueous Solution

C: Acid Base Reactions – Strong Vs Weak

See class web site to interact with this simulation



While all acids are designated as (aq) ... only 6 ionize 100% in water.

If an acid is not one of the 6 strong acids then you may infer that it is weak.

6 Strong Acids

HCl	Hydrochloric acid
HBr	Hydrobromic acid
HI	Hydroiodic acid
HNO_3	Nitric acid
$HClO_4$	Perchloric acid
H_2SO_4	Sulfuric acid

4 Soluble Strong Bases

LiOH	Lithium hydroxide
NaOH	Sodium hydroxide
KOH	Potassium hydroxide
$Ba(OH)_2$	Barium hydroxide

4.3 Reactions in Aqueous Solution

C: Acid Base Reactions – Strong Acid + Strong Base

Give the Net Ionic Equation for the reaction that takes place when aqueous solutions of hydrochloric acid and potassium hydroxide are mixed?

$HCl(aq) + KOH(aq)$

$[H^+, Cl^-] \quad [K^+, OH^-]$

$KCl(aq), \quad HOH = H_2O(l)$

$$HCl(aq) + KOH(aq) = KCl(aq) + H_2O(l)$$

$$HCl(aq) + KOH(aq) = KCl(aq) + H_2O(l)$$

SA SB Salt

$$H^+ + Cl^- + K^+ + OH^- = K^+ + Cl^- + H_2O(l)$$

$$\boxed{H^+ + OH^- = H_2O(l)}$$

$\Downarrow$

NIE

4.3 Reactions in Aqueous Solution

C: Acid Base Reactions – Weak Acid + Strong Base

Give the Net Ionic Equation for the reaction that takes place when aqueous solutions of hydrocyanic acid (HCN) and sodium hydroxide are mixed?

$HCN(aq) + NaOH(aq)$

$[H^+, CN^-] \quad [Na^+, OH^-]$

$NaCN(aq), \quad HOH = H_2O(l)$

$$HCN(aq) + NaOH(aq) = NaCN(aq) + H_2O(l)$$

$$HCN(aq) + NaOH(aq) = NaCN(aq) + H_2O(l)$$

WA SB Salt

$$HCN(aq) + Na^+ + OH^- = Na^+ + CN^- + H_2O(l)$$

$$HCN(aq) + OH^- = CN^- + H_2O(l)$$

$\Downarrow$

NIE

4.3 Reactions in Aqueous Solution

D: Gas-Forming Reactions -- Metal Carbonate + Strong Acid

Give the Net Ionic Equation for the reaction that takes place when calcium carbonate is place in an aqueous solution of hydrochloric acid.

$CaCO_3(s) + HCl(aq)$

$[Ca^{2+}, CO_3^{2-}]$ $[H^+, Cl^-]$

$CaCl_2(aq)$, $H_2CO_3 \rightarrow H_2O(l) + CO_2(g)$

$CaCO_3(s) + HCl(aq) = CaCl_2(aq) + H_2O(l) + CO_2(g)$ Not Balanced.

$CaCO_3(s) + 2HCl(aq) = CaCl_2(aq) + H_2O(l) + CO_2(g)$ Balanced

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$CaCO_3(s) + 2H^+ + 2Cl^- = Ca^{2+} + 2Cl^- + H_2O(l) + CO_2(g)$

$CaCO_3(s) + 2H^+ = Ca^{2+} + H_2O(l) + CO_2(g)$

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4.3 Reactions in Aqueous Solution

D: Gas-Forming Reactions -- Metal Carbonate + Weak Acid

Give the Net Ionic Equation for the reaction that takes place when calcium carbonate is place in an aqueous solution of hydrofluoric acid (HF).

$CaCO_3(s) + HF(aq)$

$[Ca^{2+}, CO_3^{2-}]\ [H^+, F^-]$

$CaF_2(aq),\ H_2CO_3 \rightarrow H_2O(l) + CO_2(g)$

$CaCO_3(s) + HF(aq) = CaF_2(aq) + H_2O(l) + CO_2(g)$ Not balanced

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$CaCO_3(s) + 2\,HF(aq) = CaF_2(aq) + H_2O(l) + CO_2(g)$ Balanced

$CaCO_3(s) + 2\,HF(aq) = Ca^{2+} + 2F^- + H_2O(l) + CO_2(g)$

$\Downarrow$

NIE

4.3 Reactions in Aqueous Solution

D: Gas-Forming Reactions -- Other Types

2. $NaHCO_3(aq) + HCl(aq) = NaCl(aq) + H_2O(l) + CO_2(g)$

3. $Na_2S(aq) + 2\,HCl(aq) = 2\,NaCl(aq) + H_2S(g)$

4. $Na_2SO_3(aq) + 2\,HCl(aq) = 2\,NaCl(aq) + H_2O(l) + SO_2(g)$

Metal carbonate	+ acid	....	+ $CO_2(g)$
Metal hydrogencarbonate		....	+ $CO_2(g)$
Metal sulfide		....	+ $H_2S(g)$
Metal sulfite		....	+ $SO_2(g)$