Lecture 8  t – 4 class days until exam

- Announcements
- Net Ionic Equations
- Limiting Reagents
- Demo, Demo, Demo
Pre-registration Question:
Are you going to enroll in CHE 121?
(General Chemistry II)

1. Yes  I want to… I have to…. etc.
2. No   I don’t have to…I don’t want to…. etc.
3. Maybe Not sure…if I pass 111… etc.

(All responses are worth the same number of points)
Announcements

- Seminar Today – the new Dean – 4:00 VDW 102
- Exam one week from Monday, Chaps 1-4
Net Ionic Equations

- For reactions in solutions with spectator ions

\[
\text{Mg(s)} + 2\text{H}^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{H}_2(\text{g}) + 2\text{Cl}^-(\text{aq})
\]

chemical equation

\[
\text{Cl}^- \text{ is a spectator ion. It doesn’t participate in the reaction.}
\]

\[
\text{Mg(s)} + 2\text{H}^+(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{H}_2(\text{g})
\]

net ionic equation

Charge and mass are balanced – as always!
Net Ionic Equation Examples

\[ \text{Ag}^+(aq) + \text{NO}_3^-(aq) + \text{Ba}^{2+}(aq) + \text{Cl}^-(aq) \rightarrow \text{AgCl}(s) + \text{NO}_3^-(aq) + \text{Ba}^{2+}(aq) \]

\[ \text{Ag}^+(aq) + \text{Cl}^-(aq) \rightarrow \text{AgCl}(s) \]

\[ \text{Pb}^{2+}(aq) + \text{NO}_3^-(aq) + \text{Na}^+(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{PbSO}_4(s) + \text{NO}_3^-(aq) + \text{Na}^+(aq) \]

\[ \text{Pb}^+(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{PbSO}_4(s) \]

\[ \text{K}^+(aq) + \text{C}_2\text{O}_4^{2-}(aq) + \text{Ca}^{2+}(aq) + \text{OH}^- + \text{H}^+(aq) + \text{Cl}^-(aq) \rightarrow \]
\[ \text{CaC}_2\text{O}_4(s) + \text{K}^+(aq) + \text{OH}^-(aq) + \text{H}^+(aq) + \text{Cl}^-(aq) \]
\[ \text{Ca}^{2+}(aq) + \text{C}_2\text{O}_4^{2-}(aq) \rightarrow \text{CaC}_2\text{O}_4(s) \]
Limiting Reagent

\[
\text{Mg(s)} + 2\text{H}^+(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{H}_2(\text{g})
\]

- We’ll run this reaction three times with differing amounts of the two reactants.
- Amount of product will be observed by volume of gas evolved.

<table>
<thead>
<tr>
<th>Trial</th>
<th>mass Mg</th>
<th>moles Mg</th>
<th>vol HCl</th>
<th>moles H⁺</th>
<th>moles H₂(g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.60 g</td>
<td></td>
<td>100 mL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.2 g</td>
<td></td>
<td>100 mL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.8 g</td>
<td></td>
<td>100 mL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Limiting Reagent

\[ \text{Mg(s)} + 2\text{H}^+(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{H}_2(\text{g}) \]

- We’ll run this reaction three times with differing amounts of the two reactants.
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<th>mass Mg</th>
<th>moles Mg</th>
<th>vol HCl</th>
<th>moles H(^+)</th>
<th>moles H(_2)(g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.60 g</td>
<td>0.025 mol</td>
<td>100 mL</td>
<td>0.10 mol</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.2 g</td>
<td>0.050 mol</td>
<td>100 mL</td>
<td>0.10 mol</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.8 g</td>
<td>0.075 mol</td>
<td>100 mL</td>
<td>0.10 mol</td>
<td></td>
</tr>
</tbody>
</table>
# Limiting Reagent

\[
\text{Mg}(s) + 2\text{H}^+(aq) \rightarrow \text{Mg}^{2+}(aq) + \text{H}_2(g)
\]

- We’ll run this reaction three times with differing amounts of the two reactants.
- Amount of product will be observed by volume of gas evolved.

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<th>moles H(_2)(g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.60 g</td>
<td>0.025 mol</td>
<td>100 mL</td>
<td>0.10 mol</td>
<td>0.025 mol</td>
</tr>
<tr>
<td>2</td>
<td>1.2 g</td>
<td>0.050 mol</td>
<td>100 mL</td>
<td>0.10 mol</td>
<td>0.050 mol</td>
</tr>
<tr>
<td>3</td>
<td>1.8 g</td>
<td>0.075 mol</td>
<td>100 mL</td>
<td>0.10 mol</td>
<td>0.050 mol</td>
</tr>
</tbody>
</table>
Limiting Reagent

\[ \text{Mg(s)} + 2\text{H}^+(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{H}_2(\text{g}) \]

The moles of \( \text{H}_2 \) gas actually produced are the lesser of what could possibly be produced from each reactant.

<table>
<thead>
<tr>
<th>Trial</th>
<th>moles Mg</th>
<th>moles ( \text{H}_2(\text{g}) ) due to Mg</th>
<th>moles ( \text{H}^+ )</th>
<th>moles ( \text{H}_2(\text{g}) ) due to ( \text{H}^+ )</th>
<th>moles ( \text{H}_2(\text{g}) ) actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.025 mol</td>
<td>0.025 mol</td>
<td>0.10 mol</td>
<td>0.050 mol</td>
<td>0.025 mol</td>
</tr>
<tr>
<td>2</td>
<td>0.050 mol</td>
<td>0.050 mol</td>
<td>0.10 mol</td>
<td>0.050 mol</td>
<td>0.050 mol</td>
</tr>
<tr>
<td>3</td>
<td>0.075 mol</td>
<td>0.075 mol</td>
<td>0.10 mol</td>
<td>0.050 mol</td>
<td>0.050 mol</td>
</tr>
</tbody>
</table>
Today

• Go to seminar 4:00 VDW102
• Go to party tonight

By Monday

• Finish up CAPA set #5
• Read rest of Chapter 4

Remember: You are done with the homework when you understand it!