PREDICTING THE PRODUCTS OF REACTIONS

Combustion Reaction
- Oxygen ($O_2$) reacts with a hydrocarbon ($C_xH_y$), producing energy in the form of heat and light
- $CO_2$ and $H_2O$ are always produced

Reactivity of metals
- Single displacement reaction
  $A + BC \rightarrow AC + B$
  A is more reactive than B since it replaced it
  - $Zn + Pb(NO_3)_2 \rightarrow Pb + Zn(NO_3)_2$
  - Zinc is more reactive than Pb

Single Displacement Reaction
- The ionic compound is usually in solution (aq)
- If the single element is a non-metal, assume a reaction will always occur.
- If the single element is a metal, must check activity series.
  - If single element is higher on activity series, it will react
**Activity Series**

- Compares the reactivity of metals
- Metals become less reactive going down the list

<table>
<thead>
<tr>
<th>K</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na</td>
<td>Sodium</td>
</tr>
<tr>
<td>Ca</td>
<td>Calcium</td>
</tr>
<tr>
<td>Mg</td>
<td>Magnesium</td>
</tr>
<tr>
<td>Al</td>
<td>Aluminium</td>
</tr>
<tr>
<td>C</td>
<td>Carbon</td>
</tr>
<tr>
<td>Si</td>
<td>Silicon</td>
</tr>
<tr>
<td>Fe</td>
<td>Iron</td>
</tr>
<tr>
<td>Sn</td>
<td>Tin</td>
</tr>
<tr>
<td>Pb</td>
<td>Lead</td>
</tr>
<tr>
<td>H</td>
<td>Hydrogen</td>
</tr>
<tr>
<td>Cu</td>
<td>Copper</td>
</tr>
<tr>
<td>Ag</td>
<td>Silver</td>
</tr>
<tr>
<td>Au</td>
<td>Gold</td>
</tr>
<tr>
<td>Pt</td>
<td>Platinum</td>
</tr>
</tbody>
</table>

Addition for comparison

Reactivity Series of Metals

Most reactive

| Least reactive |

**Single Displacement Examples**

- $\text{Al} + \text{CuCl}_2 \rightarrow$ Reaction or No Reaction?
- $\text{Zn} + \text{AlCl}_3 \rightarrow$ Reaction or No Reaction?
- $\text{F}_2 + \text{AlCl}_3 \rightarrow$ Reaction or No Reaction?

2 of these will react, 1 will not. Why?

**Solubility**

- Solubility is the property of a solid, liquid, or gaseous chemical substance (called solute) to dissolve in a solvent to form a homogenous solution.
  - Solvent is usually a liquid

**Double Displacement Reaction**

- For double displacement reaction to occur, a gas, water molecule, or precipitate must be produced.
- Most often a precipitate is formed
- Precipitates can be determined by looking at a solubility table
If compound is **soluble**, it will stay in aqueous solution and **no reaction** occurs.

If compound is **insoluble**, a reaction will occur and a **precipitate** will form.

Look at solubility chart:
- Sol = soluble
- Insol and sl sol mean insoluble

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### Double Displacement Products

- If compound is **soluble**, it will stay in aqueous solution and **no reaction** occurs.
- If compound is **insoluble**, a reaction will occur and a **precipitate** will form.
- Look at solubility chart:
  - Sol = soluble
  - Insol and sl sol mean insoluble

### Double Displacement Examples

- $\text{LiCl}_\text{aq} + \text{NaBr}_\text{aq} \rightarrow$ Reaction or No Reaction?
- $\text{AlCl}_3\text{aq} + \text{Ba(OH)}_2\text{aq} \rightarrow$ Reaction or No Reaction?
- $\text{Li}_2\text{SO}_4\text{aq} + \text{CaCl}_2\text{aq} \rightarrow$ Reaction or No Reaction?
- $\text{AgF}_\text{aq} + \text{Zn(NO}_3\text{)}_2 \rightarrow$ Reaction or No Reaction?

- 2 will react, 2 will not. Why?

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### Review

- Single Displacement reaction occurs when a single element replaces an element in a compound to form a new compound:
  - If reactivity of single element is higher, reaction occurs.

- Double Displacement reaction occurs when two aqueous compounds combine to form two new compounds:
  - 1 compound will be solid, other compound will be aqueous.