

## Single Replacement

**Purpose:** To examine the reactions between 3 metals; copper, magnesium and nickel, and 4 solutions; copper (II) sulfate, magnesium chloride, nickel (II) nitrate and hydrochloric acid. From these results, an activity series showing the relative reactivity of 4 elements will be established.

**Procedure:** Go to the web site provided by your instructor. Examine the starting materials and the products of the reactions. It is often difficult to see the solids in the products but hopefully you will be able to see color changes in the solution. Remember that  $\text{Mg}^{2+}$  in solution is colorless,  $\text{Cu}^{2+}$  in solution is light blue and  $\text{Ni}^{2+}$  in solution is light green.

**Prelab:** Prepare your notebook to take data.

**Post lab:** See instant lab report

## Lab Report

### Single Replacement Reactions

**Purpose:** To examine the reactions between 3 metals; copper, magnesium and nickel, and 4 solutions; copper sulfate, magnesium chloride, nickel nitrate and hydrochloric acid. From these results, an activity series showing the relative reactivity of 4 elements will be established.

**Procedure:** Using a series of web pages, a virtual lab environment has been created to show these reactions. The procedure is as stated in the lab book.

#### Data:

Reaction	Appearance of metal solid (reactant)	Appearance of Solution (reactant)	Appearance of Reaction (product)	reaction occurs? (Y/N)
$\text{Cu}_{(s)} + \text{MgCl}_2$				
$\text{Cu}_{(s)} + \text{Ni}(\text{NO}_3)_2$				
$\text{Cu}_{(s)} + \text{HCl}$				
$\text{Mg}_{(s)} + \text{CuSO}_4$				
$\text{Mg}_{(s)} + \text{Ni}(\text{NO}_3)_2$				
$\text{Mg}_{(s)} + \text{HCl}$				
$\text{Ni}_{(s)} + \text{CuSO}_4$				
$\text{Ni}_{(s)} + \text{MgCl}_2$				
$\text{Ni}_{(s)} + \text{HCl}$				

**Discussion:** Single replacement reactions follow the pattern  $A + BC \rightarrow B + AC$  where A, B, and C represent elements. A begins in its elemental state and B ends up in its elemental state. A is oxidized and B is reduced. A reaction occurs when B is more stable in its elemental state than A. We can develop an activity series based on the relative activities.

1. Based on my results, magnesium (Mg) is the most reactive of the metals tested because it reacts with  $\text{Cu}^{2+}$  (in  $\text{CuSO}_4$ ),  $\text{Ni}^{2+}$  (in  $\text{NiNO}_3$ ) and  $\text{H}^+$  in HCl.
2. \_\_\_\_\_ is the next most reactive because it reacts with \_\_\_\_\_, and \_\_\_\_\_ but not \_\_\_\_\_.
3. Hydrogen is next in the activity series because \_\_\_\_\_.
4. \_\_\_\_\_ is the least reactive because it does not react with \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

**Errors & Modifications:** Not applicable because this is a virtual lab.

**Conclusion:** The Activity series for these 4 elements is

- 1.
- 2.
- 3.
- 4.

**Post Lab Questions.** Please write the equations for the following reactions



Total Ionic equation:

Net Ionic Equation:



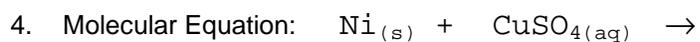
Total Ionic equation:

Net Ionic Equation:



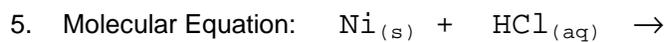
Total Ionic equation:

Net Ionic Equation:



Total Ionic equation:

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Total Ionic equation:

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