

## Ch. 7: Chemical Reactions

### 1. Experiment

- Add deionized water to  $\text{Na}_2\text{CO}_3$  in beaker "A". Write the chemical reaction.
- Add deionized water to  $\text{MgCl}_2$  in beaker "B". Write the chemical reaction.
- Add beaker "B" to beaker "A". Write the chemical reaction (total ionic and net ionic).

### 2. Experiment (if available)

- Using the solubility rules on page 199, invent a reaction to synthesize  $\text{CaCO}_3$  (limestone) from two soluble salts.

*Verify an example reaction as follows using sodium carbonate and calcium chloride.*

- Add deionized water to  $\text{Na}_2\text{CO}_3$  in beaker "C". Write the chemical reaction.
- Add deionized water to  $\text{CaCl}_2$  in beaker "D". Write the chemical reaction.
- Add beaker "D" to beaker "C". Write the chemical reaction (total ionic and net ionic).

### 3. Balance the following reactions using the guidelines on page 190 (top).

	Balanced reaction
<b>Group 1</b>	
7-3(a)	$2\text{NaBr} + \text{Cl}_2 \rightarrow 2\text{NaCl} + \text{Br}_2$
7-3(b)	$2\text{KOH} + \text{H}_3\text{AsO}_4 \rightarrow \text{K}_2\text{HAsO}_4 + 2\text{H}_2\text{O}$
7-3(c)	$\text{Ti} + 2\text{Cl}_2 \rightarrow \text{TiCl}_4$
7-3(d)	$2\text{Al} + 3\text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + 3\text{H}_2$
<b>Group 2</b>	
7-5(a)	$\text{Ca}(\text{CN})_2 + 2\text{HBr} \rightarrow \text{CaBr}_2 + 2\text{HCN}$
7-5(b)	$\text{C}_3\text{H}_6 + 3\text{O}_2 \rightarrow 3\text{CO} + 3\text{H}_2\text{O}$
7-5(c)	$8\text{P}_4 + 3\text{S}_8 \rightarrow 8\text{P}_4\text{S}_3$
7-5(d)	$2\text{Cr}_2\text{O}_3 + 3\text{Si} \rightarrow 4\text{Cr} + 3\text{SiO}_2$
<b>Group 3</b>	
7-7(a)	$\text{Na}_2\text{NH} + 2\text{H}_2\text{O} \rightarrow \text{NH}_3 + 2\text{NaOH}$
7-7(b)	$\text{CaC}_2 + 2\text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_2 + \text{Ca}(\text{OH})_2$
7-7(c)	$\text{XeF}_6 + 3\text{H}_2\text{O} \rightarrow \text{XeO}_3 + 6\text{HF}$
7-7(d)	$\text{PCl}_5 + 4\text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4 + 5\text{HCl}$
<b>Group 4</b>	
7-9(a)	$\text{NH}_3 + 2\text{Cl}_2 \rightarrow \text{NHCl}_2 + 2\text{HCl}$
7-9(b)	$\text{PBr}_3 + 3\text{H}_2\text{O} \rightarrow 3\text{HBr} + \text{H}_3\text{PO}_3$
7-9(c)	$4\text{Mg} + \text{Fe}_3\text{O}_4 \rightarrow 4\text{MgO} + 3\text{Fe}$
7-9(d)	$\text{Fe}_3\text{O}_4 + 4\text{H}_2 \rightarrow 3\text{Fe} + 4\text{H}_2\text{O}$

4. Repeat question (3) using algebra. Verify that your results are the same.

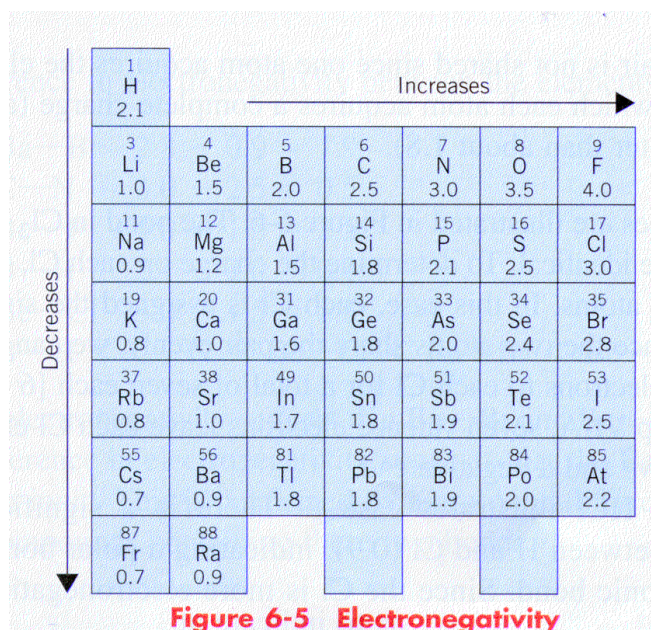
5. Write neutralization reactions for the following acids and bases.

Anion	Name of Acid	Neutralization Reaction
<b>Group 1</b>		
Acid	Nitric acid	$\text{HNO}_3 (\text{aq}) + \text{NaOH} (\text{aq}) \rightarrow \text{NaNO}_3 (\text{aq}) + \text{H}_2\text{O}(\text{l})$
Base	Sodium hydroxide	
<b>Group 2</b>		
Acid	Sulfuric acid	$\text{H}_2\text{SO}_4 (\text{aq}) + 2\text{KOH} (\text{aq}) \rightarrow \text{K}_2\text{SO}_4 (\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
Base	Potassium hydroxide	
<b>Group 3</b>		
Acid	Hydrochloric acid	$\text{HCl} (\text{aq}) + \text{KOH} (\text{aq}) \rightarrow \text{KCl} (\text{aq}) + \text{H}_2\text{O}(\text{l})$
Base	Sodium hydroxide	
<b>Group 4</b>		
Acid	Phosphoric acid	$\text{H}_3\text{PO}_4 (\text{aq}) + 3\text{KOH} (\text{aq}) \rightarrow \text{K}_3\text{PO}_4 (\text{aq}) + 3\text{H}_2\text{O}(\text{l})$
Base	Potassium hydroxide	

## Ch. 6: The Chemical Bond

1. Rank the following bonds in order of increasing polarity. Identify each as ionic, polar, or nonpolar (covalent) - see p. 170.

- (a) Rb–F                      0.8-4.0  $\rightarrow$  3.2  
 (b) Ba–Te                     0.9-2.1  $\rightarrow$  1.2  
 (c) C–N                        2.5-3.0  $\rightarrow$  0.5  
 (d) K–Sb                        0.8-1.9  $\rightarrow$  1.1  
 (e) Tl–Po                       1.8-2.0  $\rightarrow$  0.2  
 (f) F–F                         4.0-4.0  $\rightarrow$  0

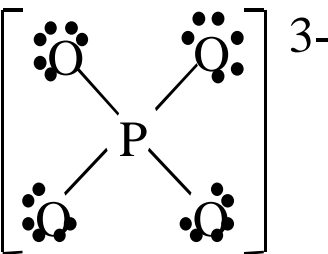
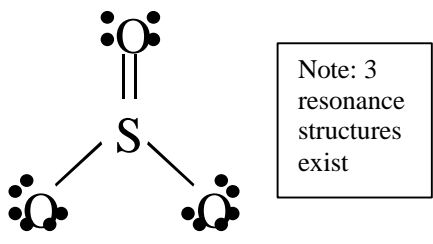
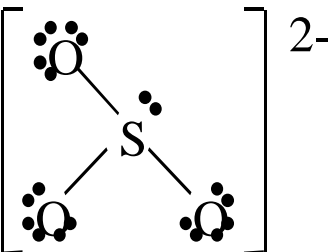


f (covalent) < e (polar) < c (polar) < d (polar) < b (polar) < a (ionic)

2. Choose the element or ion that matches the given property.

Property	Choose the correct item (circle one)	
Smallest atomic radius	Y	Sc
"	S	P
"	F	F <sup>-</sup>
"	Mg	Mg <sup>2+</sup>
Largest ionization energy	F	O
"	Mo	Ru
"	Na <sup>+</sup>	Na
"	Se	Se <sup>-2</sup>

3. Draw Lewis structures for the following molecules or ions. Identify the molecular geometry of each structure using names in the list below. Include resonance structures where needed.

Molecule or ion	Lewis structure	Molecular geometry*
Na <sub>2</sub> S	$\text{Na} \text{---} \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{S}}} \text{---} \text{Na}$	V-shaped (near 109°)
PO <sub>4</sub> <sup>3-</sup>		Tetrahedral
SO <sub>3</sub>		Trigonal planar
SO <sub>3</sub> <sup>2-</sup>		Trigonal pyramidal