

## Some Reactions of Oxo Anions

The principles developed to predict the extent of hydrolysis of cations are most useful with metallic elements when they are in not too high an oxidation state. Nonmetals and metals in high oxidation states do not exist in solution as cations. The best approach to systematizing the chemistry of nonmetals in aqueous solution with positive oxidation numbers is to study their oxo anions. Carry out the following test tube experiments analogously to those in the "cation" experiment.

### Procedure

1. Check the pH of distilled water. Measure and compare the pHs of NaClO and NaClO<sub>4</sub> and Na<sub>2</sub>SO<sub>3</sub> and Na<sub>2</sub>SO<sub>4</sub>. For each pair of compounds, indicate which component of the oxo anion, general formula MO<sub>x</sub><sup>y-</sup>, is being varied and the effect this has on the pH.

Compound	pH	Component Varied/pH Effect
NaClO		
NaClO <sub>4</sub>		
Na <sub>2</sub> SO <sub>3</sub>		
Na <sub>2</sub> SO <sub>4</sub>		

Predict whether NaNO<sub>2</sub> or NaNO<sub>3</sub> will have the higher pH. Test your hypothesis by measuring and comparing the pH values.

Compound	pH	Component Varied
NaNO <sub>2</sub>		
NaNO <sub>3</sub>		

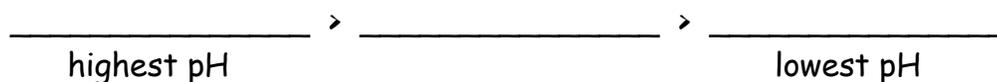
2. Write an equation that would produce the pHs observed using the most active oxo anion tested.

3. Design an experiment to determine the effect of the charge (-y) of an oxo anion on its basicity and carry out the experiment. In addition to the salts from step 1, the following are available:

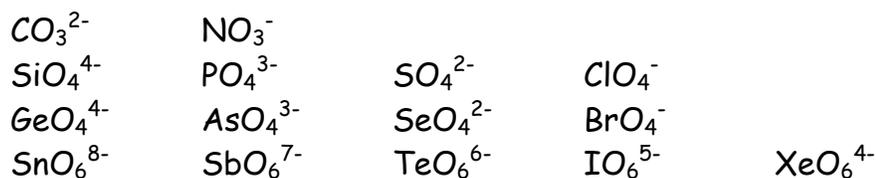


Indicate the relationship between charge and basicity observed.

4. Predict the trend in pHs of the following series of solutions (two of these are too intensely colored to be tested with pH paper).



5. Consider the following list of the oxo anions of the later p-block elements in their highest oxidation states. Notice that the number of oxo groups (oxygen atoms) changes as you proceed down a periodic table family.



How could you explain the fact that the oxo group number does not remain constant?

