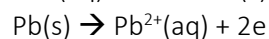
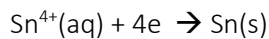
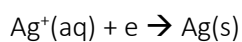
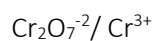


Lesson 2 – Redox. Writing oxidation and reduction half equations for more complex oxidants and reductants.

Simple oxidants such as Ag^+ are somewhat easy to write a balanced half equation for.

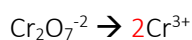


Electrons always added to the most positive side



To write a balanced half equation follow the steps

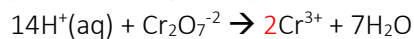
1. Balance for all elements other than O or H



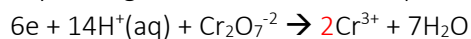
2. balance for oxygen by adding water to the side with least number of oxygens



3. balance for hydrogens by adding $\text{H}^+(\text{aq})$ to the side with least hydrogens



4. balance for charge by adding electrons to the most positive side



1. Use the steps outlined above to give a balanced half equation, states not included, for the reaction of the the following conjugate pairs. Indicate if the reaction is an oxidation or a reduction.

Keep in mind : Reduction – electrons appear on the left

Oxidation – electrons appear on the right

- a. $\text{MnO}_4^- / \text{Mn}^{2+}$
 $5e + 8\text{H}^+ + \text{MnO}_4^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$ -- reduction
- b. $\text{BiO}_4^{3-} / \text{Bi}^{3+}$
 $2e + 8\text{H}^+ + \text{BiO}_4^{3-} \rightarrow \text{Bi}^{3+} + 4\text{H}_2\text{O}$ -- reduction
- c. $\text{SO}_3^{-2} / \text{SO}_4^{-2}$
 $\text{H}_2\text{O} + \text{SO}_3^{-2} \rightarrow \text{SO}_4^{-2} + 2\text{H}^+ + 2e$ – oxidation
- d. $\text{NO}_3^- / \text{NO}_2$
 $e + 2\text{H}^+ + \text{NO}_3^- \rightarrow \text{NO}_2 + \text{H}_2\text{O}$ – reduction
- e. $\text{C}_2\text{O}_4^{-2} / \text{CO}_2$
 $\text{C}_2\text{O}_4^{-2} \rightarrow 2\text{CO}_2 + 2e$ -- oxidation
- f. $\text{H}_5\text{IO}_6 / \text{IO}_3^-$
 $2e + \text{H}^+ + \text{H}_5\text{IO}_6 \rightarrow \text{IO}_3^- + 3\text{H}_2\text{O}$ -- reduction
- g. $\text{BrO}_3^{-3} / \text{Br}^-$
 $4e + 6\text{H}^+ + \text{BrO}_3^{-3} \rightarrow \text{Br}^- + 3\text{H}_2\text{O}$ -- reduction
- h. $\text{MnO}_2 / \text{Mn}_2\text{O}_3$
 $2e + 2\text{H}^+ + 2\text{MnO}_2 \rightarrow \text{Mn}_2\text{O}_3 + \text{H}_2\text{O}$ -- reduction
- i. $\text{HClO}_4 / \text{HCl}$
 $8e + 8\text{H}^+ + \text{HClO}_4 \rightarrow \text{HCl} + 4\text{H}_2\text{O}$ -- reduction
- j. $\text{P}_4\text{H}_{10} / \text{P}_2\text{O}_5$
 $\text{P}_4\text{H}_{10} + 10\text{H}_2\text{O} \rightarrow 2\text{P}_2\text{O}_5 + 30\text{H}^+ + 30e$ -- oxidation
- k. $\text{P}_4 / \text{PO}_4^{-3}$
 $16\text{H}_2\text{O} + \text{P}_4 \rightarrow 4\text{PO}_4^{-3} + 32\text{H}^+ + 20e$ -- oxidation