

Balancing Redox Reactions 2 : Notes/W.S. 28

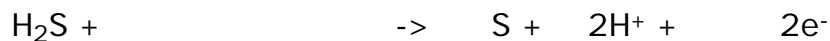
Many redox reactions are difficult to balance by inspection. The best method for balancing these reactions is to break apart the reaction into an oxidation half-reaction and a reduction half-reaction. Then balance each half-reaction and add the two together after multiplying both by a factor to eliminate the electrons on both sides.

Examples:

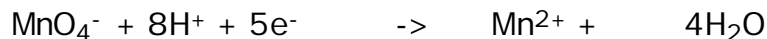
Balance in an acid solution:



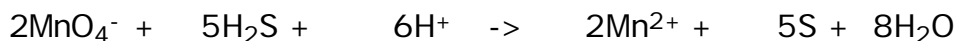
Sulfur is oxidized:



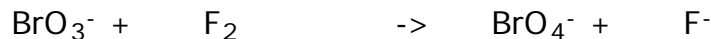
Mn is reduced:



Adding the two equations after multiplying the first by five and the second by two, we have;



Balance in a basic solution:



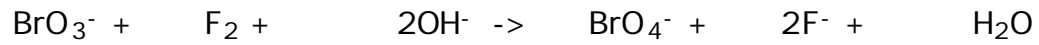
Br is oxidized:



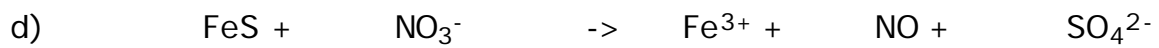
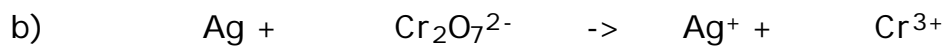
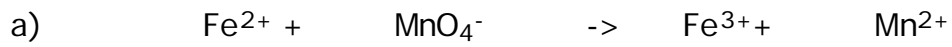
F is reduced:



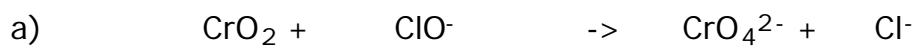
Adding both equations together we have:

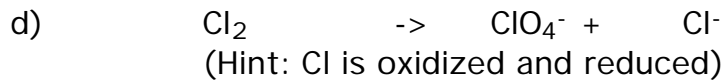


1) Balance the following redox reactions in an acid solution.



2) Balance the following reactions in a basic solution.





Answers: 1)a) $5\text{Fe}^{2+} + \text{MnO}_4^- + 8\text{H}^+ \rightarrow 5\text{Fe}^{3+} + \text{Mn}^{2+} + 4\text{H}_2\text{O}$, b) $6\text{Ag} + \text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ \rightarrow 6\text{Ag}^+ + 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$, c) $2\text{MnO}_4^- + 10\text{Cl}^- + 16\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 5\text{Cl}_2 + 8\text{H}_2\text{O}$, d) $\text{FeS} + 3\text{NO}_3^- + 4\text{H}^+ \rightarrow \text{Fe}^{3+} + 3\text{NO} + \text{SO}_4^{2-} + 2\text{H}_2\text{O}$, 2)a) $\text{CrO}_2 + \text{ClO}^- + 2\text{OH}^- \rightarrow \text{CrO}_4^{2-} + \text{Cl}^- + \text{H}_2\text{O}$, b) $8\text{MnO}_4^- + \text{I}^- + 8\text{OH}^- \rightarrow 8\text{MnO}_4^{2-} + \text{IO}_4^- + 4\text{H}_2\text{O}$, c) $4\text{Zn} + \text{NO}_3^- + 6\text{H}_2\text{O} + 7\text{OH}^- \rightarrow 4\text{Zn(OH)}_4^{2-} + \text{NH}_3$, d) $4\text{Cl}_2 + 8\text{OH}^- \rightarrow \text{ClO}_4^- + 7\text{Cl}^- + 4\text{H}_2\text{O}$.