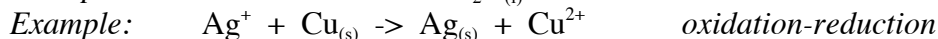


("q&d") Redox Reactions Guide for CH 223

"q&d" = "Quick 'n' Dirty"

Part I: General Instructions - for reactions where pH is not important

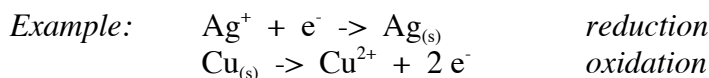
- 1) Recognize that the reaction is an oxidation-reduction reaction. Look for changes in oxidation number on similar atoms in both the reactant and product side.



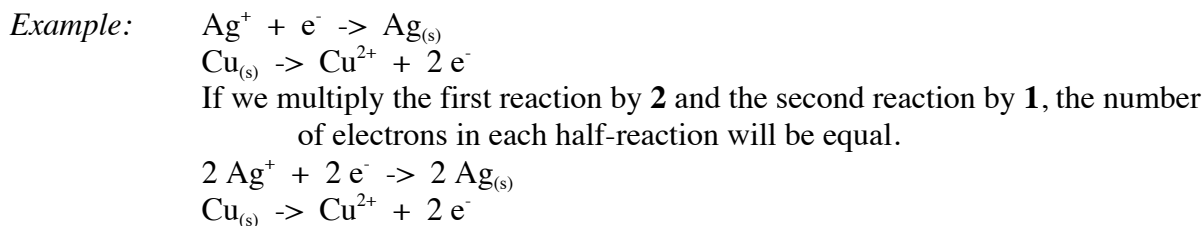
- 2) Separate the process into two **half-reactions**. One side will be a **reduction** and the other will be an **oxidation**.



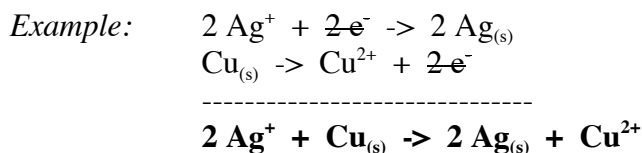
- 3) Balance each half-reaction for **mass** (atoms) and **charge** (using electrons).



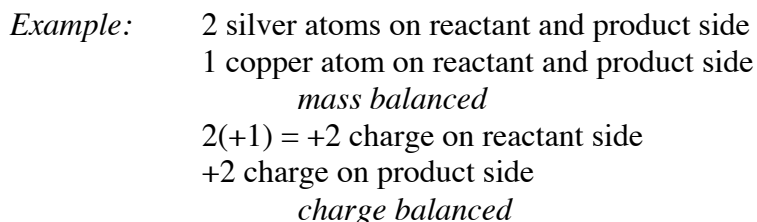
- 4) Multiply each half-reaction by a factor that makes the number of electrons equal.



- 5) Add the two half-reactions to create the overall balanced equation. The equation should be balanced for mass and devoid of electrons.

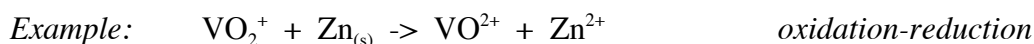


- 6) Confirm that mass and charge are balanced in the overall equation.

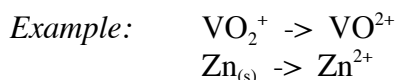


Part II: Acidic Conditions - for reactions where $pH < 7$

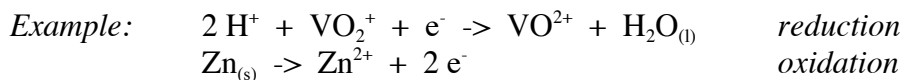
- 1) Recognize that the reaction is an oxidation-reduction reaction. Look for changes in oxidation number on similar atoms in both the reactant and product side.



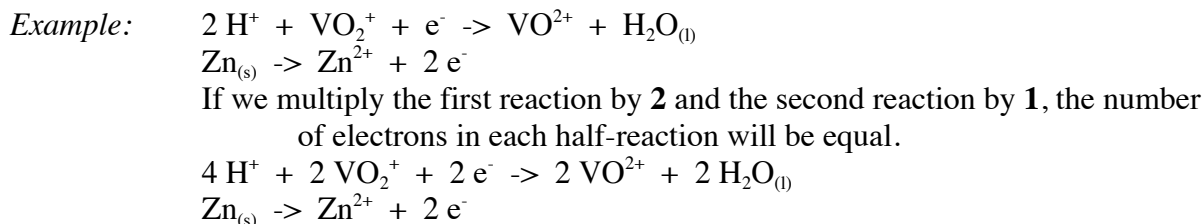
- 2) Separate the process into two **half-reactions**. One side will be a **reduction** and the other will be an **oxidation**.



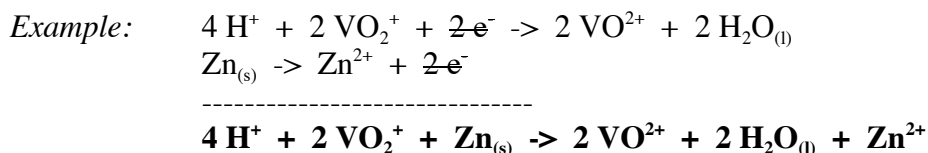
- 3) Balance each half-reaction for **mass** (atoms) and **charge** (using electrons). Note that in *acidic solution*, mass can be balanced by using water and H^+ if appropriate. Water will go to the side that is *oxygen deficient*, and hydrogen ions will go to the side that is *hydrogen deficient*. Some half-reactions will not need any water or hydrogen ions.



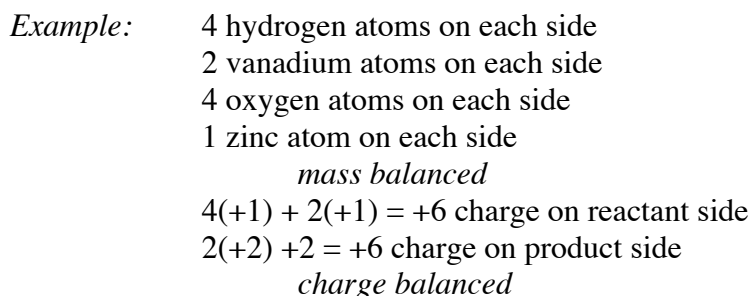
- 4) Multiply each half-reaction by a factor that makes the number of electrons equal.



- 5) Add the two half-reactions to create the overall balanced equation. The equation should be balanced for mass & devoid of electrons. Cancel water and/or protons if present on both sides of the equation.

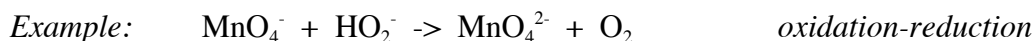


- 6) Confirm that mass and charge are balanced in the overall equation.

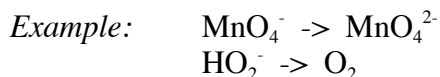


Part III: Basic Conditions - for reactions where $\text{pH} > 7$

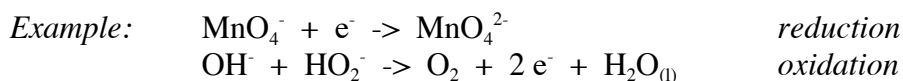
- 1) Recognize that the reaction is an oxidation-reduction reaction. Look for changes in oxidation number on similar atoms in both the reactant and product side.



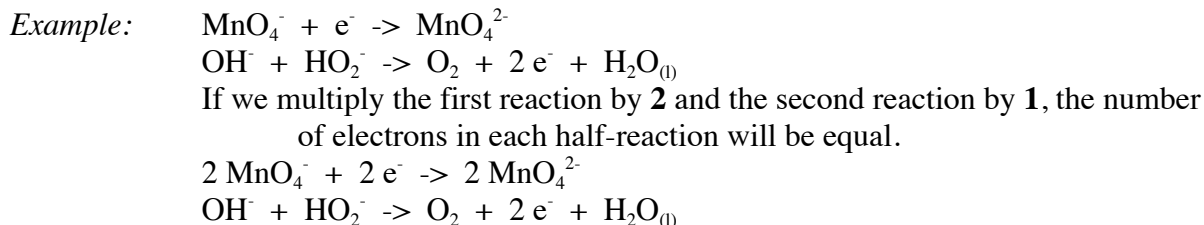
- 2) Separate the process into two **half-reactions**. One will be a **reduction** and the other an **oxidation**.



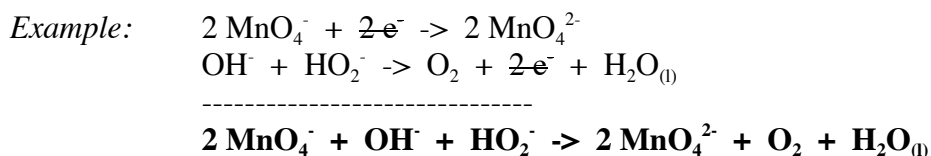
- 3) Balance each half-reaction for **mass** (atoms) and **charge** (using electrons). Note that in *basic solution*, mass can be balanced by using water and OH^- if appropriate. Hydroxide will go to the side that is *oxygen deficient*, and water will go to the side that is *hydrogen deficient*. Some half-reactions will not need any water or hydrogen ions.



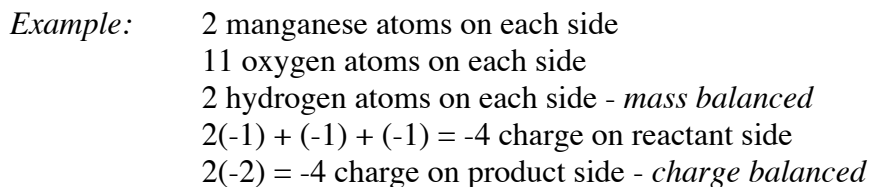
- 4) Multiply each half-reaction by a factor that makes the number of electrons equal.



- 5) Add the two half-reactions to create the overall balanced equation. The equation should be balanced for mass and devoid of electrons. Cancel water and/or hydroxide if present on both sides of the equation.



- 6) Confirm that mass and charge are balanced in the overall equation.



- 7) *Alternatively*, you may balance basic redox reactions using the acidic process used in Part II. Upon completing step 5, add OH^- to neutralize any H^+ present. Add a similar amount of OH^- to both sides. All of the H^+ will be converted to H_2O , and the opposite side should have OH^- present.