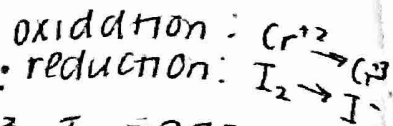
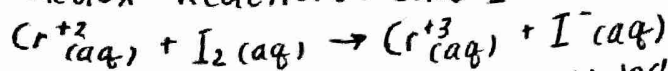
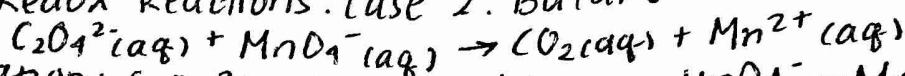


Balancing Redox Reactions: case 1 - Balance



- Step 1. Divide the reaction into two half reactions: $\text{Cr}^{+2} \rightarrow \text{Cr}^{+3}$, $\text{I}_2 \rightarrow 2\text{I}^{-}$
 Step 2. Balance each half reaction for mass
 - In general, add H_2O to balance O, and H^{+} to balance H
 Step 3. Balance each half reaction for charge by adding electrons
 $\text{Cr}^{+2} \rightarrow \text{Cr}^{+3} + 1\text{e}^{-}$, $2\text{e}^{-} + \text{I}_2 \rightarrow 2\text{I}^{-}$
 Step 4. Multiply half reactions by integers so that electrons cancel
 $2\text{Cr}^{+2} \rightarrow 2\text{Cr}^{+3} + 2\text{e}^{-}$, $2\text{e}^{-} + \text{I}_2 \rightarrow 2\text{I}^{-}$
 Step 5. Add the half reactions and simplify: $2\text{Cr}^{+2} + \text{I}_2 \rightarrow 2\text{Cr}^{+3} + 2\text{I}^{-}$
 Step 6. Check to make sure that the rxn is balanced for mass and charge

Balancing Redox Reactions: case 2: Balance



1. Oxidation: $\text{C}_2\text{O}_4^{2-} \rightarrow \text{CO}_2$, Reduction: $\text{MnO}_4^{-} \rightarrow \text{Mn}^{2+}$
 - Assigning oxidation numbers shows that C is oxidized (+3 $\rightarrow$ +4) and Mn is reduced (+7 $\rightarrow$ +2)
 2. $\text{C}_2\text{O}_4^{2-} \rightarrow 2\text{CO}_2$, $\text{MnO}_4^{-} \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$
 $\text{MnO}_4^{-} + 8\text{H}^{+} \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$
 3. $\text{C}_2\text{O}_4^{2-} \rightarrow 2\text{CO}_2 + 2\text{e}^{-}$, $\text{MnO}_4^{-} + 8\text{H}^{+} + 5\text{e}^{-} \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$
 4. $5\text{C}_2\text{O}_4^{2-} + 10\text{CO}_2 + 10\text{e}^{-}$, $2\text{MnO}_4^{-} + 16\text{H}^{+} + 10\text{e}^{-} \rightarrow 2\text{Mn}^{2+} + 8\text{H}_2\text{O}$
 5. $5\text{C}_2\text{O}_4^{2-} + 2\text{MnO}_4^{-} + 16\text{H}^{+} \rightarrow 10\text{CO}_2 + 2\text{Mn}^{2+} + 8\text{H}_2\text{O}$
 6. Check to make sure that the reaction is balanced for mass and charge

Balancing in a Basic Solution

- Follow above steps. At the end, add OH^{-} to each side to neutralize the H^{+}
 - Simplify H_2O terms if necessary