

**In-Class Practice Problems for Balancing Redox Equations**  
**Dr. Angela King Fall 2008**

Since redox reactions don't generate or destroy electrons, the number of electrons lost by the reducing agent must equal the number of electrons gained by the oxidizing agent. If each molecule of oxidizing agent and reducing agent experiences a gain or loss of different numbers of electrons, then they will not react in a 1:1 ratio and the equation must be balanced to account for this.

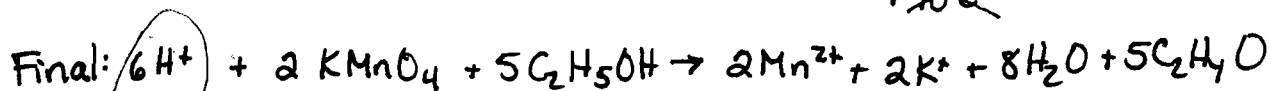
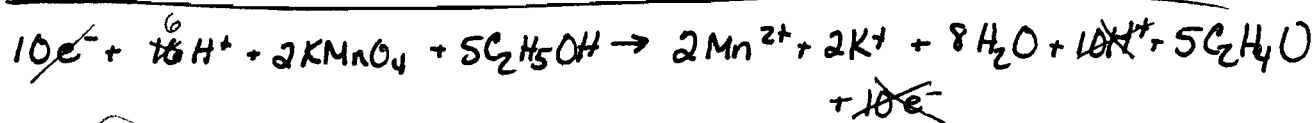
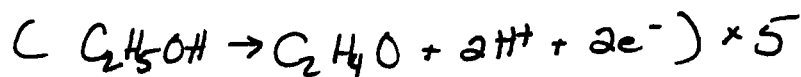
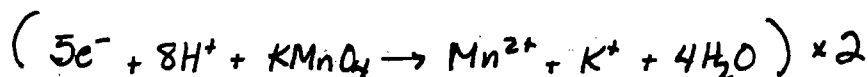
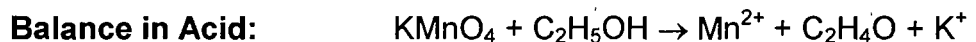
**Step-wise Instructions for Balancing in Acidic Solution:**

- Write separate equations for oxidation and reduction half reactions.
- For each half reaction balance:
  - a. all elements except H and O
  - b. O using water
  - c. H using H<sup>+</sup>
  - d. charges using electrons
- Equalize electrons by multiplying coefficients in half-reaction(s) by integers.
- Add half reactions together and cancel species that appear on both sides.
- Check.

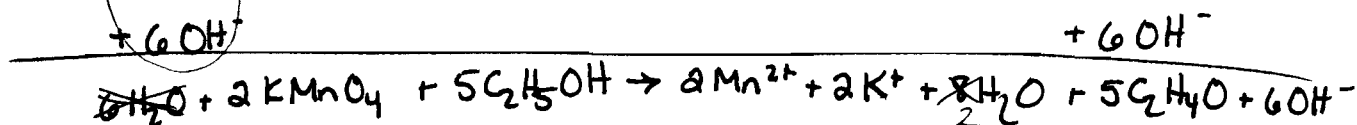
**Step-wise Instructions for Balancing in Basic Solution:**

- Balance as if in acid.
- To both sides of the balanced equation, add the same # OH<sup>-</sup> as H<sup>+</sup> appears.
- If H<sup>+</sup> and OH<sup>-</sup> appear on the same side they will react in a 1:1 ratio to form water.
- Cancel any water molecules that appear on both sides.
- Check.

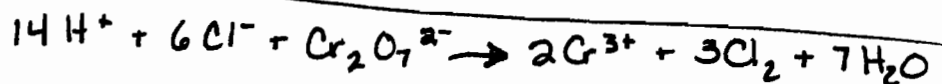
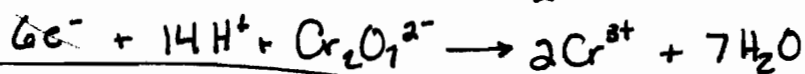
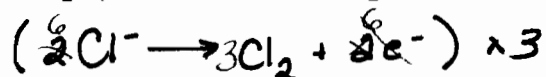
*Following these rules you will always be able to balance any redox reaction, but it takes PRACTICE to correctly apply them.*



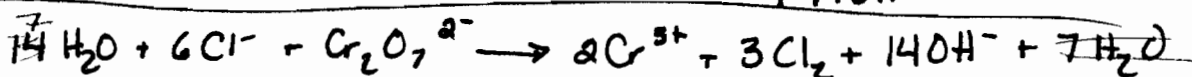
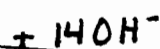
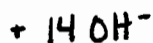
Balance the same equation in Base:



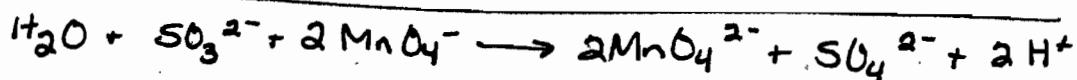
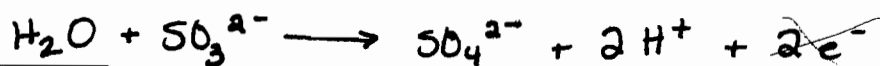
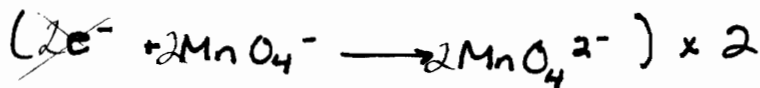
Balance in Acid:  $\text{Cr}_2\text{O}_7^{2-} + \text{Cl}^- \rightarrow \text{Cr}^{3+} + \text{Cl}_2$



Balance the above equation in base:



Balance in Acid:  $\text{MnO}_4^- + \text{SO}_3^{2-} \rightarrow \text{SO}_4^{2-} + \text{MnO}_4^{2-}$



Balance the above equation in Base:

