

Chapter 18: 2, 6, 8, 10, 30, 32, 38, 40, 58, 70

18.2 Balance each redox reaction occurring in acidic aqueous solution.

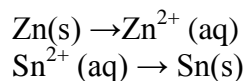
- $\text{Zn(s)} + \text{Sn}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Sn(s)}$
- $\text{Mg(s)} + \text{Cr}^{3+}(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{Cr(s)}$
- $\text{MnO}_4^{-}(\text{aq}) + \text{Al(s)} \rightarrow \text{Mn}^{2+}(\text{aq}) + \text{Al}^{3+}(\text{aq})$

SOLUTION:

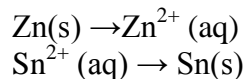
a.

6-1/2 magic steps!

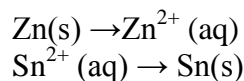
1. Separate into $\frac{1}{2}$ reactions:



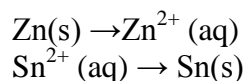
2. Balance everything but H and O



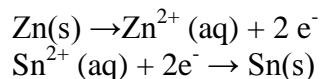
3. Balance O using H_2O



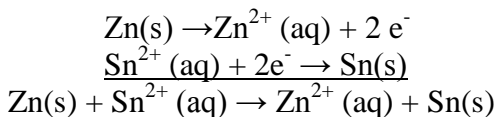
4. Balance H using H^{+}



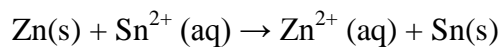
5. Balance charge by adding electrons



6. Recombine half-reactions, making sure to cancel electrons



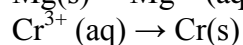
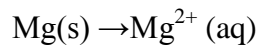
7. Only applies to basic solutions



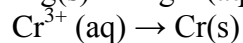
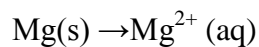
b.

6-1/2 magic steps!

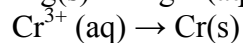
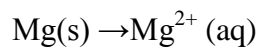
1. Separate into 1/2 reactions:



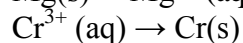
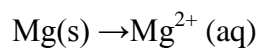
2. Balance everything but H and O



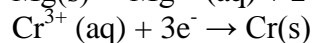
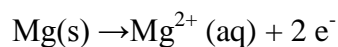
3. Balance O using H₂O



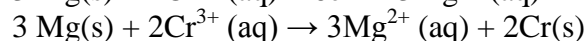
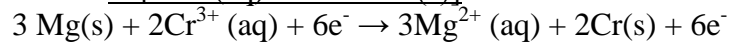
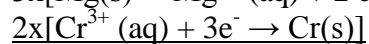
4. Balance H using H⁺



5. Balance charge by adding electrons



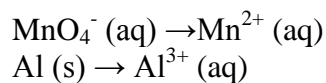
6. Recombine half-reactions, making sure to cancel electrons



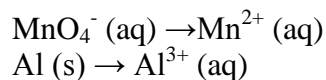
c.

6-1/2 magic steps!

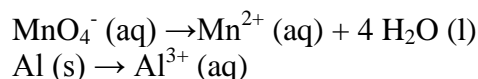
1. Separate into 1/2 reactions:



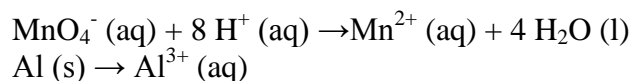
2. Balance everything but H and O



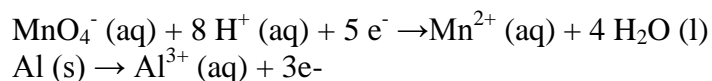
3. Balance O using H₂O



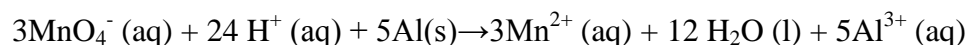
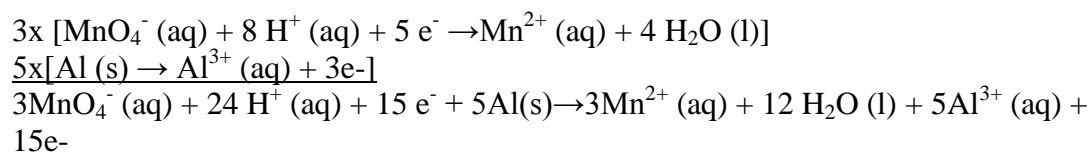
4. Balance H using H⁺



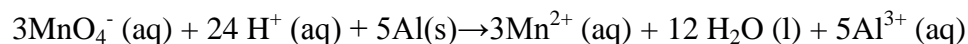
5. Balance charge by adding electrons



6. Recombine half-reactions, making sure to cancel electrons



7. Only applies to basic solutions



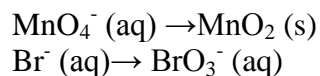
18.6 Balance each redox reaction occurring in basic aqueous solution.

- a. $\text{MnO}_4^- (\text{aq}) + \text{Br}^- (\text{aq}) \rightarrow \text{MnO}_2 (\text{s}) + \text{BrO}_3^- (\text{aq})$
 b. $\text{Ag} (\text{s}) + \text{CN}^- (\text{aq}) + \text{O}_2 (\text{g}) \rightarrow \text{Ag}(\text{CN})_2^- (\text{aq})$
 c. $\text{NO}_2^- (\text{aq}) + \text{Al} (\text{s}) \rightarrow \text{NH}_3 (\text{g}) + \text{AlO}_2^- (\text{aq})$

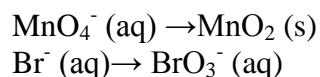
SOLUTION:

a.

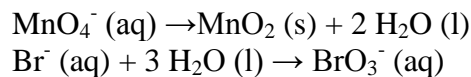
1. Separate into $\frac{1}{2}$ reactions:



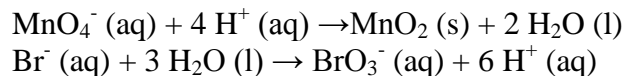
2. Balance everything but H and O



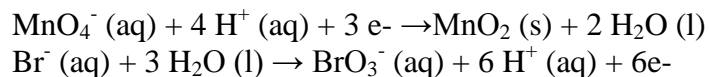
3. Balance O using H_2O



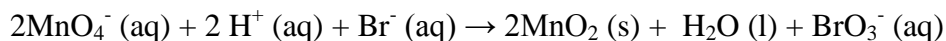
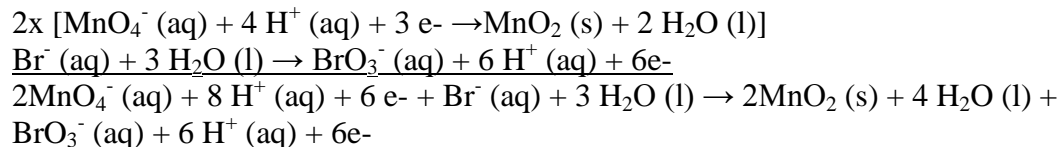
4. Balance H using H^+



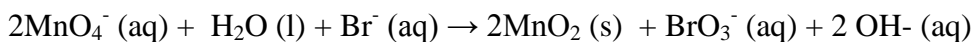
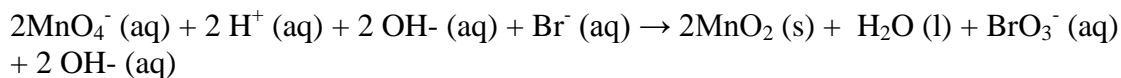
5. Balance charge by adding electrons



6. Recombine half-reactions, making sure to cancel electrons

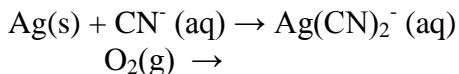


7. In basic solution, add OH⁻ to both sides to neutralize H⁺

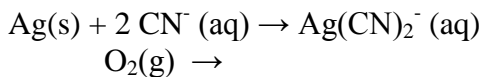


b. (this one's a little tricky to separate. The oxygen is going to end up as OH⁻ but it isn't visible the way the book wrote the equation. They should have really put an OH⁻ on the right.)

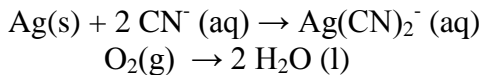
1. Separate into ½ reactions:



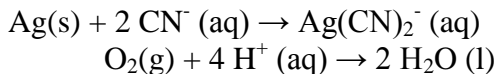
2. Balance everything but H and O



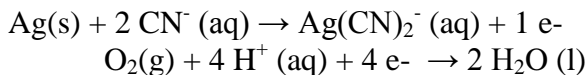
3. Balance O using H₂O



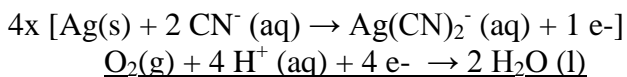
4. Balance H using H⁺

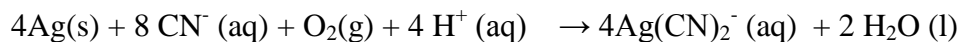
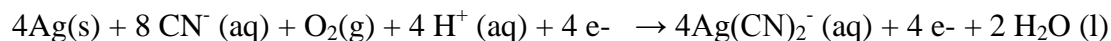


5. Balance charge by adding electrons

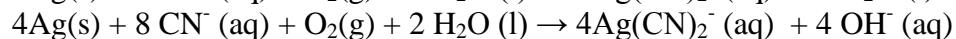
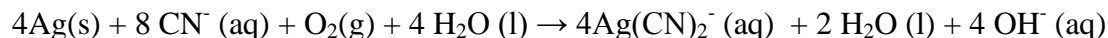
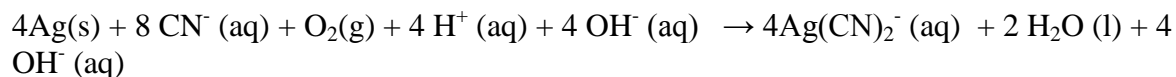


6. Recombine half-reactions, making sure to cancel electrons



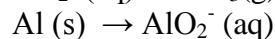
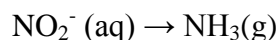


7. In basic solution, add OH⁻ to both sides to neutralize H⁺

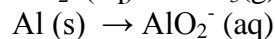
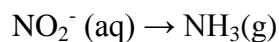


c.

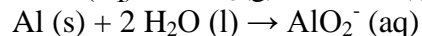
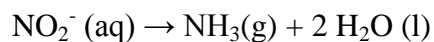
1. Separate into ½ reactions:



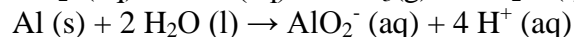
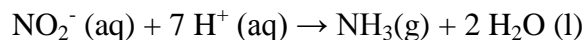
2. Balance everything but H and O



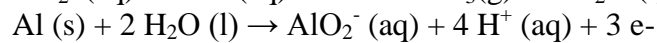
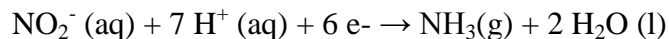
3. Balance O using H₂O



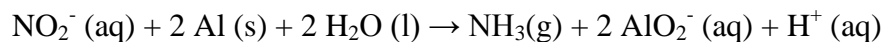
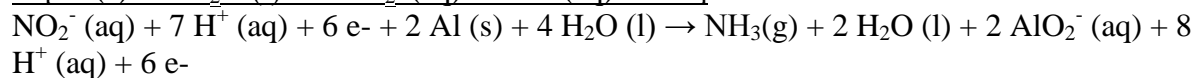
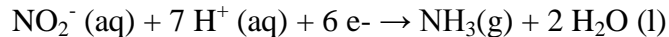
4. Balance H using H⁺



5. Balance charge by adding electrons



6. Recombine half-reactions, making sure to cancel electrons



7. In basic solution, add OH⁻ to both sides to neutralize H⁺

