

**OXIDATION-REDUCTION REACTIONS****Practice Problems**

*In your notebook, solve the following problems.*

**SECTION 20.1 THE MEANING OF OXIDATION AND REDUCTION**

*Determine what is oxidized and what is reduced in each reaction. Identify the oxidizing agent and the reducing agent.*

- $2\text{Sr} + \text{O}_2 \rightarrow 2\text{SrO}$
- $2\text{Li} + \text{S} \rightarrow 2\text{Li}_2\text{S}$
- $2\text{Cs} + \text{Br}_2 \rightarrow 2\text{CsBr}$
- $3\text{Mg} + \text{N}_2 \rightarrow \text{Mg}_3\text{N}_2$
- $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$
- $\text{Cl}_2 + 2\text{NaBr} \rightarrow 2\text{NaCl} + \text{Br}_2$
- $\text{Si} + 2\text{F}_2 \rightarrow \text{SiF}_4$
- $2\text{Ca} + \text{O}_2 \rightarrow 2\text{CaO}$
- $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
- $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$

**SECTION 20.2 OXIDATION NUMBERS**

- Give the oxidation number of each kind of atom or ion.
  - Sn
  - $\text{K}^+$
  - $\text{S}^{2-}$
  - $\text{Fe}^{3+}$
  - Se
  - $\text{Mg}^{2+}$
  - $\text{Sn}^{4+}$
  - $\text{Br}^-$
- Calculate the oxidation number of chromium in each of the following formulas.
  - $\text{Cr}_2\text{O}_3$
  - $\text{H}_2\text{Cr}_2\text{O}_7$
  - $\text{CrSO}_4$
  - $\text{CrO}_4^{2-}$
- Use the changes in oxidation number to determine which elements are oxidized and which are reduced in these reactions. (Note: It is not necessary to use balanced reactions.)
  - $\text{C} + \text{H}_2\text{SO}_4 \rightarrow \text{CO}_2 + \text{SO}_2 + \text{H}_2\text{O}$
  - $\text{HNO}_3 + \text{HI} \rightarrow \text{NO} + \text{I}_2 + \text{H}_2\text{O}$
  - $\text{KMnO}_4 + \text{HCl} \rightarrow \text{MnCl}_2 + \text{Cl}_2 + \text{H}_2\text{O} + \text{KCl}$
  - $\text{Sb} + \text{HNO}_3 \rightarrow \text{Sb}_2\text{O}_5 + \text{NO} + \text{H}_2\text{O}$
- For each reaction in problem 3 above, identify the oxidizing agent and reducing agent.

**SECTION 20.3 BALANCING REDOX EQUATIONS**

1. Balance these equations using the oxidation-number-change method.
  - a.  $\text{C} + \text{H}_2\text{SO}_4 \rightarrow \text{CO}_2 + \text{SO}_2 + \text{H}_2\text{O}$
  - b.  $\text{H}_2\text{S} + \text{HNO}_3 \rightarrow \text{S} + \text{NO} + \text{H}_2\text{O}$
  - c.  $\text{HNO}_3 + \text{HI} \rightarrow \text{NO} + \text{I}_2 + \text{H}_2\text{O}$
  - d.  $\text{Sb} + \text{HNO}_3 \rightarrow \text{Sb}_2\text{O}_5 + \text{NO} + \text{H}_2\text{O}$
  - e.  $\text{KMnO}_4 + \text{HCl} \rightarrow \text{MnCl}_2 + \text{Cl}_2 + \text{H}_2\text{O} + \text{KCl}$
  - f.  $\text{KIO}_4 + \text{KI} + \text{HCl} \rightarrow \text{KCl} + \text{I}_2 + \text{H}_2\text{O}$
  - g.  $\text{Zn} + \text{Cr}_2\text{O}_7^{2-} + \text{H}^+ \rightarrow \text{Zn}^{2+} + \text{Cr}^{3+} + \text{H}_2\text{O}$
2. Write half-reactions for the oxidation and reduction processes for each of the following reactions.
  - a.  $\text{Fe}^{2+} + \text{MnO}_4^- \rightarrow \text{Fe}^{3+} + \text{Mn}^{2+}$  (acidic solution)
  - b.  $\text{Sn}^{2+} + \text{IO}_3^- \rightarrow \text{Sn}^{4+} + \text{I}^-$  (acidic solution)
  - c.  $\text{S}^{2-} + \text{NO}_3^- \rightarrow \text{S} + \text{NO}$  (acidic solution)
  - d.  $\text{Mn}^{2+} + \text{H}_2\text{O}_2 \rightarrow \text{MnO}_2 + \text{H}_2\text{O}$  (basic solution)
3. Balance these reactions using the half-reaction method.
  - a.  $\text{Zn} + \text{HgO} \rightarrow \text{ZnO}_2^{2-} + \text{Hg}$  (basic solution)
  - b.  $\text{Fe}^{2+} + \text{MnO}_4^- \rightarrow \text{Fe}^{3+} + \text{Mn}^{2+}$  (acidic solution)
  - c.  $\text{Sn}^{2+} + \text{IO}_3^- \rightarrow \text{Sn}^{4+} + \text{I}^-$  (acidic solution)
  - d.  $\text{S}^{2-} + \text{NO}_3^- \rightarrow \text{S} + \text{NO}$  (acidic solution)
  - e.  $\text{Mn}^{2+} + \text{H}_2\text{O}_2 \rightarrow \text{MnO}_2 + \text{H}_2\text{O}$  (basic solution)
  - f.  $\text{CrO}_2 + \text{ClO}^- \rightarrow \text{CrO}_4^{2-} + \text{Cl}^-$  (basic solution)