

## Post-Laboratory Review Questions

Examine the five reactions shown below and identify those that can be classified as oxidation–reduction.

- $2\text{H}_3\text{PO}_4 + 3\text{Ca}(\text{OH})_2 \rightarrow \text{Ca}_3(\text{PO}_4)_2 + 6\text{H}_2\text{O}$
- $2\text{Cr} + 3\text{Cl}_2 \rightarrow 2\text{CrCl}_3$
- $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$
- $\text{Na}_2\text{CO}_3 \rightarrow \text{Na}_2\text{O} + \text{CO}_2$
- $2\text{VO}^{2+} + \text{Zn} + 4\text{H}^+ \rightarrow 2\text{V}^{3+} + \text{Zn}^{2+} + 2\text{H}_2\text{O}$

The decomposition of a compound into simpler substances by means of an electrical current is called electrolysis.

- Write the balanced chemical equation for the electrolytic decomposition of water to its elements.
- Balance the following oxidation and reduction half-reactions for the decomposition of water.  
 $\text{H}_2\text{O} \rightarrow \text{O}_2 + \text{H}^+ + \text{e}^-$   
 $\text{H}_2\text{O} + \text{e}^- \rightarrow \text{H}_2 + \text{OH}^-$
- Explain how the oxidation and reduction half-reactions may be combined to give the balanced chemical equation for the decomposition of water. What happens to the electrons and to the  $\text{H}^+$  and  $\text{OH}^-$  ions?

The usefulness of metals in structural applications depends on their physical and chemical properties. Corrosion is the oxidation of metals and is a common failing point for a metal structure.

	$\text{Cu}(\text{NO}_3)_2$	$\text{Mg}(\text{NO}_3)_2$	$\text{Zn}(\text{NO}_3)_2$	$\text{AgNO}_3$
<b>Cu</b>		No reaction	No reaction	Silver crystals form on Cu surface; soln. turns green
<b>Mg</b>	Dark ppt. forms; soln. bubbles, turns green/gray		Soln. bubbles and dark ppt. forms	Large amount of flaky ppt.; dark gray soln.
<b>Zn</b>	Dark ppt. forms; soln. slowly turns green	No reaction		Large amount of flaky gray ppt.; dark gray soln.

- Examine the observations above for the metals Cu, Mg and Zn. Identify the metal that is most susceptible to oxidation (corrosion). Identify the metal that is most resistant to oxidation.
- Because silver metal is expensive, it was not used in the tests shown above. Based on the reactions of Cu, Mg and Zn with silver nitrate, explain why it was not necessary to test silver metal to deduce its reactivity.