

## 4: Reactions in Aqueous Solution

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### OVERVIEW OF THE CHAPTER

#### 4.1, 4.3 **Aqueous Solution: Electrolytes, Acids, and Bases**

**Review:** Solutions (1.2), nomenclature of acids, bases, and salts (2.8)

**Learning Goals:** You should be able to:

1. Classify substances as nonelectrolytes, strong electrolytes, or weak electrolytes.
2. Predict the ions formed when electrolytes dissociate or ionize.
3. Identify substances as acids, bases, or salts.

#### 4.2 **Precipitation Reactions: Ionic Equations**

**Learning Goals:** You should be able to:

1. Use solubility rules to predict whether a precipitate forms when two different salt solutions are mixed.
2. Predict the products of metathesis reactions (including both neutralization and precipitation reactions) and write balanced chemical equations for them.
3. Write molecular and net ionic equations for reactions in aqueous solutions.

#### 4.4 **Oxidation and Reduction: Oxidation Numbers and Activity Series**

**Learning Goals:** You should be able to:

1. Determine whether a chemical reaction involves oxidation and reduction.
2. Assign oxidation numbers to atoms in molecules and ions.
3. Use the activity series to predict whether a reaction will occur when a metal is added to an aqueous solution of either a metal salt or an acid, and write the balanced molecular and net ionic equations for the reaction.

#### 4.5 **Concentrations of Solutions**

**Learning Goals:** You should be able to:

1. Calculate molarity, solution volume, or number of moles of solute given any two of these quantities.
2. Calculate the volume of a more concentrated solution that must be diluted to obtain a given quantity of a more dilute solution.

#### 4.6 **Solution Stoichiometry**

**Review:** Stoichiometry of chemical reactions (3.6), limiting reactants (3.7).

**Learning Goals:** You should be able to:

1. Calculate the volume of a solution required to react with a volume of a different solution using molarity and the stoichiometry of the reaction.
2. Calculate the amount of a substance required to react with a given volume of a solution using molarity and the stoichiometry of the reaction.
3. Calculate the concentration or mass of solute in a sample from titration data.