

OpenStax	Learning Outcomes	
4.1	Write and balance a chemical equation.	
11.2, 4.2	Classify an ionic compound as soluble or insoluble using the solubility rules.	
11.2, 4.2		Summarize the difference between soluble and insoluble compounds.
11.2, 4.2		Memorize the solubility rules.
4.2	Summarize characteristics of strong, weak, and non-electrolytes.	
11.2		Describe how an ionic compound dissolves in water.
11.2, 4.2		Distinguish between strong electrolyte, weak electrolytes and nonelectrolyte solutions on the macroscopic level, that is how they behave.
11.2, 4.2		Distinguish among strong electrolyte, weak electrolyte, and nonelectrolyte solutions on the molecular level, that is, what makes them.
11.2, 4.2		Identify substances as strong, weak, or non-electrolytes.
4.2	Describe precipitation reactions.	
4.2		Define precipitation.
4.2		Predict the precipitate that may form when aqueous solutions of ionic compounds are mixed.
4.1		Write complete ionic equations.
4.1		Write net ionic equations.
4.2	Identify strong acids and bases.	
4.2		List the names and formulas of the six strong acids.
4.2		Write the reactions for the ionization of a strong acid or base in water.
4.2		Recognize that hydroxides of Group I metals, calcium, strontium, and barium are strong bases.
4.2	Describe acid-base reactions.	
4.2		Describe Arrhenius acids and bases.
4.2		Identify the products of reactions between acids and bases.
4.2		Write balanced neutralization reactions.
4.2		Define the common terms associated with a titration: titrant, equivalence point, indicator.
4.2	Explain properties of oxidation-reduction reactions.	
4.2		State rules for calculation of oxidation numbers.
4.2		Apply the rules to calculate the oxidation number of all atoms in a compound, for free elements, and for ions.
4.2		Recognize a redox reaction.
4.2		Define oxidation and reduction in terms of the loss or gain of electrons.
4.2		Identify what substance is oxidized and what substance is reduced.
4.2		Identify the oxidizing agent and reducing agent.
4.2		Balance redox reactions given the number of electrons in each half-reaction.
4.3	Calculate the quantitative relationships among substances in a reaction.	
4.3		Determine mole-to-mole ratios between substances based on a balanced chemical equation.
4.3		Given the amount of one substance (in moles or mass) and a chemical equation, calculate the amount of another substance (in moles or mass)
4.4		Identify limiting reagent problems.
4.4		Determine substances that are the limiting and excess reagents.
4.4		Calculate theoretical yield.
4.4		Calculate the amount of remaining excess reactant.
4.4		Distinguish between actual and theoretical yields.
4.4		Calculate percent yield
4.4		Use percent yield to calculate actual or theoretical yields.
4.5		Use molarity to solve stoichiometry and limiting reagent problems.
4.5		Recognize that the dilution formula is used for dilutions only and NOT for stoichiometry problems.
4.5		Distinguish between a dilution and a reaction.
4.5		Calculate quantities of reactants in a titration.