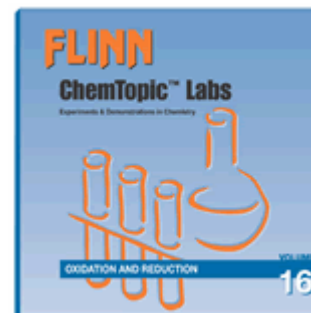


Oxidation and Reduction— Experiment Summaries and Concepts



Metal Activity and Reactivity—Oxidation and Reduction Reactions

The usefulness of metals depends on both their physical properties and their relative reactivity. A ranking of metals based on their relative reactivity and ease of oxidation is called an activity series. In this microscale experiment, students compare the activity of metals by investigating the reactions of metals with metal cations. The single-replacement reactions will occur in one direction only, with a more active metal always replacing a less active metal ion. Use this experiment as a simple introduction to oxidation–reduction reactions and to help students develop critical thinking skills as they rank metals from most active to least active.



Oxidation–Reduction Survey—Iron(II) and Iron(III) Reactions

Dietary iron comes in two forms, iron(II) and iron(III) compounds. Although iron(II) is more easily absorbed, iron(III) is more easily stored. How are these ions related? The purpose of this microscale experiment is to investigate the role of electron transfer in the reactions of iron(II) and iron(III) ions with oxidizing and reducing agents, respectively. Students carry out a series of reactions, determine the change in oxidation state for each reagent, write oxidation and reduction half-reactions, and balance the equations to describe the overall redox reactions.



Corrosion of Iron—Guided Inquiry Activity

Billions of dollars are spent every year in the fight against corrosion. Numerous corrosion-prevention remedies, including chemical treatments, surface coatings, and combinations of metals, have been developed to reduce or prevent the corrosion of iron. In this guided inquiry activity, students examine the evidence for the electrochemical model of corrosion and use this model to design anticorrosion metal treatments and test their effectiveness. Chemical indicators for the products of corrosion give colorful results—see the inside back cover for color photos of corrosion test plates.



Analysis of Hydrogen Peroxide—A Redox Titration

Hydrogen peroxide is a common drugstore chemical. Ask your students to look into the far reaches of their medicine cabinets at home. Chances are, some of them will find old bottles of hydrogen peroxide that have long since passed their expiration dates. Does the concentration of hydrogen peroxide deteriorate over time? The purpose of this experiment is to analyze the percent hydrogen peroxide in the drugstore solution by redox titration with potassium permanganate. A great culminating experiment ties together key concepts in your oxidation–reduction lesson plan and integrates prior knowledge in stoichiometry.

Concepts

- Activity series
- Single replacement reactions
- Oxidation–reduction
- Half-reactions

- Oxidation–reduction
- Oxidation state
- Half-reactions
- Oxidizing and reducing agents

- Corrosion
- Oxidation–reduction
- Half-reactions
- Activity of metals

- Redox reaction
- Titration
- Oxidizing and reducing agents
- Half-reactions