

Scope and Sequence

Unit 1: Introduction to Chemistry and Engineering

Lesson 1.1 Exploring Matter

Exploration 1 Exploring Physical and Chemical Changes

Exploration 2 Properties of Matter

Exploration 3 Classifying Matter

Exploration 4 The Study of Chemistry

Take it Further **Careers in Science:** Crystallographer

Lesson 1.2 Chemistry and the Engineering Design Process

Exploration 1 Separating a Mixture

Exploration 2 The Engineering Design Process

Exploration 3 Systems and Models

Exploration 4 Case Study: Biosphere 2

Take it Further **Engineering:** Multiscale Modeling

Unit 2: Atoms and Elements

Lesson 2.1 Modeling Atomic Structure

Exploration 1 Comparing Elements Based on Their Properties

Exploration 2 Investigating Atomic Structure

Exploration 3 Describing Atoms with Numbers

Exploration 4 Identifying Elements Using a Flame Test

Exploration 5 Modeling Electron Configurations

Take it Further **Language Arts:** Mass Spectrometry

Lesson 2.2 Investigating Patterns in the Periodic Table

Exploration 1 Modeling Periodic Trends

Exploration 2 Predicting the Properties of Elements

Exploration 3 Patterns in Ionization Energy

Exploration 4 Patterns in Atomic Size

Exploration 5 Patterns in Electronegativity

Take it Further **Careers in Science:** Analytical Chemist

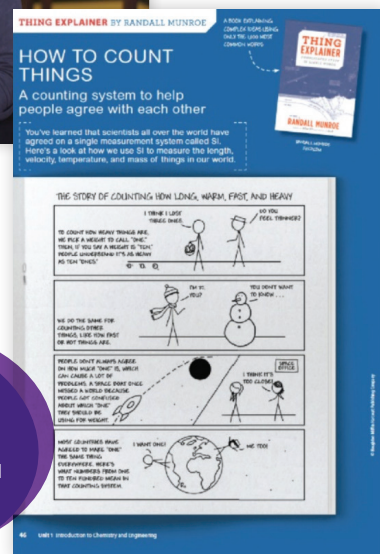
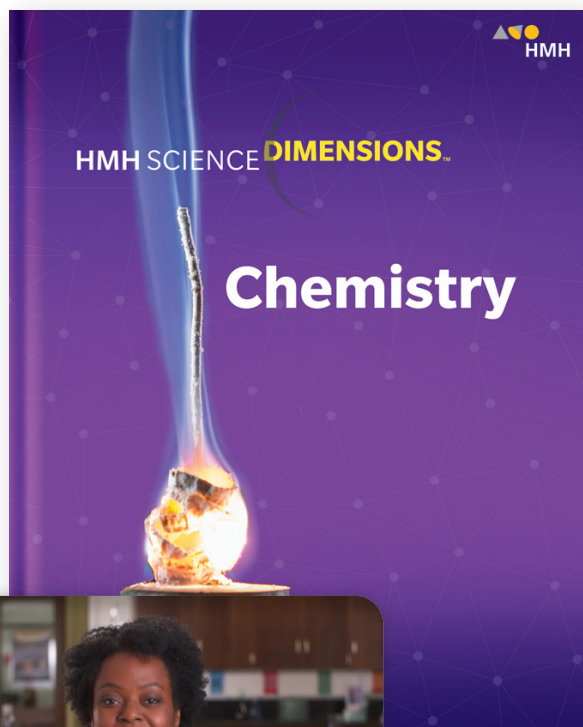
Lesson 2.3 Analyzing Nuclear Reactions

Exploration 1 Explaining Nuclear Stability

Exploration 2 Investigating Radioactive Decay

Exploration 3 Analyzing Nuclear Fission and Fusion

Exploration 4 Case Study: Exploring Nuclear Energy

Take it Further **Careers in Engineering:** Environmental Engineer

Thing Explainer

Illustrations from
xkcd.com author
Randall Munroe featured
in the textbook!

Unit 3: Compounds and Mixtures

Lesson 3.1 Investigating Chemical Compounds

Exploration 1 Analyzing the Properties of Compounds

Exploration 2 Describing Chemical Bonds

Exploration 3 Predicting the Structure of Compounds

Exploration 4 Modeling the Shapes of Molecules

Take it Further Guided Research: Asking Questions about Minerals

Lesson 3.2 Analyzing the Properties of Compounds and Solutions

Exploration 1 Exploring Intermolecular Forces in Liquids

Exploration 2 Explaining Intermolecular Forces

Exploration 3 Describing Solutions

Exploration 4 Measuring the Electrical Conductivity of Solutions

Exploration 5 Analyzing the Behavior of Solutions

Take it Further Careers in Engineering: Water Supply Engineer

Lesson 3.3 Engineering Materials

Exploration 1 Exploring Materials Science and Design

Exploration 2 Experimenting with Polymers

Exploration 3 Analyzing Types of Materials

Exploration 4 Case Study: Shape Memory Alloys

Take it Further Careers in Science: Organic Chemist

Unit 4: Chemical Reactions

Lesson 4.1 Observing and Modeling Chemical Reactions

Exploration 1 Evaluating Systems in Chemical Reactions

Exploration 2 Exploring Conservation of Mass

Exploration 3 Modeling Chemical Reactions

Take it Further Hands-On Lab: Modeling the Conservation of Mass

Lesson 4.2 Analyzing Chemical Reactions

Exploration 1 Quantifying Matter in Chemical Reactions

Exploration 2 Limiting and Excess Matter

Exploration 3 Case Study: Analyzing Greenhouse Gas Emissions

Exploration 4 Gravimetric Analysis

Take it Further Guided Research: Redefining the Mole

Lesson 4.3 Investigating Energy in Chemical Reactions

Exploration 1 Investigating Thermal Energy and Heat

Exploration 2 Measuring the Energy in Food

Exploration 3 Exploring Reaction Energy

Exploration 4 Case Study: Energy in Fuels

Take it Further Careers in Science: Computational Chemist

Unit 5: Reaction Rates and Equilibrium

Lesson 5.1 Investigating Reaction Rates

Exploration 1 Observing Reaction Rates

Exploration 2 Collision Theory

Exploration 3 Energy Flow in Chemical Reactions

Exploration 4 The Rate Law

Take it Further Engineering: Chemical Kinetics

Lesson 5.2 Exploring Chemical Equilibrium

Exploration 1 Explaining Equilibrium

Exploration 2 Concentration Influences Equilibrium

Exploration 3 Pressure and Temperature Influence Equilibrium

Exploration 4 Exploring Acids and Bases

Exploration 5 Analyzing Acid-Base Equilibrium Systems

Take it Further Language Arts: Carbon Monoxide Poisoning

Lesson 5.3 Analyzing Chemical Systems

Exploration 1 Defining Chemical Systems

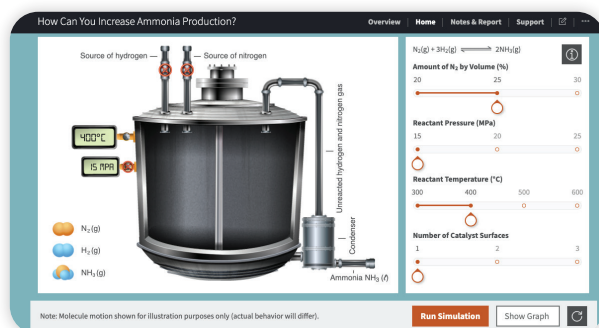
Exploration 2 Storing a Charge

Exploration 3 Case Study: Optimizing an Industrial Reaction

Exploration 4 Exploring the Effects of Carbon Dioxide and pH

Exploration 5 Case Study: Ocean Acidification

Take it Further Careers in Science: Environmental Chemist



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