Connections to the Next Generation Science Standards

The You Be The Chemist Challenge® Passport to Science Exploration study materials expose students in grades 5-8 to the fascinating world of science and chemistry. These study materials are meant to supplement classroom learning for meeting the Next Generation Science Standards (NGSS). Below is an outline of the Passport to Science Exploration: The Core of Chemistry and the corresponding performance expectations of the NGSS to which each section aligns.

To learn more about the Next Generation Science Standards, visit www.nextgenscience.org.

Passport to Science Exploration: The Core of Chemistry

I. SCIENCE- A WAY OF THINKING

Engineering, Technology, and Application of Science (ETS)1 Engineering Design

ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that optimal design can be achieved.

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

ETS1.B: Developing Possible Solutions

ETS1.C: Optimizing the Design Solution

Crosscutting Concepts

Patterns

Cause and Effect

Systems and System Models

Science and Engineering Practices

Developing and Using Models

Planning and Carrying out Investigations

Analyzing and Interpreting Data

Constructing Explanations and Designing Solutions

Nature of Science

Scientific Investigations Use a Variety of Methods

Science is a Way of Knowing

Science Addresses Questions About the Natural and Material World

II. MEASUREMENT

Physical Science (PS)2 Motion and Stability: Forces and Interaction

PS2-4: Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

PS3 Energy

PS3-1: Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

PS3-2: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
Disciplinary Core Ideas
PS3.A: Definitions of Energy
ETS1.A: Defining and Delimiting Engineering Problems

Crosscutting Concepts
Patterns
Scale, Proportion, and Quantity

Science and Engineering Practices
Asking Questions and Defining Problems
Using mathematics and computational thinking

Nature of Science
Scientific Knowledge Assumes an Order and Consistency in Natural Systems
Science Addresses Questions About the Natural and Material World

III. CLASSIFICATION OF MATTER

PS1 Matter and Its Interactions

PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.

PS1-2: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

PS1-3: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

PS3 Energy

PS3-1: Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

PS3-2: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

Disciplinary Core Ideas
PS1.B: Chemical Reactions
PS3.A: Definitions of Energy
PS3.B: Conservation of Energy and Energy Transfer

Crosscutting Concepts
Systems and Models
Energy and Matter
Structure and Function
Stability and Change

Science and Engineering Practices
Asking Questions and Defining Problems
Using Mathematics and Computational Thinking

Nature of Science
Scientific Investigations Use a Variety of Methods
Scientific Knowledge is Based on Empirical Evidence
Scientific Models, Laws, Mechanisms, and Theories
Explain Natural Phenomena

IV. ATOMIC STRUCTURE

PS1 Matter and Its Interactions

PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.

Disciplinary Core Ideas

Crosscutting Concepts
Patterns
Systems and Models
Structure and Function

Science and Engineering Practices
Developing and using models
Using Mathematics and Computational Thinking
Constructing Explanations and Designing Solutions

Nature of Science
Scientific Knowledge Assumes an Order and Consistency in Natural Systems
V. THE PERIODIC TABLE

PS1 Matter and Its Interactions

PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.

Disciplinary Core Ideas


Crosscutting Concepts

Patterns
Systems and Models
Energy and Matter
Structure and Function

Science and Engineering Practices

Developing and using models
Using Mathematics and Computational Thinking
Constructing Explanations and Designing Solutions

Nature of Science

Scientific Knowledge is Open to Revision in Light of New Evidence
Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

VI & VII. LABORATORY EQUIPMENT & LABORATORY AND CHEMICAL SAFETY

Science and Engineering Practices

Planning and Carrying out Investigations
Analyzing and Interpreting Data
Obtaining, Evaluating, and Communicating Information
Constructing Explanations and Designing Solutions
Obtaining, Evaluating, and Communicating Information

Nature of Science

Scientific Investigations Use a Variety of Methods
Scientific Knowledge is Based on Empirical Evidence
Science is a Way of Knowing
Science is a Human Endeavor