

# 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](http://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**

**EST1-1:** 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

PS1.A: Structure and Properties of Matter  
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.A: Structure and Properties of Matter  
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

PS1.A: Structure and Properties of Matter

### 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

PS1.A: Structure and Properties of Matter

#### 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