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ODYSSEY Molecular Explorer

High School Chemistry
— Release 5.4 —

Correlation with the

Next Generation Science Standards*

High School

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Physical Sciences

Matter and Its Interactions

Students who demonstrate understanding can:

HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

→ **Lab 21** "Atomic Orbitals"
→ **Lab 24** "Molecular Structure and Dynamics of the Elements"
→ **Lab 89** "The Alkali Metals"
→ **Lab 90** "The Alkaline Earth Metals"
→ **Lab 91** "The Elements of the Boron Group"
→ **Lab 92** "The Elements of the Carbon Group"
→ **Lab 93** "The Elements of the Nitrogen Group"
→ **Lab 94** "The Elements of the Oxygen Group"
→ **Lab 95** "The Halogens"
→ **Lab 96** "The Noble Gases"

HS-PS1-3 Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

→ **Lab 28** "Ionic Bonding"

→ **Lab 67** "Observing the Consequences of Surface Tension"

→ **Lab 69** "Illustrating Vapor Pressure"

→ **Lab 70** "The Evaporation of Liquid Air"

→ **Lab 71** "Bonding in Crystalline Solids"

HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

→ **Lab 30** "The Energetics of Bonding in Chlorine and Nitrogen"

→ **Lab 81** "Reactive Collisions between Molecules"

→ **Lab 82** "Examining a Reaction Mechanism"

HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

→ **Lab 80** "Observing a Chemical Reaction"

→ **Lab 81** "Reactive Collisions between Molecules"

HS-PS1-6 Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

→ **Lab 83** "The Dynamic Nature of Equilibria"

→ **Lab 84** "Chemical Equilibrium and Temperature"

→ **Lab 85** "Chemical Equilibrium and Pressure"

HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

→ **Lab 80** "Observing a Chemical Reaction"

→ **Lab 82** "Examining a Reaction Mechanism"

Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

HS-PS2-4 Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

⟶ **Lab 14** "The Law of Energy Conservation"

⟶ **Lab 28** "Ionic Bonding"

HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

⟶ **Application 6** "High Explosives"

⟶ **Application 7** "Recyclable Plastics"

⟶ **Application 9** "Rubber"

⟶ **Application 39** "Small-Molecule Prescription Drugs"

⟶ **Application 85** "Liquid Crystals"

Energy

Students who demonstrate understanding can:

HS-PS3-1 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

⟶ **Lab 14** "The Law of Energy Conservation"

⟶ **Lab 15** "The Nature of Thermal Energy"

⟶ **Lab 16** "Measuring the Specific Heat"

HS-PS3-2 Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

⟶ **Lab 14** "The Law of Energy Conservation"

⟶ **Lab 16** "Measuring the Specific Heat"

HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

⟶ **Lab 14** "The Law of Energy Conservation"

HS-PS3-4 Plan and conduct an investigation to provide evidence that the transfer of thermal

energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

⟶ **Lab 86** "The Conduction of Heat in a Piece of Copper"

HS-PS3-5 Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

⟶ **Lab 28** "Ionic Bonding"

⟶ **Lab 30** "The Energetics of Bonding in Chlorine and Nitrogen"

⟶ **Lab 64** "The Attraction Between Water Molecules"