

Accelerated Physical Science-Integrated Year-at-a-Glance
ARKANSAS STATE SCIENCE STANDARDS

FIRST SEMESTER		SECOND SEMESTER	
<u>Unit 1</u> Forces and Motion	<u>Unit 2</u> Energy Transformation	<u>Unit 3</u> Chemistry of Matter	<u>Unit 4</u> Human Impact
7 weeks	13 weeks	9 weeks	6 weeks
<ul style="list-style-type: none"> ● A8-PS2-2 ● A8-PS2-1 ● APSI-PS2-1 ● APSI-PS2-3 ● APSI-PS2-5 ● APSI-ESS1-5 ● APSI-ESS2-1 ● APSI-ETS1-1 	<ul style="list-style-type: none"> ● A8-PS2-3 ● A8-PS2-5 ● A8-PS3-1 ● A8-PS3-2 ● A8-PS4-1 ● A8-PS4-2 ● A8-PS4-3 ● APSI-PS2-5 ● APSI-PS3-1 ● APSI-PS3-2 ● APSI-PS3-3 ● APSI-PS3-4 ● APSI-PS4-1 ● APSI-PS4-2 ● APSI-ETS1-2 	<ul style="list-style-type: none"> ● APSI-PS1-1 ● APSI-PS1-2 ● APSI-PS1-3 ● APSI-PS1-4 ● APSI-PS1-7 ● APSI-PS2-6 	<ul style="list-style-type: none"> ● APSI-LS2-7 ● APSI-LS4-5 ● APSI-ESS2-7 ● APSI-ESS3-1 ● APSI-ESS3-2 ● APSI-ETS1-1 ● APSI-ETS1-2 ● APSI-ETS1-3 ● APSI-ETS1-4
<u>Recurring</u>			
<ul style="list-style-type: none"> ● RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments taking measurements, or performing technical tasks. ● RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to Grades 6-8 texts and topics. ● RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). ● WHST.6-8.1 Write arguments focused on discipline-specific content. 			

[Unit 1](#)

[Unit 2](#)

[Unit 3](#)

[Unit 4](#)

Unit 1	Forces and Motion	Grade Level	8	Approx length	7 weeks
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CPSD Power Standards with Student Learning Objectives

A8-PS2-2 Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object.

Student-Friendly Objectives:

- I can identify and describe each of Newton’s three laws.
- I can measure the mass of an object.
- I can calculate the net force acting on an object and predict the movement of an object.
- I can plan and conduct an investigation to collect evidence related to an object’s motion.

Learning Indicators of Power Standards

Students will know...

- Newton’s Laws (First, Second, Third)
- The difference between balanced and unbalanced forces
- The relationship between force and mass

And be able to...

- Measure the mass of an object.
- Draw free body diagrams.
- Calculate the net force acting on an object.
- Plan an investigation and collect data to relate how the sum of forces on and the mass of an object affect the object’s motion.
- Predict the movement of an object.

Additional Arkansas State Standards

- **A8-PS2-1** Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.
- **APSI-PS2-1** Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
- **APSI-PS2-3** Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
- **A8-PS2-5** Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- **APSI-ESS1-5** Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
- **APSI-ESS2-1** Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

- **APSI-ETS1-1** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Unit 2	Energy Transformations	Grade Level	8	Approx Length	13 weeks
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CPSD Power Standards with Student Learning Objectives

APSI-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 position of particles (objects).

Student-Friendly Objectives:

- I can use the relationships between mass, velocity, and kinetic energy to solve problems.
- I can use the relationships between mass, gravity, height, and potential energy to solve problems.
- I can use the relationships between mechanical, potential, and kinetic energies to solve problems.
- I can create a model to illustrate the relationship between kinetic, potential, and mechanical energy.

APSI-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).

Student-Friendly Objectives:

- I can explain the law of conservation of energy.
- I can predict the direction of heat transfer between two objects.
- I can compare and contrast conduction, convection, and radiation.
- I can measure and record changes in temperature when two substances are combined.
- I can collect and analyze data to show a relationship between temperature, mass, and heat transfer.

APSI-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

Student-Friendly Objectives:

- I can explain how waves transfer energy.
- I can compare and contrast different waves to determine the relationships between wavelength, speed, frequency, and energy.
- I can use the relationships between frequency, speed, wavelength to solve problems.
- I can describe how different types of waves travel through different types of media.

Learning Indicators of Power Standards

Students will know...	And be able to...
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- Forms of energy: thermal, electrical, chemical, mechanical
- Energy can be transferred in a closed system, however the total amount of energy is conserved
- In a closed system, kinetic energy (KE) and potential energy (PE) have an inversely proportional relationship
- The relationship between mechanical energy and kinetic and potential energy
- States of matter (solid, liquid, gas) and phase changes
- Energy cannot be created or destroyed, but it can be transferred between systems
- Systems always move towards a more stable state where energy is uniformly distributed
- The amount of energy transfer needed to change the temperature of a sample of matter would depend on the nature and size of the matter and the environment
- Thermal energy is transferred from areas of higher heat to areas of less heat
- Processes of heat transfer: conduction, convection, radiation
- Waves transfer energy, not matter
- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude
- Waves of the same type can differ in amplitude (height of the wave) and wavelength
- Medium (plural: media) refers to the material through which a wave travels (ex: air, water, etc.)
- The wavelength and frequency of a wave are related to each other by the speed of the wave, which depends on the type of wave and the medium through which it is passing
- The higher a sound wave's frequency, the higher the sound pitch

- Use appropriate formula to calculate KE, GPE, and ME.
- Compare and contrast the behaviors of solids, liquids, and gases.
- Create a model to illustrate the relationship between kinetic, potential, and mechanical energy.
- Predict the direction of heat transfer between two objects.
- Compare and contrast conduction, convection, and radiation.
- Conduct an investigation to measure changes in thermal energy when two substances of different temperatures are combined within a closed system.
- Collect and analyze data to relate how temperature and mass affect the amount of heat that is transferred in system.
- Explain how waves transfer energy.
- Compare and contrast different waves to determine the relationships between amplitude, frequency, and energy.
- Use appropriate formula to calculate frequency, speed, and wavelength of a wave.

Additional Arkansas State Standards

- **A8-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.
- **A8-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.
- **A8-PS4-1** Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

- **A8-PS4-2** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- **A8-PS4-3** Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
- **APSI-PS2-5** Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
- **APSI-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.
- **APSI-PS3-3** Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
- **APSI-PS4-2** Evaluate questions about the advantages of using a digital transmission and storage of information.
- **APSI-ETS1-2** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Unit 3	Chemistry of Matter	Grade Level	8	Approx Length	9 weeks
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CPSD Power Standards with Student Learning Objectives

APSI-PS1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

Student-Friendly Objectives:

- I can identify types of chemical reactions based on patterns.
- I can determine what type of bond will form between two elements.
- I can compare and contrast atoms and ions.
- I can determine the number of valence electrons in an atom.
- I can compare and contrast characteristics of metals, nonmetals, and metalloids.

Learning Indicators of Power Standards

Students will know...

- Outcomes of chemical reactions
- Chemical properties
- Characteristics of atoms and ions
- The periodic table sequences elements horizontally by atomic number and vertically based on similar chemical properties
- Trends of the periodic table: electronegativity and atomic radius
- Types of chemical reactions: single displacement, double displacement, combustion, synthesis, and decomposition
- Types of bonds: ionic, covalent, metallic

And be able to...

- Identify types of chemical bonds from chemical formulas.
- Predict ion formation from valence electrons.
- Identify metals, nonmetals, metalloids.
- Compare and contrast atoms and ions.
- Determine the number of valence electrons.
- Identify patterns based on valence electrons.
- Use patterns of the periodic table to predict element characteristics in a particular group or period.
- Predict what type of bond will form between two given elements.

Additional Arkansas State Standards

- **A8-PS2-3** Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- **A8-PS2-5** Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- **APSI-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.
- **APSI-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.

- **APSI-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.
- **APSI-PS1-7** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
- **APSI-PS2-6** Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Unit 4	Human Impact	Grade Level	8	Approx Length	6 weeks
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CPSD Power Standards with Student Learning Objectives

APSI-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Student-Friendly Objectives:

- I can provide examples of human activities that impact the environment and biodiversity positively or negatively.
- I can design a potential solution for optimizing the impact of human activity on the environment and biodiversity.
- I can evaluate and provide feedback on a potential solution for optimizing the impact of human activity on the environment and biodiversity.
- I can use feedback from others to refine my potential solution to optimize the impact of human activity on the environment and biodiversity.

Learning Indicators of Power Standards

<p>Students will know...</p> <ul style="list-style-type: none"> ● Definition of biodiversity with examples ● Current examples of local, state, and national solutions for reducing human activities on the environment; ie mobile homeless shelter units and business parks ● Some human effects are reversible with informed and responsible management 	<p>And be able to...</p> <ul style="list-style-type: none"> ● Identify human activities that impact the environment and biodiversity. ● Differentiate between positive & negative outcomes of human impact. ● When given a scenario, design a potential solution for reducing the negative or enhancing the positive impact of human activity on the environment and biodiversity. ● Evaluate and provide feedback on a potential solution aimed at affecting impacts of human activities. ● Use feedback to refine a potential solution for affecting the impacts of human activities on the environment and biodiversity.
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Additional Arkansas State Standards

- **APSI-LS4-5** Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
- **APSI-ESS2-7** Construct an argument based on evidence about the simultaneous coevolution of Earth’s systems and life on Earth.
- **APSI-ESS3-1** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- **APSI-ESS3-2** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
- **APSI-ETS1-1** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal

needs and wants.

- **APSI-ETS1-2** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- **APSI-ETS1-3** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
- **APSI-ETS1-4** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.