Arkansas Science

Physics: Grades 9, 10, 11, 12

Adopted 2018

Motion

P-PS1-1AR. Create a model of motion and forces, including vectors graphed on the coordinate plane, to describe and predict the behavior of a system. P-PS1-1AR

P-PS1-2AR. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. P-PS1-2AR

P-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. P-PS2-1

P-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. P-PS2-2

P-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. P-ESS1-2

P-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. P-ESS1-4

P1-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. P1-ETS1-2

Work and Energy

P-PS2-1AR. Develop computational and graphical models to calculate and illustrate the work done and changes in energy in a system. P-PS2-1AR

P-PS2-2AR. Plan and conduct an investigation to provide evidence that work done equals energy stored in a conservative system. P-PS2-2AR

P-PS2-3AR. Plan and conduct an investigation to rate the power used in performing work on a system. P-PS2-3AR

P-PS2-4AR. Analyze data to demonstrate the relationship between rotational and linear motion, energy, and momentum. P-PS2-4AR

P-PS2-5AR. Use mathematical representations to support the claim that the change in kinetic energy of a system is equal to the net work performed upon the system. P-PS2-5AR

P-PS2-6AR. Use mathematical representations to support the claim that the total impulse on a system of objects is equal to the change in momentum of the system. P-PS2-6AR

P2-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. P2-ETS1-3

Heat and Thermodynamics

P-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. P-PS3-1

P-PS3-1AR. Construct an explanation based on evidence of the relationships between heat, temperature, and the Kinetic Molecular Theory. P-PS3-1AR

P-PS3-2AR. Plan and conduct an investigation of the relationships between pressure, volume, temperature, and amount of gas. P-PS3-2AR

P-PS3-3AR. Use mathematical representations to model the conservation of energy in fluids. P-PS3-3AR

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

P-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). P-PS3-4

P3-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. P3-ETS1-1

P3-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. P3-ETS1-2

P3-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. P3-ETS1-3

	P3-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. P3-ETS1-4
Waves, Sound, and Simple Harmonic Motion	**P-PS4-1AR.** Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, speed, and energy of waves traveling in various media. P-PS4-1AR
	P-PS4-2AR. Develop and use models to investigate longitudinal and transverse waves in various media. P-PS4-2AR
	P-PS4-3AR. Develop and use models to describe the interaction of light with matter. P-PS4-3AR
	P4-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. P4-ETS1-4
Electricity	**P-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. P-PS2-4
	P-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. P-PS2-5
	P-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). P-PS3-2
	P-PS5-1AR. Use mathematical representations and conduct investigations to provide evidence of the relationships between power, current, voltage, and resistance. P-PS5-1AR
	P-PS5-2AR. Evaluate competing design solutions for construction and use of electrical consumer products. P-PS5-2AR
	P-PS5-3AR. Obtain and combine information on alternating and direct current circuits in various applications. P-PS5-3AR
	P5-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. P5-ETS1-1