

Third Grade

PS2.A Forces and Motion—Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object’s speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.)

PS2.A Forces and Motion—The patterns of an object’s motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum and vector quantify, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.

Fourth Grade

PS3.A Definition of Energy—The faster a given object is moving, the more energy it possess.

PS3.B Conservation of Energy and Energy Transfer—Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion.

Middle School

PS2.A Forces and Motion—For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton’s third law).

PS2.A Forces and Motion—The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.

PS3.A Definitions of Energy—The Term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for the second meaning; it refers to the energy transferred due to the temperature difference between two objects.

PS3.A Definitions of Energy—Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.