

Forces, Gravity and Einstein

MS-4400

NGSS Standards

These standards provide a comprehensive framework for teaching and assessing students' understanding of Newton's laws of motion. They encompass not only the scientific principles but also the mathematical reasoning and literacy skills necessary to interpret and apply these laws. Teachers can align their curriculum and instructional practices with these standards to ensure that students develop a deep and integrated understanding of these fundamental concepts in physics.

MS-PS2-1: Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

MS-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.

HS-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.

HS-PS2-2: Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-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.

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.

HS-PS2-10: (Optional State Assessment) Analyze evidence supporting the claim that gravitational interactions within a system are attractive and dependent only upon the masses of interacting objects and the distance between objects’ centers.

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

Common Core Standards

Mathematics:

CCSS.MATH.HSA-SSE.A.1: Interpret expressions that represent a quantity in terms of its context.

CCSS.MATH.HSA-CED.A.1: Create equations and inequalities in one variable and use them to solve problems.

CCSS.MATH.HSA-CED.A.4: Rearrange formulas to highlight a quantity of interest.

CCSS.MATH.HSA-CED.A.2: Create equations in two or more variables to represent relationships between quantities.

CCSS.MATH.HSA-REI.B.4: Solve quadratic equations in one variable.

CCSS.MATH.HSF-IF.C.7: Graph functions expressed symbolically and show key features of the graph.

CCSS.MATH.HSF-IF.C.8b: Use the properties of exponents to interpret expressions for exponential functions.

English Language Arts (for integration with scientific texts):

CCSS.ELA-LITERACY.RST.9-10.3: Follow precisely a complex multi step procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

CCSS.ELA-LITERACY.RST.11-12.3: Follow precisely a complex multi step procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CCSS.ELA-LITERACY.RST.9-10.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.