



Stackable Instructionally- embedded Portable Science (SIPS) Assessments Project

Grade 8 Science Unit 1 Range Performance Level Descriptors Forces and Energy September 2023

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SIPS Grade 8 Unit 1 Range Performance Level Descriptors

Grade 8 Unit 1 EOU Assessment Performance Expectations

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. *[Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]*

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. *[Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]*

MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. *[Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]*

MS-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. *[Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.]*

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SIPS tasks require students to apply and transfer their science learning through engagement with science and engineering practices (SEPs) and application of the crosscutting concepts (CCCs) to demonstrate their understanding of disciplinary core ideas (DCIs) to make sense of and explain phenomena and/or to design solutions to phenomena-rooted engineering problems.

Level 1	Level 2	Level 3 (Target)	Level 4
<p>A student performing at this level produces evidence of three-dimensional science learning by their ability to:</p> <ul style="list-style-type: none"> use a provided or partial model to create a simple, partial description to describe forces and interacting objects. 	<p>A student performing at this level produces evidence of three-dimensional science learning by their ability to:</p> <ul style="list-style-type: none"> develop and use incomplete but accurate models to create an explanation that the force exerted on a pair of interacting objects is of the same magnitude but opposite in direction. 	<p>A student performing at this level produces evidence of three-dimensional science learning by their ability to:</p> <ul style="list-style-type: none"> develop and use accurate and complete models to create an accurate and complete explanation that the force exerted on a pair of interacting objects is of the same magnitude but opposite in direction and the relationships among mass, speed, and direction. 	<p>A student performing at this level produces evidence of three-dimensional science learning by their ability to:</p> <ul style="list-style-type: none"> develop and use accurate and complete models to create scientifically accurate and complete explanations that the force exerted on a pair of interacting objects is of the same magnitude but opposite in direction and the relationships among mass, speed, and direction.
<ul style="list-style-type: none"> apply relationships among mass, speed, and direction to select a design solution to meet a given criterion or constraint to a problem involving the collision of two objects. 	<ul style="list-style-type: none"> apply relationships among mass, speed, and direction to describe a design solution to meet the given criteria or constraints to a problem involving the collision of two objects. 	<ul style="list-style-type: none"> use Newton’s Third Law to describe how well a design solution to reduce damage in accidents involving the collision of two objects meets the criteria and constraints of a problem involving the collision of two objects. 	<ul style="list-style-type: none"> use Newton’s third law to systematically describe how various aspects of a design solution to reduce damage in accidents involving the collision of two objects meet the criteria and constraints of a problem.
<ul style="list-style-type: none"> use some aspects of provided data to identify a relationship between mass and force in a problem about forces involved in a collision. 	<ul style="list-style-type: none"> identify an observation or measurement of mass, motion, and/or forces as evidence to support an incomplete description of the relationship between the mass and the sum of the forces involved in a collision. 	<ul style="list-style-type: none"> determine how to collect observations and gather data on mass, motion, and/or forces as evidence to support an accurate and complete description of the relationship between the mass and the sum of the forces involved in a collision. 	<ul style="list-style-type: none"> explain the purpose of collecting observations and data that best facilitates measurement of mass, motion, and/or forces as evidence to support scientifically accurate and complete description of the relationship between the mass and the sum of the forces involved in a collision.

<ul style="list-style-type: none"> support an argument that gravitational forces are attractive and mass-dependent using some provided data as evidence. 	<ul style="list-style-type: none"> support an argument that gravitational forces are attractive and mass-dependent using some appropriate data as evidence. 	<ul style="list-style-type: none"> construct an argument that gravitational forces are attractive and mass-dependent using data and justifications to connect the relevant evidence about the forces on objects released from different heights. 	<ul style="list-style-type: none"> construct a scientifically accurate and complete argument that gravitational forces are attractive and mass-dependent using data and justifications to connect the relevant evidence about the forces on objects released from different heights.
<ul style="list-style-type: none"> support a description of the relationship between kinetic energy and mass or kinetic energy and speed using some provided data as evidence. 	<ul style="list-style-type: none"> support a description of the relationship between kinetic energy and mass or kinetic energy and speed using some appropriate data as evidence. 	<ul style="list-style-type: none"> use data to develop graphical displays to draw accurate and complete conclusions about the relationships between kinetic energy and mass separately from kinetic energy and speed. 	<ul style="list-style-type: none"> analyze and interpret data to develop graphical displays to support inferences and draw scientifically accurate and complete conclusions with evidence related to the relationships between kinetic energy and mass separately from kinetic energy and speed.