

Prep Notes	
Materials	Scissors 8-oz paper cup ruler with a center groove marble book, pencil
Teacher Background	In this project, as the marble rolls down the ruler, it gains momentum because it gains velocity (speed). Momentum is just mass times velocity. A higher momentum translates to a higher force of impact when the marble hits the cup.
Opener Ideas	Talk about how much energy it takes to climb a hill or mountain, and how much fun it is to bicycle down a hill without exerting any energy of your own (you exerted all the energy getting <u>up</u> the hill). Talk about how you have to exert energy to cycle on a flat surface in order to get the same kind of speed.
Grammar	<ul style="list-style-type: none"> • Potential Energy: “stored” energy; energy can be “stored”, e.g., by lifting a mass up high, by coiling a spring or rubber-band, or in other ways in which you could suddenly “release” the energy, transforming it into kinetic energy... • Kinetic Energy: “movement” energy – when an object is actually in motion, the energy of the movement is “kinetic”. • Momentum: mass in motion; technically, momentum = mass times velocity
Scientific Method	
Observations	What happens when you roll a ball down a hill? Down a <u>big</u> hill?
Question	How does hill height relate to energy?
Hypotheses	“The higher the hill, the higher the energy” is the most obvious, and the correct, but other ideas are worth considering.
Experiment (Procedure)	<ul style="list-style-type: none"> • Cut a square section from the top of the paper cup, about 1.5” per side • Place the cup upside-down over the ruler (ruler through the hole) with the end of the ruler touching the back of the cup • Rest the opposite end of the ruler on a pencil • Place the marble in the center groove of the ruler at its highest end, and release • Observe the cup's movement when the marble strikes it at the bottom of its journey • Now rest the high end of the ruler on a book, so that it is higher than when it rested on the pencil • Place the marble in the center groove at the top, again, and release • Observe the cup's movement when the marble strikes it, and compare
Results	The cup moves further, indicating a higher force, due to a higher-energy impact from the marble which came from the higher elevation.
Conclusions	A higher hill (elevation) translates to more potential energy, which can be transferred to more kinetic energy.
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