

The Mystery of Motion: Momentum, Kinetic Energy and Their Conversion

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Understanding Newton's Laws is fundamental to all of physics. This Blossoms module introduces the vital concepts of momentum and energy, and their conservation, for high school students. Only some preliminary ideas of algebra are used. All the concepts used in the video can be found in any high-school level physics book.

The student should be introduced to the concept of "definition". In science one can always introduce any number of new terms or definitions. But they may or may not be useful, and they may or may not stand the test of time. However, the definition of "quantity of motion" or "momentum" has certainly withstood the test. These are fundamental to Newtonian mechanics (although their mathematical expressions undergo a slight alteration when speeds approach those of light, something that will not be covered here).

The concept of momentum applied to hard-body collisions is explained using a number of simple demonstrations, all of which can be repeated in the classroom. Getting hold of large steel balls may not be easy, but large ball bearings can be procured easily.

A point to note: teachers should stress that the everyday understanding of "elasticity" relates to something that is easily stretchable, like a rubber band. On the other hand, the definition used in the video (and generally in physics) is that an elastic object comes back to its original state after it has been stretched or hit. So steel is more elastic than rubber!

On the basis of what students have learned in the video, teachers can easily generate a large number of questions that relate to one's daily experiences, or which pose new challenges: In a collision between a heavy and light vehicle, why do those inside the lighter one suffer less injury? In jumping off a high wall, why does one buckle one's knees just before landing? Could a computer be taught to play billiards, and what should you teach it in order to become a master player? Etc.