

## CHAPTER OVERVIEW

### 10: Linear Momentum and the Center of Mass

#### Learning Objectives

- Understand how to calculate linear momentum.
- Understand how to calculate impulse and that it corresponds to a change in momentum.
- Understand when and how to apply conservation of linear momentum to model situations.
- Understand the difference between elastic and inelastic collisions, and when mechanical energy is conserved.
- Understand how to calculate the center of mass of an object.

In this chapter, we introduce the concepts of linear momentum and of center of mass. Momentum is a quantity that, like energy, can be defined from Newton's Second Law, to facilitate building models. Since momentum is often a conserved quantity within a system, it can make calculations much easier than using forces. The concepts of momentum and of center of mass will also allow us to apply Newton's Second Law to systems comprised of multiple particles including solid objects.

#### Prelude

You hit a pool ball square on with the cue ball. If both balls have the same mass, and you can neglect any “english” on the cue ball, what happens to the cue ball?

- A. It stops.
- B. It continues, with half of its original speed.
- C. It continues, with its original speed.
- D. It rebounds, with its original speed.

[10.1: Momentum](#)

[10.2: Collisions](#)

[10.3: The center of mass](#)

[10.4: Summary](#)

[10.5: Thinking about the material .](#)

[10.6: Sample problems and solutions](#)

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