CHAPTER 2 Highlights

KEY IDEAS

Section 1 Displacement and Velocity

- Displacement is a change of position in a certain direction, not the total distance traveled.
- The average velocity of an object during some time interval is equal to the displacement of the object divided by the time interval. Like displacement, velocity has both a magnitude (called speed) and a direction.
- The average velocity is equal to the slope of the straight line connecting the initial and final points on a graph of the position of the object versus time.

Section 2 Acceleration

- The average acceleration of an object during a certain time interval is equal to the change in the object's velocity divided by the time interval. Acceleration has both magnitude and direction.
- The direction of the acceleration is not always the same as the direction of the velocity. The direction of the acceleration depends on the direction of the motion and on whether the velocity is increasing or decreasing.
- The average acceleration is equal to the slope of the straight line connecting the initial and final points on the graph of the velocity of the object versus time.
- The equations in **Table 4** are valid whenever acceleration is constant.

Section 3 Falling Objects

- An object thrown or dropped in the presence of Earth's gravity experiences a constant acceleration directed toward the center of Earth. This acceleration is called the free-fall acceleration, or the acceleration due to gravity.
- Free-fall acceleration is the same for all objects, regardless of mass.
- The value for free-fall acceleration on Earth's surface used in this book is $a_g = -g = -9.81\ \text{m/s}^2$. The direction of the free-fall acceleration is considered to be negative because the object accelerates toward Earth.

Variable Symbols

Quantities	Units	Quantities	Units
x position	m meters	y position	m meters
Δx displacement	m meters	Δy displacement	m meters
v velocity	m/s meters per second	a acceleration	m/s^2 meters per second^2

KEY TERMS

frame of reference (p. 40)

displacement (p. 41)

average velocity (p. 43)

instantaneous velocity (p. 46)

acceleration (p. 48)

free fall (p. 60)

PROBLEM SOLVING

See **Appendix D: Equations** for a summary of the equations introduced in this chapter. If you need more problem-solving practice, see **Appendix I: Additional Problems.**