Focussing Questions

- What is the fastest moving object that you have ever seen?
- How do you measure potential energy and kinetic energy? In what circumstances would these measurements be important?
- How is gravity related to energy and work?
As a space shuttle lifts off from the pad, it accelerates to speeds far greater than speeds of objects anywhere on Earth. While in orbit, the space shuttle travels at 28,000 km/h. It uses about 1,500 t of fuel just to take off. A cheetah crouches motionless until just the right moment. The big cat then springs into action, reaching greater speeds than any other land animal on the planet. The cheetah can run over 100 km/h.

Every object, whether it is an advanced technological craft or a living being, must use energy to begin or change its motion. What form of energy does the space shuttle transform into kinetic energy? What form of energy does the cheetah use? How do you mathematically describe the energy of motion of the space shuttle and of the cheetah? In this chapter, you will answer these questions and many more.

In Chapter 4, you learned that kinetic energy is the energy of motion. You also learned that energy is often defined as the ability to do work. A force does work on an object when it causes that object to move. It is clear that work, motion, and energy are closely related. In this chapter, you will study forms of energy and energy transformations in more detail. You will learn about many different ways in which energy can be stored. You will learn how to describe, analyze, measure, and predict the motion of an object.

As you study this chapter, look ahead from time to time to the Unit 2 Project: Building an Energy-Conversion Device. Start gathering ideas and materials for your project and discuss your plans with your team members. Make a checklist of the concepts and skills you will need to complete the project. Pay special attention to calculations of kinetic energy and potential energy.