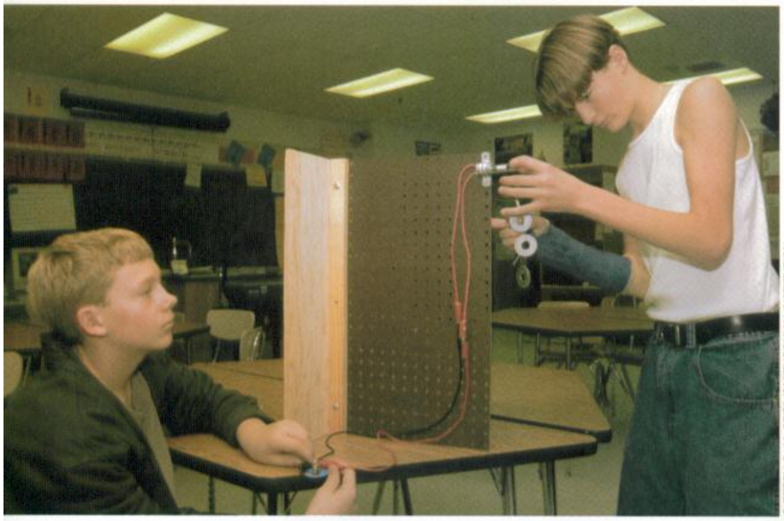
LESSON 10

Assessing What You Know



Students setting up equipment for the performance assessment

INTRODUCTION

In the previous nine lessons, you investigated energy, forces, work, and power. You explored how energy is transformed—how it changes from one form to another—and you examined the nature of different forces. You learned how to calculate work and power, and you investigated how the power of a motor depends on the number of batteries used. You also learned how to graph data and draw conclusions from your observations.

This lesson gives you a chance to show how well you learned the skills and concepts presented in Lessons 1 through 9. You will complete an activity in which you set up and use equipment to collect data. You will then draw conclusions based on your data. Next, you will graph and analyze data and interpret its meaning. Finally, you will complete short-response and multiple-choice questions.

OBJECTIVES FOR THIS LESSON

Manipulate equipment.

Gather and record data.

Interpret data and draw conclusions based on the data.

Demonstrate knowledge of energy, forces, work, and power.

Relate your knowledge to new situations.

Getting Started

1. Review the objectives of this assessment with the class.

2. Listen as your teacher describes the assessment and its parts.

3. Make sure you have sharpened pencils and other materials your teacher says you need.

MATERIALS FOR LESSON 10

For you

- 1 copy of Inquiry Master 10.5: Multiple-Choice Questions
- 1 copy of Student Sheet 10.1: Performance Assessment
- 1 copy of Student Sheet 10.2: Data Analysis
- 1 copy of Student Sheet 10.3: Multiple-Choice and Short-Answer Response Sheet

For your group

- 1 copy of Inquiry Master 10.1: Performance Assessment Directions
- 1 pegboard assembly
- 7 large washers
- 1 electric motor with wire leads and alligator clips
- 1 motor pulley with nail
- 1 motor clamp
- 3 machine screws with wing nuts
- 1 miniature lightbulb
- 1 miniature lightbulb holder
- 1 black insulated connector wire with alligator clips
- 1 red insulated connector wire with alligator clips
- 1 large paper clip
- 1 piece of string
- 1 meterstick
- 1 0- to 2.5-N spring scale

Period 1

Performance Assessment

PROCEDURE

1. Read Inquiry Master 10.1: Performance Assessment Directions. Ask your teacher to explain anything that is not clear.

2. Go to your station with your lab partner when your teacher asks you to.

3. Complete the activity as described on the inquiry master and record your responses on Student Sheet 10.1. Be sure to complete all activities and answer all questions.

4. When you finish the performance assessment, your teacher will collect your students sheets and give you further directions.

Period 2

Data Analysis and Multiple-Choice and Short-Response Questions

PROCEDURE

1. Do this part of the assessment on your own. Follow the directions on Student Sheet 10.2: Data Analysis. Your teacher will collect the student sheet when you have completed the data analysis.

2. Read the multiple-choice questions on Inquiry Master 10.5: Multiple-Choice and Short-Answer Questions. Then, on Student Sheet 10.3: Multiple-Choice and Short-Answer Response Sheet, circle the choice that best answers each question or completes each statement.

3. When you have completed the multiple-choice questions, answer the short-answer questions on Student Sheet 10.3. Use complete sentences. Your teacher will tell you what to do with the student sheet when you have completed it.

REFLECTING ON WHAT YOU'VE DONE

1. Discuss with the class the results of the performance assessment. Evaluate how well you followed directions and used the equipment. Were your conclusions based on your observations and data?

2. Your teacher will show you a graph of the data you used in the data-analysis assessment. Think about the following questions:

   A. How well did you follow good graphing procedures?

   B. Were your conclusions based on evidence from the graph?

3. Ask questions and clarify your understanding of any of the multiple-choice questions or short-answer responses if you answered any incorrectly.

CARS: ENERGY TO BURN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Cars racing at the Miami Indy Car Race in Florida

During the first nine lessons of this module, you've learned about energy transformation, force, work, and power. How can you tie these ideas together into a single application? Take a ride in an automobile!

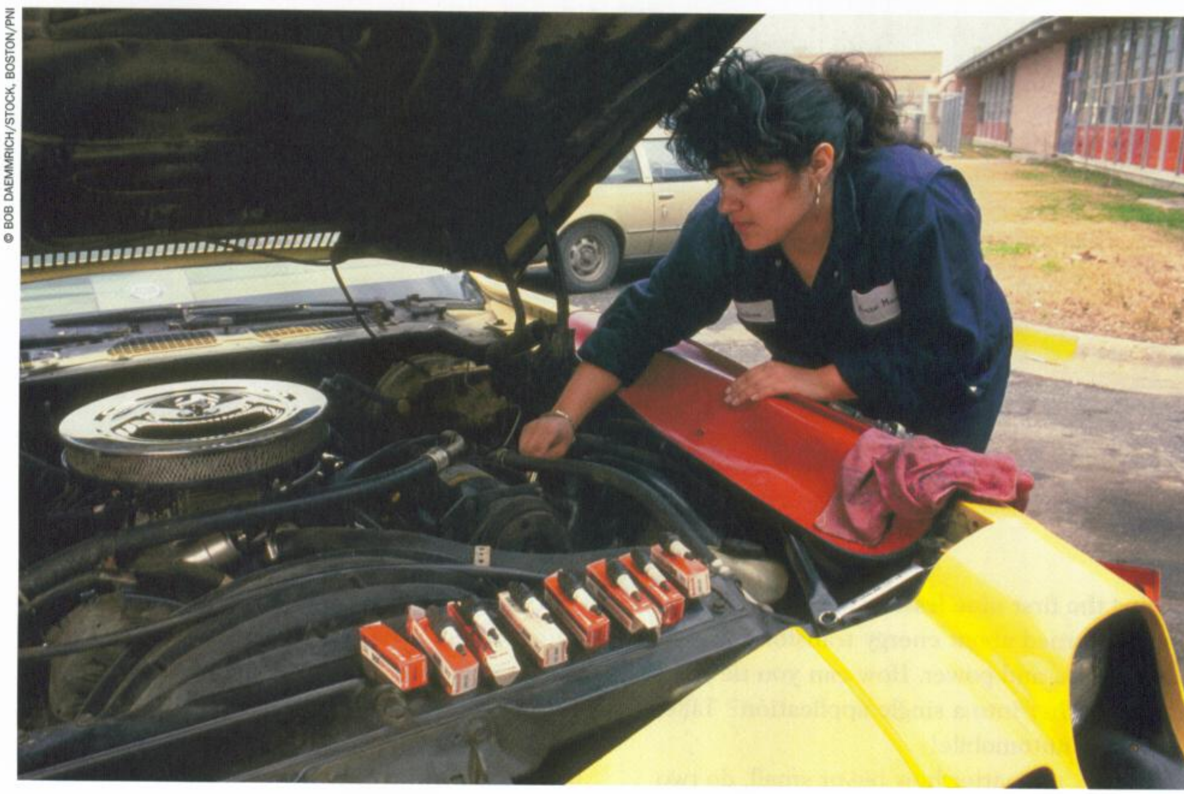
All cars, no matter how big or small, do two basic things. First, they transform chemical energy to heat energy and energy of motion. Second, they convert energy of motion to heat energy.

The heart of a car is its engine. In the engine, a fuel (usually gasoline) burns in a cylinder, which is a closed container about the size of a 1-liter milk carton. As the fuel burns, it creates hot gases. These gases expand and press against the piston, which is a movable block at one end of the cylinder. Through a combination of rods, shafts, and gears, the piston is connected to the wheels of the car. The pressure of the expanding gases makes the piston move. This causes the wheels to rotate and makes the car move.

The moving car has kinetic energy, which is energy of motion. At this point, an important energy conversion has taken place: Some of the energy stored in the fuel has become energy of motion.

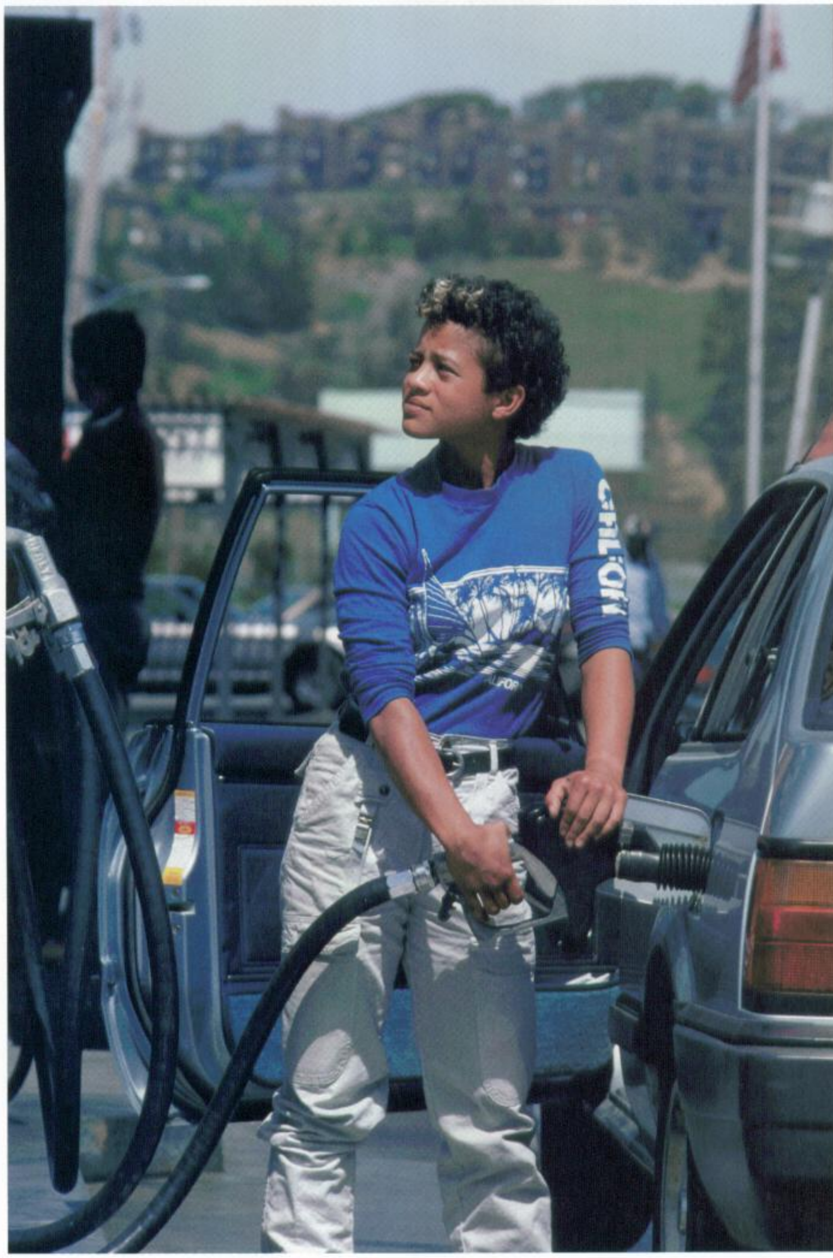
But there's something else to think about. Not all the energy released when gasoline burns goes to help move the car. Most of it becomes heat energy. That is why the car needs a radiator. The radiator is the center of the car's cooling system. The cooling system circulates water and a coolant around the engine to prevent it from overheating.

Once a car is moving, the next important energy transformation comes when it's time to stop. Friction helps here. Friction from the brakes stops the car; in other words, it reduces the car's kinetic energy. When the brake pads rub against the brake drums, the brakes get very hot—a sign that energy of movement is being transformed to heat energy. By the time that a car stops, most of the chemical energy that had been stored in the fuel tank has been converted to heat.



Looking under the hood. The heart of a car is its engine.

In a moving car, energy conversions are taking place continually. That's why it takes a constant supply of fuel to keep it going. When the fuel is used up, drivers need more. That means a stop at the fuel pump. Once the tank is filled, you have energy to burn! □



Fill 'er up!