



UNIT 2

ENERGY AND NASCAR

ENERGY • FRICTION • SPEED

★ **NASCAR ENERGY UNIT LEARNING OUTCOMES** ★

LESSON 1: POTENTIAL ENERGY HIDDEN ENERGY

At the end of Lesson 1, students will be able to:

1. Define potential energy
2. List the four main types of potential energy
3. Identify forces that influence potential energy

LESSON 2: KINETIC ENERGY ENERGY IN MOTION

At the end of Lesson 2, students will be able to:

1. Define kinetic energy
2. Identify forces that influence kinetic energy
3. Describe the relationship between potential and kinetic energy

LESSON 3: ENERGY AND SPEED UNDER THE HOOD

At the end of Lesson 3, students will be able to:

1. Explain the connection between potential and kinetic energy
2. Explain how NASCAR engines work

LESSON 4: FRICTION AND ENERGY A DYNAMIC DUO

At the end of Lesson 4, students will be able to:

1. Define friction
2. Describe the relationship between friction and speed
3. Describe the relationship between friction and racecar safety

BEFORE YOU BEGIN: Have students complete the pre-assessment. Save the pre-assessments until the end of the unit to measure the growth in student knowledge.

PRE-ASSESSMENT ANSWER KEY: 1. C; 2. B; 3. D; 4. B; 5. A; 6. A; 7. C; 8. D; 9. D; 10. D

CORE CONCEPTS AND SKILLS SPOTLIGHT

NEXT GENERATION SCIENCE STANDARDS

Energy and NASCAR covers overarching concepts and skills relevant to a range of principles that can be easily applied to your state's science and reading standards.

DISCIPLINARY CORE IDEAS: PHYSICAL SCIENCE

Motion and Stability: Forces and Interactions

- ▶ The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.

Related Standard:

Support an argument that the gravitational force exerted by Earth on objects is directed down.

- ▶ The sum of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. For any given object, a larger force causes a larger change in motion.

Related Standard:

Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

Energy

- ▶ Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.

Related Standard:

Construct and interpret graphical displays of data to describe the relationship of kinetic energy to the mass of an object and to the speed of an object.

- ▶ A system of objects may also contain stored (potential) energy, depending on their relative positions.

Related Standard:

Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

SCIENCE AND ENGINEERING PRACTICES

Planning and Carrying Out Investigations

- ▶ Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
- ▶ Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Engaging in Argument From Evidence

- ▶ Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

Constructing Explanations and Designing Solutions

- ▶ Construct an explanation of observed relationships.

Obtaining, Evaluating, and Communicating Information

- ▶ Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.

Source: NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States*. Washington, DC: The National Academies Press.

COMMON CORE READING STANDARDS

ENGLISH LANGUAGE ARTS: READING INFORMATIONAL TEXT

Key Ideas and Details

- ▶ Determine central idea of a text and draw inferences by citing textual evidence and analyses of key individuals, events, or ideas.

Craft and Structure

- ▶ Determine meaning of words, phrases, and sentences in the context of their significance to the passage.

Source: Common Core State Standards Initiative. 2017.