Unit 2 Lesson 2 Kinetic and Potential Energy
On the Move

What is kinetic energy?

- Energy is the ability to cause change. There are different forms of energy. One form is kinetic energy, the energy of motion.

- Every moving object has kinetic energy. The faster an object moves, the more kinetic energy it has. If two objects move at the same speed, the object that has more mass will have more kinetic energy.
How is the kinetic energy of an object calculated?

- The kinetic energy of an object equals one-half the object’s mass \((m)\) times the square of its volume \((v)\).

- Kinetic energy = \(\frac{1}{2} mv^2\)

- When mass is expressed in kilograms (kg) and speed in meters per second (m/s), kinetic energy is expressed in joules (J).
What determines the potential energy of an object?

• An object that is not moving can still have energy. **Potential energy** is the energy an object has because of its position, condition, or chemical composition.

• An object has **elastic potential energy** when it has been stretched or compressed. Elastic potential energy is stored in a stretched spring or a rubber band.
What determines the potential energy of an object?

- An object has *gravitational potential energy* due to its position above the ground. An object held above the ground has the potential to fall. The higher the object is above the ground, the greater its gravitational potential energy.

- Potential energy that depends on an object’s position is referred to as *mechanical potential energy*.

- A substance stores *chemical potential energy* as a result of its chemical bonds. Some of that energy can be released during chemical reactions.
How is the gravitational potential energy of an object calculated?

- The gravitational potential energy of an object equals its mass \((m)\) times its height above the ground \((h)\) times the acceleration due to Earth’s gravity \((g)\).

- Gravitational potential energy \(= mgh\)

- An object’s mass is expressed in kilograms. An object’s height above the ground is expressed in meters. The acceleration due to Earth’s gravity is 9.8 m/s\(^2\).

- Potential energy is expressed in units of joules.
How is the gravitational potential energy of an object calculated?

• When does the bouncing ball have zero gravitational potential energy?
It All Adds Up!

How is the mechanical energy of an object calculated?

• A moving object can have both kinetic and potential energy. **Mechanical energy** is the energy possessed by an object due to its motion and position.

• The sum of an object’s kinetic energy (KE) and mechanical potential energy (PE) is its mechanical energy (ME).

• ME = KE + PE
How is the mechanical energy of an object calculated?

• If the object’s only potential energy is gravitational potential energy, you can use the following equation to find mechanical energy.

• \[ ME = \frac{1}{2} mv^2 + mgh \]
How is the mechanical energy of an object calculated?

• As the basketball falls to the ground, its kinetic energy increases and its gravitational potential energy decreases. However, its mechanical energy remains constant.