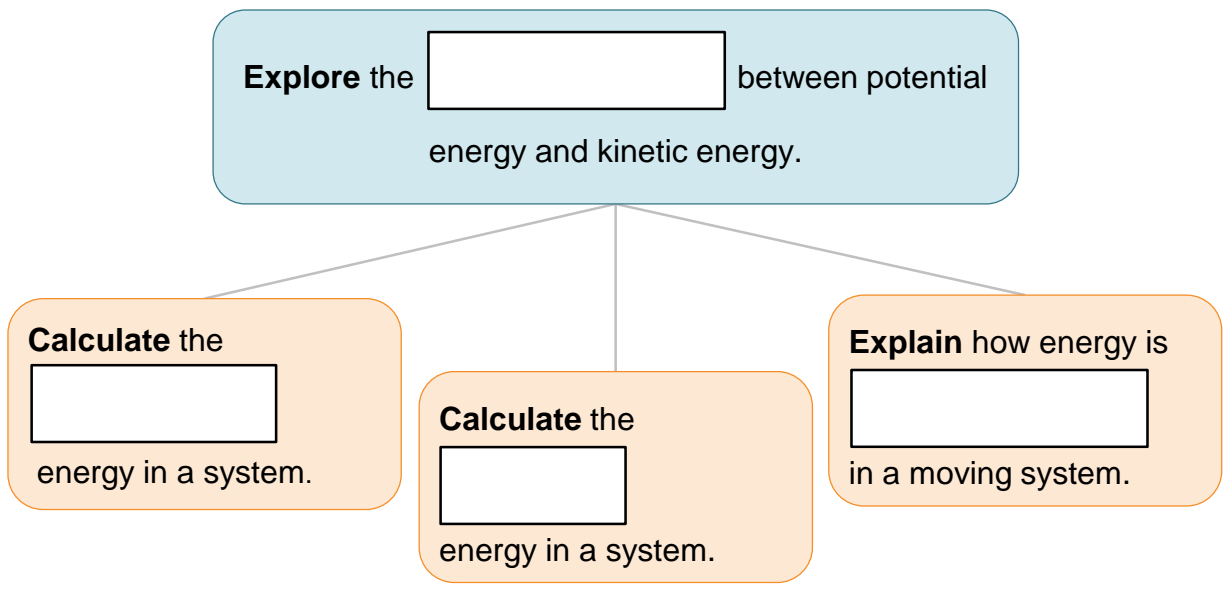




### Lesson Question



### Lesson Goals



### Words to Know

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

- |                      |  |
|----------------------|--|
| ___ system           | A. the energy an object has due to its motion                        |
| ___ transformation   | B. a group of related objects that interact and form a complex whole |
| ___ kinetic energy   | C. the stored energy an object has due to its position               |
| ___ potential energy | D. a change in form, appearance, nature, or characteristic           |

**Energy**

- Energy is the ability to do .
- Work involves the  of energy from one object to another.
- Energy exists in several .
  - Chemical
  - 
  - Mechanical
  - 
  - 
  - Kinetic

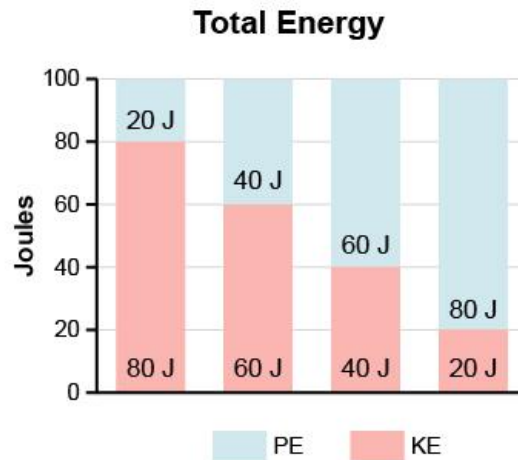
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### Potential Energy and Kinetic Energy

- Objects can have more than one form of  at the same time.
- is the energy an object has due its position.
- is the energy an object has due to its motion.
- The amount of each form of energy depends on the  and position of an object.

### Total Energy



A  is the group of objects that interact with each other.

- The  in a system stays the same.
  - If potential energy increases, then kinetic energy .
  - If potential energy decreases, then kinetic energy .

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**Gravitational Potential Energy**

- Potential energy is  energy.
- Potential energy related to the  of an object is known as gravitational potential energy.
  - Gravitational potential energy comes from the presence of .
  - The greater the height of an object, the  its gravitational potential energy.

**The Potential Energy Equation**

- Gravitational potential energy is directly related to:
  - an object's ,  $m$ .
  - the acceleration due to ,  $g$ .
  - an object's ,  $h$ .

$$PE = mgh$$

**An Application of the Potential Energy Equation**

What is the potential energy of a 150 kg rock resting on top of a hill that is 25 m high?

Gravity on Earth is a constant of  m/s/s.

$$PE = (150 \text{ kg})(9.8 \text{ m/s}^2)(25 \text{ m}) = \text{  }$$

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**The Potential Energy Equation**

When potential energy is known,  or  can be found.

$$PE = mgh$$

To find mass, rearrange equation:  $m = PE/gh$

To find height, rearrange equation:  $h = PE/gm$

**Example:** Jeremiah, who has a mass of 60 kg, starts skating down a hill with a potential energy of 1,200 J. What is the height of the hill? Round your answer to the nearest whole number.

Step 1: Identify what is known.

- $m =$
- $g = 9.8 \text{ m/s/s}$
- $PE =$

Step 2: Multiply mass x gravity.

$$60 \text{ kg} \times 9.8 \text{ m/s/s} = \text{  } \text{ kg m/s/s}$$

Step 3: Solve the equation.

$$h = (1,200 \text{ J})/588 \text{ kg m/s/s} = \text{  }$$

Step 4: Round the answer to the nearest whole number.

$$h = 2.04 \text{ m} = \text{  } \text{ m}$$

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### Kinetic Energy

Kinetic energy:

- is the energy of .
- depends on the mass and velocity of an object.
  - Increases when  increases
  - Increases when  increases

### The Kinetic Energy Equation

- Kinetic energy is directly related to  an object's mass,  $m$ , times an object's velocity,  $v$ , .

$$KE = \frac{1}{2}mv^2$$

Mass ( $m$ ) is measured in .

Velocity squared ( $v^2$ ) is measured in .

Multiplied together give us , J.

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**An Application of the Kinetic Energy Equation**

**Example:** What is the kinetic energy of a 55 kg girl walking at a velocity of 2 m/s?

Step 1: Identify what is known.

- $m =$
- $v =$  2 m/s

Step 2: Find half of 55 kg.

$$55 \text{ kg} / 2 = \text{  } \text{ kg}$$

Step 3: Square the velocity

$$\text{  } \text{ m/s} \times \text{  } \text{ m/s} = \text{  } \text{ m}^2/\text{s}^2$$

Step 4: Solve the equation.

$$\text{KE} = 27.5 \text{ kg} \times 4 \text{ m}^2/\text{s}^2 = \text{  }$$

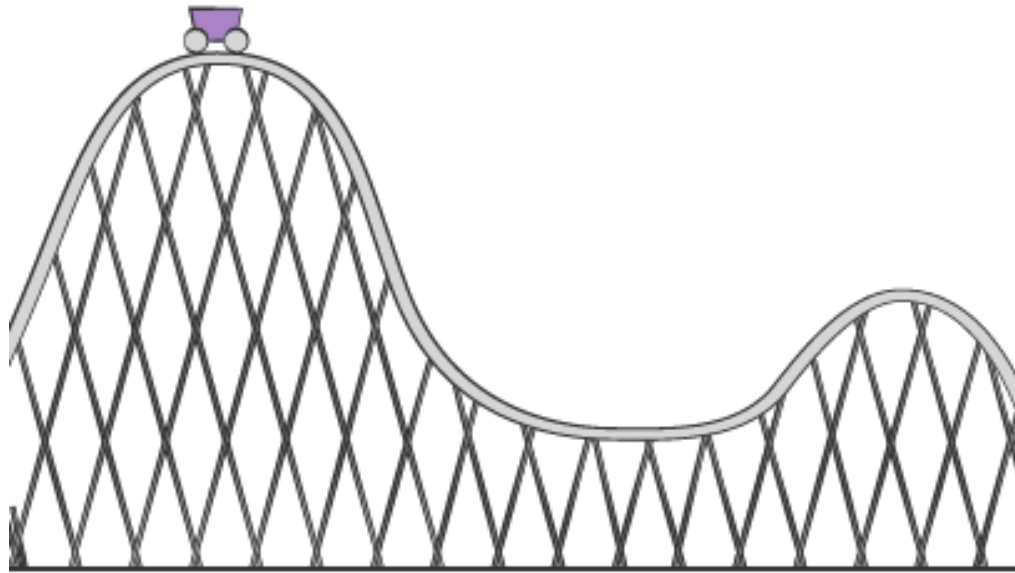
Imagine that the girl's velocity increases to 4 m/s. Her kinetic energy increases to .

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**Potential and Kinetic Energy Transformations**

- PE and KE goes through , or changes
- Top of the hill = all  energy
- Downhill = potential becomes
- On the ground =  kinetic energy
- Uphill = kinetic becomes





# Summary

## Potential and Kinetic Energy



### Lesson Question

What is the relationship between potential and kinetic energy?



### Answer

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### Review: Key Concepts

- Gravitational potential energy  as an object gets closer to the ground.
- At the same time, kinetic energy increases because the object is  up.

Term	Definition	Affected by	Equation
Kinetic	Energy of <input type="text"/>		$KE =$ <input type="text"/>
Potential	Energy due to <input type="text"/>		$PE =$ <input type="text"/>



# Summary

## Potential and Kinetic Energy

*Use this space to write any questions or thoughts about this lesson.*