

## Chapter 15 Energy

**Calculating Potential Energy**

A 60.0-kg person is standing on the edge of a pier that is 2.5 m above the surface of a lake. How much higher would the pier have to be to raise the gravitational potential energy of this person by 10 percent?

**1. Read and Understand**

*What information are you given?*

Mass of person =  $m = 60.0 \text{ kg}$

Height above lake level =  $h = 2.5 \text{ m}$

Acceleration due to gravity =  $g = 9.8 \text{ m/s}^2$

**2. Plan and Solve**

*What variable are you trying to determine?*

Gravitational potential energy = ?

*What formula contains the given variables?*

Gravitational potential energy (PE) =  $mgh$

Initial PE =  $(60.0 \text{ kg})(9.8 \text{ m/s}^2)(2.5 \text{ m}) = 1500 \text{ J}$

*Determine the 10-percent increase of PE.*

$(1500 \text{ J})(0.10) = 150 \text{ J}$

Final PE =  $1500 \text{ J} + 150 \text{ J} = 1650 \text{ J}$

*Rearrange the equation to determine the final height.*

$h = \text{PE}/mg = 1650 \text{ J}/(60.0 \text{ kg})(9.8 \text{ m/s}^2) = 2.8 \text{ m}$

The height increase for the pier would be  $2.8 \text{ m} - 2.5 \text{ m} = 0.3 \text{ m}$ .

**3. Look Back and Check**

*Is your answer reasonable?*

This is a reasonable answer because 0.3 m is about 10 percent of 2.5 m. A 10-percent increase in  $h$  should result in a 10-percent increase in the gravitational PE.

**Math Practice**

*On a separate sheet of paper, solve the following problems.*

1. A 300-gram toy car and a 500-gram toy car are sitting on a shelf that is 2 meters higher than the floor. By what percent is the PE of the 500-g car greater than the PE of the 300-g car?
2. An 80-kg rock climber is standing on a cliff so that his gravitational PE = 10,000 J. What percent increase in height is required to raise his PE by 3500 J?

**Math Skill:**  
**Percents and**  
**Decimals**

You may want to read more about this **Math Skill** in the **Skills and Reference Handbook** at the end of your textbook.

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**WordWise**

Complete the sentences by using one of the scrambled vocabulary words below.

absoism reegny	ynrege vnsnoorctaie	slisfo sluef
rslao eeyngr	neegyr seonoscvi	caurnle rygnee
mrelhta eeryng	loptnieat nygeer	gyreen
mcelhaci reeyng	ctniek yenrge	rvtnatgialoai

When an object is raised to a higher level, its \_\_\_\_\_ potential energy increases.

The motion of microscopic particles in matter partly determines the amount of \_\_\_\_\_ within it.

As a pole-vaulter springs higher into the air, her kinetic energy decreases as her gravitational potential energy increases. This is an example of \_\_\_\_\_.

Atomic fission and fusion produce \_\_\_\_\_.

When your muscles move, \_\_\_\_\_ from the cereal you ate for breakfast is converted into \_\_\_\_\_.

The \_\_\_\_\_ of a 100-kg boulder perched high on a cliff is greater than that of a 50-kg boulder at the same height.

You can recognize \_\_\_\_\_ by the changes it causes, such as motion and sound.

Formed from the remains of once-living organisms, \_\_\_\_\_ are nonrenewable energy resources.

Photovoltaic cells convert \_\_\_\_\_ into electrical energy.

Methods of \_\_\_\_\_ include ways to reduce energy needs.

When you sit around a campfire, you are enjoying energy stored in wood—a type of \_\_\_\_\_.