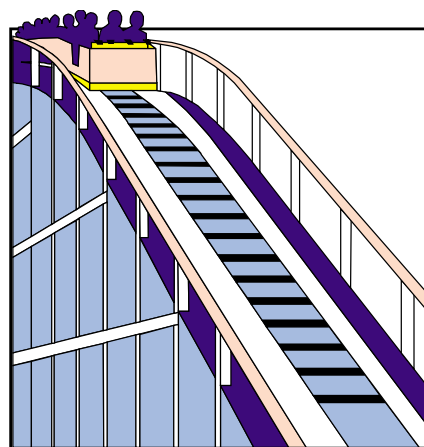
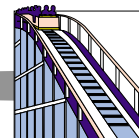


Unit 12: Energy, Work, Force, and Power





Vocabulary

Study the vocabulary words and definitions below.

energy the ability to do work or cause change

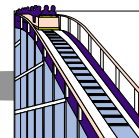
force pressure exerted on an object; a push or a pull

kinetic energy the energy of motion; the energy of moving things

potential energy energy that has not been released; stored energy that is waiting to be used

power the amount of work that can be done in a given amount of time

work the amount of change caused or energy transferred

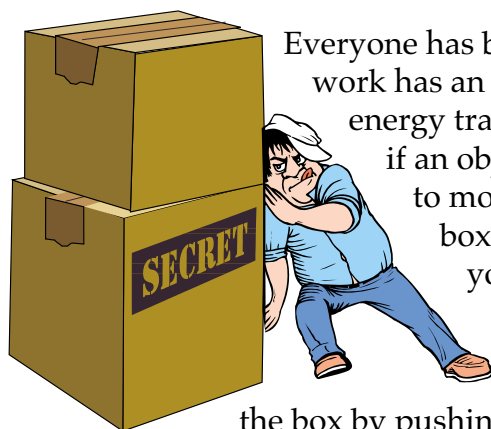


Introduction

In this unit, you will begin to learn about physics. Physics is the study of how matter and energy are related.

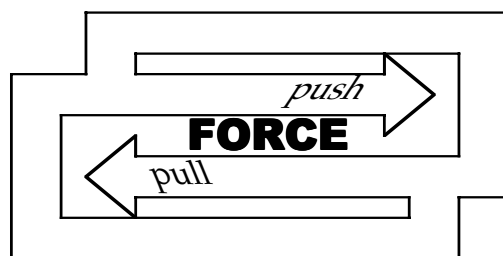
Energy, Work, Force, and Power

What is energy? Look around you. Many things move. A door opens, the hands on the clock move, and a person jogs down the sidewalk. What makes them move? Energy! **Energy** can be defined as the ability to do work or cause change. Energy often produces motion.



Everyone has been told to “get to work.” In science, work has an important meaning. **Work** is the result of energy transferred to an object. Work is done only if an object moves. Imagine that you were told to move a large box. You push and pull the box for an hour, and it does not move. Have you done any work? No, because the box did not move.

Think about the box. You tried to move the box by pushing and pulling. You used **force**. Force is either a push or a pull. Lifting is a form of pulling. It is difficult to think of a force that cannot be called a push or a pull.



Power is another measure that is related to energy, work, and force. Power is the amount of work that can be done in a given amount of time. The faster work is done, the greater the power. You probably have heard the term “horsepower.” It refers to the amount of work an average horse can do. This work was compared to the power of the steam engine. Today, it is common for the power of engines to be measured in horsepower.



Potential and Kinetic Energy

There are two basic kinds of energy—potential and kinetic. Potential means stored. **Potential energy** is energy that has not been released. It is energy that is waiting to be used. A stretched rubber band has potential energy. A brick placed on the edge of a window sill has potential energy. What happens if the rubber band is snapped or the brick falls? The potential energy of the objects is changed into kinetic energy.



Potential Energy



Kinetic energy is the energy of motion. All moving objects have kinetic energy. If a moving object is stopped, its kinetic energy is made zero.

The object may then have potential energy.

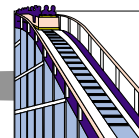


Kinetic Energy



Summary

Energy is the ability to do work. Work is done if an object moves. The push or pull on an object is defined as force. Power tells how much work can be done in a certain amount of time. Potential energy is energy at rest or waiting to be used. When an object is moving, it has kinetic energy. Energy can change back and forth between potential and kinetic energy.



Practice

Look at the paired pictures below. Decide which **type of energy** is being demonstrated. Write one of the following terms on the line provided.

potential energy or kinetic energy

Figure A



Figure B



1. A. _____

B. _____

Figure A



Figure B



2. A. _____

B. _____

3. Can energy change back and forth between potential and kinetic energy?



Lab Activity

Facts:

- Potential energy is stored energy.
- Kinetic energy is energy in motion.

Investigate:

- You will differentiate between objects having potential and kinetic energy.

Materials:

- assorted classroom objects

1. Look around the classroom. Observe objects around you.
2. On the chart below, list five examples of potential energy and five examples of kinetic energy.

| potential energy | kinetic energy |
|------------------|----------------|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |
| 5. | 5. |



Practice

Match each definition with the correct term. Write the letter on the line provided.

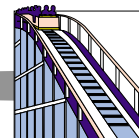
- | | |
|--|---|
| _____ 1. the ability to do work or cause change | A. a brick on the edge of a window sill |
| _____ 2. the amount of work that can be done in a given amount of time | B. a brick that is falling |
| _____ 3. an example of kinetic energy | C. energy |
| _____ 4. energy of motion | D. force |
| _____ 5. stored energy; energy that is waiting to be used | E. kinetic energy |
| _____ 6. an example of potential energy | F. potential energy |
| _____ 7. the result of energy | G. power |
| _____ 8. a push or pull | H. work |



Practice

Write **P** if it is an example of **potential energy** or **K** if it is an example of **kinetic energy** on the line provided.

- _____ 1. a large rock on top of a mountain
- _____ 2. a rock rolling down the side of a mountain
- _____ 3. a log falling
- _____ 4. a log on the ground
- _____ 5. a match being lit
- _____ 6. a match in a matchbox
- _____ 7. a hammer lying on a counter
- _____ 8. a hammer striking a nail
- _____ 9. charcoal on a grill
- _____ 10. burning charcoal
- _____ 11. a bird in a nest
- _____ 12. a bird flying



Practice

Use the list below to complete the following statements. One or more terms will be used more than once.

| | | |
|----------------|------------------|---------------|
| energy | potential | stored |
| force | power | work |
| kinetic | | |

1. _____ can be defined as the ability to do work.
2. _____ is the product of energy.
3. _____ is the pressure placed on an object in the form of pushing or pulling.
4. _____ is the amount of work that can be done in a given amount of time.
5. _____ energy has not been released.
6. Potential energy is _____ energy that is waiting to be released.
7. _____ energy is energy in motion.
8. Things that are moving have _____ energy.
9. Things that are not yet moving, or have just stopped moving, may have _____ energy.



Practice

Write one example of **potential energy** and one example of **kinetic energy**.

1. potential energy: _____
2. kinetic energy: _____

For each of the following, use a **W** to indicate if **work** was done or an **X** to indicate **no work** was done.

- _____ 3. Pushing against a mountainside that does not budge.
- _____ 4. Moving a paper clip with your finger.
- _____ 5. Slowly forcing a couch up a flight of stairs.
- _____ 6. Leaning against a pole to keep it from falling.
- _____ 7. Tapping your toes in time to music.

Answer the following using short answers.

8. Which has more power? A horse that hauls 50 kilograms across a field in 1 minute *or* a mule that hauls 100 kilograms across a field in 1 minute?

9. Which has more power? A train full of passengers that carries them across the state *or* the same train without any passengers as it makes the trip?

10. What must you have to do more work in the same amount of time?
