

ACTIVITY #3: Passing Energy Along

MAIN IDEAS: The important concepts and skills covered in this activity are ...

- The kinetic energy of an object determines the amount of change it can produce in the motion of other objects.
- The kinetic energy of an object can be transferred to other objects.
- Objects can have stored energy that is called **potential energy**. A common form of potential energy is due to the Earth's gravity. It is called the gravitational potential energy and depends on the object's mass and how high it is above the ground.
- **Energy Transformation** occurs whenever energy changes from one form to another form.
- The kinetic energy of objects can be transferred to the tiny particles that make up the objects. When this happens, the kinetic energy becomes disorganized and does not contribute to the motion of the objects. Collectively, this random kinetic energy is called **heat energy**.

Question #1: Is the height of the ramp or the length of the ramp more important in determining the speed the ball when it reaches the bottom of the ramp? What evidence do you have to support your claim?

Question #2: Using your graph, how far would you predict the cup would slide if you raised the height of the ramp by one more block?

Question #3: Compare your two graphs. Where does the golf ball have its greatest gravitational potential energy? What evidence are you using to support your decision?

Question #4: For the same ramp height, which has more gravitational potential energy, the solid golf ball or the hollow golf ball? What evidence is there to support your decision?"

Question # 5: Talk to your lab partners and describe what happens to the energy that you gave the golf ball when you lifted it to the top of the ramp. Trace what became of this energy as the ball was placed on the ramp, released and finally rolled to rest with the cup.

MAKING SENSE OF ENERGY ...

In the last activity, we looked at the energy of motion, called Kinetic Energy (KE). We also discovered that the higher the ball is released, the greater its kinetic energy will be at the bottom of the ramp. We have not yet formally addressed why this is true. When the ball is lifted to the top of the ramp, the energy you use to lift it is stored. As the ramp gets higher and higher, the golf ball's stored energy at the top of the ramp gets larger too. If the 'stored' energy at the top of the ramp gets larger the kinetic energy of the ball at the bottom of the ramp will get larger too. Where did the 'stored' energy come from? It came from you, or whoever lifted the ball to the top of the ramp. The ball will not roll up the ramp by itself. It must be lifted upwards to the top of the ramp, because gravity pulls downward on everything. The lifting process requires energy, and the energy you use to lift the ball is stored by gravity. The higher you lift the ball, the greater will be the energy expended. This energy given to the ball by the 'lifter' is stored by gravity, and is called potential energy. Where did you get the energy needed to lift the ball? From the energy stored in the food you recently ate. This 'food' energy is another form of stored energy, and our muscles use it to move objects by pushing and pulling on them. We can think of the energy in our food being transferred to the ball by our muscles, and transformed by gravity into stored energy. When the ball is released, this stored energy is transformed into kinetic energy, and the ball begins moving down the ramp with greater and greater speeds.

In summary, two important forms of energy are:

Kinetic Energy (KE), the energy an object has because of its motion, which is determined by the object's mass and speed.

Gravitational PE, the stored energy an object has because it was lifted to some height. This potential energy is determined by the object's mass and its height above the ground.

Two important properties of energy are:

Energy transfer is the passing of energy from one object to another.

Energy transformation is the changing of energy from one form to another.