

Name _____

Bounce!



**Be very careful with the balls. Do not throw them
DROP the balls as instructed in the procedure.**

Background information: Energy causes things to happen. During the day, the sun gives off light and heat energy. At night, street lamps convert electrical energy to light. As a car drives by you, it converts chemical energy, stored in the gasoline into mechanical energy. Our bodies converting the chemical energy in food into the kinetic energy we need to play or study.

Energy is defined as the ability to do work or cause the change in the speed, direction, shape, or temperature of an object. Work is done when a force causes an object to move. There is a very close relationship between work and energy. Both work and energy are measured in Joules.

Energy can be divided into two main types:

Potential Energy – energy that is stored (energy of position or height).

- ✓ If you stretch a rubber band, you will give it potential energy. As the rubber band is released, potential energy is changed to motion
- ✓ Potential energy is the energy gained as work is being done to an object
- ✓ The chemical energy in a can of gasoline, the energy in a rubber ball before it is dropped, and the energy in water behind a dam are all examples of potential energy.
- ✓ Gravitational potential energy is the energy stored in an object as the result of its height. The higher the object is, the greater its potential energy.

- ✓ There is a relationship between the mass of an object and its gravitational potential energy. The more massive an object is, the greater its potential energy.

Kinetic Energy – energy that is moving, (energy of motion).

- ✓ A rubber band flying through the air has kinetic energy, a bouncing ball has kinetic energy, and you have kinetic as you are walking to class.
- ✓ Kinetic energy is related to both mass and speed. The greater the mass or speed of an object, the greater the potential energy.
- ✓ Kinetic energy is the energy released by an object as it is doing work
- ✓ Even when an object seems to be at rest, its atoms and molecules are in constant motion and thus have kinetic energy. The average kinetic energy of the atoms or molecules is measured by the temperature of the body.
- ✓ Kinetic energy comes in different forms - There are different forms of kinetic energy. When we turn on a lamp, **electrical energy** gives us light. When we start a car, **mechanical energy** takes us from home to school. When we build a campfire, **heat (also called thermal) energy** roasts our marshmallows. And, when we eat the marshmallows, the **chemical energy** from carbohydrates fuels our bodies.
- ✓ Different forms of kinetic energy can be changed into other forms.
- ✓ Kinetic energy, as well as other forms of energy, can be transferred from one object to another. When energy is transferred or changes form, the total amount of energy stays the same. Energy cannot be created or destroyed.



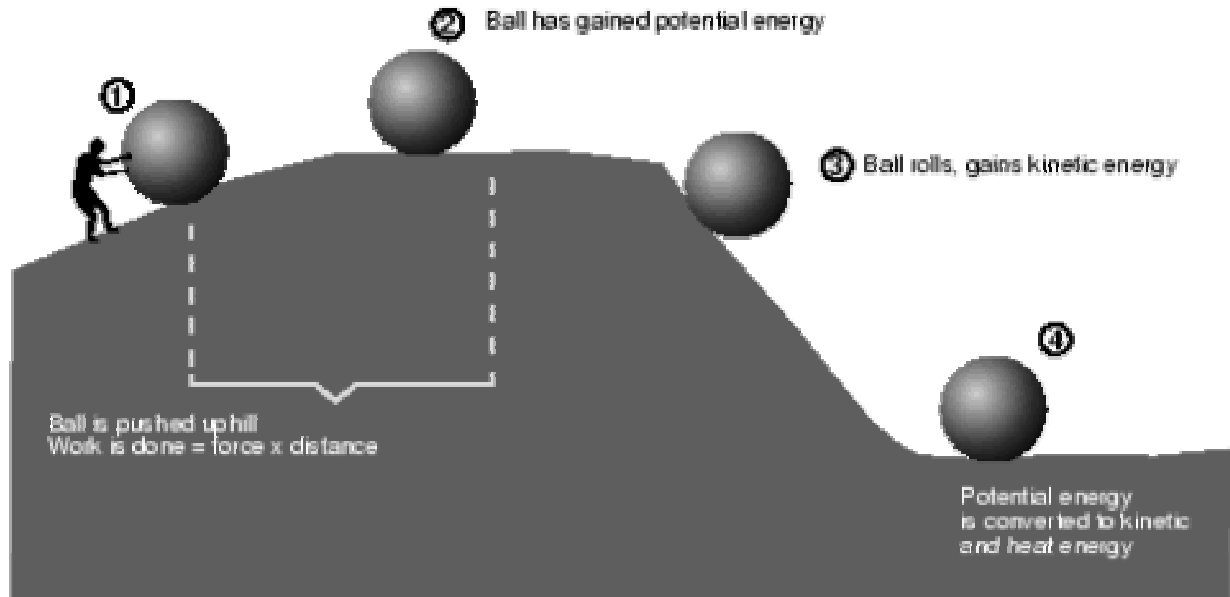
Potential energy is converted into kinetic energy.

For example – A waterfall has both potential and kinetic energy. The water at the top of a waterfall has potential energy. When the water begins to fall, its potential energy is changed into kinetic energy. This change in energy happens at Niagara Falls where it is used to provide electricity from the transformation of mechanical and electromagnetic energy to parts of the northeastern United States.

It does not take much effort to lift a ball off the ground. However, work is being done to the ball as it is being lifted, giving it energy. When the ball

is dropped, the ball begins to move. The potential energy is converted into kinetic energy.

For example:



<http://questions.science.nus.edu.sg/Book/node3.html#SECTION0031300000000000>

Energy is conserved. When you drop a ball, the potential energy is changed into kinetic energy. When the ball bounces to a lower and lower height, it is not losing energy. As the falling ball rubs against the air, some of the kinetic energy is changed into heat. Some energy changes into sound when the ball hits the floor. Because some energy becomes unusable when it changes from one form to another, the ball will never have enough energy to bounce back up to its starting height. In any conversion of energy, some of the energy becomes unavailable for future use. **Energy can be neither created nor destroyed, but it can be converted from one form to another and it can be transferred from one object to another. You can't ever get as much energy out of a transformation as you put into it.**



Problem: To observe the relationship between potential and kinetic energy.

Materials:

Small rubber ball	Meter stick	3" wide masking tape
Pen		

Procedure:

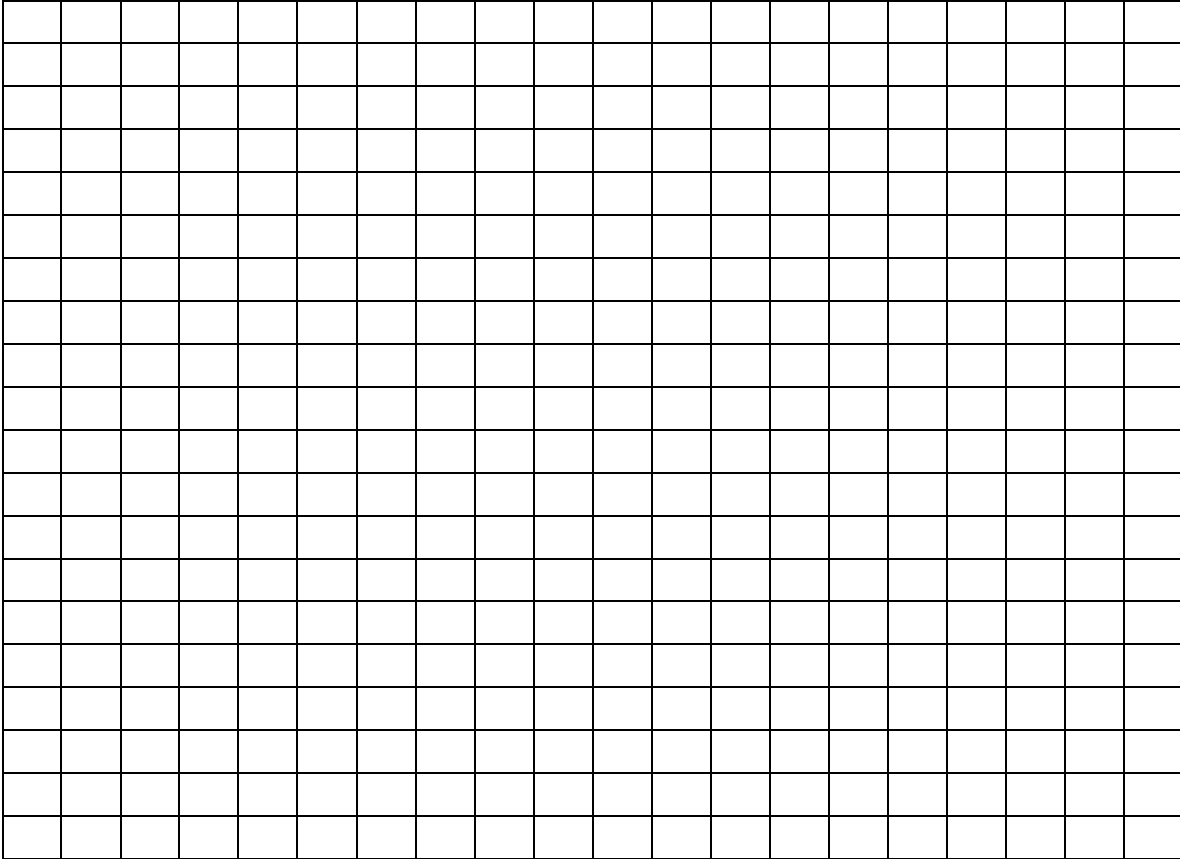
1. Starting at the floor, stretch the tape vertically against the wall or table leg.
2. Draw lines across the tape to mark $\frac{1}{2}$ meter (50cm), $\frac{3}{4}$ meter (75cm), and 1 meter (100 cm) above the floor.
3. Hold the ball at the $\frac{1}{2}$ meter mark and drop it. Observe carefully as the ball bounces.
4. Mark the height of the bounce on the tape.
5. Use the meter stick to measure the height of the bounce and record it in the data table.
6. Repeat steps 3 – 5 for a total of 5 trials.
7. Hold the ball at the $\frac{3}{4}$ meter mark and repeat steps 3 – 6.
8. Hold the ball at the 1 meter mark and repeat steps 3 – 6.

Data:

Starting Height	<i>Bounce Height</i>					Average Bounce Height
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
50 cm						
75 cm						
100 cm						

Data Analysis:

Make a *bar graph* to *compare* the average bounce height at different starting heights. Remember to title and label your graph.



What patterns or relationships do you see in the data?

Questions: (use your textbooks if necessary)

1. Describe energy:

2. Describe potential energy:

3. Describe kinetic energy:

4. When is work being done in this investigation?

5. When did the ball have the most potential energy in this investigation? Explain your answer.

6. How were you able to increase the amount of potential the ball had?

7. Explain another way to increase the amount of potential energy in an object:

8. How is the potential energy in the ball changed to kinetic energy in this investigation?

9. How is kinetic energy in the ball changed back to potential energy in this investigation?

10. Not all of the ball's potential energy was converted into kinetic energy. Where did this energy go?

11. Give an example of potential energy in nature:

12. Give an example of kinetic energy in nature:

13. Describe a situation when a lever has potential energy:

14. Describe a situation when a pulley has kinetic energy:

15. A basketball player throws a ball into the air and catches it before it hits the ground. Label where the ball has potential energy, kinetic energy, and two different energy conversions.

