GOLF BALLS AND THEIR POTENTIAL
Lab on Potential Energy

Introduction

The potential energy of an object is calculated by multiplying its mass by its acceleration and height. The formula for potential energy is

$$\text{potential energy} = \text{mass} \times \text{acceleration due to gravity} \times \text{height}$$
$$PE = m \times g \times h$$

If the object moves downward due to the pull of gravity, then its acceleration is 10 m/sec². In this lab you will be judging the movement of a golf ball down a ramp. The unit to denote potential energy (stored energy) is the newton-meter (joule).

Kinetic energy is the energy of motion. When a stationary object moves, the potential energy of that object changes into kinetic energy. The formula for kinetic energy is

$$\text{kinetic energy} = \tfrac{1}{2}\,\text{mass} \times \text{velocity}^2$$
$$KE = \tfrac{1}{2}\,mv^2$$

The joule is also the unit for this type of calculation. Remember that kg is the unit for mass.

Prelab Questions

1. A ball that has a mass of 2 kg is resting on top of a fence 20 m above the ground. Answer these questions about the ball:

   a. What is its potential energy?

   b. Is the potential energy greater when the ball is sitting on top of the fence or when the ball has fallen 10 m from the fence?

   c. Is the kinetic energy greater near the top or the bottom of the fence? Explain.

2. Create a word problem that addresses work, power, efficiency, kinetic energy, and potential energy. Include a drawing that accompanies that problem. You can write on the back of this page if you do not have enough room below. Be sure to make an answer key to go with your problem.

Materials

Golf ball

Three or four small blocks of wood (to support the meter sticks)

Paper or plastic cup

Platform balance or electronic balance

Two meter sticks or two same-size pieces of wood

Tape

Procedure

1. Tape the underside of two meter sticks together lengthwise so that there is a slit between them that forms a groove. The golf ball can roll down this groove as if it were on a track.

2. Use the small blocks of wood to construct a support for one end of the joined meter sticks. The support should raise one end of the sticks to a distance of 8 cm above the ground (see Figure A). Place a paper cup with the open side facing toward the slit at the other end of the meter sticks.

3. Hold the ball at the top of your ramp. Release it and let it roll down the ramp and into the cup.

4. Measure the distance from the bottom end of the meter sticks to where the cup and ball move along the floor. Record the measurement in the data table.

5. Repeat steps 3 and 4, but vary the height of the ramp each time; indicate the heights in the data table. Complete the data table as you go.

6. Use the balance to determine the mass of the ball.

7. Calculate the potential energy of the ball for each of the heights in the data table. Show your work (be sure to use the units kg, m/sec^2, and m).
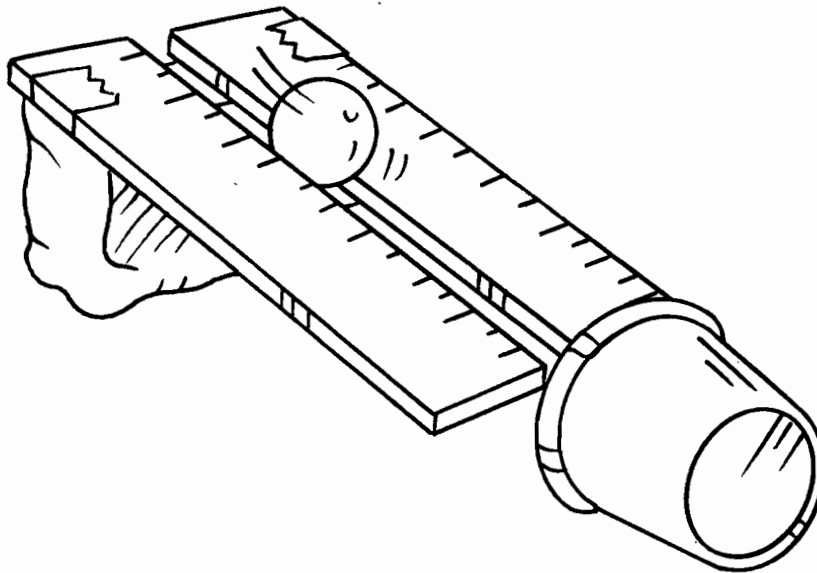

FIGURE A

DATA TABLE

Height of Ramp	Distance Cup Traveled	Potential Energy of the Ball
8 cm		
___ cm		
___ cm		
___ cm		

Postlab Questions

1. As the potential energy of the ball increased, what happened to the amount of work done on the cup? Explain your answer.

2. Explain how potential energy changes into kinetic energy as the ball rolls down the ramp.

3. What type of simple machine was represented in the lab.

4. If you oiled or greased the ramp, what do you think might have happened to your results?