

Student Name: \_\_\_\_\_ Bell: \_\_\_\_\_

## Energy Unit Alternate Assessment Version 1

### Formulas

$$E_g = mgh \quad = \quad E_k = \frac{1}{2} mv^2 \quad = \quad W = F \times d$$

$$m(10 \text{ m/s/s})h \quad = \quad \frac{1}{2} mv^2 \quad = \quad ma \times d$$

$E_k = \frac{1}{2} mv^2$  rearranged to solve for  $v$  looks like this:

$$\sqrt{\frac{2E_k}{m}} = \sqrt{v^2} \quad \text{which becomes} \quad \sqrt{\frac{2E_k}{m}} = v$$

If you don't know how to take a square root, then solve one side of the equation and leave the other side as  $v^2$

**Remember that h or d must be converted from cm to m**

Example  $15.3 \text{ cm} \div 100 = 0.153 \text{ m}$  OR mathematically  $\frac{15.3 \text{ cm}}{1} \times \frac{1 \text{ m}}{100 \text{ cm}} = 0.153 \text{ m}$

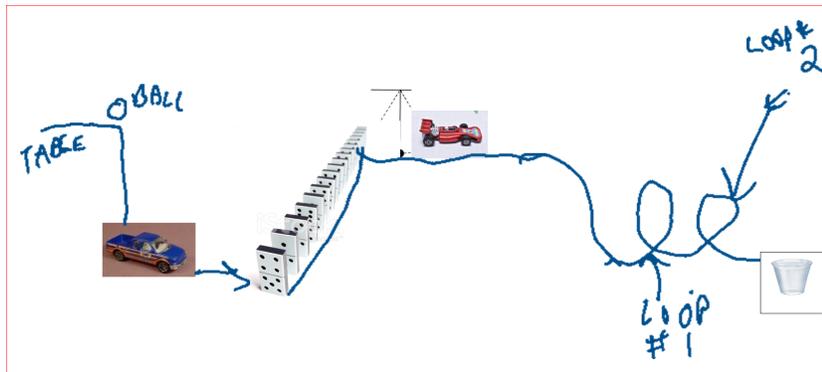
You need to use the measurements with each section of problems to answer/solve them. You must show ALL work, with units. If you choose to make a copy of this Google Doc and type the answers that is fine or you can choose to work on notebook paper or a whiteboard, take a clear photo of the work and upload it to the appropriate location in the Google Doc.

Please, give yourself plenty of time, so that you can show that you have mastered this skill set.

There is a different Rube Goldberg Machine for each problem set. Best of Luck!

## Machine # 1

Ball pushed from edge of table drops. Strikes toy truck, moves forward strikes dominoes. Dominoes fall uphill and strike pendulum. Pendulum swings and strikes toy racecar. Toy racecar falls and goes through loop 1 and then loop 2 before falling into cup.



### Measurements are listed here:

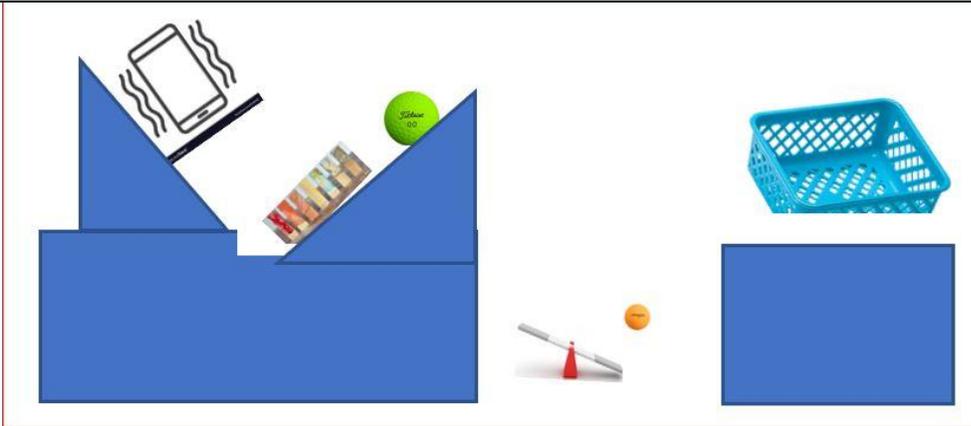
Height of golf ball on table to where it hits toy truck is 40.0 cm    Mass of golf ball is 0.04593 kg

Distance truck moves to reach dominoes is 6.0 cm    Mass of toy truck is 0.114 kg

1. (8 points) Compute the  $E_g$  for the golf ball.
2. (8 points) Compute the velocity for the toy pick-up truck using your knowledge of  $E_k$  and  $E_g$ .
3. (8 points) What work did the truck do? (You must give an **explanation** and a **numerical answer** with the **units** to earn all the points.)
4. (3 points) Draw the energy bar chart for when the ball is  $\frac{1}{2}$  way through its fall.

## Machine # 2

Vibrating Cell phone slides down the ramp and causes the Jenga blocks to fall going up the ramp. This causes the golf ball to roll up the ramp and fall, striking the see-saw below. The ping pong ball travels up, landing in the basket.



### Measurements are listed here:

Height of cell phone to Jenga blocks is 15.0 cm Mass of cell phone is 0.138 kg

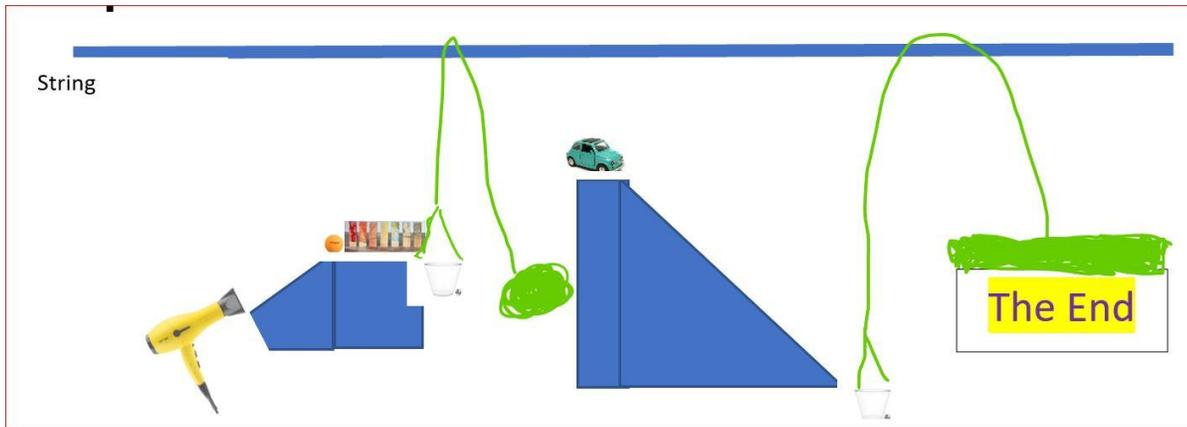
Distance the golf ball falls is 56.0 cm Mass of golf ball is 0.04593 kg

Height of ping pong ball to the blue basket is 33.0 cm Mass of ping pong 0.0027 kg

1. (8 points) Compute the  $E_g$  for the ping pong ball.
2. (8 points) Compute the velocity for the golf ball using your knowledge of  $E_k$  and  $E_g$ .
3. (8 points) What work did the golf ball do?( You must give an explanation and a numerical answer with the units to earn all of the points.)
4. (3 points) Draw the energy bar chart for the position of the ping pong ball as shown in the image.

## Machine # 3

The hairdryer pushed the ping pong ball uphill, causing it to knock over the Jenga blocks. The last Jenga Block falls into a cup, attached to a pulley. The other end of the pulley has a round lid attached to it, so that when it raises up, it strikes the toy car. The toy car ,travels down a ramp and into a cup, attached to a pulley. The cup with the car falls to the ground, raising a sign.



### Measurements are listed here:

Height of Jenga and cup to ground is 50.5 cm    Mass of Jenga is 0.0107 kg    Mass of cup is 0.00853 kg  
Distance the car and cup falls is 72.4 cm    Mass of toy car is 0.038 kg    Mass of cup is 0.00853 kg  
Distance the sign moves is 72.4 cm    Mass of the sign is 0.09 kg

1. (8 points) Compute the  $E_g$  for the Jenga and cup.
2. (8 points) Compute the velocity for the sign, using your knowledge of  $E_k$  and  $E_g$ .
3. (8 points) What work did the golf ball do?( You must give an explanation and a numerical answer with the units to earn all of the points.)
4. (4 points) Draw the energy bar chart for the ping pong when it is half-way up the ramp and don't forget to include the types of energy associated with the hair dryer.