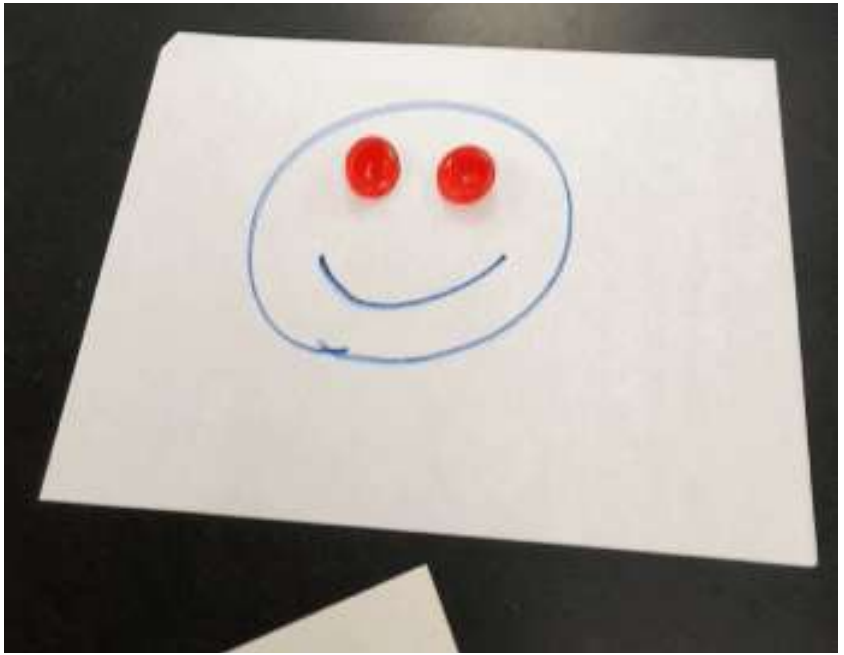
Popper Lab

Investigating Energy

Instructions:

Invert the rubber popper with your fingers and place it on the floor. The popper will launch itself upward. In this activity, you will measure the maximum height attained by the popper and will use this to calculate its potential energy. You will then use this information to consider how the energy is transformed at various points along the popper's motion.



Do Now: Get a copy of the handout and read it!

Popper Lab

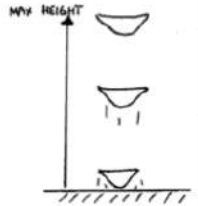
Instructions: Invert the rubber popper with your fingers and place it on the floor. The popper will launch itself upward. In this activity, you will measure the maximum height attained by the popper and will use this to calculate its potential energy. You will then use this information to consider how the energy is transformed at various points along the popper's motion.

Some helpful formulas:

CAUTION: Do not put your face directly over the popper or aim the popper at anyone else!

$$KE = \frac{1}{2}mV^2 \qquad PE = mgh$$

Consider the diagram below and select the energy that the popper has at each location.



C	KE Only	PE Only	Both KE and PE
B	KE Only	PE Only	Both KE and PE
A	KE Only	PE Only	Both KE and PE

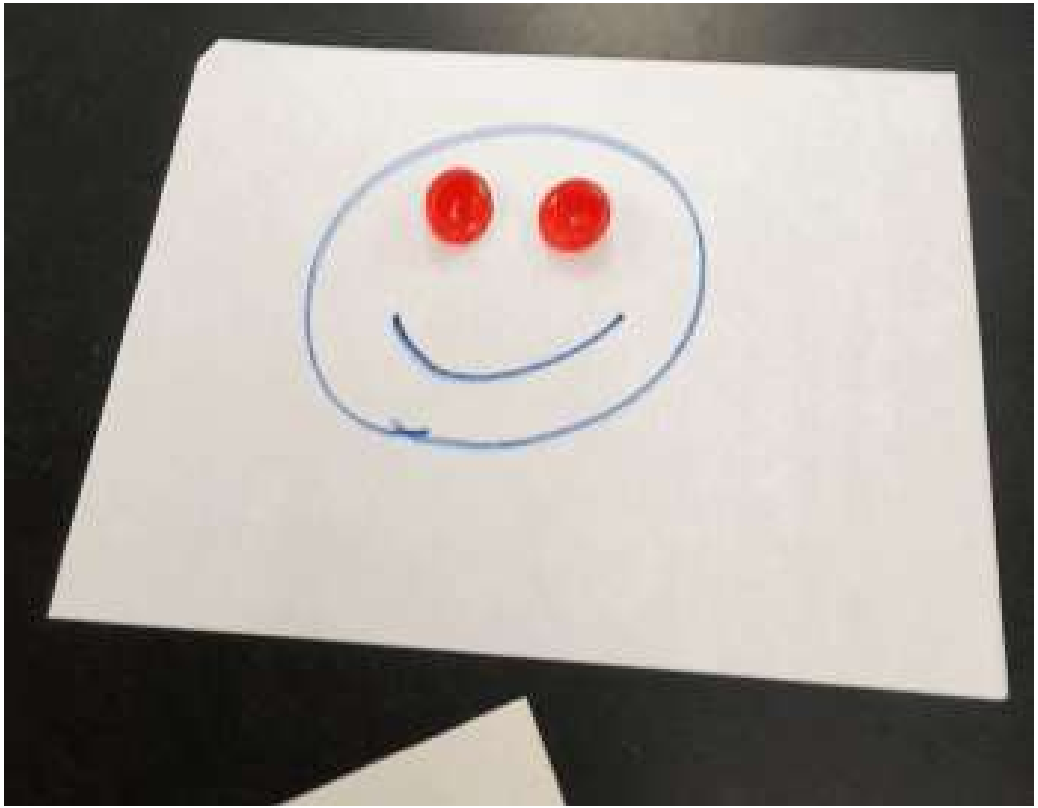
The average mass of a popper is **1.7 grams**. Normally, you would measure this, but COVID ruins everything. Before we can use this mass in the equations above, it must be converted to kilograms. Do this in the space below. Show your work.

Use a meter stick to measure the maximum height that the popper rises to.

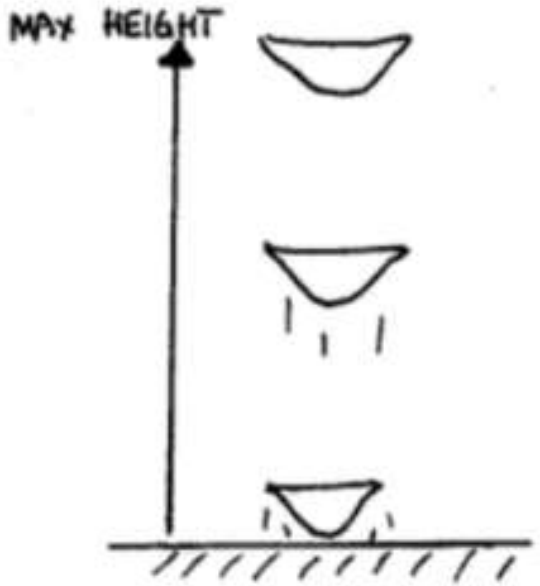
Perform 5 trials and calculate an average.

Wash your hands after handling the meter stick.

Trial #	
1	
2	
3	
4	
5	
Average	



Consider the diagram below and select the energy that the popper has at each location.



C	KE Only	PE Only	Both KE and PE
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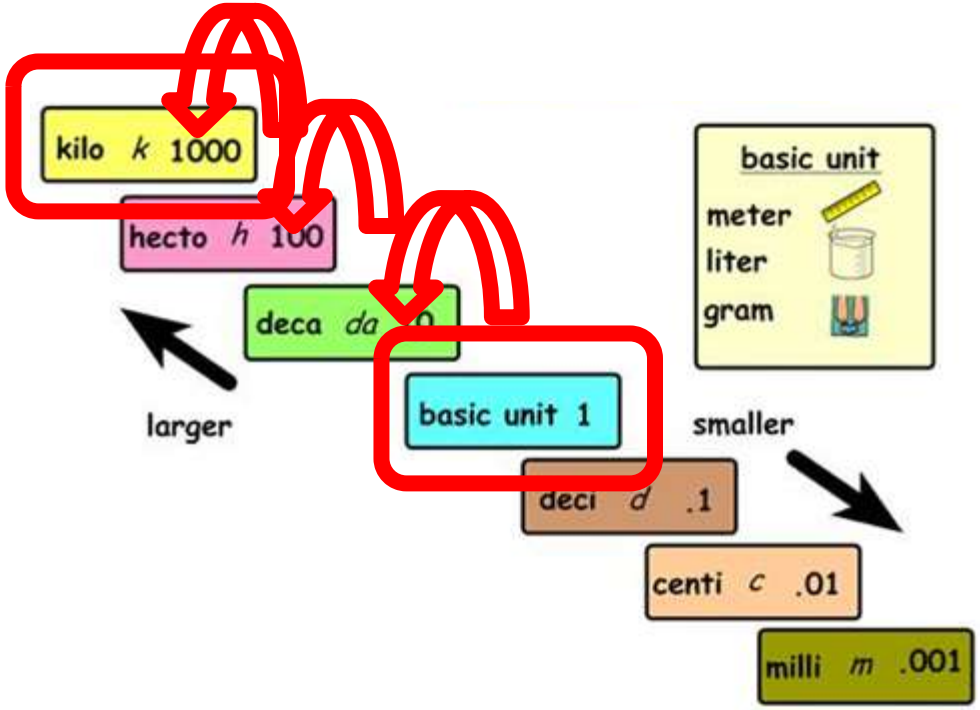
$$KE = \frac{1}{2} m V^2 \quad PE = mgh$$

The average mass of a popper is 1.7 grams.
Before we can use this mass in the equations above, it must be converted to kilograms. Do this in the space below. Show your work



1.7 grams = 0.0017 kilograms

Use a meter stick to measure the maximum height that the popper rises to.

Perform 5 trials and calculate an average.

Make sure that your mass is in kilograms and your height is in meters.

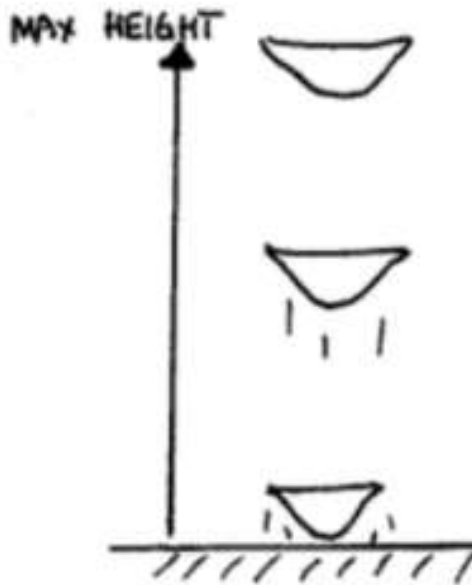
Trial #	
1	
2	
3	
4	
5	
Average	

Previewing the Questions...

$$KE = \frac{1}{2}mV^2 \qquad PE = mgh$$

1. Calculate the gravitational potential energy of your popper at its highest point.

2. What is the total energy of your popper at any location?
(Hint: Conservation of Energy)



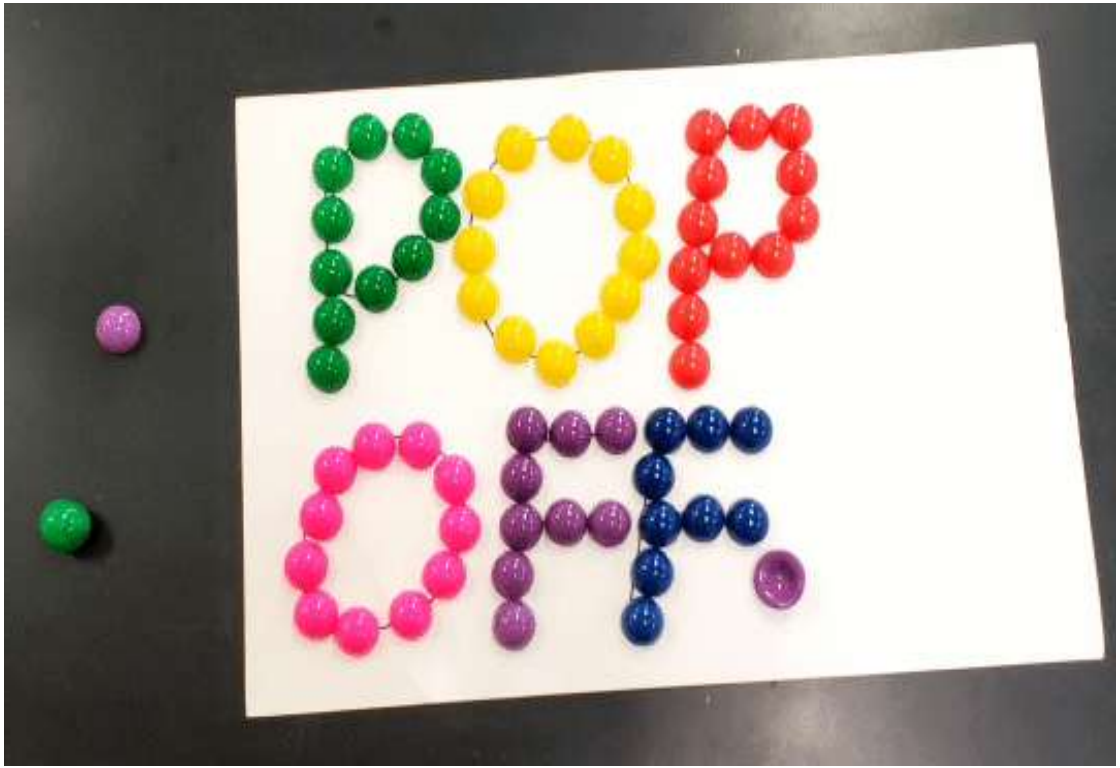
3. Calculate the potential energy of your popper at position B.
Assume position B is at half of its maximum height.

4. Calculate the kinetic energy of your popper at position B.

5. Calculate the speed of your popper at Position A,
just after the launch.

6. What are some possible sources of error you may have encountered in this lab? How could this lab be improved in the future?

Get materials. Conduct five trials. Take the average.



Trial #	
1	
2	
3	
4	
5	
Average	

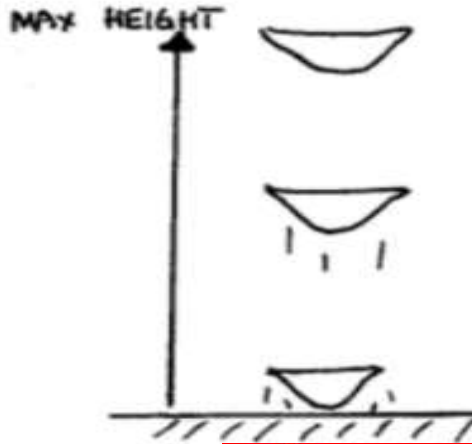
Grab your stuff...we're heading outside.

Take the next five minutes to answer the questions.

$$KE = \frac{1}{2}mV^2 \qquad PE = mgh$$

1. Calculate the gravitational potential energy of your popper at its highest point.

2. What is the total energy of your popper at any location? (Hint: Conservation of Energy)



3. Calculate the potential energy of your popper at position B. Assume position B is at half of its maximum height.

4. Calculate the kinetic energy of your popper at position B.

5. Calculate the speed of your popper at Position A, just after the launch.

6. What are some possible sources of error you may have encountered in this lab? How could this lab be improved in the future?

Share Out…what was your average height?

Trial #	
1	
2	
3	
4	
5	
Average	

1. Calculate the gravitational potential energy of your popper at its highest point.

$g = 9.81\ m/s^2$

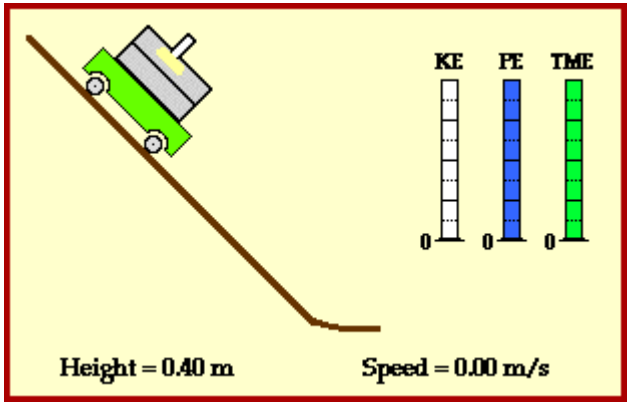
$$PE = mgh$$

$$PE = 0.0017\ kg \times 9.81\ m/s^2 \times 1.6\ m$$

$$PE = 0.0267\ Joule^*$$

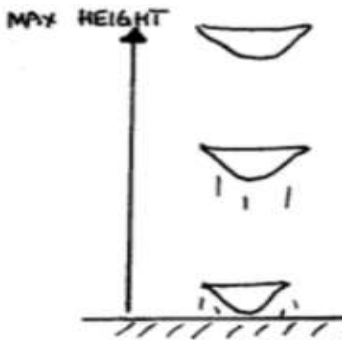
*Joule is a unit of energy

2. What is the total energy of your popper at any location? (Hint: Conservation of Energy)



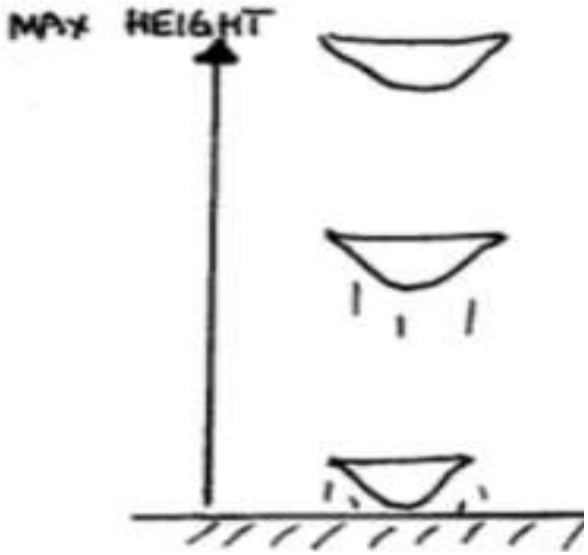
Same as question #1.

Total amount of energy remains the same.



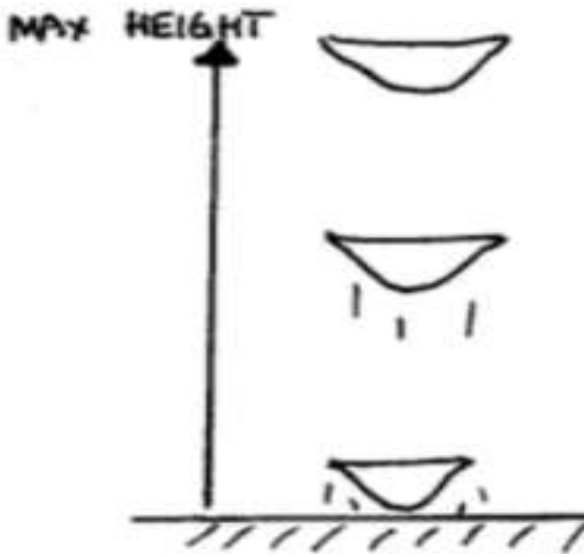
3. Calculate the potential energy of your popper at position B. Assume position B is at half of its maximum height.

$$PE = mgh$$



4. Calculate the kinetic energy of your popper at position B.

$$\text{Energy} = KE + PE$$



So…

KE = Energy - PE

5. Calculate the speed of your popper at Position A, just after the launch.

$$KE = \frac{1}{2} m V^2$$

6. What are some possible sources of error you may have encountered in this lab? How could this lab be improved in the future?