



EXPERIMENTING WITH FORCE OF MOTION

**Basic Physics**

**Define Energy-**

**Define Work-**

**Define Force-**

**Define Velocity-**

**Define Mass-**

**Define Joule-**

**Define Potential Energy-**

**Define Kinetic Energy-**

Below is a word bank of actions categorized them as either kinetic or potential energy

<ul style="list-style-type: none"><li>● Ball falling</li><li>● Ball on a shelf</li><li>● Car parked on a hill</li><li>● Car moving down a highway</li><li>● Wind blowing</li><li>● Person on top of a ladder</li><li>● Satellite in orbit</li><li>● Earth orbiting the sun</li><li>● Brick on top of a building</li><li>● Raindrop falling from the clouds</li></ul>	
Potential Energy	Kinetic Energy

## EXPERIMENTING WITH FORCE OF MOTION

### Know Before You Start:

After bouncing the egg a little it's time to test the physics of what's going on. In this experiment we will learn about the forces the egg experiences as it falls through the air and splashes on to the plate! This demonstration can be very messy so be prepared to clean up! To try avoid a mess make sure the experiment is done over a large plate.

Note: This experiment asked you to measure your egg with scale but if a scale is not available use the average mass for a large chicken egg of 56.7 grams.

### Materials Needed:

- Egg from part 1
- Ruler
- Large plate
- Scale (if available)

### Directions:

#### Step 1 -- Splat!

- To begin we will measure the weight of the egg using a scale. If a scale is not available to you use the weight given to you in "Know Before You Start" section
  - Be sure you weigh the egg in grams. If the scale you are using does not provide grams be sure you look up the necessary conversions online
- Place your egg on the plate and have a ruler ready
- Lift your egg above the plate and measure its height from the bottom of the egg in centimeters
- **DROP IT!**
- Continue to drop your egg above the plate in increasing heights until your egg breaks
  - Be sure you note the height on the trial when the egg burst as you will be using this for your calculations later



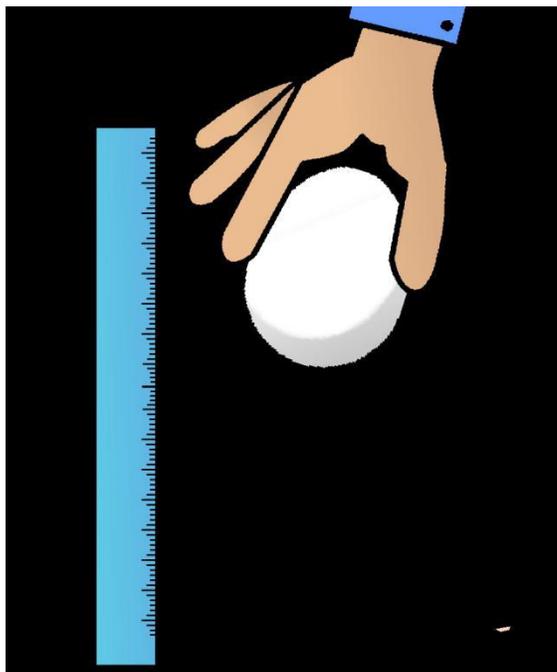
**Mass of egg** \_\_\_\_\_

**Height of egg drop** \_\_\_\_\_

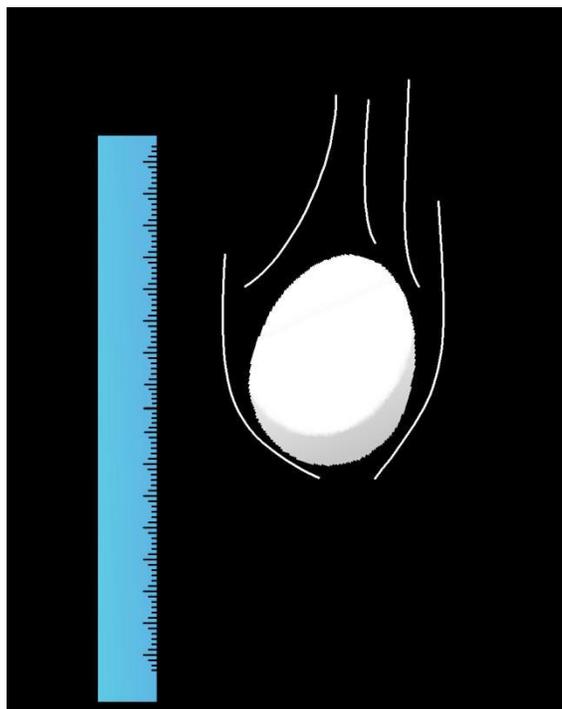
## Exploring Physics!

Having seen your egg splashed onto the plate its time to learn the physics of what happened.

When you hold your egg in the air you work against the force gravity to lift the egg. However, the force of gravity is still acting on the egg generating what we call potential energy. Potential energy is the energy given to an object by its position and can be influenced by a few factors. The more massive the object or the higher its position the more potential energy it generates. Therefore, the formula for potential energy can be described as mass times acceleration due to gravity times height or  $PE=mgh$ . While mass and height can vary depending on the object acceleration due to gravity is always  $9.8 \text{ m/s}^2$  anywhere on Earth!



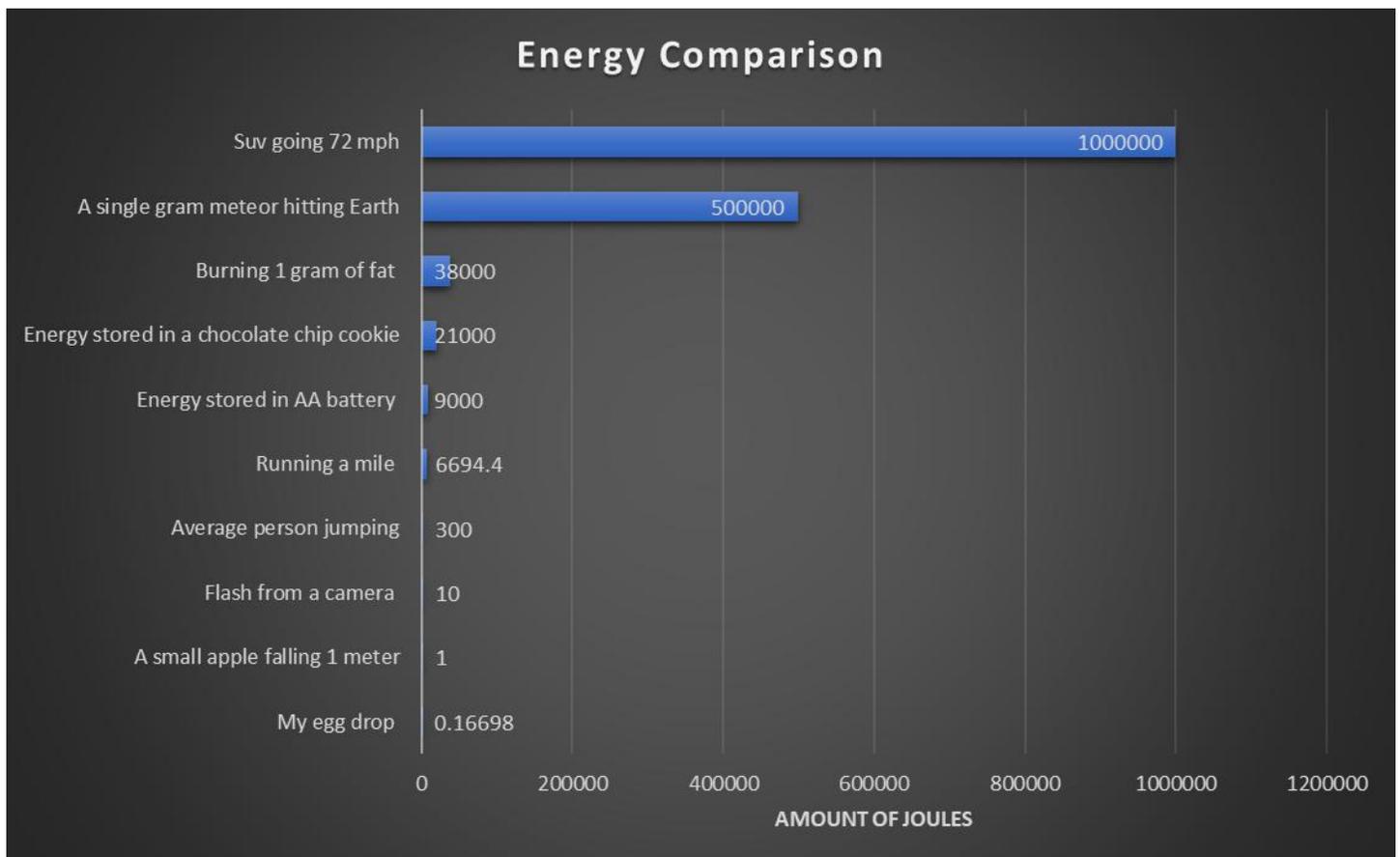
At the moment you let go of the egg the force of gravity immediate acts on it propelling the egg towards the ground. The energy experienced from this motion is what we call kinetic energy. Kinetic energy just like potential energy can be influence by a few factors. These factor are the mass and velocity of a object. Picture the same car travelling at different speeds. It takes longer for a car to stop when travelling at a higher speed. We can describe the formula for kinetic energy as  $1/2$  times mass times velocity squared or  $KE=1/2mv^2$ .



## Step 3 – Calculating potential energy!

- Now that we know the formula for potential energy as  $PE=mgh$  its time to input our values
- To find m or mass we have to take the weight of the egg and convert it to kilograms
  - If you are working in grams all you have to do is take that value and divide it by 1000
  - $m = \text{_____} \text{ g} \div 1000$
- G or acceleration due to mass is given during the potential energy discussion
- To find h you must take the height during the egg drop and convert it to meters
  - If you are working in centimeters all you have to do is take that value and divide it 100
  - $h = \text{_____} \text{ cm} \div 100$
- Now we are ready to find potential energy by plugging in all the converted values into the formula
  - $PE = \text{_____} \times \text{_____} \times \text{_____}$

Now that we have your potential energy use the chart below to compare your value!



### Practice Makes Perfect

1. This 1,500 kg boulder is balanced on a single point 30 meters above the parking lot. While an interesting sight park rangers want to know if the boulder might cause damage if it falls. Calculate the potential energy of the boulder.



2. The Kingda Ka in Six Flags Great Adventure amusement park is the tallest roller coaster in the world! Participants will make a thrilling 139 meter drop and be propelled at 129 miles per hour. James is a thrill seeker as well as a dedicated physicist. James wonders if he weights 70 kg what is his potential energy at the highest point in the roller coaster?

