Outline:

* **Research question how x affects y**

How does the mass of an object entering a body of water affect the oscillation?

* **Describe your experiment setup**

My experiment will be conducted in a large body of water such as a bath tub. I will have a single size container that I can change the mass of, for example an empty water bottle. Since the water bottle is empty I can change it’s weight by filling it up with a heavy substance, for example sand. The camera will be mounted at the surface level of the water so that I don’t have to adjust my calculations for the perspective.

I will start with a full bottle and remove approximately 25ml of sand every repetition of the experiment. I will use a weight scale to measure the weight left in the bottle. This will give me 20 data points to measure assuming the standard size of a 500ml water bottle.

I will also attach a weight to the bottom of the water bottle so that it oscillates vertically and does not flip over in the water.

Once I have completed the experiment I will take the slow motion footage and measure the number of pixels that the bottle moves, by comparing this to a control object such as a ruler that I will show in the video, I will be able to convert the number of pixels to a distance measurement such as meters.

* **Range of independent quantity and assume range of depended quantity**

My independent quantity is the mass of the water bottle the upper range of my independent quantity is 810g = 750g (500ml of sand) + 10g (weight of the bottle) +50g (weight at the bottom) and the lower range is 60g (weight of the bottle + weight).

The quantity that depends on this is the the frequency and amplitude of the oscillation.

My controlled variables are the water bottle, density of the water and the distance and perspective of the camera.

* **Prior knowledge, theoretical background**

My prior knowledge is limited to what we studied in class. In class we learned about gravity and kinetic energy as such I will be able to calculate the energy of the bottle before it hits the water. I will need to study oscillations so that I am able to analyze the relationships between the energy of the bottle and oscillation.

* **Limitations**

There are a couple of limitations in my method of measuring the vertical distance of the of the oscillations. The frame rate of the camera will limit the accuracy of my calculations. Also perspective will warp the distance depending on how far from the center center of the shot I am measuring. The third limitation is dropping the bottle always from the same height but this can be minimized by having a platform (such as the edge of the bathtub) to always drop the bottle from the same height.