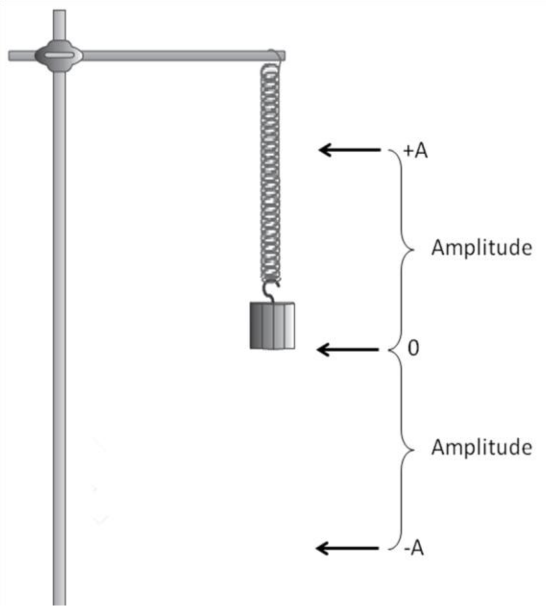
Determination of Frequency in a Mass-Spring System

Aim:
This experiment is conducted to determine the frequency in a mass-spring system

Equipments
Spring, Mass, Stand, Ruler, and holders.

Pre-Lab Questions
What does the frequency of a mass-spring system depend upon?
How is the influence of the amplitude on harmonic motion?

Introduction and Theory
Lots of things vibrate or oscillate. A vibrating tuning fork, a moving child's playground swing, and the loudspeaker in a radio are all examples of physical vibrations. There are also electrical and acoustical vibrations, such as radio signals and the sound you get when blowing across the top of an open bottle.
One simple system that vibrates is a mass hanging from a spring. The force applied by an ideal spring is proportional to how much it is stretched or compressed. Given this force behavior, the up and down motion of the mass is called *simple harmonic.*



Objectives:
- In this experiment, you will collect position *vs.* time data as a mass, hanging from a spring, is set in an oscillating motion.
- Determine the best fit equation for the position *vs.* time graph of an object undergoing simple harmonic motion (SHM).
- Define the terms of amplitude.

Step I: determination of force constant.

Procedure:
1.) Measure the length of the spring with no mass added. Record this length in the data table.
2.) Hang a mass to the spring. Calculate and record the force (weight) produced by the mass.

3.) Measure and record the distance of *stretched* spring (the *change* in length).

Mass /gr	Force (F=mg) Newton	X/ meter	ΔX / meter	K = F/ΔX (N/m)
500				

Where X is the length of the spring before mass loaded.
ΔX is the change of length after mass loaded.
K is spring's constant .
F forces produced
Note: you use the K in the next part of the experiment.

Step II: frequency dependency: frequency oscillation of the spring is not a function of amplitude. It's a function of the loaded mass.

Procedure:

- Load the mass as shown in table below.
- Calculate the value of T and Frequency (f) of each loaded mass.
- Compare the calculated time of oscillation with the one calculated with stoppage watch.
- Plot between Mass on X-axis and F at Y axis. Discuss the line.

Mass/gram	**Amplitude (cm)**	**Time of Oscillation (T) in seconds** $T=2\pi \sqrt{(m/k)}$	**Frequency of oscillation (Hz)** $F=1/T$
300			
400			
500			
600			
700			
