**Horizontal Mass Spring System:**

Let we consider a mass spring system. One side of spring attached with hard rigid body and other side with mass “ m ”.

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The motion of object between two extreme points about its origion.

**According to Hook’s Law:**

Principle of physics that states that the force needed to extend or compress a spring by some distance is proportional to that distance. That is where is a constant factor characteristic of the spring, its stiffness.

F = -kx

**Amplitude:**

Max displacement from main is called amplitude.

F = -kx --------------------- (1)

F = ma -----------------------(2)

Comparing (1) and (2) .

-kx = ma

-kx/m = a

a = (-k/m) x -k/m = constant

a ∝ -x

**Result:**

It means that horizontal mass spring system is a simple harmonic oscillator that execute a simple harmonic motion.

**Simple Pendulum:**

Consider we have a string (Not Flexible) with attached with a mass “ m “. And other side with a hard rigid body.



**θ**

**l**

**l**

**F sin θ**

**F sin 𝛉**

**F cos 𝛉**

**θ**

**F cos θ**

 m

**mg**

F = -mg sin θ

The horizontal component of force mg cosθ is always use to balance the tension force.

The components of force is drive the pendulum.

F = -mg sin θ ---------------------- (1)

F = ma ---------------------- (2)

Comparing (1) and (2).

ma= -mg sin θ

a= -g sin θ

sin θ = perpendicular/hypotenuse , =x / l

sin θ ≈ θ , cos θ ≈ θ

a= -g θ

θ = x / l

Put the value of “ θ “.

a = -g(x/l)

a ∝ -x

**Vibratory, Periodic Motion:**

A motion that repeats itself in equal intervals of time.

 **Oscillatory Motion:**

 If a particle in periodic motion moves back and forth (To and Fro) over the same path, then this type. Of motion is called Vibratory or Oscillatory Motion.

**Simple Harmonic Motion (SHM):**

Simple harmonic motion is a type of periodic motion where the restoring force is directly proportional to the displacement and acts in the direction opposite to that of displacement.

1. a ∝ x
2. a ∝ -x

The direction of acceleration is always opposite to main point.