

Definition:

Simple harmonic motion is a oscillatory motion of a body where its acceleration is directly proportional to its displacement, but in opposite direction.

Derivation of simple harmonic motion:

$$x = A\sin(\omega t)$$

$$v = A\omega\cos(\omega t)$$

$$a = -A\omega^2\sin(\omega t)$$

$$a = -\omega^2 x$$

Energy:

At maximum velocity, there is no elastic potential energy.

$$v = A\omega$$

$$E = E_k = \frac{1}{2}mv^2 = \frac{1}{2}mA^2\omega^2$$