

Free, damped and forced Oscillations,

Free Oscillations :— when a body capable of oscillation is displaced from its equilibrium position and released, it begins to oscillate. The frequency of oscillations depends upon certain properties of the body. Such oscillations are called free oscillations. And their frequency is called the natural frequency of the body.

usually the amplitude of such oscillations gradually decreases to zero due to the presence of damping (friction, viscosity etc) forces. Hence, they are called the damped oscillations. Oscillations of simple pendulum is a simple example of such oscillations.

Damped Oscillations :— when ever a system is set in to oscillations under no external influence, its amplitude decreases gradually to zero. This is because the oscillating system is always subject to frictional forces arising from air resistance or from within the system itself. The work done against these forces is dissipated out of the system as heat. Therefore, the mechanical energy of the system decreases with time and eventually the system comes to rest.

As an example, if we displace a pendulum from its equilibrium position it will oscillate with a decreasing amplitude and finally come to rest in the equilibrium position.

In most cases, the energy lost from the oscillating system in each cycle is similar to the $\rightarrow$

(P. 100)