

## Definitions and Concepts for Edexcel Physics A Level

### Topic 13: Oscillations

**Critical Damping:** Where the oscillations stop and return to equilibrium in the quickest possible time.

**Damping:** When the energy in a SHM system is not kept as KE or PE and the total energy is no longer constant. All real systems experience some damping from friction or air resistance.

**Free Vibrations:** When a system oscillates without any driving force.

**Force Vibration:** When a system's oscillations are forced to vibrate by an external driving force.

**Light Damping:** (under damping), Where the oscillation's amplitudes reduce slowly. Friction and air resistance cause light damping.

**Natural Frequency:** The frequency at which a system naturally vibrates, a free vibration will be at the natural frequency.

**Overdamping:** When the damping is greater than critical damping, it stops the oscillations but the system takes longer to return to equilibrium position than a critically damped system.

**Pendulum Oscillator:** A mass on a string that oscillates with simple harmonic motion from side to side. The time period is independent of the object's mass and the initial displacement.

**Resonance:** When the driving force is at the natural frequency of a system causing maximal energy transfer with the amplitude of oscillation at its maximum. The driving force is  $\pi/2$  radians ahead of phase of the oscillations.

**Simple Harmonic Motion:** A mechanical process where the force on an object is proportional to the negative of the displacement from equilibrium. This means there is always a restoring force pointing towards equilibrium which is proportional to the extension. The resulting motion is oscillatory about this equilibrium position.

**Spring Oscillator:** A mass on a spring that oscillates with simple harmonic motion up and down. The time period is independent of gravitational field strength and the initial displacement.

