

Unit 7: Oscillations

Text:

Chapter 15

Problems (p. 405-412)#1: 1, 7, 13, 17, 24, 26, 28, 32, 35 (*simple harmonic motion, springs*)#2: 45, 46, 49, 51, 75 (*pendulums*)**Vocabulary:**

simple harmonic motion, hertz, amplitude, phase, angular frequency, period, simple pendulum, physical pendulum, damped harmonic motion, forced harmonic motion, resonance, natural frequency, equations of motion

Math:

definitions:

$$x = A \sin(\omega t + \phi) \quad f = \frac{1}{T}$$

derived formulas:

$$\ddot{x} = -\omega^2 x \quad T = \frac{2\pi}{\omega} \quad T = 2\pi \sqrt{\frac{m}{k}} \quad T = 2\pi \sqrt{\frac{L}{g}}$$

$$T = 2\pi \sqrt{\frac{I}{rmg}}$$

skills:

no new math skills

Key Objectives:

- derive the equation of motion for simple harmonic motion.
- apply Newton's Second Law to a variety of situations, solve for the equations of motion, and determine the period of motion, if it is simple harmonic motion.
- derive the formulas listed above.
- correctly use the equations above in a variety of word problems.
- identify, define and give examples for the vocabulary listed above.
- understand and explain the assumptions and approximations made in the above formulas.
- understand and explain what happens to the energy of an oscillating system.
- set up, but not solve, the equations of motion for a damped harmonic oscillator.
- explain qualitatively what happens to a damped harmonic oscillator, e.g. energies, amplitudes, periods, velocities, etc.