Simple Harmonic Motion - Outline

1. Identify the conditions of simple harmonic motion.
2. Explain how force, velocity, and acceleration change as an object vibrates with simple harmonic motion, such as springs and pendulums.
3. Calculate the spring force or spring constant using Hooke's law.
4. Identify the amplitude of vibration.
5. Recognize the relationship between period and frequency.
6. Calculate the period and frequency of an object vibrating with simple harmonic motion.

Notes

- Hooke's Law - Springs

  - ✓ Where is Maximum Speed Obtained?:

  - ✓ Where is Maximum Acceleration and Force Obtained?:

  - ✓ Definition of Simple Harmonic Motion (SHM):

  - ✓ Elastic Potential Energy:

- The Simple Pendulum

  - ✓ Restoring Force of a Pendulum:

  - ✓ Gravitational Potential Energy of a Pendulum:

- Measuring Simple Harmonic Motion

  - ✓ Amplitude:

  - ✓ Period (T):

  - ✓ Frequency (*f*):

  - ✓ Period of a Spring:

  - ✓ Period of a Pendulum:

• Sample/Practice Problems

A. Simple Harmonic Motion - Blue Study Guide, page 61

B. Measuring Simple Harmonic Motion – Blue Study Guide, page 62

C. Period on a Spring

1. A spring of spring constant 30.0 N/m is attached to different masses and the system is set in motion. Find the period and frequency of vibration for masses of the following magnitudes:
   a. 2.3 kg
   b. 15 g
   c. 1.9 kg

2. A mass of 0.30 kg is attached to a spring and is set into vibration with a period of 0.24 s. What is the spring constant of the spring?

D. Period on a Pendulum

1. Calculate the period and frequency of a 3.500 m long pendulum at the following locations:
   a. the North Pole, where $a_g = 9.832\ m/s^2$
   b. Chicago, where $a_g = 9.803\ m/s^2$
   c. Jakarta, Indonesia, where $a_g = 9.782\ m/s^2$

2. You are designing a pendulum clock to have a period of 1.0 s. How long should the pendulum be?