

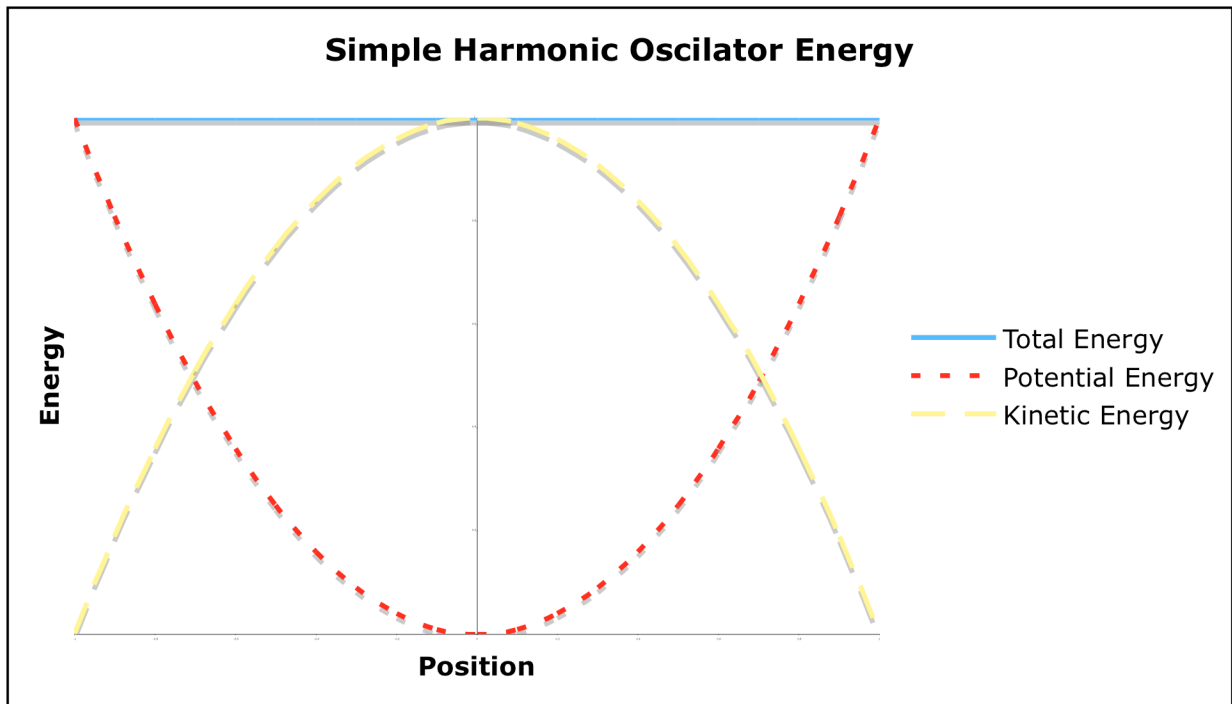
SHM Review

1. The frequency of an oscillator is 2 HZ. What is its period? What is its frequency in rpm? What is the average speed of the oscillator if its amplitude is 20 cm?
2. At what point in an oscillation cycle (middle, end, in between) are the following quantities at a maximum? Minimum?
 - a. Speed
 - b. Net Force
 - c. Potential Energy
 - d. Kinetic Energy
 - e. Acceleration
3. A 2 kg mass and a 50 N/m spring comprise a horizontal spring-mass oscillator on a frictionless surface. If the amplitude of the oscillator is 40 cm,
 - a. What is the maximum force on the mass?
 - b. What is the maximum potential energy of the spring?
 - c. What is the maximum acceleration of the mass?
 - d. What is the minimum acceleration of the mass?
 - e. Using conservation of energy, calculate the maximum speed of the mass.
4. A spring-mass oscillator is placed on a horizontal, frictionless surface. The spring constant, k , is 40 N/m, the mass is 5 kg, and the oscillator is initially displaced by 3 meters before being released from rest. Answer the following questions:
 - a. What is the initial force on the oscillator?
 - b. What is the initial acceleration of the oscillator?
 - c. What is the maximum speed of the oscillator?
 - d. What is the total energy of the oscillator?
 - e. What is the amplitude of the oscillator?
 - f. How far does the mass travel during one cycle?
 - g. If the mass were increased to 45 kg, how would that affect the period?
 - h. If the spring constant were decreased to 10 N/m, how would that affect the period?
 - i. If the mass were hung vertically from the spring, how far would the spring stretch when the mass is balanced?
5. If a spring mass oscillator has a maximum EPE of 100 Joules and the k of the spring is 4 N/m, what is the amplitude of the oscillator? If the maximum speed of the oscillator is 10 m/s, what is the mass of the oscillator?
6. Sketch a graph of the EPE, KE, and total energy of a horizontal oscillator versus position on the same set of axes.
7. What has to be true of the force on an object for it to oscillate in SHM?
8. How would you recognize whether an oscillating object in lab was a Simple Harmonic Oscillator?
9. What property of musical instruments clearly indicates to the observer that their oscillations are Simple Harmonic?

SHM Review -- KEY

1. $T = 0.5 \text{ s}$, $f = 120 \text{ rpm}$, $v = \Delta s/t = 1.6 \text{ m/s}$
2.

	<u>maximum</u>	<u>minimum</u>
a. Speed	middle	end
b. Net Force	end	middle
c. Potential Energy	end	middle
d. Kinetic Energy	middle	end
e. Acceleration	end	middle
3. a. 20 N, b. 4 J, c. 10 m/s^2 , d. 0, e. 2 m/s
4. a. 120 N, b. 24 m/s^2 , c. 8.49 m/s, d. 180 J, e. 3 m, f. 12 m, g. period would triple, h. period doubles, i. 1.25 m
5. 7.07 m, 2 kg
6. .



7. Force is proportional to displacement.
8. Period is independent of amplitude.
9. The volume at which a note is played does not effect the pitch of a note.