Simple Harmonic Motion

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| a) 2.65 rad/s  b) 0.398 m/s | 1. a) What is the angular velocity of a Simple Harmonic Oscillator with a period of 2.37 seconds? b) If the oscillator has an amplitude of 0.150 m, what is the maximum velocity it reaches? |
| a) 10. 2 rad/s  b) 0.614 s  c) 1.63 Hz | 2. A SHO has a maximum velocity of 0.870 m/s with an amplitude of 8.50 cm. a) What is its angular velocity? b) What is its period of motion? c) What is its frequency? |
| a) 3.91 x 10-3 s  b) 1610 rad/s  c) 3.38 m/s  d) ±2.36 m/s | 3. A tuning fork vibrates at 256 Hz with an amplitude of 2.10 mm (2.10 x 10-3 m). a) What is its period of motion? b) What is its angular velocity? c) What is its maximum velocity? d) What is its velocity when it is 1.50 mm from equilibrium? |
| a) 2.75 m  b) 3.17 rad/s  c) 2.36 m  d) 8.72 m/s  e) x = 3.4sin(2.2t)  f) v = 7.6cos(2.2t) | 4. A simple harmonic oscillator has an equation of motion (in m) of  **x = 2.75sin(3.17t)**  a) What is its amplitude of motion? b) What is its angular velocity? c) What is its position at t = 14.2 seconds? d) What is its maximum velocity?  A different SHO has a period of 2.8 seconds, and an amplitude of 3.4 m. e) Write the equation for its position, and f) write an equation for its velocity vs. time. |
| a) -0.444 m  b) 20.3 m/s  c) 13.3 m/s  d) v = 20.3cos(45.1t)  e) +3.18 m/s | 5. A simple harmonic oscillator has an equation of motion (in m) of  **x = 0.450sin(45.1t)**  a) What is its position at t = 156.7 seconds? b) What is its maximum velocity? c) What is its speed when it is 0.34 m from equilibrium? d) What is the equation for its velocity? e) What is its velocity at t = 156.7 seconds? |
| (ω = 197.5844 rad/s)  a) 15.3 J  b) 15.3 J  c) 15.3 J  d) 11.1 J  e) 4.17 J | 6. A SHO has a period of 0.0318 seconds, and has a mass of 0.185 kg that moves with an amplitude of 0.0650 m. a) What is the total energy of this system? (find ω first) b) What is the maximum kinetic energy?, c) what is the maximum potential energy? d) When the mass is displaced only 0.0340 m from equilibrium, what is the kinetic energy? e) What is the potential energy when it is that far from equilibrium? |
| (ω = 25.57736 rad/s)  a) 0.246 s  b) 17.1 m/s  c) 12.7 m/s  d) x = 0.67sin(25.6t)  e) v = 17.1cos(25.6t) | 7. A SHO has an energy of 348 J, has a mass of 2.37 kg, and moves with an amplitude of 0.670 m. What is its period of motion? What is its maximum speed? What is its speed when it is only 0.450 m from equilibrium? What is its possible equation of position vs. time? What is its possible equation of velocity vs. time? |
| i) 0.0376 J  ii) 0.370 m/s  a) -0.0366 m  b) +0.360 m/s)  c) 0.0357 J  d) 0.00197 J | 8. A simple harmonic oscillator with a mass of 0.551 kg has an equation of motion of  **x = 0.160sin(2.31t)**  i) What is its total energy? ii) What is its maximum velocity? At time = 13.5 seconds, find: a) the position of the oscillator, b) the velocity of the oscillator c) the kinetic energy of the oscillator and d) its potential energy. |
| **ω =** | 9. If you set the equation total energy of an SHO given in your data packet equal to the potential energy stored in a spring (not in the data packet) you get this:  **1/2mω2xo2 = 1/2kxo2**  Solve for **ω** in terms of **k** and **m**. (aha!) |