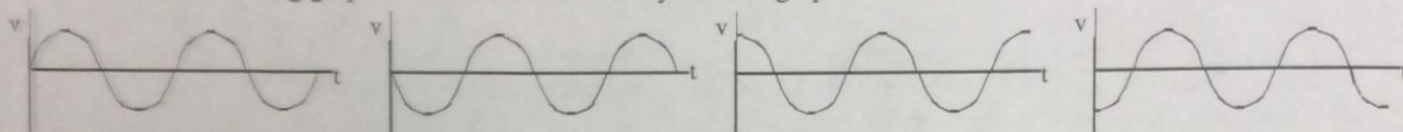
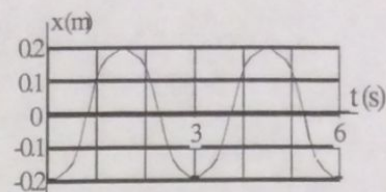


Physics Practice Problems – SHM

Simple harmonic motion:

- At what point(s) in a SHM does each of the following occur?
a) a_{\max} , b) v_{\max} , c) F_{\max} , d) KE_{\max} , e) PE_{\max} , f) $a = 0$, g) $v = 0$, h) $F = 0$, i) $KE = 0$.
- The position x of a simple harmonic oscillator is shown in the graph on the right.
 - Find the amplitude of the SHM.
 - What is the period of the SHM?
 - Write the position x as a function of time, $x(t)$.
 - Which of the following graph is the oscillator's velocity vs. time graph?

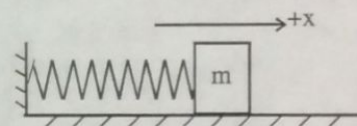


Hooke's law spring:

- A Hooke's law spring is 0.5 m long when a weight of 2kg hangs from it and is 0.6 m long when a weight of 5kg hangs from it. What is the spring constant of this spring?

Spring-mass oscillator:

- A spring-mass simple harmonic oscillator vibrates 10 times in 3 s.
 - Find the period of the SHM.
 - Find the frequency of the SHM.
 - Find the period of the SHM if the amplitude of the oscillation is doubled.
 - Find the period of the SHM if the mass of the oscillator is doubled.
- A spring stretches 0.3 m when a 2-kg weight hangs from it.
 - What is the spring constant?
 - What will be the frequency and amplitude of vibration if the weight is pulled down 0.2 m more and released so that it vibrates up and down?
- A 0.4-kg mass at the end of a spring vibrates with a frequency of 3Hz. What is the spring constant of the spring?
- The horizontal spring-mass simple harmonic oscillator is on a frictionless surface. $m=2\text{kg}$, $k=500\text{N/m}$. The box is pulled to the right so that the spring is stretched by 0.4 m. It is then released at $t = 0$ and begins to oscillate. Let $x = 0$ be the equilibrium position of the mass. Find the SHM's
 - period,
 - amplitude,
 - max. speed,
 - the total mechanical energy of the system,
 - the speed of the box at $x = 0.3$ m, and
 - the position as a function of time, $x(t)$.



Simple pendulum:

- A simple pendulum oscillates 10 times in one minute.
 - What is the length of the simple pendulum?
 - What would the period be if a simple pendulum of the same length oscillates on the surface of a hypothetical planet where the gravitational acceleration is three times that of the earth?
- A 3-m long simple pendulum has a 0.1kg mass hanging at its end. What is its frequency when it vibrates with an amplitude of 0.2 m?