What is Simple Harmonic Motion?

Worksheet

In SHM the period of a mass-spring system is T = 2(m/k); the object oscillates with constant amplitude and frequency, governed by the restoring force F = kx.

x(t) = A @cos(@omega t + @phi)

Questions

1. What is the period formula for a mass-spring system?

A) T = 2(k/m)
B) T = 2(m/k)
C) T = 2m/k
D) T = k/(2m)

2. If the mass is quadrupled and k stays the same, the period

A) Doubles
B) Halves
C) Quadruples
D) Stays the same

3. The restoring force in SHM always points

A) Away from equilibrium
B) Toward equilibrium
C) In the direction of velocity
D) Perpendicular to displacement

4. For m = 2 kg and k = 200 N/m, what is the period?

A) 0.628 s
B) 1.256 s
C) 0.314 s
D) 2 s

5. A 2 kg mass on a spring with k = 200 N/m. Find the period.

6. A 0.5 kg mass on a spring with k = 20 N/m. Find the period.

7. A 1 kg mass oscillates with period T = 2 s. Find the spring constant k.

8. Define: What is simple harmonic motion?

9. Define: Period formula for a mass-spring system?

10. Define: Does amplitude affect the period in ideal SHM?

Answer Key

1. B) T = 2(m/k) - T = 2(m/k) - larger mass or smaller k increases the period.
2. A) Doubles - T m, so quadrupling m doubles T.
3. B) Toward equilibrium - F = kx always opposes displacement, pulling the object back to equilibrium.
4. A) 0.628 s - T = 2(2/200) = 20.1 = 0.628 s.
5. T = 2(m/k) T = 6.283(2/200) = 6.2830.01 T = 6.2830.1 = 0.628 s
6. T = 6.283(0.5/20) = 6.2830.025 T = 6.2830.1581 T 0.993 s
7. T = 2(m/k) k = 4m/T k = 49.8701/4 k 9.87 N/m
8. Periodic oscillation where the restoring force is proportional to displacement and directed toward equilibrium, F = kx.
9. T = 2(m/k).
10. No - period depends only on mass and spring constant, not amplitude.