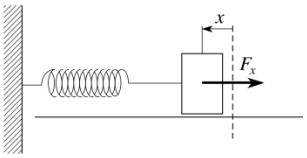
School of Physics and Materials Science
Thapar Institute of Engineering & Technology, Patiala
APPLIED PHYSICS (UPH 004)

TUTORIAL SHEET # 1: OSCILLATIONS

1. A mass of 3 kg is attached to the free end of a spring as shown in the figure. For this spring, a force of 6 N causes a displacement of 0.03 m. If the mass is pulled aside by a distance of 0.06 m and released, then



   (a) Compute the force constant of the spring.
   (b) Compute the period and frequency of vibration.
   (c) Compute the maximum velocity attained by the vibrating mass.
   (d) Compute the maximum acceleration.
   (e) Compute the velocity and acceleration when the mass has moved halfway toward the centre from its initial position.
   (f) How much time is required for the mass to move halfway to the centre from its initial position?

2. A 50 g mass hangs at the end of a spring. When 20 g more are added to the end of the spring, it stretches 5 cm more.
   (a) Find the spring constant.
   (b) If the 20 g mass is now removed, what will be the period of the motion?

3. A block of mass 4 kg hangs from a spring of Force constant k = 400 N/m. The block is pulled down 15 cm below equilibrium and released. Find
   (a) Amplitude, frequency and period of motion.
   (b) Kinetic energy when the block is 10 cm above equilibrium.

4. Compute the oscillation frequency of LCR circuit having L = 0.1 mH, C = 20 μF, R = 0.1 ohm. What will happen if R is made zero?

5. A simple pendulum executes 90 oscillations per minute. It takes 15 oscillations to reduce its amplitude, which is 15º, by 50%. Find relaxation time of the pendulum.

6. A galvanometer coil oscillates with a periodic time of 5 second and successive maximum displacements are observed at 76.0, 34.2, 15.5, and 6.9 scale divisions. Compute
   (a) Logarithmic decrement.
   (b) Damping factor.
   (c) Deflection of the galvanometer coil in the absence of damping.