

# PHY 2105

## Physics

1. A body of mass 25gm is attached with a spring of spring constant 400dyns/cm. The body is displaced by 10cm from its equilibrium position and released. Then the body executes simple harmonic motion. Calculate (i) the time period, (ii) frequency, (iii) angular frequency and (iv) maximum velocity.
2. In an electric shaver, the blade moves back and forth over a distance of 2.0mm in simple harmonic motion, with a frequency 120Hz. Find (a) the amplitude, (b) the maximum blade speed and (c) the magnitude of the maximum acceleration of blade.
3. A 0.12kg body undergoes simple harmonic motion of amplitude 8.5cm and period 0.20s. (a) What is the magnitude of the maximum force acting on it? (b) If the oscillations are produced by a spring what is the spring constant?
4. A hydrogen atom has a mass of  $1.68 \times 10^{-27}$  kg, when it attach to a certain massive molecule, it oscillate as classical oscillator with frequency of  $10^{14}$  Hz and with amplitude of  $10^{-10}$  m. Calculate force acting on the hydrogen atom.
5. A body executes SHM such that its velocity at mean position is 1m/s and acceleration at one extremity is  $1.57\text{m/s}^2$ . Calculate time period of oscillation.
6. A particle executes SHM of amplitude 5m when the particle is 3m from its mean position, its acceleration is found to be  $48\text{m/s}^2$ . Find (i) velocity (ii) time period (iii) Maximum velocity
7. Particle executes harmonic motion about the point  $x = 0$ ; at  $t = 0$  it has displacement  $x = 0.37\text{cm}$  and zero velocity. The frequency of the motion is 0.25Hz, determine, (i) the period, (ii) the angular frequency, (iii) the amplitude, iv) the displacement at  $t = 3.0\text{s}$  and v) the velocity at  $t = 3.0\text{s}$ .
8. A mass oscillates with an amplitude of 4.00 m, a frequency of 0.5 Hz and a phase angle of  $\pi/4$ .  
(i)What is the period  $T$ ?  
(i)Write an equation for the displacement of the particle.  
(iii)Calculate the velocity and acceleration of the object at time  $t = 5\text{s}$ .
9. A 2.00 kg block is attached to a spring and force constant of the spring is  $k = 196 \text{ N/m}$ . The block is held a distance of 5.00 cm from equilibrium and released at  $t = 0$ .  
(a) Find the angular frequency  $\omega$ , the frequency  $f$ , and the period  $T$ .  
(b) Write an equation for  $x$  vs. time.
10. An air-track glider is attached to a spring, pulled 20 cm to the right, and released at  $t = 0$ . It makes 15 complete oscillations in 10 s.  
(a)What is the period of oscillation?  
(b)What is the object's maximum speed?  
©What is its position and velocity at  $t = 0.80 \text{ s}$ ?
11. In oscillatory circuit  $L = 0.4\text{h}$ ,  $C = 0.0020\mu\text{F}$ . What is maximum value of resistance( $R$ ) for the circuit to be oscillatory?
12. For a damped oscillator  $m = 250\text{gm}$ ,  $k = 85\text{N/m}$  and  $b = 70\text{gm/s}$ . (a) What is the period of the motion? (b) How long does it take for the amplitude of the damped oscillations to drop to half its initial value?