

A particle having amplitude 8cm also has mass of 5gm executing S.H.M. Determine the maximum velocity and energy at mean position of particle if this particle makes 16 vibrations per second.

The displacement of a particle executing S.H.M is given as:

$$x = a \sin(\omega t + \phi)$$

And the velocity  $v = \frac{dx}{dt} = a\omega \cos(\omega t + \phi)$

It will be maximum when  $\cos(\omega t + \phi) = 1$

i.e.  $V_{\max} = a\omega = 2\pi a n$

Here  $a = 8\text{cm}$ ,  $n = 16 \text{ vib/sec}$

$$V_{\max} = 2 \times 3.14 \times 8 \times 16 = 803.8 \text{ cm/sec}$$

The energy is completely kinetic at mean position

$$E = \frac{1}{2} m v^2 = \frac{1}{2} \times 5 \times (803.8)^2$$

$$= 1.61 \times 10^6 \text{ ergs}$$