

Chapter 03

MOTION IN A STRAIGHT LINE

Example– 4:

An α particle travels inside a straight hollow tube 2 m long of a particle accelerator under uniform acceleration. How long is the particle in the tube if it enters at a speed of 1000 m/s and leaves at 9000 m/s. What is its acceleration during this interval?

Solution:

Let 'a' be the uniform acceleration of α -particle.

According to given problem,

$s = 2\text{ m}$, $v = 9000\text{ m/s}$ and $u = 1000\text{ m/s}$.

Since $v^2 - u^2 = 2as$,

$$(9000)^2 - (1000)^2 = 2a(2)$$

$$\Rightarrow a = 2 \times 10^7 \text{ m/s}^2$$

Let the particle remains in the tube for time 't', then

$$v = u + at$$

$$\Rightarrow t = \frac{v - u}{a} = \frac{9000 - 1000}{2 \times 10^7} = 4 \times 10^{-4} \text{ s}.$$