

Q. A particle of mass  $100\text{ gm}$  is placed in a field of potential  $U = 5x^2 + 10 \text{ ergs/cm}$ . Find the frequency.

Here potential energy  $U = 5x^2 + 10 \text{ ergs/cm}$ ,  $m = 100\text{ gm}$

$$F = -\frac{dU}{dx} \quad \therefore F = \frac{d}{dx} (5x^2 + 10) = -10x$$

Taking  $x$  as the displacement, we have

$$F = m \frac{d^2x}{dt^2}$$

$$m = \frac{d^2x}{dt^2} = -10x \quad \text{or} \quad \frac{d^2x}{dt^2} = -\frac{10}{m}x$$

This is the equation of a simple harmonic motion with force constant  $S = 10 \text{ dyne/cm}$

$\therefore$  Frequency

$$n = \frac{1}{2\pi} \sqrt{\frac{S}{m}} = \frac{1}{2\pi} \sqrt{\frac{10}{100}}$$

$$= \frac{1}{2\pi\sqrt{10}} = 0.05 \text{ Hz} \quad \underline{\text{Ans}}$$