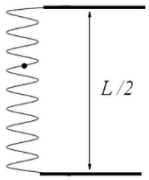
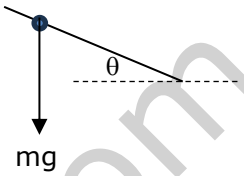
Q- A bead slides down along a frictionless stiff wire of length *L* which is bent in form of a serpentine coil of length L/2 and placed vertically as in figure. What is the slide time to reach the ground? The gap between the turns is much less than the length of the wire.



As the wire is frictionless, For motion in a vertical direction is just as a block slides on a frictionless inclined surface.

The slope of the wire is given by



$$Sin\ \theta = \frac{L\backslash 2}{L} = 0.5$$

Gives $\theta = 30^0$

Component of weight of the bead along the wire is mg sin θ and hence the acceleration of the bead along the wire will be

$$a = \frac{mg\sin\theta}{m} = g\sin\theta = 0.5\ g$$

Therefore, the time to cover the length of the wire from rest at the top is given by

$$[s = ut + ½\ at^2]$$

$$L = 0 + \frac{1}{2} * 0.5\ g\ t^2$$

Or $$t = \sqrt{\frac{4L}{g}}$$