

NB1140: Physics 1A - Classical mechanics and Thermodynamics

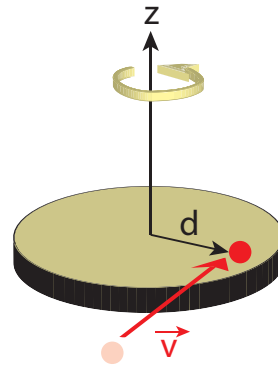
Quiz 3

18 January 2017

You have 10 minutes to finish this quiz

A small insect landing on a spinning disk

A turntable (circular disk) has rotational inertia I and is rotating with angular speed ω about a frictionless vertical axis (z -axis) (see figure). Viewed from the top, the turntable is rotating in the counterclockwise direction. In other words, the angular velocity vector of the turntable points in the $+z$ direction. A small (point-like) insect of mass m , shown as the red dot in the figure, jumps onto the turntable and sticks at a point that is distance d from the rotation axis. The insect hits horizontally with its velocity \vec{v} at 90 degrees ($\frac{\pi}{2}$ radians) angle to the turntable's radius, and in the same direction as the turntable's rotation (i.e., the radial vector of length d shown in the figure is perpendicular to the red velocity vector \vec{v} in the figure. \vec{v} is the velocity of the insect just before it sticks to the disk at the point shown).



For what speed $v = |\vec{v}|$ does the turntable's angular speed drop from half of its initial value?