A thin uniform rod is initially positioned in the vertical direction, with its lower end attached to a frictionless axis that is mounted on the floor. The rod has a length of 2.00 m and is allowed to fall, starting from rest. Find the tangential speed of the free end of the rod, just before the rod hits the floor after rotating through 90 degree.

a. 3.59 m/s
b. 4.26 m/s
c. 5.89 m/s
d. 7.67 m/s
e. 6.83 m/s

Solution :

Use conservation of energy as follows
$mg(l/2) = (½)I\ w^2$
find w i.e. angular velocity
then velocity of free end $= l\ w$
Solving this we get 7.67m/s