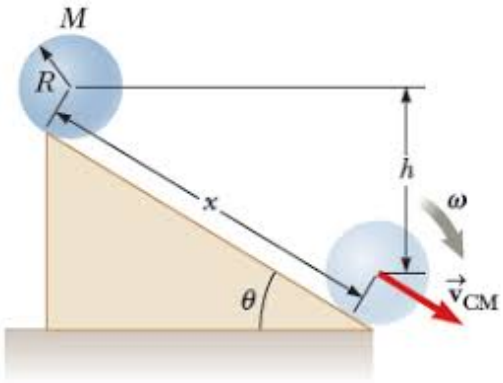
Physics 1211, Fall 2018, November 30, 2018 Quiz 6



In the figure below a **hollow sphere** of mass 2kg and radius 0.2 m, is **released** from **rest** from a height of h = 0.8 m. It rolls **without slipping** down an incline of angle $\theta = 53.1°$.

A) Use conservation of mechanical energy, with $K = \frac{1}{2}Mv_{com}^2 + \frac{1}{2}I_{com}\omega^2$, to calculate the com speed, v_{cm}, and angular speed ω, when it reaches the bottom of the incline. **Answer: v = 3.07 $\boldsymbol{m \cdot s^{-1}}$, $\boldsymbol{\omega}$ =15.35 rad/s**

B) Calculate the linear, a_{cm}, and angular, α,acceleration of the sphere. **Answer:** $a_{cm} = 4.7m \cdot s^{-1}$, $\alpha = 23.5rad \cdot s^{-2}$.

C) Draw a **FBD** of all **forces** acting on the sphere. Use Newton's law for linear motion, $\vec{F}_{net} = M\vec{a}_{com}$, and rotational motion, $\vec{\tau}_{net} = I\vec{\alpha}$, to find the linear a_{cm}, and angular, α,acceleration.

D) Calculate the **minimum value** of **static friction coefficient**, μ_s, in order for the sphere to roll without slipping.

E) If the actual $\mu_s$is **smaller** than the value calculated in part D). will the **linear speed** of the sphere at the **bottom** be **smaller** or **greater** than the **value calculated** in **part A)**.