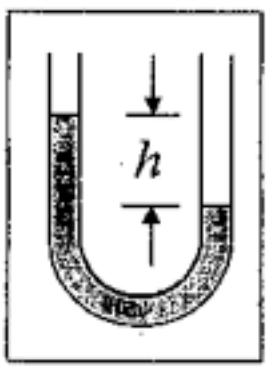
1) 上圖 U 型管內的水銀(黑色部份)在晃動時跟 U 型管內壁無摩擦力：(a)試求 h 的運動方程式(b)若將水銀改成水，h 的運動方程式做何改變?。(25%) (假設重力加速度為 g)



2) 假設地球表面的重力加速度為 $9.8m/\sec^2$ 、地球半徑為 $r=6000km$ 、而地球的自轉周期為 24 小時整，試求地球同步衛星的軌道半徑(m)跟其運行速度($m/\sec$)。(25%)

3) Assuming that there is no air on Earth. If a stone is dropped from the top of a building of 100 Meter height located in Tainan (about 23° latitude), calculate in which direction and how far away from the building the stone will hit the ground. Let the gravity constant be $9.8m/\sec^2$. (25%)

4) As shown in the figure below, the ball has a mass of $2\ kg$ and a negligible size. Initially, it travels around the horizontal circular path of radius $r_0=0.5m$ such that the angular rate of rotation is $\dot{\theta}_0=1\,\text{rad}/\sec$. If the attached cord ABC is drawn down through the hole at a constant speed of $0.2m/\sec$, determine the force the cord exerts on the ball at the instant $r=0.25m$. Hint: $r^2\dot{\theta}=C$, where C is a constant determined from the problem data. (25%)