計算題

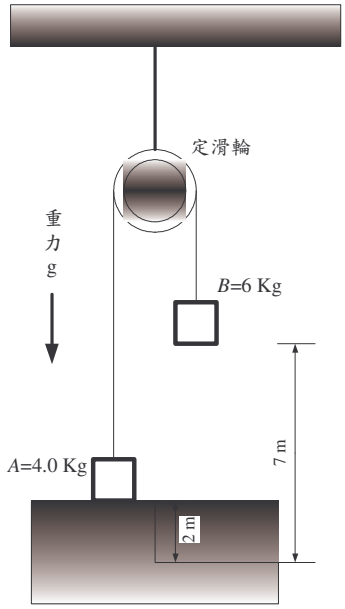
固力部份

1.(15%) 有一個無摩擦且質量可忽略的定滑輪掛了二個質量分別爲 4 Kg 與 6 Kg的方塊，如右下圖所示。若二個方塊原爲靜止狀態，且重力加速度常數 g=9.8 N/m^2，試計算：

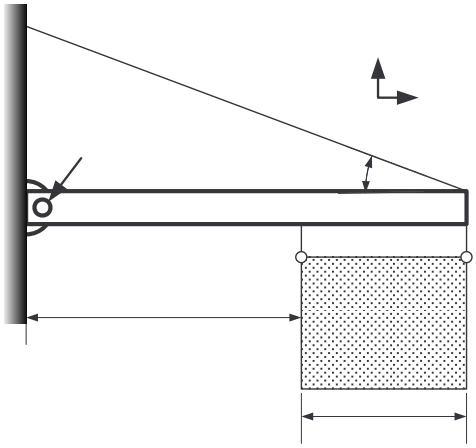
(1) 方塊 B 需要多少時間墜落至地面？ 5%

(2) 當方塊 B 墜落至地面瞬間，方塊 A 向上的速度爲何？ 5%

(3) 方塊 A 最高可以向上移動多少公尺？ 5%

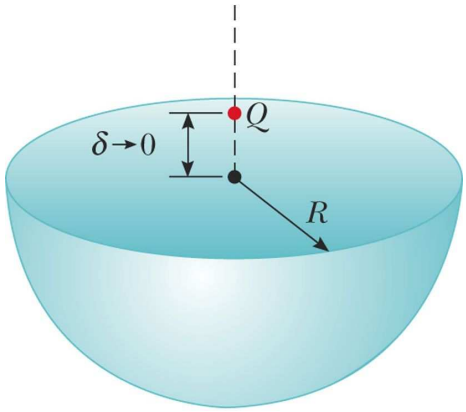


2.(20%) 有一重量均勻分佈的 10 Kgw 招牌懸吊於一剛性桿之下，如右下圖所示。剛性桿與牆壁之間有插銷連接，且右端由一繩索支撐。若夾角 θ=30°，試計算繩索張力以及插銷處牆壁對剛性桿在 x 與 y 方向的反力各爲多少 N。剛性桿與繩索的重量不計，重力加速度常數爲 9.8 N/m^2。



電學部份

3. (15%) A point charge Q is located just above the center of the flat face of a hemisphere of radius R as shown below. What is the electric flux (a) through the curved surface and (b) through the flat face.



4. (15%) A uniformly charged insulating rod of length l is bent into the shape of a semicircle. The rod has a total charge q. Find the magnitude and direction of the electric field at the center of the semicircle.

熱力部份

5. (20%) A person produces heat at a rate of 80 W. What is the temperature increase in one hour due to two people in an airtight room of volume 100 m^3 initially at 10℃ and 10^5 Pa? Assume that all the heat is absorbed by the air. Take C_v = 0.72 $kJ/kg\cdot K$ and M = 29 g/mol.

6. (15%) A refrigerator with a coefficient of performance of 4.0 absorbs 100kJ from the freezer compartment. (a) How much work does this require? (b) How much heat is expelled to the surroundings?