

Exercises in Physics

Assignment # 10

Date Given: June 16, 2022

Date Due: June 23, 2022

- P1.** (2 points) The crate, which has a mass of 100kg, is subjected to the action of the two forces. If it is originally at rest, determine the distance it slides in order to attain a speed of 6m/s. The coefficient of kinetic friction between the crate and the surface is $\mu_k = 0.2$.

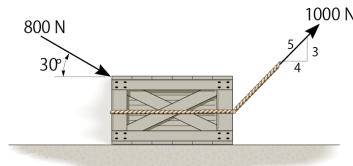


Figure 1: Illustration to Problem 1.

- P2.** (3 points) The 0.5kg collar C starts from rest at A and slides with negligible friction on the fixed rod in the vertical plane. Determine the velocity v with which the collar strikes end B when acted upon by the force \mathbf{F} which is constant in direction and has constant magnitude 5N. Neglect the small size of the collar.

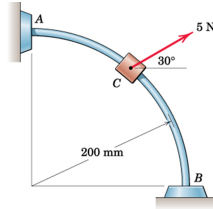


Figure 2: Illustration to Problem 2.

- P3.** (3 points) The track is to be designed so that the passengers of the roller coaster experience a certain normal force at points of maxima and minima. Determine the limiting heights h_A and h_C so that the normal force at point C is zero and at point B is four times of the passenger weight. The roller coaster starts from rest at position A . The radii of curvature at the points are indicated. Neglect friction.

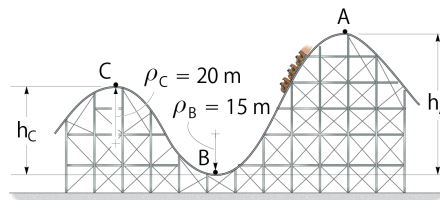


Figure 3: Illustration to Problem 3.

- P4.** (2 points) The block has a mass of 0.8kg and moves within the smooth vertical slot. If it starts from rest when the attached spring is in the unstretched position at A , determine the constant vertical

force F which must be applied to the cord so that the block attains a speed $v_B = 2.5\text{m/s}$ when it reaches B ; $s_B = 0.15\text{m}$. Neglect the size and mass of the pulley. (*Hint:* The work of F can be determined as $F\Delta l$, where Δl is the difference in cord lengths AC and BC .)

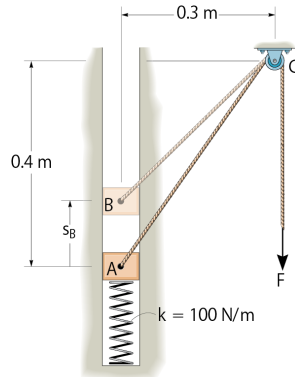


Figure 4: Illustration to Problem 4.