

## Exercises in Physics

### Assignment # 13

Date Given: July 7, 2022

Date Due: July 14, 2022

- P1.** (2 points) A particle of mass  $m$  moves with negligible friction on a horizontal surface and is connected to a light spring fastened at  $O$ . At position  $A$  the particle has the velocity  $v_A = 4 \text{ m/s}$ . Determine the velocity  $v_B$  of the particle as it passes position  $B$ .

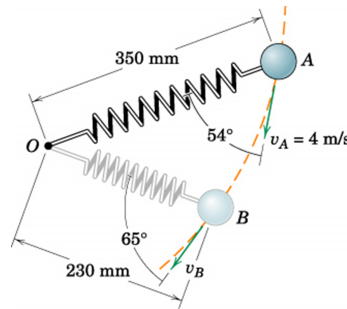


Figure 1: Illustration to Problem 1.

- P2.** (3 points) The two spheres of equal mass  $m$  are able to slide along the horizontal rotating rod. If they are initially latched in position a distance  $r$  from the rotating axis with the assembly rotating freely with an angular velocity  $\omega_0$ , determine the new angular velocity  $\omega$  after the spheres are released and finally assume positions at the ends of the rod at a radial distance of  $2r$ . Also find the fraction  $n$  of the initial kinetic energy of the system which is lost. Neglect the small mass of the rod and shaft.

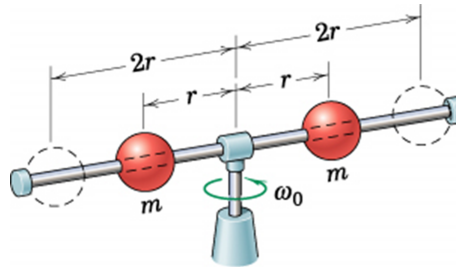


Figure 2: Illustration to Problem 2.

- P3.** (2 points) The man of mass  $m_1$  and the woman of mass  $m_2$  are standing on opposite ends of the platform of mass  $m_0$  which moves with negligible friction and is initially at rest with  $s = 0$ . The man and woman begin to approach each other. Derive an expression for the displacement  $s$  of the platform when the two meet in terms of the displacement  $x_1$  of the man relative to the platform.

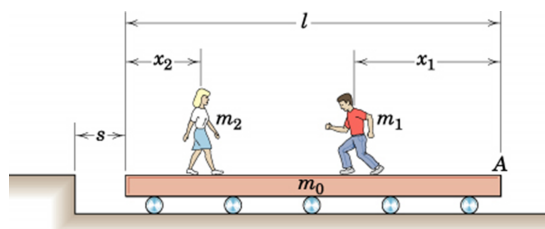


Figure 3: Illustration to Problem 3.

- P4.** (3 points) The  $10 \times 10^3$  kg barge  $B$  supports a  $2 \times 10^3$  kg automobile  $A$ . The barge and the automobile are originally at rest. If someone drives the automobile to the other side of the barge, determine how far the barge moves. Neglect the resistance of the water.

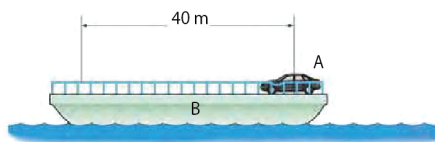


Figure 4: Illustration to Problem 4.