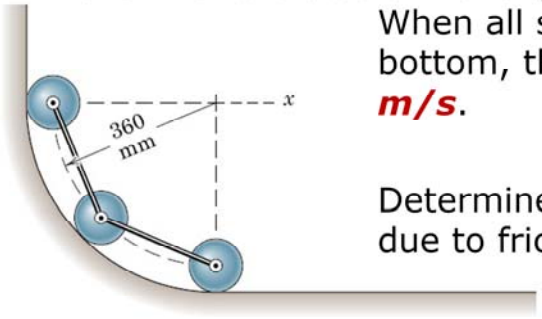
Work-Energy: Exercise 2

Three steel balls, each of ***mass 2.75 kg***, are connected by hinged links of negligible mass. They are released from rest in the position shown and slide down the quarter-circular guide.



When all spheres reach the bottom, their ***velocity*** is ***1.56 m/s***.

Determine the ***energy loss*** due to friction.

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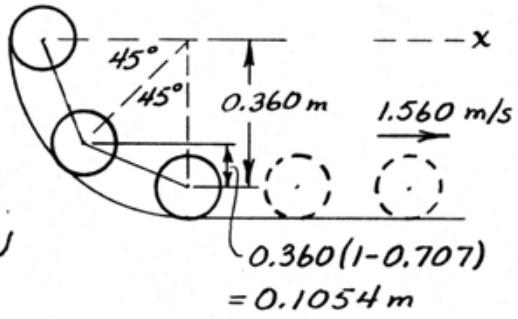
$U'_{1-2} = \Delta T + \Delta V_g$

$= 3\left(\frac{1}{2} \times 2.75 \times 1.560^2\right) - 0$

$- 2.75 \times 9.81 (0.360 + 0.1054)$

$= 10.04 - 12.56 = -2.52 \text{ J}$

so loss is $\underline{\Delta Q = 2.52 \text{ J}}$



$I_x = \int \Sigma F_x \, dt = \Delta G_x = G_2 - G_1, \; G_2 = 3mv = 3(2.75)(1.560)$

$= 12.87 \text{ N·s}, \; G_1 = 0$

$\underline{I_x = 12.87 \text{ N·s}}$