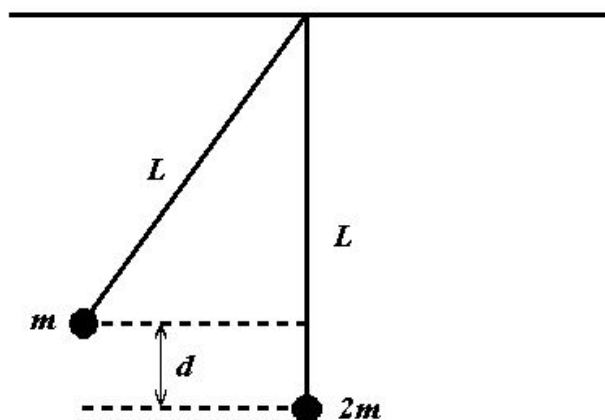


QP14



A pendulum of mass  $m_1 = m$  is raised a distance  $d$  and dropped so that it collides elastically with a second pendulum of mass  $m_2 = 2m$ .

- (1 point) Find the initial height of the center of mass relative to the lower mass.
- (1 point) Find the velocities before  $(v_{1i}, v_{2i})$  and after  $(v_{1f}, v_{2f})$  the collision. Express your answers in terms of  $v_0 = \sqrt{2gd}$ .
- (3 points) How high does each mass rise? Assuming that the masses reach their maximum heights at the same time, how high does the center of mass rise? Express your answer in terms of  $d$ . Use  $v_{1f} = -v_0/4$  and  $v_{2f} = 3v_0/4$  if you were unable to solve the previous part.
- (2 points) How high does the system rise if the collision is completely inelastic (i.e. if the balls stick together)? What fraction of the initial energy is lost in this case?