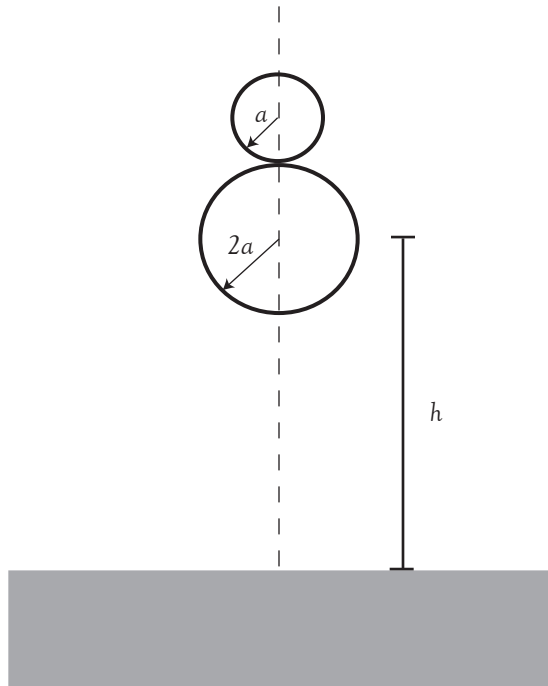


QP38

Problem (6 points) - Double Drop

Two balls, the lower one of radius $2a$ and the upper one of radius a , are dropped from a height h (measured from the center of the lower ball to the floor), as shown in the figure. The mass of the upper ball is m and the mass of the lower ball is $M = 3m$. Assume that the centers of the spheres always lie along the vertical line and that all collisions are perfectly elastic. You may neglect air resistance.



- (a) (1 point) Calculate the velocity v_0 of the balls immediately before they hit the floor. Assume there is a short interval between the lower ball bouncing on the floor and it hitting the upper ball. What is the velocity of the lower ball immediately after hitting the floor but before hitting the upper ball?
- (b) (3 points) Immediately after the lower ball hits the upper ball, what will the velocity v_1 be for the upper ball?
Hint: It might be less cumbersome to compute this in terms of v_0 , substituting the answer to part (a) only at the very end.
- (c) (2 points) How high will the upper ball bounce? Express the answer H in terms of h and a . (Measure H from floor level to the upper ball's center at its highest position.)