A uniform thin rod with mass m and length L is released and falls under the influence of gravity, g. Its long axis is parallel to the ground. The rod has no initial velocity or angular momentum. After falling a distance h it strikes a straight edge which delivers a vertical impulse during the elastic collision. The point of impact is at a distance d from the center of mass of the rod.

(a) Calculate the velocity of the center of mass of the rod immediately after the collision. Express your answer in terms of h, L, g, and the moment of inertia I about the center of mass of the rod.

(b) Calculate the value of I.