IC-W11D2-4 Table Problem Angular Collision

A long narrow stick of length $l$ and mass $m$ lies motionless on ice (assume the ice provides a frictionless surface). The moment of inertia of the stick about its center of mass is $I_{cm}$. A puck (with putty on one side), has the same mass $m$ as the stick. The puck slides without spinning on the ice with a speed of $v_0$ toward the stick, hits one end of the stick, and attaches it. You may assume that the radius of the puck is much less than the length of the stick so that the moment of inertia of the puck is negligible compared to the stick.

a) How far from the midpoint of the stick is the center of mass of the stick plus the puck after the collision?

b) What is the velocity of the stick plus puck after the collision?

c) Is mechanical energy conserved during the collision? Explain your reasoning.

d) What is the angular velocity of the stick plus puck after the collision?

e) How far does the stick's center of mass move during one rotation of the stick?