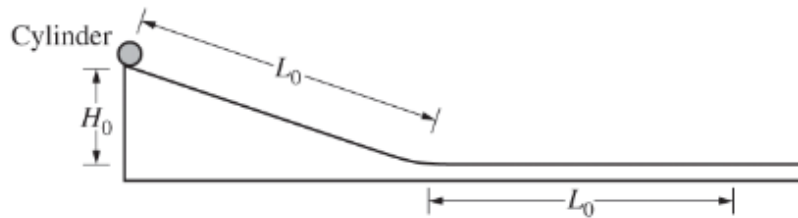


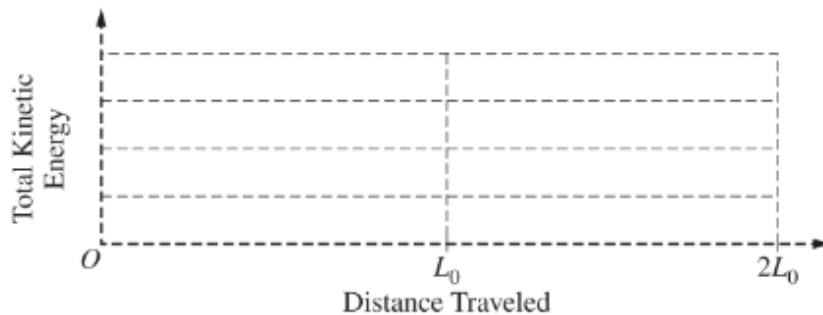
Begin your response to **QUESTION 4** on this page.



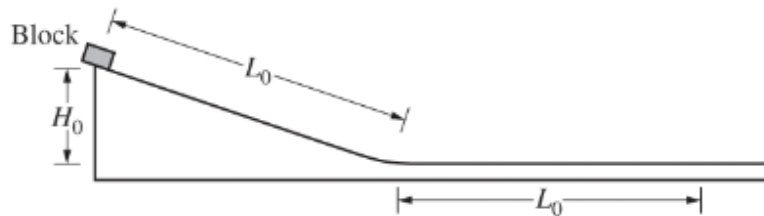
4. (7 points, suggested time 13 minutes)

A cylinder of mass m_0 is placed at the top of an incline of length L_0 and height H_0 , as shown above, and released from rest. The cylinder rolls without slipping down the incline and then continues rolling along a horizontal surface.

(a) On the grid below, sketch a graph that represents the total kinetic energy of the cylinder as a function of the distance traveled by the cylinder as it rolls down the incline and continues to roll across the horizontal surface.



Continue your response to **QUESTION 4** on this page.



The cylinder is again placed at the top of the incline. A block, also of mass m_0 , is placed at the top of a separate rough incline of length L_0 and height H_0 , as shown above. When the cylinder and block are released at the same instant, the cylinder begins to roll without slipping while the block begins to accelerate uniformly. The cylinder and the block reach the bottoms of their respective inclines with the same translational speed.

(b) In terms of energy, explain why the two objects reach the bottom of their respective inclines with the same translational speed. Provide your answer in a clear, coherent paragraph-length response that may also contain figures and/or equations.