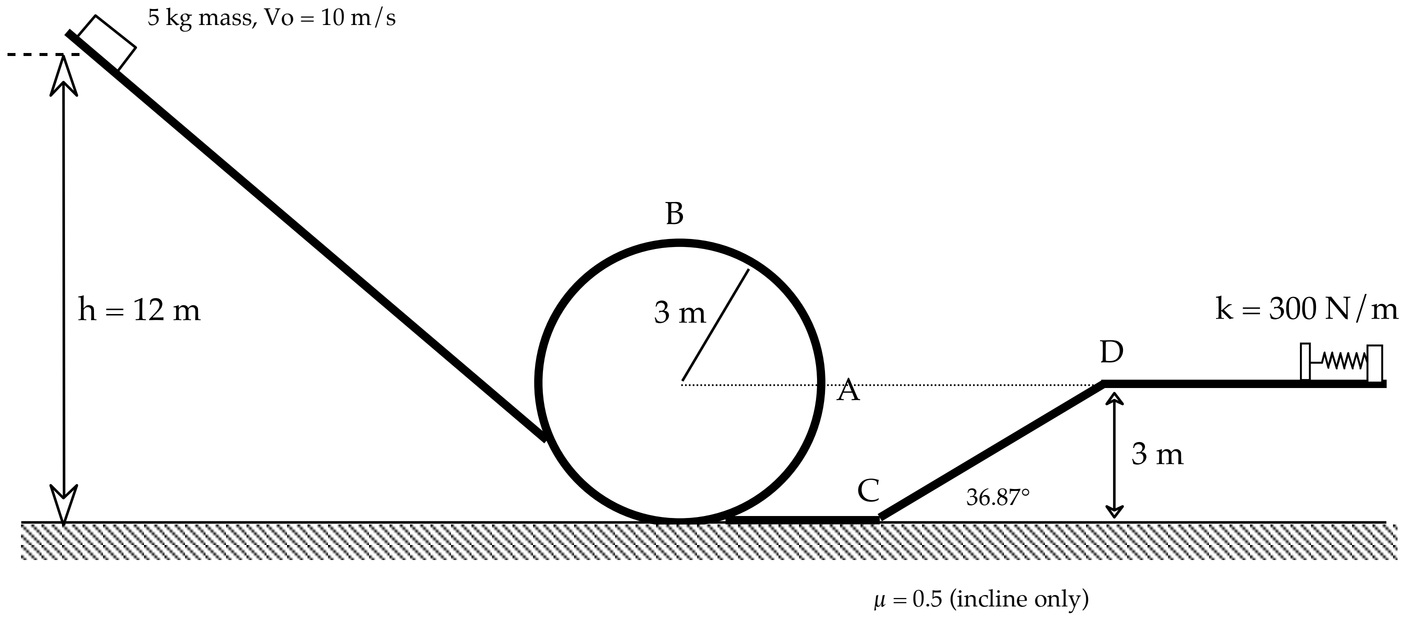

a. Calculate the speed of the block at Pt. A.
b. What is the magnitude of the centripetal force at Pt. A
c. Determine the speed of the block at Pt. B.
d. Calculate the normal force on the block at Pt. B
e. Calculate the critical speed at Pt. B. Given your answer to (d), how could you have known that the speed of the block was above this critical speed without having to calculate that speed?
f. Calculate the speed of the block at Pt. C.
g. Draw a FBD for the block when it is on the incline. Determine the force of friction that acts on the block and the work done by friction as the block slides from Pt. C to D. (μ for the incline is 0.5)
h. By energy methods, what is the TE and the KE of the block at Pt. D?
i. What is the maximum compression of the spring? (Assume no energy loss during the collision.)
j. How fast was the block going when the spring was compressed 1.0 m (not the full compression found in (i))?

Answers:

a. 16.73 m/s
b. 467 N
c. 14.83 m/s
d. 317 N
e. v_{crit} = 5.48 m/s; given $F_N > 0$, then block must have been above critical speed
f. 18.44 m/s
g. $F_f = \mu F_N = \mu m g_{perp}$ = 20 N; $W_{friction}$ = –100 J (negative as mechanical energy is lost)
h. TE = 750 J; KE = 600 J
i. 2 m
j. 13.42 m/s