*Directions: Show all work in working the following question. The question is worth 15 points, and the suggested time for answering the question is about 15 minutes. The parts within a question may not have equal weight.*

1. (15 points)

ℓ

A

B

h

C

x

D

A small 0.10 kg block starts from rest at point A, which is at a height of 1.0 m. The surface between points A and B and between points C and D is frictionless, but is rough between points B and C, having a coefficient of friction of 0.10. After traveling the distance ℓ = 1.0 m, the small block strikes a larger block of mass 0.30 kg, and sticks to it, compressing the spring to a maximum distance *x* = 0.50 m. Determine

(a) the speed of the 0.10 kg block at point B.

(b) the acceleration of the 0.10 kg block between points B and C.

(c) the speed of the block at point C.

(d) the speed of the combined small and large block immediately after they collide.

(e) the spring constant of the spring.