6-6)

m = 2kg, k = 400 N/m, $x_{SPRINGi}$ = -0.27m, θ = 37°.

Use WE Theorem:

W_N = 0, since the normal force is always perpendicular to the path of the mass.
W_g = cons
W_{SP} = cons

So, W_{NC} = 0 and we have conservation of mechanical energy.

$0 = K_f - K_i + U_{gf} - U_{gi} + U_{SPf} - U_{SPi}$

a)
The initial situation is when the spring is compressed, the final situation is when the spring is relaxed and before the mass hits the incline.
$^1/_2mv_i^2 + gmy_i + {}^1/_2k\chi_i^2 = {}^1/_2mv_f^2 + gmy_f + {}^1/_2k\chi_f^2$

Here, y refers to altitude of the block above the plane at the bottom and χ refers to the compression of the spring, not to the location of the block in the horizontal direction. Some terms we realize are zero, in particular, v_i, y_i, y_f, and χ_f .

$^1/_2k\chi_i^2 = {}^1/_2mv_f^2$

So,

$v_f = [k\chi_i^2/m]^{1/2} = [400*0.22^2/2]^{1/2} =$ 3.11 m/s

b)
For (b), we can take the initial point to be when the spring is compressed, or the 'final' point from (a). I'll do the first, so that v_i, v_f, y_i, and χ_f are all zero:

$^1/_2mv_i^2 + gmy_i + {}^1/_2k\chi_i^2 = {}^1/_2mv_f^2 + gmy_f + {}^1/_2k\chi_f^2$

$^1/_2k\chi_i^2 = gmy_f$

$y_f = k\chi_i^2/2mg = 400*0.22^2/2*2*9.8 = 0.49$ m

but, we want the distance up the incline, L:

$y_f/L = \sin37^o$ -> $L = y_f/\sin37^o = 0.49/0.6 =$ 0.82 m