Work and Energy

① $W = Fd\cos\theta$
$= (50\,kg)(9.8\,m/s^2)(4\,m)$
$= \underline{1960\,J}$

② $W = Fd\cos\theta$
$= (0.5\,kg)(9.8\,m/s^2)(0.4\,m)$
$= \underline{1.96\,J}$

③ $W = Fd\cos\theta$
$= (2500\,N)(1500\,m) = \underline{3.75\times10^6\,J}$

④ $W = Fd\cos\theta$
$= (6\,N)(4\,m)\cos 37° = \underline{19.2\,J}$

⑤ $E_b = E_a$
$mgh = \frac{1}{2}mv^2$
$(9.8\,m/s^2)(12.5\,m) = \frac{1}{2}v^2$

$v = \underline{15.7\,m/s}$

⑥ $E_b = E_a$
$\frac{1}{2}mv^2 = mgh$
$\frac{1}{2}(12\,m/s)^2 = (9.8\,m/s^2)h$

$h = \underline{7.35\,m}$

⑦ $E_b = E_a$
$mgh = \frac{1}{2}mv^2$
$(9.8\,m/s^2)(2.5\,m) = \frac{1}{2}v^2$

$v = \underline{7.0\,m/s}$

(8) $F = -kx$

$-(0.250\,kg)(9.8\,m/s^2) = -k(.15\,m)$

$k = 16.3\ N/m$

(9) $E_b = E_a$

$mgh = \frac{1}{2}kx^2$

$(.5\,kg)(9.8\,m/s^2)(.4\,m) = \frac{1}{2}(20\,N/m)x^2$

$x = 0.44\ m$

(10) $E_b = E_a$

$\frac{1}{2}kx^2 = \frac{1}{2}mv^2$

$(5.0\,N/m)(.1\,m)^2 = (.25\,kg)v^2$

$v = 0.45\ m/s$

(11) $E_b = E_a$

$\frac{1}{2}kx^2 = mgh$

$\frac{1}{2}(19.6\,N/m)(1.0\,m) = (.5\,kg)(9.8\,m/s^2)h$

$h = 2.0\ m$

Calculate k for spring

$F = kx$

$(.5\,kg)(9.8\,m/s^2) = k(.25\,m)$

$k = 19.6\ N/m$

(12) (a) $W_f = Fd\cos\theta$

$= (5.88\,N)(10\,m)$

$= -58.8\,J$

$F_f = \mu F_N$

$= (.12)49$

$= 5.88\,N$

$F_N = F_g = mg$

$= (5\,kg)(9.8\,m/s^2)$

$= 49\,N$

*friction opposes the motion, therefore, work is negative

(b) $W_p = Fd\cos\theta$

$= (250\,N)(10.0\,m) = 2500\,J$

(c) $W_{total} = W_f + W_p = (-58.8\,J) + 2500\,J = 2441\,J$