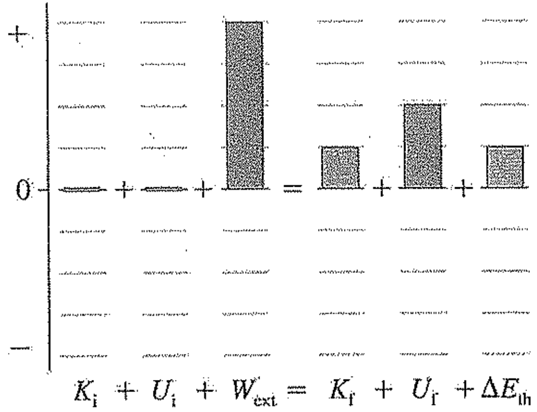
Name: Solution

Quiz 8, 03/30/12

I will give partial credit for your work, only if you use the GOAL protocol.

Which of the choices below describes the scenario depicted by the energy bar chart?



A. A car traveling at high speed jams on the brakes and skids to a halt on a rough flat road. X $K_i = 0$

B. A block attached to a wall by a spring is pulled with increasing speed along a rough flat surface. X $PE_i = 0, K_i = 0$

[✓ C.] A ball is shot straight upward from a compressed spring, then sticks to the ceiling. X $K_f \neq 0$

D. A rope is lifting a box straight upward at constant speed. X $K_i = K_f \neq 0$

E. A person is pushing a crate up a rough slope at constant speed. X $K_i = K_f \neq 0$

Tries 0/99

Problem 7-51: A 2.30kg box has an initial velocity of 3.40m/s upwards along a rough plane inclined at 26.0 degrees above the horizontal. The coefficient of kinetic friction between the box and plane is 0.360. How far along the incline does the box travel?

Tries 0/99

G) known

$v_i = 3.4 m/s$

$v_f = 0$

$\mu = 0.36$

$m = 2.3 kg$

$\theta = 26$

unknown

$h = ?$

$d = h/\sin\theta$

estimate ignore friction:

$\cancel{m}gh = \frac{1}{2}\cancel{m}v^2$

$h = \frac{1}{2}v^2/g \simeq \frac{1}{2}(3.4)^2/10$

$= 0.58m$

$h < 0.6m$

O) energy accounting

$$\underset{\substack{\downarrow\\0}}{K_i} + U_i + \underset{\substack{\downarrow\\\text{from friction}}}{W_{ext}} = \underset{\substack{\downarrow\\0}}{K_f} + \underset{\substack{\downarrow\\mgh}}{U_f} + \Delta E_{th}$$

need fbd

$f_f = \mu N$

$= \mu mg\cos\theta$

$\frac{1}{2}mv_i^2 - \mu mgd\cos\theta = mgh$

A) $\frac{1}{2}\cancel{m}v_i^2 - \mu\cancel{m}gd\cos\theta = \cancel{m}gd\sin\theta$

~~$d = \frac{1}{2}v_i^2 - \mu$~~

$\frac{1}{2}v_i^2 = d(g\sin\theta + \mu g\cos\theta)$

$$d = \frac{\frac{1}{2}v_i^2}{g(\sin\theta + \mu\cos\theta)}$$

$$= \frac{0.5(3.4\ m/s)^2}{9.8 m/s^2(\sin 26 + .36\cos 26)}$$

$= 0.77 m$

L) units check,

$h = 0.77\sin 26 = 0.34m$

estimate checks

note: masses cancelled