Energy #3

p 221 mc 4
p 223 Prob 25, 32, 34
Online - Where's Energy

(8)

p 221 - Multiple Choice

4) choose process work done on system

(1) a) relaxed spring compressed by you then release to fly up

(external F did work)

- Problem

25) $m = 1100\,kg$ wet mud slows car
$v = 24\,m/s$
$F_{external} = 1.7 \times 10^4\,N$
$d = 18\,m$
$V_{final} = ?$

(1)

$E_o + W = E_f$

$K + W = K$

$\frac{1}{2} m v_o^2 + Fd = \frac{1}{2} m v_f^2$

$$v_f = \sqrt{\frac{2}{m}\left(\frac{1}{2} m v_o^2 + Fd\right)}$$

$$= \sqrt{v_o^2 + \frac{2Fd}{m}}$$

$$= \sqrt{(24\,m/s)^2 + \frac{2(-1.7 \times 10^4\,N)(18\,m)}{1100\,kg}}$$

$$= 4.4\,m/s$$

p224 # 32) $l = 500\,m$ ski slope w/ skier

$\theta = 6.4°$

$m = 60\,kg$

a) ① $d_y = d \sin\theta$

$= (500\,m) \sin 6.4°$

$= 55.7\,m$

② $\Delta U_g = mg\Delta y$

(2)

$= (60kg)(9.81\,m/s^2)(55.7m)$

$= 33000\,J$

b) 20% of U_g becomes K $\quad v_f = ?$

$K = 20\%$ of $33{,}000J$ $\qquad K = \frac{1}{2}mv^2$

$K = 6600J$

$v = \sqrt{\frac{2K}{m}}$

$= \sqrt{\frac{2(6600J)}{60kg}} = 15\,m/s$

p224 34) car off embankment

$y = 6.0\,m$
$v_0 = 12\,m/s$
$v_f = ?$

$E_0 = E_f$

$U_g + K_0 = K_f$

$mgy + \frac{1}{2}mv_0^2 = \frac{1}{2}mv_f^2$

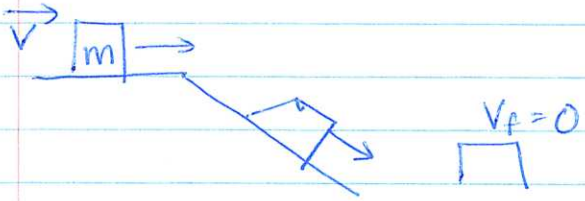
(1)

$v_f^2 = \sqrt{v_0^2 + 2gy}$

$= \sqrt{(12\,m/s)^2 + 2(9.81\,m/s^2)(6.0\,m)}$

$= 16\,m/s$

- Online - Where's the Energy?



Block slides down hill

a) Why assume frictionless?

smooth

(3) b) form of conserve E

$E_0 = E_f$ $\quad U_g + K = K$

$$mgh_i + \frac{1}{2}mv_i^2 = \frac{1}{2}mv_f^2 \; (+ \overset{\text{zero}}{mgh_f})$$

c) what happens to K, U, E slides down ramp

K ↑ U ↓ E RTS

d) find V_b $\quad \cancel{m}gh_i + \frac{1}{2}\cancel{m}v_i^2 = \frac{1}{2}\cancel{m}v_f^2$

$$v_f = \sqrt{2gh_i + v_i^2}$$

(online continued)

e) slide on floor $E_0 = E_f$

$K + W = K$

$\frac{1}{2}mv_i^2 + W_{nc} = \frac{1}{2}mv_f^2$

f) as slide what happens to K U E

K ↓ U RTS E ↓

g) force responsible for ↓ E

friction

h) find E dissipated ← W_{done}

$E = \frac{1}{2}mv^2 + mgh$

$E_0 = E_f$

$E_0 + W_{total} = E_f$

$U_g + K = W_{total}$