Reminders 10-04-10:

-Force Questions (see BlackBoard) Due Today

-Extra Credit to Replace lowest Quiz Score Turn in "Identifying Forces Worksheet" by Monday at Beginning of Class ONLY (You must follow the given instructions)

-Turn in "Work" Worksheet Wednesday October 6

-Quiz Wednesday on Work and Conservation of Energy

-Exam 2 Ch 4-6 Mon. Oct. 18

Objectives:

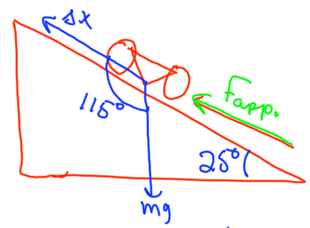
-Potential Energy

-Conservation of Energy

-Conservative and Non-Conservative Forces

A person on a bicycle is riding up a 25° hill at 3.0m/s. The total mass of the system is 85 kg.

- **<u>Using the definition of work</u>, how much work is done by gravity after the bicycle travels a distance of 25.0m?**



$$W_g = |mg||\Delta\vec{x}|\cos 115$$
$$= (85\,kg)(9.80\,\tfrac{m}{s^2})\,25.0\,m\,\cos 115^\circ$$
$$= -8800\,J$$

According to W-KE thm

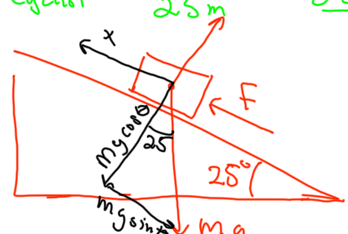
$W_g + W_{cyclist} = 0$ since v is constant

$$W_g = -W_{cyclist}$$

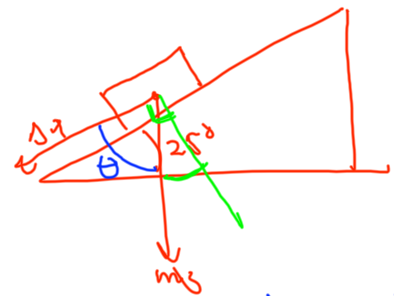
$$W_{cyclist} = +8800\,J$$

$$8800\,J = F_{cyclist}\,25\,m$$

$$F_{cyclist} = \frac{8800\,J}{25\,m} = 350\,N$$



$$F = mg\sin\theta = (85\,kg)(9.80)\sin 25 = 350\,N$$



$W = (85\,kg)(9.80\,\frac{m}{s^2})(25.0\,m)\cos 65^\circ$

$= +8800\,J$

– The force is doubled over the next 10m. Find v_f.

$F_{app} = 700\,N$

$W_g + W_{cyclist} = \frac{1}{2} m (v_f^2 - v_i^2)$

$\frac{2[W_g + W_{cyclist}]}{m} = v_f^2 - v_i^2$

$\sqrt{\frac{2[W_g + W_{cyclist}]}{m} + v_i^2} = v_f$

$v_f = \sqrt{\frac{2[(85\,kg)(9.80)(10\,m)\cos 115 + (700\,N)(10)\cos 0]}{85.0\,kg} + 3^2}$

$= 8.8\,m/s$

If a spring and gravity are the sole f

$$W_{net} = 1/2k(y_f^2 - y_i^2) + mg(y_i - y_f) = (1/2)m$$

or

$$W_{net} = KE_f - KE_i = (EPE_i - EPE_f) + (GP$$

$$\Delta KE = -(\Delta GPE + \Delta EPE)$$

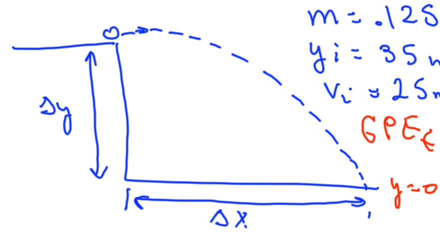
Conservation of Mechanical Ener

$$KE_i + GPE_i + EPE_i = KE_f + GPE_f +$$

$$TE_i = TE_f$$

A 125 g rock is hurled horizontally off a 35 m high cliff with an initial velocity of 25 m/s.

- What is its initial kinetic energy?
- What is its initial potential energy?
- What is its total initial energy?
- What is its final energy just when it hits the ground below?
- What is its final speed when it hits the ground?



$m = .125\ kg$

$y_i = 35\ m$

$v_i = 25\ m/s$

$GPE_f = 0$

$$TE_i = TE_f$$

$$KE_i + GPE_i = KE_f + GPE_f$$

$$\frac{1}{2}mv_i^2 = KE_i = \frac{1}{2}(.125kg)(25)^2 = 39J$$

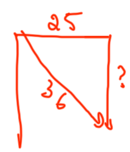
$$GPE = mgy_i = (0.125kg)(9.80\tfrac{m}{s^2})(35m) = 43J$$

$$TE_i = KE_i + GPE_i = 39J + 43J = 82J$$

$$82J = TE_f = \frac{1}{2}mv_f^2$$

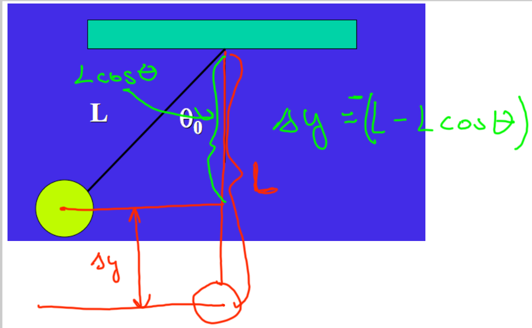
$$82J = \frac{1}{2}mv_f^2$$

$$v_f = \sqrt{\frac{2(82J)}{.125\ kg}} = 36m/s$$



$$V_{xf} = 25m/s$$

$$V_{yf} = \sqrt{36^2 - 25^2} = 26m/s$$



$$\Delta KE + \Delta GPE = 0$$

$$\frac{1}{2}m(v_f^2 - v_i^2) + mg\Delta y = 0$$

$$v_i = 0$$

$$\frac{1}{2}mv_f^2 + mg\Delta y = 0$$

$$\frac{1}{2}\cancel{m}v_f^2 + \cancel{m}g[-(L - L\cos\theta)] = 0$$

$$\frac{1}{2}v_f^2 = g[L - L\cos\theta] = gL(1-\cos\theta)$$

$$v_f = \sqrt{2gL(1-\cos\theta)}$$

$$v_f = \sqrt{2(9.80)(1)(1-\cos 30)}$$

$$= 1.62\ m/s$$

if $\theta_i = 15°$

$$v_f = 1.40\ m/s$$

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if $\theta_f = 15$ and $\theta_i = 30°$

$$\Delta y = L(\cos\theta_f - \cos\theta_i)$$

$$v_f = \sqrt{2gL(\cos\theta_f - \cos\theta_i)}$$

$$= \sqrt{2g(1)(\cos 15 - \cos 30)}$$

$$= 1.4\ m/s$$