Quiz (Work + Energy) - Monday

- Work $W = Fd\cos\theta$

  W = area under a F-d graph

  $W = \Delta E$ (Work Energy Theorem)

- Kinetic Energy $E_K = \frac{1}{2}mv^2$
- Gravitational Potential Energy $E_g = mgh$
- Elastic Potential Energy $E_e = \frac{1}{2}kx^2$

Hooke's Law: $F_a = kx$

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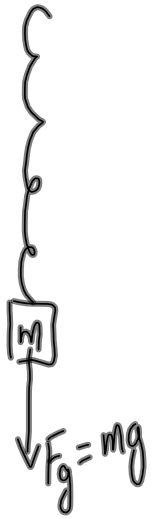
37. $k = 1.50\ N/m$

$x = 10.0\ cm$

$m = ?$



$F_a = kx$

$F_g = kx$

$mg = kx$

$m = \frac{kx}{g}$

Cameron

$F_g = 765N$

$\Delta d = 8(18cm)$
$1.44m$

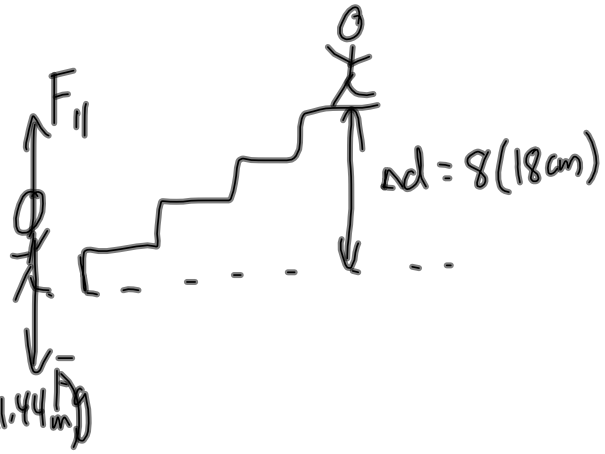
$\Delta t = 1.5s$

Tyler

$F_g = 635N$

$\Delta d = 8(18cm)$
$1.44m$

$\Delta t = 1.5s$



$W = F_{||}\Delta d$

$W = (765N)(1.44m)$

$W = 1.10 \times 10^3 J$

$W = (635N)(1.44m)$

$W = 914 J$

$P = \frac{W}{\Delta t}$ (Power)

$P = \frac{1.10 \times 10^3 J}{1.5s}$

$P = 7.3 \times 10^2 \frac{J}{s}$ ← watt (W)

Cameron's Power

$P = \frac{W}{\Delta t}$

$P = \frac{914 J}{1.5s}$

$P = 6.1 \times 10^2 W$

Tyler's power

§6-4 Power + Efficiency

Power is the rate at which work is done

$$P = \frac{W}{\Delta t} \quad \text{(a scalar quantity!)}$$

Where P is power (J/s or W)

W is work (J)

Δt is the time to do the work (s)

MP 263

$W = 1.50 \times 10^5 J$

$\Delta t = 10.0 s$

$P = ??$

$$P = \frac{W}{\Delta t}$$

$$P = \frac{1.50 \times 10^5 J}{10.0 s}$$

$$P = 1.50 \times 10^4 W$$

"Power" bill charges you for: kW·h

$P \cdot \Delta t = W$

The kW·h is a unit for energy NOT power!!

$1 kW \cdot h = 1 kW \cdot 1 h$

$= 1000 \frac{J}{s} \cdot 3600 s$

$= 3.6 \times 10^6 J$

$= 3.6 MJ$ ← 1 kW·h

Historical term:

$1 hp = 746 W$

horses could lift 550 lb => 1 ft in 1 s

$F_a = \left(\frac{550}{2.2}\right)(9.81 m/s^2)$

550 lbs

F_g

Efficiency

$$\text{Efficiency} = \frac{\text{Energy output}}{\text{Energy input}} \times 100\%$$

MP|269

$\leftarrow E_g = mgh$

$E_g = (0.500\,kg)(9.81\,m/s^2)(1.00\times10^2\,m)$

$E_g = 490.5\,J$

(output energy)

INPUT:

$3.50\times10^3\,J$

$$\text{Efficiency} = \frac{\text{Energy out}}{\text{Energy in}} \times 100\%$$

$$\text{Efficiency} = \frac{490.5\,J}{3.50\times10^3\,J} \times 100\%$$

Efficiency = 14.0%

Where does the other 86% of the energy go?

- sound
- light
- heat
- air resistance

To DO:

① PP|266 (Power)

② PP|270-271 (Efficiency)