Notes: Work, Energy, Power, Efficiency

**Work** - takes energy to do work

$W = \vec{F}\vec{d}$ $\qquad \vec{F} \parallel \vec{d}$

measured in Joules (J), like energy

$W = F_g h = mgh = E_p$

$W = \Delta E$

**Power** - rate of doing work

$P = \frac{W}{t}$ measured in Watts (W)

$= \frac{\vec{F}\vec{d}}{t} = \vec{F}\vec{v}$

Work, power, and energy are all scalars. (No direction)

**Efficiency**

$Eff = \frac{\text{work out}}{\text{work in}} \times 100\%$ (smaller # is always on top)

$Eff = \frac{\text{power out}}{\text{power in}} \times 100\%$

**Potential Energy** - stored energy; has the potential to do work

$E_p = mgh$

**Kinetic Energy** - energy of motion

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

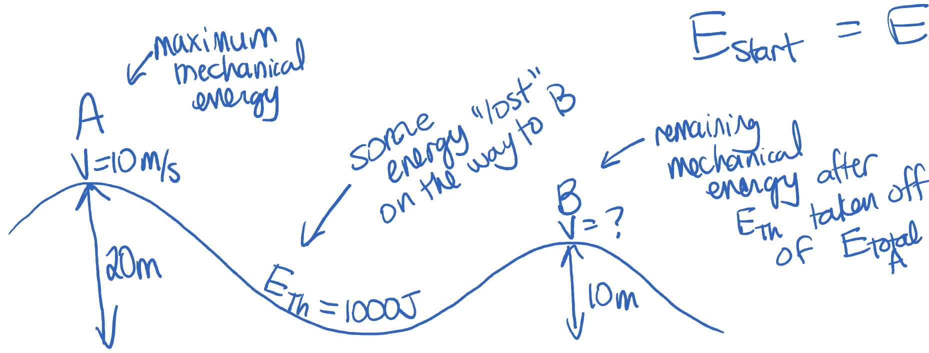
**Conservation of Energy**

- E is never created or destroyed, only changes form
- If no friction is involved, then energy converts between $E_p$ and $E_k$ (← mechanical energy)
- If friction is involved (real life) then some energy converts to heat ($E_{Th}$) too.
- Regardless, always $E_{Total\ before} = E_{Total\ after}$

$$E_{start} = E_{end} + E_{Th}$$

Ex

$m = 10kg$




Before After

$$E_{Tot\ A} = E_{Th} + E_{Tot\ B}$$

$$E_{kA} + E_{pA} = 1000J + E_{kB} + E_{pB}$$

$$\frac{1}{2}mv_A^2 + mgh_A = 1000J + \frac{1}{2}mv_B^2 + mgh_B$$

↑ plug in and solve for $v_B$

Note: can often cancel mass if no heat/friction involved