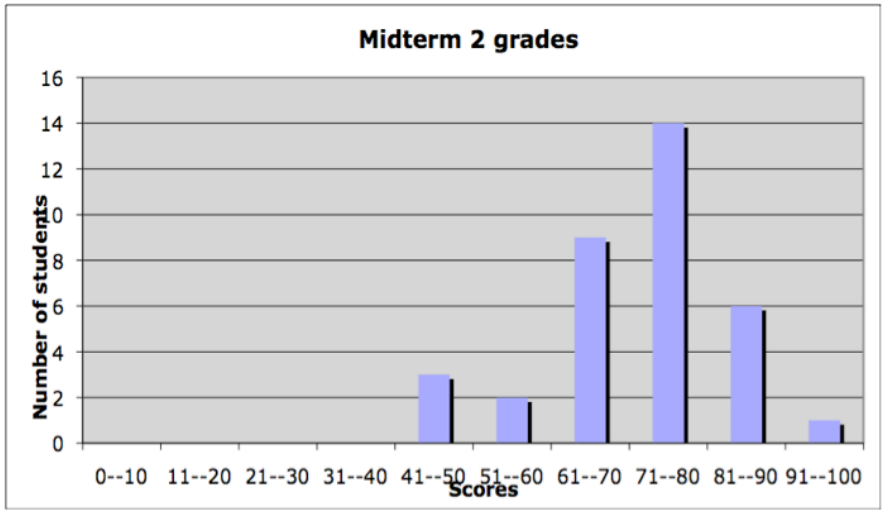
October 29

Get Whiteboards

Find your new groups. Get groupmate info.

Contracts due next Wednesday.



Ave: 71.5
Median: 74
Std Dev: 12

Bit lower than I wanted, so gave everyone +4

Heat Capacity

$C = \frac{\Delta E_{thermal}}{\Delta T}$

Specific heat capacity $c = \frac{\Delta E_{thermal}}{m\Delta T}$

$E_{thermal}$ is not Q

↑ energy transfer due to temp difference

$\Delta E = W + Q$

Tangible: Hang on tight

$\Delta E_{thermal} = mc\Delta T$

$C_{Al} = 900\,J/kg\cdot K$

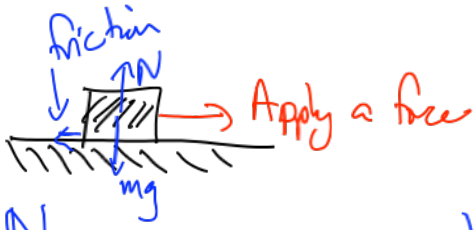
$= (36\times10^{-3}\,kg)\left(900\frac{J}{K\cdot kg}\right)(35°C - 25°)$

$= 330\,J$

$\text{Power} = \frac{\text{energy}}{\text{time}} = \frac{330\,J}{60\,s} \simeq 5.5\,W$

Dissipative Forces

Sliding Friction



$f_s \leq \mu_{static} N$ ← not sliding on surface

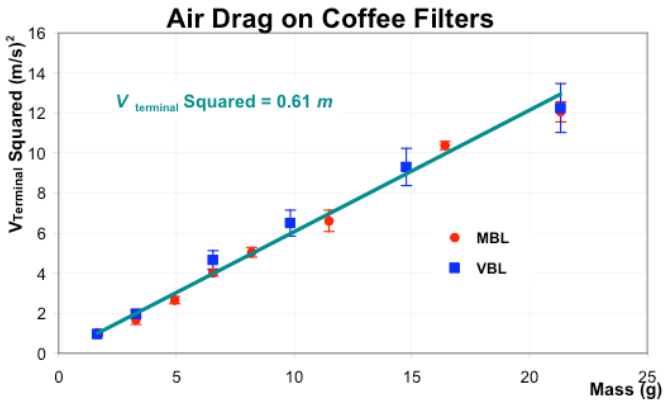
↑ normal force

$f_K = \mu_{kinetic} N$

Air Drag

$V^2 \propto mg$

$F_{drag} = mg$



$$F_{drag} = mg$$

$$\Delta \vec{p} = \vec{F}_{net} \Delta t$$

$$0 = (F_{drag} - mg)\Delta t$$

Increase mass

$\Rightarrow V_{terminal}$ goes up

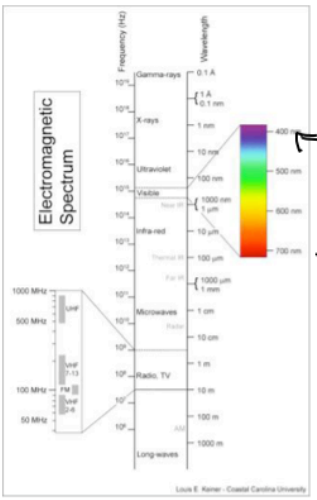
$$F_{drag} \propto v^2$$

time to fall goes down

$$d = V_{terminal} t \Rightarrow t = \frac{d}{V_{terminal}}$$

Energy in light

red 1.8 eV, violet 3.1 eV



← 3.1 eV/photon

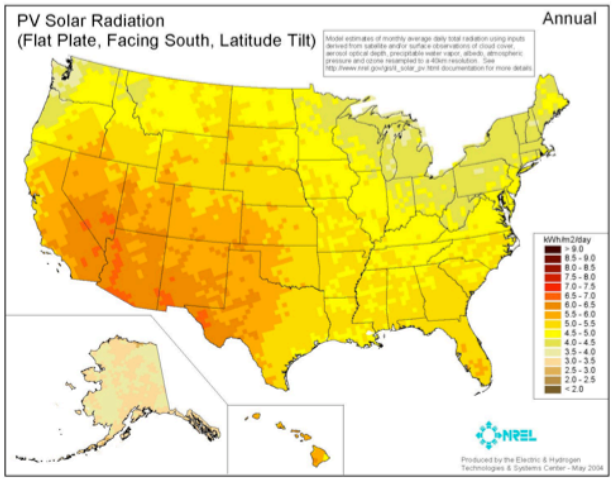
← 1.8 eV

$1eV = 1.6 \times 10^{-19} J$

Photovoltaic (Solar) Cell Engineering

Insolation

1400 W/m² at Earth's distance from sun



ave photon has ~ 2.5eV

What is it at Earth's surface?

250 W/m²

↳ 2.5 W/m²

How many photons per second per m²? (we can say energy)

6.5×10^{20}

In US, house uses $\sim 18 \frac{\text{kWh}}{\text{day}}$

$\Rightarrow 750\,\text{W}$

$\frac{750\,\text{W}}{25\,\text{W/m}^2} \simeq 30\,\text{m}^2$