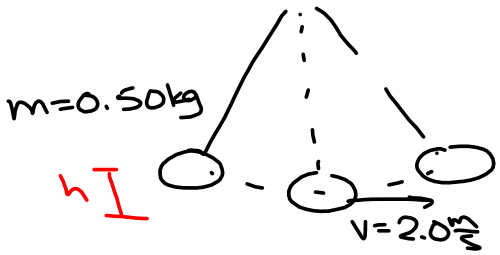


$PE = mgh$

$KE = \text{☺}$

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

$PE = \text{☺}$

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

$h = \frac{v^2}{2g} = \frac{(2\ m/s)^2}{2(9.80\ m/s^2)} = 0.204\ m$

Energy and Efficiency

0K = -273°C
273K = 0°C

Efficiency is a measure of how energy is transformed from one form to another form of "useful" energy.

For example, if we do 20 J of work on a box, but "lose" 4 J of energy to heat (from friction), we only have 16 J of energy left in the box.

in Kelvin

Best

$1 - \frac{T_{out}}{T_{in}}$

$1 - \frac{350K}{600K}$

41.7%

We say this process is $\frac{16\text{ J}}{20\text{ J}} \times 100\% = 80\%$ efficient.

In general

output energy

$$efficiency = e = \frac{E_{out}}{E_{in}} \times 100\%$$

input energy

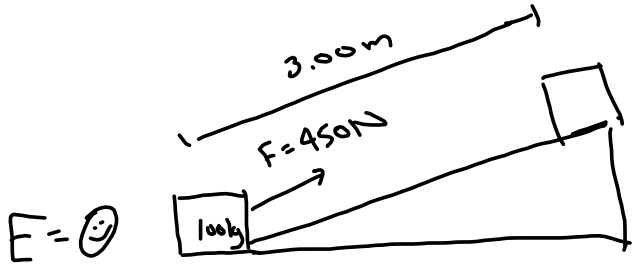
$$e = \frac{E_{in} - E_{lost}}{E_{in}} \times 100\% = \left(1 - \frac{E_{lost}}{E_{in}}\right) \times 100\%$$

Example: A box of mass *m* = 100 kg is pushed up a ramp that is 3.00 m long and 1.00 m high using a force of 450 N.

a) How efficient is this process?

b) How much energy was "lost" to friction while sliding it up the hill?

c) What is the force of friction acting on the box?



$PE = mgh = 981\,J = E_{out}$

$KE =$

$E =$

$W = F_{||}d = (450N)(3.00m) = 1350J = E_{in}$

a) $e = \frac{E_{out}}{E_{in}} = \frac{981J}{1350J} = 0.73$ or 73%

b) $E_{lost} = E_{in} - E_{out} = 1350 - 981\,J = 369\,J$

c) $W_f = fd$

$369J = f(3.00m)$

$f = 123N$

Homework: Page 270 Text # 44-48
Page 274 Text # 2, 5
Sheet #17 (This one is trickier), 18