

Quiz 4/28/11

Which has more entropy,

A) a system of two $6 \times 6 = 36$

random 6-sided dice, or

$$S = k \ln 36 = k \ln(6^2) = 2k \ln 6$$

B) a system of three

randomly flipped coins ?

$$2 \times 2 \times 2 = 8$$

$$S = k \ln 8 = k \ln(2^3) = 3k \ln 2$$

(Just count states you
can easily observe.)

5.3: $dS = \frac{dQ}{T}$ measured

inefficiency engine compared to Carnot

$$T dS = dQ \rightarrow T = \frac{dQ}{dS}$$

$$\boxed{\frac{1}{T} = \frac{dS}{dQ}}$$

Monatomic

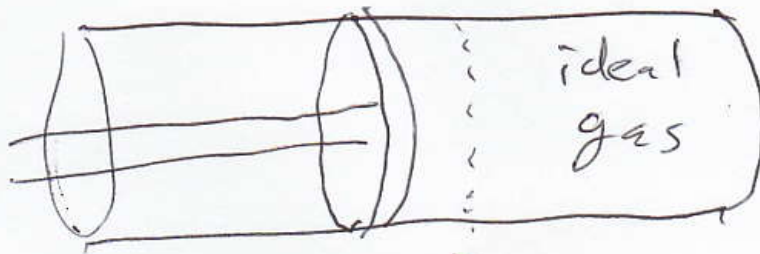
Ideal gases: $nkT = PV$

$T = \frac{2}{3} K_{\text{average}}$

Suppose we compress a piston

a small dx :

work done by gas:



$dW = PdV$
negative

$dV = Fdx$
negative

dx
negative

positive $dQ = -dW$
heat added to gas

$dS = \frac{dQ}{T} = \frac{-dW}{T}$

$dS = -\frac{PdV}{T}$ If P is constant,

then $d(nkT) = d(PV) = PdV,$

simplifying $dS = \frac{nk dT}{T} = nk d(\ln T)$

~~scribble~~ $\Delta S = \int nk d(\ln T) = nk \ln \frac{T_f}{T_i}$

HW: #8, #9; Read 5.5