Reminders 2-12-07:

-Worksheet due Today.

-Exam 1 February 14 Chapters 17-20.

Objectives:

-Entropy

-Oscillatory Motion (to be covered in lab too)

Isothermal Process

$$0 = Q - W$$

$$Q = W$$

$$Q = \int P\,dV$$

$$= \int \frac{nRT}{V}\,dV$$

$$= \int nRT\frac{dV}{V} = nRT\ln\frac{V_2}{V_1}$$

$$\frac{dQ}{T} = nR\ln\frac{V_2}{V}$$

$$\int \frac{dQ}{T} = nR\ln\frac{V_2}{V_1}$$

$$\Delta U = Q - W$$

$$dU = dQ - dW$$

$$dQ = dU + dW$$

$$= nC_v dT + P\,dV$$

from ideal gas Law $PV = nRT$

$$dQ = nC_v dT + \frac{nRT}{V} dV$$

$$\frac{dQ}{T} = nC_v \frac{dT}{T} + nR \frac{dV}{V}$$

Calorimetry

$\rightarrow m_1 c_1 dT_1 + m_2 c_2 dT_2 = 0$

Total change in entropy for process is change in entropy of each object

$$\Delta S_T = \Delta S_1 + \Delta S_2$$

$$= \int \frac{dQ_1}{T} + \int \frac{dQ_2}{T}$$

$$\int \frac{m_1 c_1 dT_1}{T_1} + \int \frac{m c_2 dT_2}{T_2}$$

The temperatures of the sun's and earth's surfaces are about 5700 K and 290 K respectively. What is the entropy change when 2000 J heat energy is transferred from the sun to the earth?

$$\Delta S_{TOTAL} = \Delta S_{SUN} + \Delta S_{EARTH}$$

$$= -\frac{Q}{T_{SUN}} + \frac{Q}{T_{EARTH}}$$

$$= -\frac{2000\,J}{5700\,K} + \frac{2000\,J}{290\,K}$$

$$= 6.54\,J/K$$