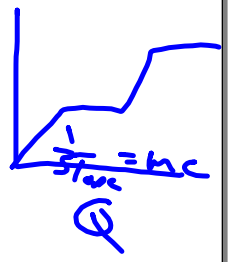
Chapter 12/14/15 Review

Temperature/Heat/Gas Laws/ Thermo

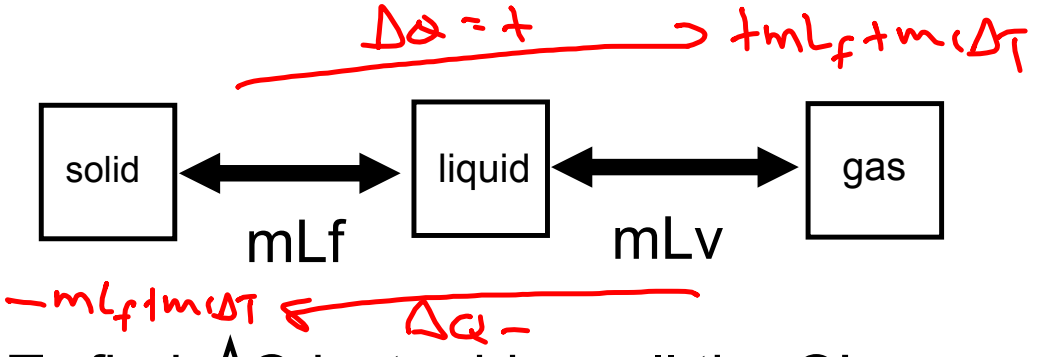
Ch 12

Temperature	Heat
^oC, K, ^oF	Cal, J
Avg KE	energy that transfers due to ΔT
KE = U $1/2mv^2 = 3/2kT$	$\Delta Q = mc\Delta T$ $\Delta Q = mLf$ $\Delta Q = mLv$
$^oC + 273 = K$ ✓ $1\Delta C = 1\Delta K$ ✓ $^oC \neq K$	c = energy to increase temp Lf = energy to melt/freeze Lv = energy to vap/condense



$Q = mc\Delta T$

$\Delta T = \frac{1}{mc} Q$



To find ΔQ just add up all the Q's

Watch your signs for mLf and mLv...

ask are you adding or taking away Q as you change state

Expanision EQ's...know!!!

linear: $\Delta L = \alpha L_o \Delta T$

volume: $\Delta V = \beta V_o \Delta T$

Conduction and Diffusion..know!!!

$$\Delta Q = \frac{kA\Delta Tt}{L} \qquad H = \frac{kA\Delta T}{L}$$

$$m = \frac{DA\Delta Ct}{L} \qquad H = \frac{\Delta Q}{t}$$

Ch 14- Gas Laws

N = # of particles (k_B) KE

n = # of moles (R)

$N_A = 6.02 \times 10^{23}$ particles/mole

KNOW and UNDERSTAND

$$PV = nRT$$

$$PV = NkT$$

$$\frac{PV}{T} = \frac{PV}{T}$$

T = Kelvins

These are on table of info....

R = 8.31 J/molK k_B = 1.38 x 10^{23} J/K

Chapter 15 - Thermo

U = 3/2nRT = 3/2NkT ALWAYS!!!

$\Delta U = \frac{3}{2} n R \Delta T$

0th Law

IF

A in equilibrium with B

B in equilibrium with C

THEN

A in equilibrium with C

1st Law

gas = system

$\Delta U = \Delta Q + W$ On gas, for the gas

(opposite = surroundings)

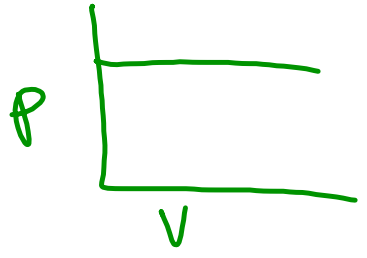
add heat = $+\Delta Q$

remove heat = $-\Delta Q$

compress gas, decrease V = + W on system

expand gas, increase V = -W on system

Isobaric



Constant P

$\Delta U = \Delta Q + W$

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$W = - P\Delta V = -nR\Delta T$

$-(-1)$ $3/2 - 5/2$

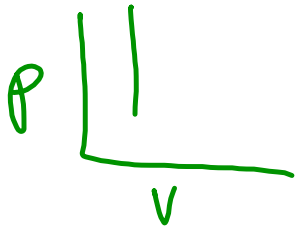
$\Delta Q = -W + \Delta U$

$\Delta Q = 5/2nR\Delta T$ $(-W + U)$

$\Delta Q = nC_p\Delta T$

$Cp = 5/2\ R$

Isochoric



constant V

$W = 0$

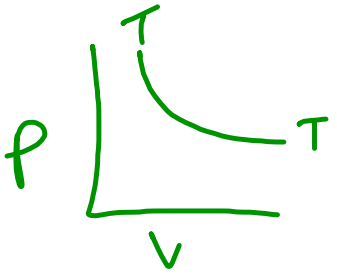
$\Delta Q = \Delta U$

$\Delta Q = \frac{3}{2} nR\Delta T$

$\Delta Q = nC_v \Delta T$

$C_v = \frac{3}{2} R$

Isothermal



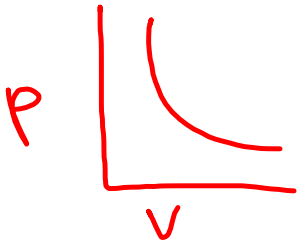
constant T

$\Delta U = 0$

$W = -\Delta Q$

Adiabatic

Constant Q ($\Delta Q = 0$)



$\Delta U = W$

$W = 3/2nR\Delta T$

P-V graphs

area = W (sign OPPOSITE ΔV)

H_2 He

Can use PV = nRT to find n or T

Cannot assume n = 1!!!! but can leave it and hope it cancels :)

$PV = nRT$

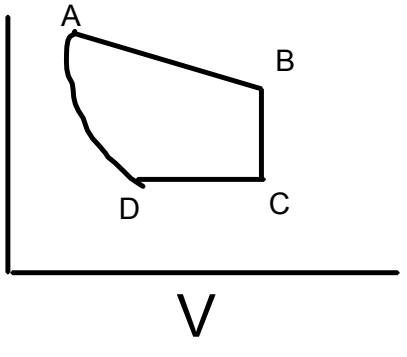
$T = \frac{PV}{nR}$

$n = \frac{PV}{TR}$

W_{ABCDA} ?

$\Delta U = \Delta Q + W$

$0 = \Delta Q + W$



~~3rd~~ 2nd Law - Entropy

$$\Delta S = \frac{\Delta Q}{T}$$

***remember T is in K

^ S = ^ disorder

melting ice cube $\Delta S = \frac{mL_f}{273}$

Heat Engines

ALL: $e = \frac{W}{Q_H}$

$e = 1 - Q_c/Q_h$

$Q_h = W + Q_c$

Carnot: = most efficient reversible

$e = 1 - T_c/T_h$

$T_c/T_h = Q_c/Q_h$

1) C
2) D
3) A
4) D
5) B
6) E
7) A
8) D
9) D
10) D