10-18-13

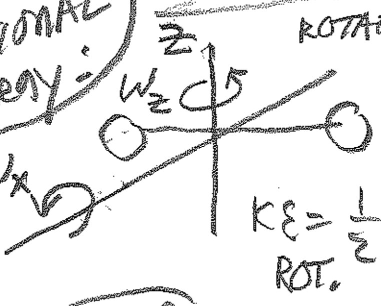
4C Ch18 Problems Test 3 Review (E.C.)

(44.) $U = E_{INT} = \frac{f}{2} NKT = \frac{f}{2} nRT = nC_v T$ $\Big\} \; C_v = \frac{f}{2} R$

Monoatomic $\quad f = 3$ translational

Diatomic $\quad f = 3$: 3 trans. only

ROTATIONAL ENERGY: ROTATES about X OR Z AXIS



$KE_{ROT.} = \frac{1}{2} I_x \omega_x^2 + \frac{1}{2} I_z \omega_z^2$

$f = 5$: 3 trans. + 2 rot.*

$f = 7$: 3 trans. + 2 rot. + vibrational (2)

VIBRATIONAL ENERGY: ⇆ ENERGY

O—mmm—O $= KE + U_s$

K

*rotational

(44.) TRIATOMIC EXAMPLE $\quad f = 6$ Explain!

$C_v = \frac{6}{2} \cdot R = 3R$

48. $f(v) = C \cdot v^2 \cdot e^{-Kv^2}$

To get most probable v:

$$\frac{df}{dv} = 0 = 2\cancel{C}v\cancel{e^{-Kv^2}} + \cancel{C}v^2(-2vK)\cancel{e^{-Kv^2}} = 0$$

$$\boxed{2v - 2v^3K = 0}$$

see #32.

9 $\frac{\sum n_i x_i}{\sum n_i}$

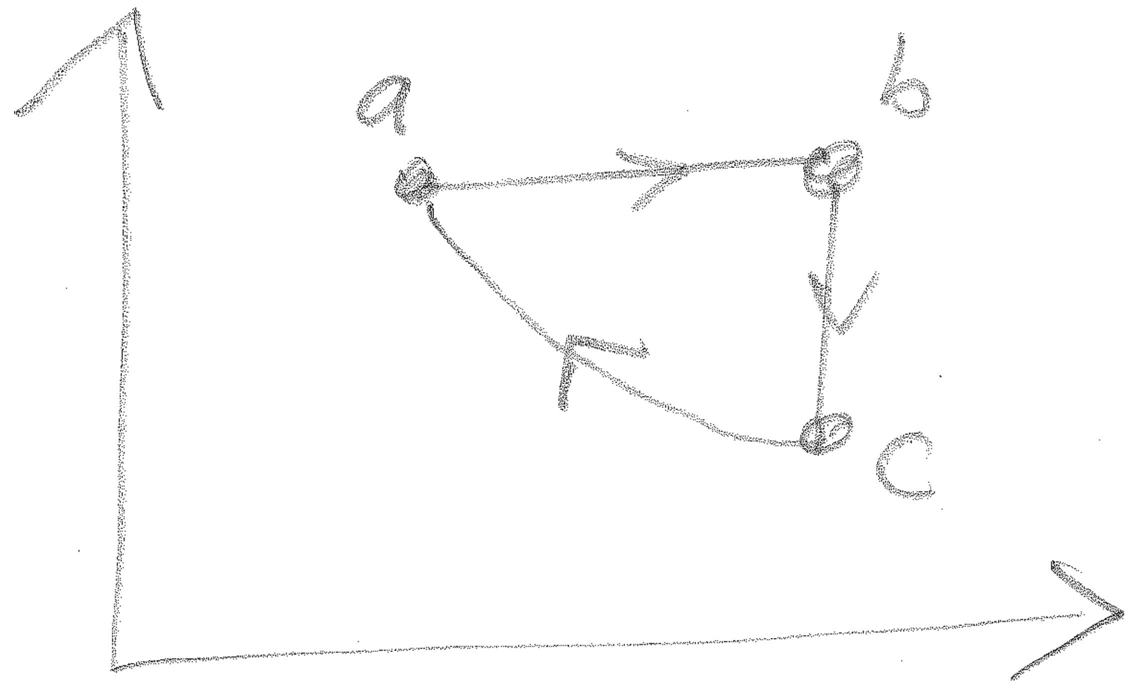
$n_i = 11, 12, 24 \ldots$

$x_i = 10, 20, 30 \ldots$

Final exam Review

Ch 9.

\# 48



$P_a V_a = n \cdot R T_a$ and $P_c V_c = nR T_c$

$T_a = T_c \Rightarrow \frac{P_a V_a}{nR} = \frac{P_c V_c}{nR}$

Get P_a, given P_c, V_c

#48

(b.) $T_a = T_c = \frac{P_c V_c}{nR}$

$T_b = ?$

$P_a = P_b$

$\frac{P_a T_a}{V_a} = \frac{P_b T_b}{V_b} \Rightarrow$ get T_b.

(c.) $c \to a \to dQ = P\,dV$

$\int dQ = \int P\,dV = Q = nT \ln \frac{V_a}{V_c}$

$C_V = \frac{f}{2} R$

$b \to c \to dQ = dU$

$Q = \frac{f}{2} nR(T_c - T_b)$

46.

$a \to b$

$$dQ = nC_p \Delta T = nC_p \cdot (T_b - T_a)$$

$$C_p = C_v + R$$

<u>Note</u>—cycle:

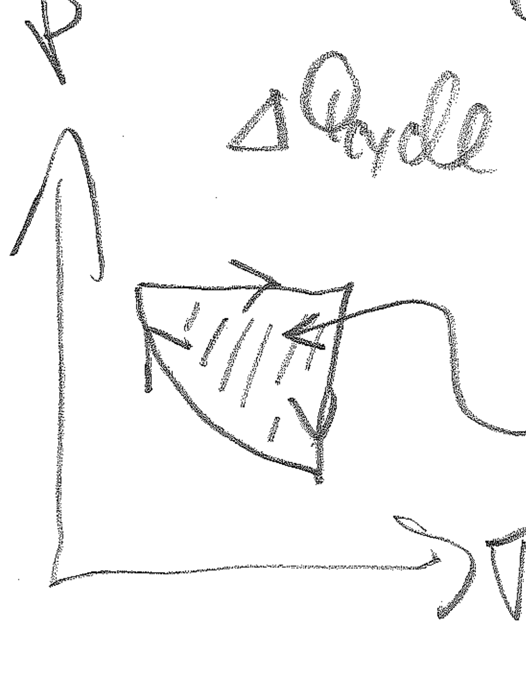
$$\Delta Q_{cycle} = \Delta U_{cycle} + W_{cycle}$$

$\downarrow$

0

$$\Delta Q_{cycle} = W_{cycle}$$

$\Updownarrow$



area under curve

CH19 Final Review

11. a.

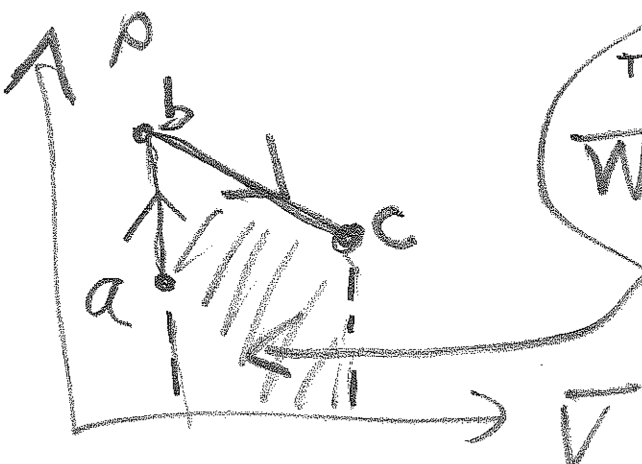
T_a ; $V_a = 2.0\,L$ ⟹ $P_a V_a = nRT_a$ get T_a.

$p = 0.20\,atm$

convert to $\frac{N}{m^2}$!

b. $W_{a \to b} = 0$

$W_{b \to c} = ?$



Triangle + rectangle areas.

W = area under curve: use geometry

c

$\Delta Q = \Delta U + W$

$\Delta Q = \Delta U_{ab} + \Delta U_{bc} + W_{bc}$

$215\,J = \Delta U_{ab} + \Delta U_{bc} + W_{bc}$