Phy 4C 1/23

Monday, January 23, 2017 11:43 AM

Goals for the Lecture:

1) Understand that temperature is directly related to the average kinetic energy of the molecules in an ideal gas
2) Understand the terms “degree of freedom” and “equipartition of energy” and “rms speed”
3) Understand molar specific heat at constant volume and at constant pressure and how to use each to solve problems
4) Understand that the ratio of molar specific heat at constant pressure that at constant volume has a special significance and can be used to solve problems

worksheet p. 269

Top: cross out the line that says T is the same

$$PV = nRT$$

same same same

$$V \propto T$$

$$T_A = T_B > T_C = T_D$$

Bottom: $PV = nRT$

$n = 1$

R = constant

$$T \propto PV$$

$$T_A \propto (3P_0)(V_0)$$

$$T_B \propto (3P_0)(4V_0)$$

$$T_C \propto (2P_0)(2V_0)$$

$$T_D \propto P_0 V_0$$

$$T_E \propto P_0(2V_0)$$

$$T_B > T_C > T_A > T_E > T_D$$

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p. 270 bottom: (same logic as above)

p. 270 bottom: (same logic as above)

$$T \propto PV$$

$$T_C > T_D > T_A = T_B$$

Common Processes:

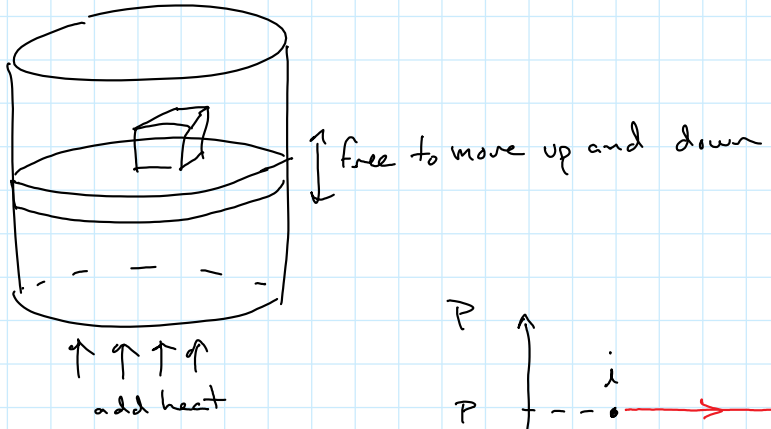
Isothermal – constant temperature

Isobaric – constant pressure

Isochoric or isovolumetric – constant volume

Adiabatic – No heat transfer

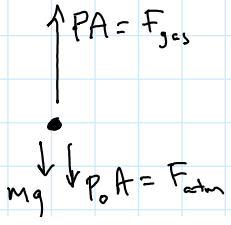
Isobaric



gas expands → push piston up

gas does work (positive work)

Worksheet p. 227 A) FBD for Piston



B) $F_{Net} = 0$

C) $F_{gas} > F_{atm}$

$F_{gas} = F_{atm} + mg$

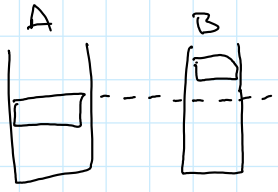
$\vec{F}_{gas} + \vec{F}_{atm} + \vec{mg} = 0$

D) $P > P_o$

$PA = P_o A + Mg$

$P = P_o + \frac{Mg}{A}$

E)



same T
same piston
different gas

$P_A = P_B$

P. 228 II A

1) $T_f > T_i$

2) $P_f = P_i$

3) $V_f > V_i$

$PV = nRT$

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

$\frac{P_i V_i}{T_i} = \frac{P_f V_f}{T_f}$

B) constant: P, n

change: V, T

C) student 1: $P \propto T$ only if V = constant

$P \propto \frac{T}{V}$

student 2: V and n are different things

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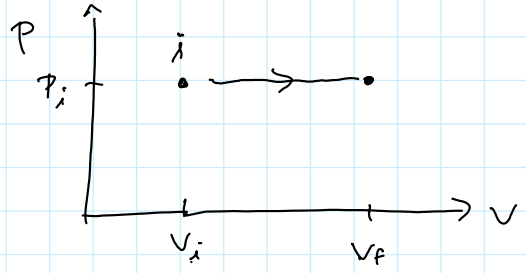
p. 229 III A) ice → boiling



B) 1) $P \cdot V = nRT$

$T \propto PV$

	PV
A	$4 \cdot 1 = 4$
B	$3 \cdot 2 = 6$
C	$1 \cdot 3 = 3$
D	$1 \cdot 4 = 4$

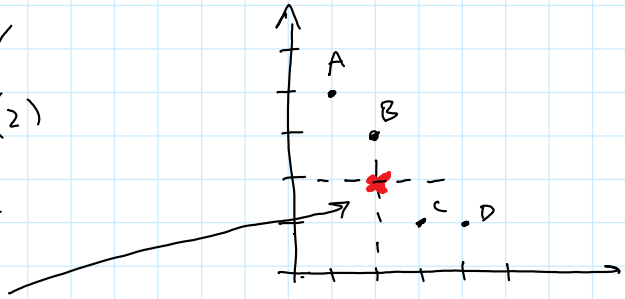
$B > A = D > C$

3) $T \propto PV$

$4 = P(2)$

$P = 2$

yes



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p. 230 IV A 1) same

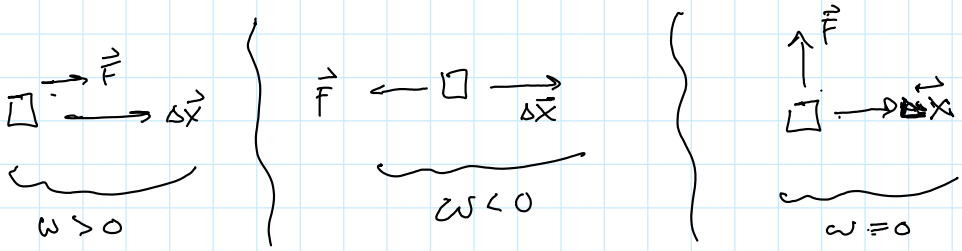
p. 230 IV A 1) same

2) same

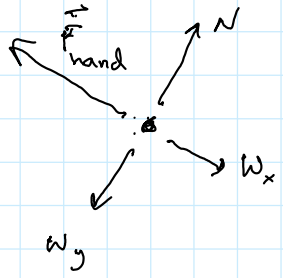
3) same

4) same

p. 231 I A)



B) i)



2) $\vec{F}_{Net}$ ←

3) $W_{\text{on block by hand}}$: +

$W_{\text{on block by earth}}$: −

$W_{\text{on block by incline}}$: 0

4) $W_{\text{on hand by block}}$: −

p. 232 C) 1) ←

Does Not Matter

2) + work ←

− work , →

3) yes same amount but opposite sign

A) $W_{on\ gas}$ +

$W_{by\ gas}$ −

B 1) E_{int} ↑

2) T ↑

C Student 1

$PV = nRT$ ↑

P increases at a faster rate then V decreases for T to increase

III Heat

1) T ↑

E_{int} ↑

P ↑

V same

ج)