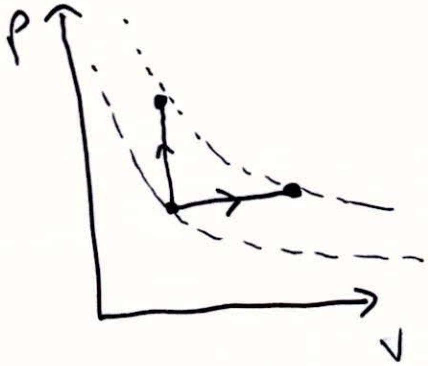
Reading 2/4

① 

If you heat a gas @ const. pressure, it expands. When the gas expands, it loses energy to the surroundings (the gas does positive work, or $W_{on\ gas} < 0$).

Therefore @ const pressure you must give the gas more energy via heat to achieve the same ΔT (and thus ΔE_{th}).

② (a) $p_0 V_0^{\gamma} = p_f V_f^{\gamma} = (2.64\,p_0)(\tfrac{1}{2}V_0)^{\gamma}$

(adiabatic)

$1 = 2.64(\tfrac{1}{2})^{\gamma} \Rightarrow \gamma = \dfrac{\ln(2.64)}{\ln(2)} \approx 1.40$

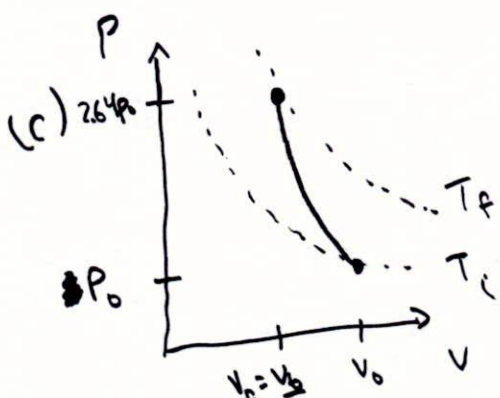
From Eq. 19.34 $\Rightarrow$ $\boxed{\text{diatomic gas}}$

(b) $T_f V_f^{\gamma-1} = T_0 V_0^{\gamma-1}$

must be abs. temp!

$T_f = \left(\dfrac{V_0}{V_f}\right)^{\gamma-1} T_0 = (2)^{0.40}(293\text{ K}) = 387\text{ K}$

$\boxed{T_f = 114\,^{\circ}\text{C}}$

(c) 

gas jumped to a higher isotherm since $T_f > T_i$

(3) Actually we need to do (b) first!

(b) $\boxed{P_a = P_b = P_c = P_d}$ Since everything is in thermal equilibrium, the temperatures are steady. So the power (energy per unit time) is the same for all 4. If it wasn't, then there would be net energy trasfered to or from one of the interfaces, changing its temperature.

(a) $P = kA\frac{\Delta T}{\Delta x} \propto k(\Delta T)$. So the biggest k's (thermal conductivities) come from the smallest ΔT's

$$\left.\begin{aligned} (\Delta T)_a &= 10°C \\ (\Delta T)_b &= 5°C \\ (\Delta T)_c &= 15°C \\ (\Delta T)_d &= 5°C \end{aligned}\right\} \Rightarrow \boxed{k_b = k_d > k_a > k_c}$$