

# PRACTICE EXAM 1

1.  $f = 5$  FOR AIR

~~QUESTION~~  $v T^{f/2} = \text{CONST}$

$$T_F = \left( \frac{v_i}{v_f} \right)^{2/f} T_i = 32^{2/5} 300 \text{ K} = 1200 \text{ K}$$

2. a)  $2^N = 2^{10} = \boxed{1024}$

b)  $\frac{1}{1024} \approx 10^{-3}$

c) ~~QUESTION~~  $\binom{10}{6} = \frac{10!}{6!4!} = 210$

$$\text{PROBABILITY} = \frac{210}{1024} \approx \boxed{20\%}$$

~~QUESTION~~

3.

$$g_A \quad \rho_A = \begin{pmatrix} g_A + n_A - 1 \\ g_A \end{pmatrix} \quad g_B \quad \rho_B = \begin{pmatrix} n_B + g_B - 1 \\ g_B \end{pmatrix} \quad \rho_{\text{total}}$$

4	15	0	1	15
3	10	1	2	→ 20
2	6	2	3	18
1	3	3	4	12
0	1	4	5	5

$$g_B = 1$$

4.

$$P_A V_A = N k T_A$$

$$P_B V_B = N k T_B$$

$$P_A = P_B$$

$$\cancel{N k} \frac{\cancel{T_A}}{V_A} = \frac{\cancel{N k} T_B}{V_B}$$

$$\frac{T_A}{V_A} = \frac{T_B}{V_B}$$

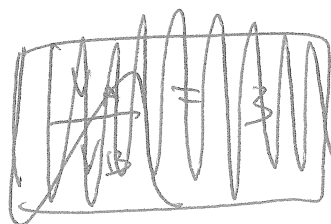
$$\frac{V_B}{V_A} = \frac{T_B}{T_A}$$

a)

$$t=0$$

$$T_A = T_0$$

$$T_B = 3T_0$$



$$\frac{V_B}{V_A} = \frac{1}{3}$$

$$t=\infty$$

$$T_A = T_B$$

$$V_A = V_B$$

b)

$$S_{\text{IDEAL}} = N k \ln \frac{V}{V_0} + \frac{3}{2} N k \ln \frac{U}{U_0} + f(N)$$

~~AAAAA~~

$$A : V : \frac{V}{4} \quad T_0 : \frac{V}{2}$$

$$\cancel{U} : U : \frac{3}{2} N k T \quad T_0 : \frac{6}{2} N k T$$

$$\Delta S_A = Nk \ln 2 + \frac{3}{2} Nk \ln 2 = \frac{5}{2} Nk \ln 2$$

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$$B : V_B \quad \frac{3V}{4} \quad \text{to} \quad \frac{V}{2}$$

$$-V_B - \frac{9}{2} NkT \quad \text{to} \quad \frac{6}{2} NkT$$

$$\Delta S_B = Nk \ln \frac{\frac{V/2}{\frac{3V}{4}}}{} = Nk \ln \frac{2}{3}$$

$$\frac{3}{2} Nk \ln \frac{6 NkT}{9 NkT} = \frac{3}{2} Nk \ln \frac{2}{3}$$

$$\Delta S_B = - \frac{5}{2} Nk \ln \frac{3}{2}$$

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$$\Delta S_{\text{TOTAL}} = \frac{5}{2} Nk \ln 2 \times \frac{3}{3}$$

$$\Delta S_{\text{TOTAL}} = \frac{5}{2} Nk \ln \frac{4}{3}$$