

Answers

1. $4000 J$

2. $U_A = 54.4, U_B = 25.6$

3.
 $\widetilde{E}_A = 5$ to one sig fig.

As for T , I'm fine with answers that, to one sig fig, fall in the range $T = 2$ to 3 , since this can vary depending on how you approximated a derivative as a difference.

4. $17/625$

5. Both U_A and U_B come out to be $F_A - T \left(\frac{\partial F_A}{\partial T} \right)_{V,N}$ (If you need to write a test correction, give a short argument/derivation as to why this is true.) If you look for $P(T,V,N)$ in a similar way ... taking a certain partial derivative of F ... you will find different answers when you use F_A and F_B (Again, if you are writing a correction, show this.)

6) I get $Z = (1/N!) (5.3 \times 10^{31} \times 1070 \times 0.0064)^N$ where I break the answer up this way so you can see the first term in parentheses is from translation, second rotation, and third vibration.