3. The constant $k$ is related to the volume by a molecule

$$v = (438.34 - 17.57 T) \text{ cm}^3 = 358.67 \text{ cm}^3$$

On the way out, it's almost zero, but once the way in the force is high,

$$F = 0.016 \text{ N/m}^2, \quad a = 1.38 \text{ m/s}^2$$

$$\text{Answer: Full interaction with surroundings}$$

Close: energy interactions, but no matter exchange

Isolated: no interaction with surroundings
(when comparing Cp and Cv for the same sample; N = 1)

\[
\Delta H = \frac{dE}{dN} - \frac{dE}{dN_a} \quad \text{[Calorimetric]} \quad \frac{dE}{dN} = \frac{dE}{dN_a} \cdot \text{[heat of reaction]}
\]

\[
\text{Substituting: } C_p - C_v = \frac{dE}{dN_a} \cdot \text{[heat of reaction]}
\]

\[
\text{Solving for } C_p - C_v = \frac{dE}{dN_a} \cdot \text{[heat of reaction]}
\]

\[
\text{Differentiating: } \frac{dE}{dN_a} = \frac{dE}{dN} \cdot \frac{dN}{dN_a}
\]

\[
\text{We know } C_p - C_v = \frac{dE}{dN_a} \cdot \text{[heat of reaction]}
\]

\[
\text{so } \frac{dE}{dN} = \frac{dE}{dN_a} \cdot \text{[heat of reaction]}
\]

\[
\text{and } (C_p - C_v) = \frac{dE}{dN} \cdot \text{[heat of reaction]}
\]

\[
\frac{dE}{dN} = \frac{dE}{dN_a} \cdot \text{[heat of reaction]}
\]

\[
\text{Therefore: } C_p - C_v = \frac{dE}{dN} \cdot \text{[heat of reaction]}
\]

\[
\text{Thus, the heat evolved from each to much states sum the}
\]

\[
\text{since the heat evolved from initial to much states sum the}
\]

\[
\text{and the final states were the same (acid, ammonium) and}
\]

\[
\text{the initial states were the same (acid, ammonium) and}
\]

\[
\text{in order to determine first from mixed acid and ammonium, then determine}
\]

\[
\text{Hess mixed substance acid and ammonium, then determine}
\]

\[
\text{g. Hess mixed substance acid and ammonium, then determine}
\]

\[
\text{\[C_2H_5OH \text{, water}] = \frac{\text{mol}}{\text{mol}} \cdot \text{[heat of reaction]} = \frac{\text{mol}}{\text{mol}}}
\]

\[
\text{\[C_2H_5OH \text{, water}] = \frac{\text{mol}}{\text{mol}} \cdot \text{[heat of reaction]} = \frac{\text{mol}}{\text{mol}}}
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\]

\[
\text{\[C_2H_5OH \text{, water}] = \frac{\text{mol}}{\text{mol}} \cdot \text{[heat of reaction]} = \frac{\text{mol}}{\text{mol}}}
\]
11. Change in volume (pressure) changes are not for substantial heat flow.

12. $\Delta U = Q + W$

\[ \Delta U = 0 = Q + W \]

\[ Q = W = \frac{1}{3} k_1 V_1^2 - \frac{1}{2} k_2 V_2^2 = 1000 - 2000 \]

13. $\Delta H = -1366.82 \text{ kJ/mol}$

14. $p \times V = n \times R \times T$

15. $\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$

16. $V = 425.3 \text{ mL}$

\[ T = 300 \text{ K} \]

\[ T_2 = 600 \text{ K} \]