

1. Case A: 1 mol of helium is placed a rigid 5 L container with pressure 2 atm. The container is initially at is initially at 200 °C and is heated to 250 °C.

Case B: 1 mol of helium is placed a flexible 5 L container with pressure 2 atm. The container is initially at is initially at 200 °C and is heated to 250 °C.

(a) Which case has the higher q ?

(b) Which case has the higher ΔU ?

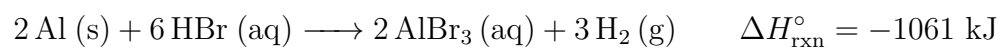
2. 0.6192 g of sulfur is combusted in a calorimeter with a heat capacity of 5.270 kJ/°C. Both SO₂(g) and SO₃(g) are formed, as shown in the equations below. The temperature of the calorimeter increases by 1.140 °C. Determine the molar ratio of SO₃(g)/SO₂(g) produced.



3. Show that for a reversible adiabatic expansion of an ideal gas:

$$PV^\gamma = \text{constant}$$

4. The heat from the reaction



is completely transferred to water that is initially at 25 °C. How many grams of water can be converted to steam at 110 °C when 191 g of aluminum is added to excess HBr(aq)?

Quantity	Value
$\Delta H_{\text{vap, H}_2\text{O}}$	$2.261 \frac{\text{kJ}}{\text{g}}$
$C_{s, \text{H}_2\text{O(l)}}$	$4.184 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}}$
$C_{s, \text{H}_2\text{O(g)}}$	$2.09 \frac{\text{J}}{\text{g}\cdot^\circ\text{C}}$

Homework Problem 14

1. Show that for a reversible adiabatic expansion of an ideal gas:

$$\frac{T_2}{T_1} = \left(\frac{P_2}{P_1}\right)^{\frac{\gamma-1}{\gamma}}$$

Start from the adiabatic relation $P_1V_1^\gamma = P_2V_2^\gamma$