1. In discussing thermochemistry, what do these following symbols represent? (3 points)

?E, q, w

When a gas is compressed from 39.92 L to 12.97 L at a constant pressure of 5.00 atm, 9.82 kJ of energy are released as heat. What are ?E, q, and w for this process? (101 J = 1 L atm) (6 points)

2. You wish to heat water for coffee. How much heat (in J) must be used to raise the temperature of 0.18 kg (1 cup) of tap water from 15°C to 86°C (coffee temperature)? Assume the specific heat of coffee is 4.18 J/g°C. (4 points)

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3. A furnace burns \( \text{CH}_4 \) (methane, 16.03 g/mol). The heat of combustion is \(-604.8 \text{ kJ/mol CH}_4\). The heat capacity of air is about 29.0 J/(mol\(\kappa\)). A typical house has 17300 moles of air.

a. What is the heat capacity of a houseful of air in kJ/K? (2 points)

b. How many kg of \( \text{CH}_4 \) must be burned to heat a houseful of air by 3\(^\circ\)C? (Assume no heat loss and 100% efficiency) (3 points)

c. How many kg of \( \text{CH}_4 \) must be burned to heat a houseful of air by 3\(^\circ\)C if the combustion and heat loss made it only 80% efficient? (2 points)