

Thermodynamics Unit - Internal Energy, Work and Heat

1. The internal energy of a system increased by 982 J when it absorbed 492 J of heat. Was work done by or on the system? How much work was done? What is ΔV if pressure is constant at 1 atm?

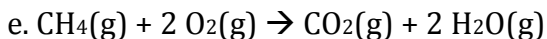
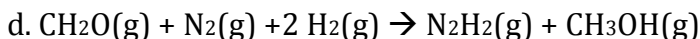
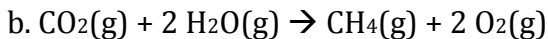
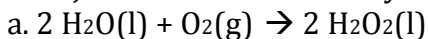
2. A gas in a cylinder was placed in a heater and gained 5500 kJ of heat. If the cylinder increased in volume from 345 mL to 1846 mL against an atmospheric pressure of 750 Torr during the process, what is the change in internal energy of the gas in the cylinder?

3. The change in internal energy for the combustion of 1.00 mol $\text{CH}_4(\text{g})$ in a cylinder according to the reaction $\text{CH}_4(\text{g}) + 2 \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{g})$ is -892.4 kJ. If a piston connected to the cylinder performs 492 kJ of expansion work due to the combustion, how much heat is lost from the system? What is this system in this situation?

4. A 80W electric heater ($1\text{W} = 1\text{J/s}$) operates for 7.5 minutes to heat the gas in a cylinder. At the same time, the gas expands from 5 to 11 L against a constant atmospheric pressure of 2.78 atm. What is the change in internal energy of the gas?



5. For which of the following reactions at room temperature (25 °C) would there be 5.0 kJ of work done on the system?



6. If an MP3 player does 200 kJ of work and released 100 kJ of heat, what is the change in internal energy for the MP3 player?

7. In the formula $\Delta U = q + w$, work done by the system during expansion is _____ (positive/negative), and heat _____ (gained/lost) by the system is positive.

8. The pressure-volume work done by an ideal gaseous system at constant volume is _____?