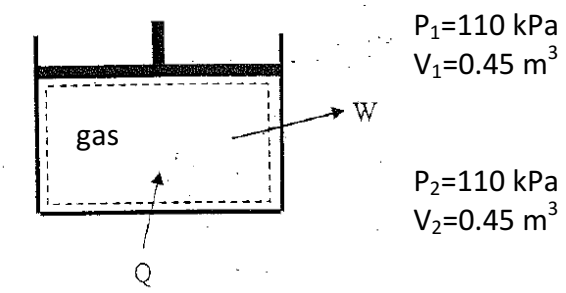
Çankaya University
Mechanical Engineering Department
ME 211 Thermodynamics I
Quiz 2 Solution

A stationary mass of gas is compressed without friction from an initial state of 0.45 m^3 and 110 kPa to a final state of 0.12 m^3 and 110 kPa, the pressure remaining constant during the process. If the internal energy of the gas **decreases** 10 kJ, how much heat is transferred? Is the gas cooled or heated, explain.



P_1=110 kPa
V_1=0.45 m^3

P_2=110 kPa
V_2=0.45 m^3

$W = \int_{V1}^{V2} PdV = \int_{V0.45}^{V0.12} 110dV = 110 \cdot (0.12 - 0.45) = -36.3\ kJ$

$\Delta U = Q_{12} - W_{12} \rightarrow -10 = Q_{12} - (-36.3) \rightarrow Q_{12} = -46.3\ kJ$

Since $Q_{12} < 0$ → System is loosing heat. Heat is transferred from the system. Gas is cooled.