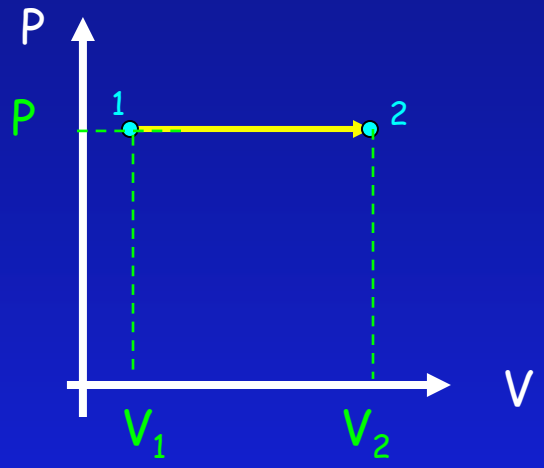
First Law of Thermodynamics Isobaric Example



2 moles of monatomic ideal gas is taken from state 1 to state 2 at constant pressure p=1000 Pa, where $V_1 = 2m^3$ and $V_2 = 3m^3$. Find T_1, T_2, ΔU, W, Q. (R=8.31 J/k mole)

1. $PV_1 = nRT_1 \Rightarrow T_1 = PV_1/nR = 120K$

2. $PV_2 = nRT_2 \Rightarrow T_2 = PV_2/nR = 180K$

3. $\Delta U = (3/2)\, nR\, \Delta T = 1500$ J
   $\Delta U = (3/2)\, p\, \Delta V = 1500$ J (has to be the same)

4. $W = -p\, \Delta V = -1000$ J

5. $Q = \Delta U - W = 1500 + 1000 = 2500$ J