1. 100 kg/s of steam at 1 MPa and 300°C enters a turbine and leaves at 1 atm with a steam quality of 0.6. How much power is generated by the steam, assuming no heat loss in the turbine? (Neglect kinetic and potential energy differences between the entrance and exit of the turbine)

2. Based on material of construction, the pressure of an engine may not exceed a maximum pressure. Due to this, 10 moles of an ideal gas with constant $C_v = 1.5R$ has to undergo a Carnot cycle with a 2-stage compression shown in Figure 1, i.e. all expansions and compressions are reversible.

![Figure 1. Carnot cycle with 2-stage compression.](image)

Paths 1→2, 3→4 and 5→6 are isothermal, while paths 2→3, 4→5 and 6→1 are adiabatic. At point 1, the gas is at 60 bars and 600 K, and at point 3, the gas is at 60 bars and 1200 K. Determine the pressure of the gas at point 2 and heat entering the system from point 1 to 2.

3. 20 moles of an ideal gas with constant $C_v = 2.5R$ was initially at 100°C and 10 bar pressure and underwent an expansion process to 1 bar pressure. What is the final temperature of the gas if the change in entropy of the gas is to be 0 J/K?
4. Steam flows at a rate of 10 kg/s through a 50-ft long uninsulated pipe at 500 kPa and 800°C and exits at 400 kPa and 500°C. What is the rate of change in entropy of surroundings due to the heat transferred from the pipe to the surroundings, with $T_{surr} = 300K$?