

Part 1:

A gas contained within a piston-cylinder assembly moves from State 1 to State 2. The system properties of each state are defined in Table 1

| State | Pressure P (bar) | Volume V (m ³) | Internal Energy U (kJ) |
|-------|------------------|----------------------------|------------------------|
| 1 | 10 | 0.1 | 400 |
| 2 | 1 | 1.0 | 200 |

Table 1: States 1 and 2

For each of the two processes described in Table 2:

1. Sketch the process on a p - V diagram
2. Evaluate the work done on/by the system, in kJ, by finding the area under the p - V curve using integral or geometric methods.
3. Evaluate the heat transfer Q , in kJ, using the First Law of Thermodynamics

| Process | Description |
|---------|--------------------------------------------------------------------------------------------------------------------|
| A | Constant volume (isochoric) from State 1 to a pressure of 2 bar, followed by a linear p - V process to State 2 |
| B | Constant temperature (isothermal, $pV=\text{constant}$) from State 1 to State 2 |

Table 2: Processes A and B

