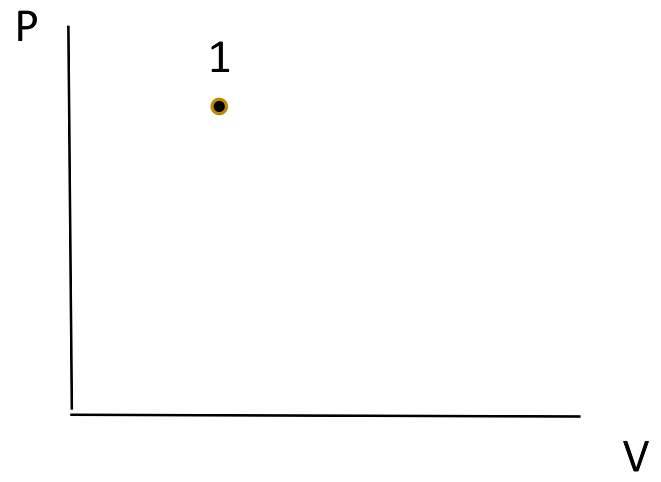
Example Problem

One more of monatomic gas is initially in an equilibrium state labeled "1" on the P-V diagram below. The gas goes through an isothermal expansion to a new equilibrium state "2", then undergoes an isobaric compression to an equilibrium state "3", then finally goes through a isochoric process back to the initial state "1". Starting from the initial state 1, sketch this thermodynamic cycle.



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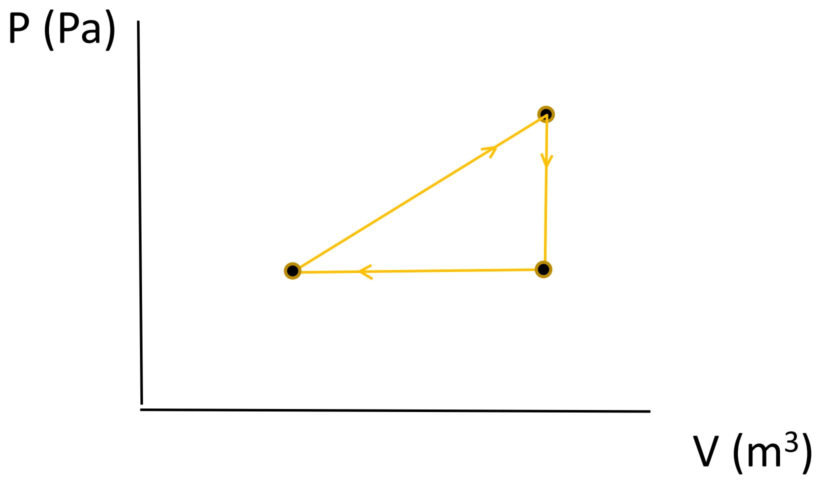
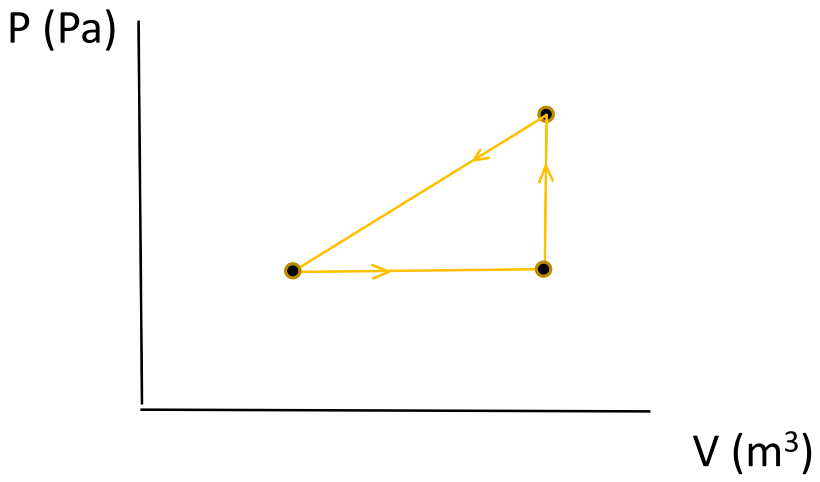
Determine the sign of the work, heat, and change in thermal energy for each process of the cycle (i.e. each “segment”) and for the total cycle.

	1 → 2	2 → 3	3 → 1	Complete cycle
ΔE^{TH}				
Q				
W				

Example Problem

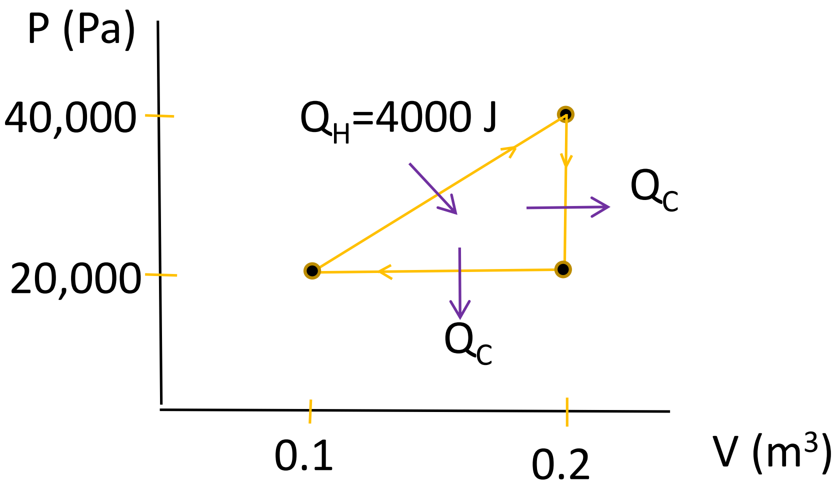
Heat Engine or Heat Pump?





Example Problem

What is the thermal efficiency of this heat engine?



An ideal monatomic gas undergoes a thermodynamic cycle of three processes:

Process 1-2: compression with PV = constant, from P_1=100kPa, V_1=1.6m^3 to V2=0.2m^3
Process 2-3: constant pressure to V_3=V_1
Process 3-1: constant volume, E_1-E_3=-3549 kJ

Sketch a PV diagram for this process.

Is this a heat engine or heat pump?

Example Problem

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Fill in the charts….

	1	2	3
P (kPa)	100		
V (m^3)	1.6	0.2	
T (K)			

	1 → 2	2 → 3	3 → 1	Complete cycle
ΔE^{TH} (kJ)			-3549	
Q (kJ)				
W (kJ)				

Example Problem