

Quiz 9

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(a) In class we discussed two statements of the second law of thermodynamics:

- *The Clausius Statement:* No process is possible whose sole effect is the transfer of heat from a colder to a hotter body.
- *The Kelvin Statement:* No process is possible whose sole effect is to extract heat from a single reservoir and convert it into an equivalent amount of work.

Start with **either one** of the above statements, and show *clearly* how an engine that violates it can be used to create an engine that violates the other. (You only need to do it for one, not both.) [5]

- (b) Sketch the Carnot cycle in (i) the TS -plane, and in (ii) the PV -plane. In both diagrams, highlight the arms along which heat *enters* the system or *leaves* the system. In the TS -diagram, shade the area corresponding to the total heat transfer in the cycle. In the PV -diagram, shade the area corresponding to the total work done in the cycle. [5]