Visualizing Thermodynamic Processes with Diagrams

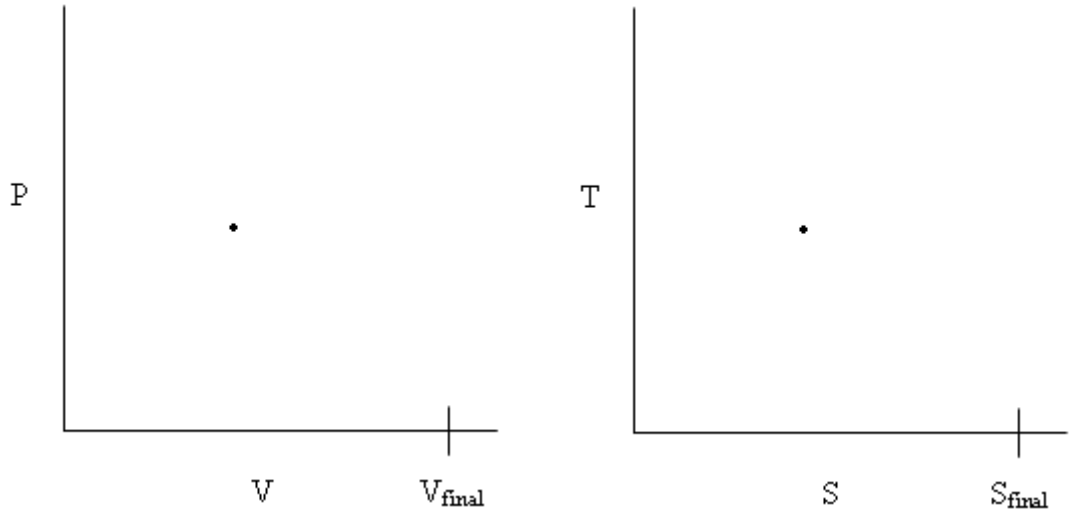
Names:

Orientation:
In this activity, your team will identify how a given process looks on a PV and TS diagram, and what the signs (+, -, or 0) are for each process as it relates to work, heat, and change in internal energy. Because it is impossible to memorize everything, engineers use general information to deduce/construct specific information. It is **critical** to understand how a process looks so you can develop and interpret cycle diagrams.

Learning Objectives:
1. Understand meaning of iso_____ words and how they relate to process paths on PV and TS diagrams.
2. Use diagrams and integral relationships to determine signs of work, heat, and change in internal energy.

Targeted Skills:
Diagramming – clarifying relationships through visual representation
Reasoning with theory – explaining data with accepted knowledge
Collaborating – working together for mutual benefit
Sharing knowledge – effectively presenting relevant facts and interpretations

1. You will use the dot as the starting point for each process – you are *not* drawing a cycle in this problem. Sketch the following processes on pressure-volume (P-V) and temperature entropy (T-S) diagrams. For processes that change in volume (V) or entropy (S), have each process end at V_{final} or S_{final}. Label the endpoint of each process with the appropriate letter. Assume ideal gas behavior.
    (a) isentropic expansion
    (b) isothermal expansion
    (c) isochoric heat addition
    (d) isobaric heat addition
    (e) reversible, adiabatic expansion



2. Which process paths are you most confident about? Why?

3. Which process paths are you least confident about? Why?

4. Give the sign (+, -, or 0) of the work, heat, and change in internal energy for each process. Assume ideal gas behavior. Hint: use integral relationships.

	W	Q	ΔU
(a) isentropic expansion			
(b) isothermal expansion			
(c) isochoric heat addition			
(d) isobaric heat addition			
(e) reversible, adiabatic expansion			

5. What are two foolproof tips for determining the sign of work, heat, and change in internal energy represented on PV and TS diagrams?