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Physics 2C, Winter 2020

Reading Assignment due Thursday 1/30: Submit via Gradescope by 11:30am

1. In any class on thermodynamics, you have to be careful with notation. Work W can either be defined to be the work done on a system (by the environment), or the work done by the system (on the environment). Which of these two conventions is your book using?

2. "Stop-to-think 19.4" on page 525. Answer the following questions / fill-in-the-blanks to arrive at the answer. Each answer should have some justificiation, like an equation.

   (a) The final point is at a higher temperature than the initial point because _____.

   (b) Because point f is at a higher temperature than point i, we know the change in internal energy $\Delta U = \Delta E_{\text{th}}$[1] is _____[2].

   (c) The work done by the gas on the environment (W_{by}), equal to the area under the graph from i to f, is _____ (+,−, or 0).

   (d) The work on the gas ($W = -W_{\text{by}}$) is therefore _____ (+,−, or 0).

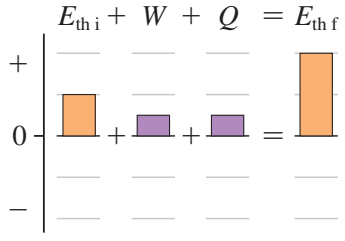
   (e) Looking at the first law of thermodynamics,

   $$\Delta U = W + Q,$$

   we can reason from teh previous results [(b) + (d)] that Q must be _____ (+, −, or 0) and bigger in magnitude than either W or ΔU.

   (f) Given all of the above, the answer to the textboook problem must be graph _____.

3. Take the following first-law bar chart and sketch a possible path (from initial state i to final state f) on a pV diagram. Explain why your path meets the requirements set by the bar graph.



For extra practice (not due): From Chapter 19 of Knight, 4th edition: Conceptual Questions: 2, 4, 7-10. Exercises: 1-11.

[1] "Internal energy" U is synonymous with "thermal energy," E_{th}. Therefore, you can write the 1st law of thermodynamics as $\Delta U = W + Q$.

[2] An important fact that your book alludes to but doesn't state explicitly until the bottom of page 532 (Sec. 19.7) is that internal energy is an increasing function of temperature alone: $U = U(T)$.