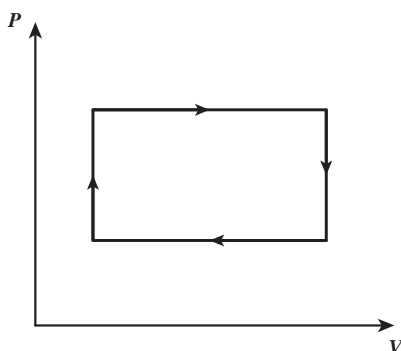


CHAPTER 9 PRACTICE QUESTIONS

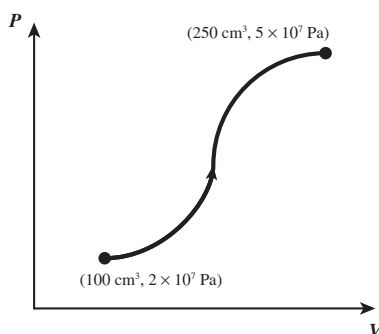
Directions: Complete the following problems as specified by each question, and then check your work using the solutions that follow. For extended, step-by-step solutions, access your Student Tools online.

1. Water has a specific heat of $4186 \text{ J/kg}\cdot\text{K}$. How much heat would it take to raise the temperature of 100 g of water from 25°C to 75°C ?
2. To change phase, a sample of a substance requires an amount of heat per unit mass known as the **latent heat** for that transformation. For evaporation, water has a latent heat of 2257 kJ/kg . How much heat is required to evaporate 30 g of water?
3. How much heat is required to completely evaporate 50 g of water at an initial temperature of 50°C ? Refer to the previous two problems for relevant constants.
4. If 3 mol of an atomic gas changes from a state $(0.1 \text{ m}^3, 1.0 \times 10^5 \text{ Pa})$ to $(0.2 \text{ m}^3, 3.0 \times 10^5 \text{ Pa})$ due to some arbitrary process, and absorbs 45 kJ of heat in the process, how much work is done? Is this an example of an engine?

5. Does the gas in the following cycle lose or gain heat?



6. What is the change in internal energy for a sample of molecular hydrogen undergoing the following process? Assume that the hydrogen atoms are connected rigidly.



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7. Two reservoirs are connected by a refrigerator, a hot reservoir at $T_H = 400\text{ K}$, and a cold reservoir at $T_C = 300\text{ K}$. If 30 kJ of heat is moved from the cold reservoir to the hot reservoir, what is the minimum amount of entropy the refrigerator must generate?
8. Your general manager wants to purchase an engine that connects a reservoir of 400 K to a reservoir of 100 K and has a proposed efficiency of 80% . Without knowing any specifics about the engine, would you recommend buying it? Why or why not?