Ch 19 - Heat and the First Law of Thermodynamics Part 2

PHYS-102

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Conceptual Questions

19. Explain in words why C_P is greater than C_V.

20. Explain why the temperature of a gas increases when it is adiabatically compressed.

Problems

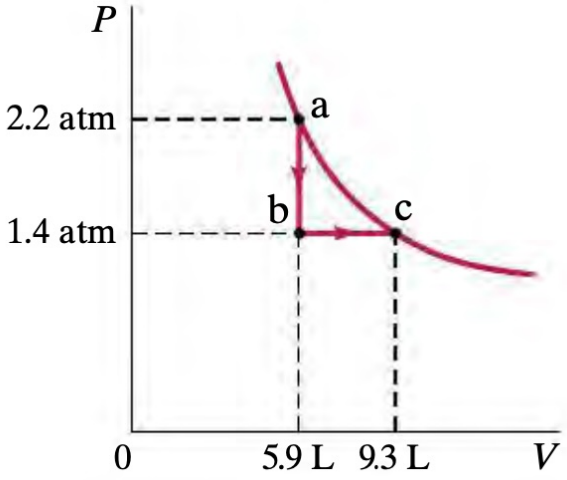
19-6 and 19-7 First Law of Thermodynamics

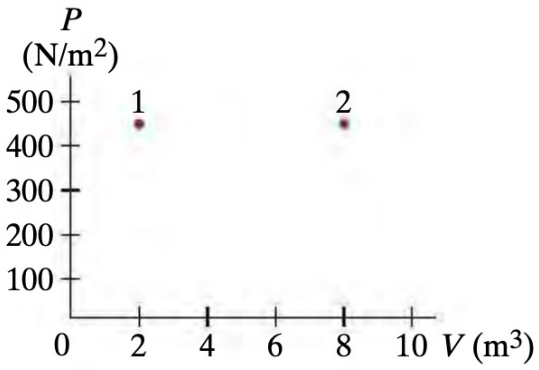
27. Sketch a PV diagram of the following process: 2.0 L of ideal gas at atmospheric pressure are cooled at constant pressure to a volume of 1.0 L, and then expanded isothermally back to 2.0 L, whereupon the pressure is increased at constant volume until the original pressure is reached.

28. A gas is enclosed in a cylinder fitted with a light frictionless piston and maintained at atmospheric pressure. When 1250 kcal of heat is added to the gas, the volume is observed to increase slowly from 12.0 m^3 to 18.2 m^3. Calculate (a) the work done by the gas and (b) the change in internal energy of the gas.

29. The pressure in an ideal gas is cut in half slowly, while being kept in a container with rigid walls. In the process, 365 kJ of heat left the gas. (a) How much work was done during this process? (b) What was the change in internal energy of the gas during this process?

31. Consider the following two-step process. Heat is allowed to flow out of an ideal gas at constant volume so that its pressure drops from 2.2 atm to 1.4 atm. Then the gas expands at constant pressure, from a volume of 5.9 L to 9.3L, where the temperature reaches its original value. See Fig. 19–30. Calculate (a) the total work done by the gas in the process, (b) the change in internal energy of the gas in the process, and (c) the total heat flow into or out of the gas.


P
2.2 atm
1.4 atm
a
b
c
0
5.9 L
9.3 L
V


P
(N/m2)
500
400
300
200
100
1
2
0
2
4
6
8
10
V (m3)