Reminders 11-28-07:
-Chapter 10 and 11 Quiz Today.
-Thermodynamics Conceptual Questions due 12/5
-Homework 11 Due 11/29
-Homework 12 Due 12/9
-Exam 4 12/10.

Objectives:
-Work and Energy
-PV Diagrams
-First Law of Thermodynamics

Aug 26-10:24 PM

Isobaric process

$\Delta U = -P\Delta V + Q$

$Q = \Delta U + P\Delta V$

$= \frac{3}{2} nR\Delta T + nR\Delta T$

$= \frac{5}{2} nR\Delta T = nC_p \Delta T$

molar heat capacity at constant pressure

$C_p = \frac{5}{2} R$ monatomic gas

$C_p = \frac{7}{2} R$ diatomic gas since $U = \frac{5}{2} nRT$

Isochoric

$W = 0$

$Q = \Delta U$

$Q = \frac{3}{2} nR\Delta T = nC_v \Delta T$

$C_v = \frac{3}{2} R$ molar heat capacity at constant volume

$C_v = \frac{5}{2} R$ for diatomic gas since $U = \frac{5}{2} nRT$!

Nov 28-1:17 PM

- A gas is compressed at a constant pressure of 3.00 atm such that its volume decreases by $5.0 \times 10^{-4} m^3$. During the process 420J of heat is given off to its surroundings. What is ΔU for this process?

$$\Delta U = Q + W$$

$$W = -P\Delta V$$

$$= -(3 \text{ atm})(101,300)(-5.0 \times 10^{-4})$$

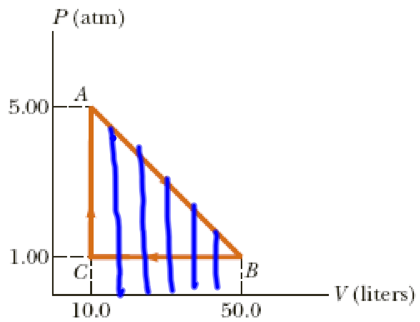
$$= 151.5 \text{ J}$$

$$\Delta U = -420 \text{ J} + 151.5 \text{ J}$$

$$= -268 \text{ J}$$

$$= -63 \text{ cal}$$

A substance undergoes the cyclic process shown in Figure P12.51. Work output occurs along path AB while work input is required along path BC, and no work is involved in the constant volume process CA. Energy transfers by heat occur during each process involved in the cycle.



(a) What is the work output during process AB?
12200 J
(b) How much work input is required during process BC?
4050 J
(c) What is the net energy input Q during this cycle?
8150 J

One mole of an ideal gas is taken through the cycle shown in Figure P12.58, with n = 7 and m = 6. At point A, the pressure, volume, and temperature are P0, V0, and T0. In terms of R and T0, find each of the following. (Hint: Recall that work equals the area under a PV curve.)

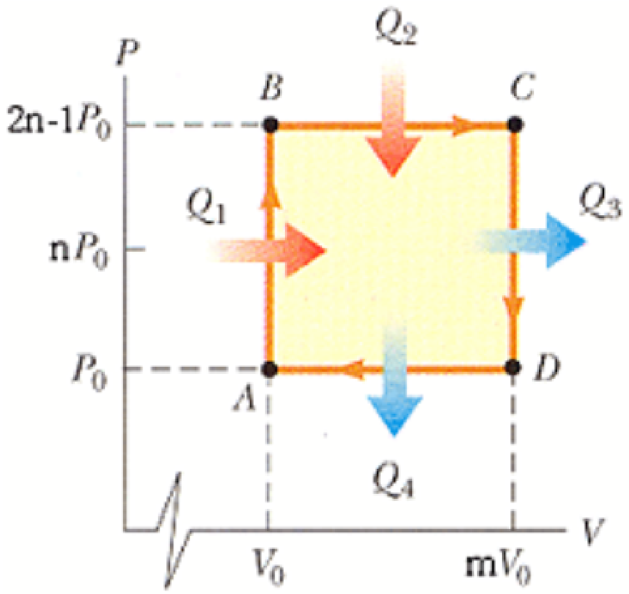


Figure P12.58

(a) the total energy entering the system by heat per cycle
180 RT0

(b) the total energy leaving the system by heat per cycle
120 RT0

(c) the efficiency of an engine operating in this cycle
33.2%

(d) the efficiency of an engine operating in a Carnot cycle between the temperature extremes for this process.
98.7%