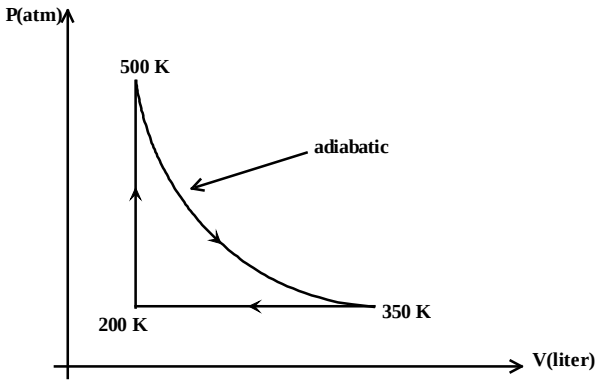
Chapter 21

1- An ideal engine, whose low-temperature reservoir is at 27 degrees Celsius, has an efficiency of 20%. By how much should the temperature of the high-temperature reservoir be increased to increase the efficiency to 50%? [225 K.]

2- An ideal monatomic gas is confined to a cylinder by a piston. The piston is slowly pushed in so that the gas temperature remains at 27 degree C. During the compression, 750 J of work is done on the gas. The change in the entropy of the gas is:[- 2.5 J/K.]

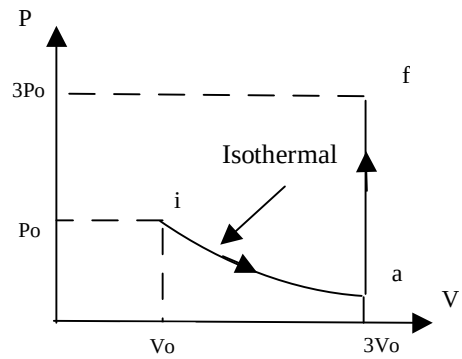
3- Five moles of an ideal monatomic gas are taken though the cycle shown in the Figure. Calculate the efficiency of the cycle. [0.17]



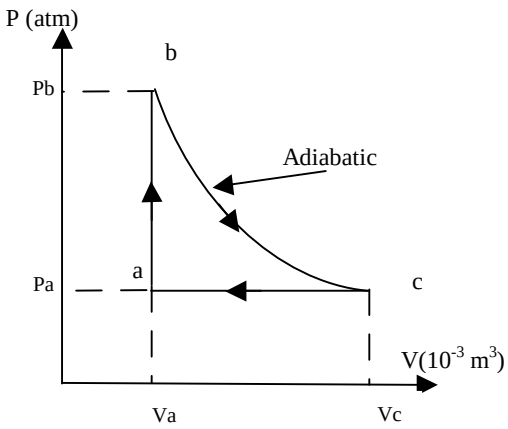
4- Five moles of an ideal gas undergo a reversible isothermal compression from volume V to volume V/2 at temperature 30 degrees C. What is the change in the entropy of the gas? [-29 J/K.]

5- An automobile engine operates with an overall efficiency of 20%. How many gallons of gasoline is wasted for each 10 gallons burned? [8]

6- One mole of a monatomic ideal gas is taken from an initial state (i) to a final state (f) as shown in figure. The curved line is an isotherm. Calculate the increase in entropy of the gas for this process. [36.5 J/K.]



7- One mole of a diatomic ideal gas is taken through the cycle shown in Figure. Process b-c is adiabatic, Pa = 0.3 atm, Pb = 3.0 atm, Vb = 1.0*10**(-3) m**3, and Vc = 4.0*Vb. What is the efficiency of the cycle? [53%.]



8- You mix two samples of water, A and B. Sample A is 100 g at 20 degree-C and sample B is also 100 g but at 80 degree-C. Calculate the change in the entropy of sample B.[- 8.9 cal/K]

9- What mass of water at 0 degrees-C can a freezer make into ice cubes in one hour, if the coefficient of performance of the refrigerator is 3.0 and the power input is 0.2 Kilowatt? [6.5 kg]

10- An ideal heat engine has a power output of 200 W. The engine operates between two reservoirs at 300 K and 600 K. How much energy is absorbed per hour? [1.44*10**6 J]