Tutorial 13

PHY-101

Q1. A Carnot engine whose low temperature reservoir is at 280 K has an efficiency of 40 %. It is desired to increase this to 50 %. By how many degrees must the temperature of the low temperature reservoir be decreased if that of the high temperature reservoir remains constant.

Q2. Calculate the increase in entropy when 50g ice at $-10^{o}C$ is converted to steam at $100^{o}C$ .Given that specific heat capacity of ice is 2090 $Jkg^{-1}K^{-1}$, specific heat capacity of water is 4180 $Jkg^{-1}K^{-1}$ and latent heat of steam is 2.26 x 10^{6} Jkg^{-1}.

Q3. A $1.5m^{3}$ of insulated rigid tank contains 2.7 kg of CO_2 at 100kPa. Paddle work is done on the system until the pressure rises to 150 kPa. What is the entropy change of CO_2 in this process. $Cv=0.657$ $KJKg^{-1}K^{-1}$

Q4. An innovative way of power generation involves the utilization of geothermal energy, the energy of hot water that exists naturally underground (hot springs), as the heat source. If a supply of hot water at 140°C is discovered at a location where the environmental temperature is 20°C, determine the maximum thermal efficiency a geothermal plant built at that location can have. If the power output of the plant is to be 5 MW, what is the minimum mass flow rate of hot water needed? $C_p=4.197Jkg^{-1}K^{-1}$