Problem set 15

1) Acetylene gas (C₂H₂) at 25°C is burned during a steady flow combustion process with 30% excess air at 27°C. It is observed that 75,000 kJ of heat is being lost from the combustion chamber to the surroundings per kmol of acetylene. Assuming combustion is complete, find the temperature of the product gases.

2) Liquid propane (C₃H₈) enters a combustion chamber at 25°C at a rate of 1.2 kg/min where it is mixed and burned with 150% excess air that enters the combustion chamber at 12°C. If the combustion is complete and the exit temperature of the combustion gases is 1200 K, determine a) The mass flow rate of the air b) The rate of heat transfer from the chamber.

3) An adiabatic constant-volume tank contains a mixture of 1 kmol of hydrogen (H₂) gas and the stoichiometric amount of air at 25°C and 1 atm. The contents of the tank are now ignited. Assuming complete combustion, determine the final temperature of the tank.