Exam 3 Review Sheet

Chemical Engineering 273

Chapters 7-9

Ch. 7 Energy Balances

1. Forms of Energy
   a. Internal, Potential, and Kinetic energy
   b. Heat and Work (Sign convention for both of these)
2. Closed system energy balance
   a. Significance of Δ
   b. Simplification of energy balance for closed systems
   c. Work term for closed systems (PV work)
3. Open system energy balance
   a. Significance of Δ
   b. Definition and use of enthalpy
   c. Shaft work
   d. Application to problems
4. Steam tables
   a. Saturated conditions
   b. Non-saturated conditions
5. Mechanical Energy Balance
   a. Bernoulli's equation

Ch. 8 Energy Balances (Non-Reactive Systems)

1. Enthalpy is a state function (path independent)
2. $\dot{Q} = \sum_{out} \dot{n}_i \hat{H}_i - \sum_{in} \dot{n}_i \hat{H}_i$
3. Inlet-Outlet Enthalpy Table
4. Heat Capacities
5. Phase Change (Heat of melting, vaporization)
6. Special cases (adiabatic, isobaric, isochoric, isentropic)
7. Psychrometric chart (Air-water at 1 atm)
   a. Definitions (wet bulb temperature, humid volume, absolute vs. relative humidity, dew point, etc.)
   b. Application to problems
8. Skipped -- Heats of Mixing

Ch. 9 Energy Balances (Reactive Systems)

1. Heat of Reaction, Heat of Formation, Heat of Combustion
2. Energy Balances
   a. Use ΔH_r method (follow path from reactants to products and ΔH_r at 25°C)
   b. Use $\hat{H}_i = \Delta H^o_{f,i} + \int_{25^oC}^{T} C_{p,i} dT$ and construct table of inlet and outlet enthalpies
3. Applications
   a. Combustion
   b. Adiabatic flame temperature

Ch. 11 Transient Material Balances

1. General balance equation
2. Applications to both overall mass/moles and/or species