Ch En 386: Section I review material

**Chapter 1:**

1. Know the nomenclature and terms. Know the batch, CSTR and PFR design equations and what each term represents.
2. Recognize units of ri (moles/vol/time, mol/kg/time, or mol/area/time) and how to write design equations based on units specified for k or ri.

**Chapter 2:**

1. If given conversion, obtain the reactor volume for a PFR or CSTR using plot of -1/rA vs XA.
2. If given volume, obtain the reactor conversion for a PFR or CSTR using plot of -1/rA vs XA.
3. Compare a CSTR and PFR and know which reactor is smaller to obtain a given conversion based on the plot of -1/rA vs XA.
4. Given a plot of -1/rA vs XA, decide which combination of steady state flow reactors you will use to minimize the volume while maximizing the overall conversion. Recognize that XA refers to the overall conversion when reactors are used in series.
5. Know the definition of space time for a CSTR or PFR.
6. Understand relationships between conversions of one reactant and another reactant.

**Chapter 3:**

1. Write rate laws for elementary reactions (single, multiple, and/or reversible reactions). Some rate laws are in terms of concentration or partial pressure. Recognize what form to use. (This is an L3 exam topic)
2. Obtain a rate constant value at different temperatures based on activation energy (E) and frequency factor (A) or a rate constant at another temperature.
3. Know how to obtain A or E from data.
4. Recognize the relationship between equilibrium constants and rate constants.
5. Know how to write rate laws, concentrations, flow rates (flow reactor), and moles (batch reactor) in terms of conversion—and identify the constraints when conversion can be used. Incorporate changing volume (batch) or changing volumetric flow rates (flow reactor) when appropriate.
6. A common mistake is to assume that, based on conversion of A, CA = CA0(1-XA). This is NOT true unless the reactor volume (for batch) or the inlet flow rate (for flow reactor) is constant. Another common mistake to avoid is when defining conversion for XA, use NA = NA0 – NA0XA, not NA = NA0-2NA0XA when 2A 🡪 B. Remember, the stoichiometric coefficient does not matter in the definition of conversion. (This is an L3 exam topic)
7. Use rate laws to make plots of -1/rA vs XA. Recognize the limitations of this graphical approach.
8. Identify maximum conversions and associated concentrations when equilibrium occurs.

**Chapter 7:**

1. Use pseudo steady state (pss) analysis to write rate laws in terms of non-pss species and rate constants. You will be told which species are at pss.
2. Use pss analysis to estimate concentrations of pss species in terms of the concentrations of non-pss species and rate constants.