A First Course on Kinetics and Reaction Engineering

Unit 17. Lesson Plan

Before Class

- Provide the redacted slides and the handouts to the students and tell them to bring them to class

During Class

- Introduce today's topic and where it fits in the course (Slides 1 and 2)
- Review of Unit 17 (5 to 10 minutes)
  - Slides 3 through 7: go over the key concepts on the slides
- Ask whether the students have any questions from their pre-class preparation and answer them
  - Slide 8
- Learning Activity 17.1 (~10 minutes) Divide the class into 4 to 6 equally sized groups; tell each group to send one member to the blackboard (divide the available blackboard space equally).
  - Slide 9: Put up the problem statement and then tell the groups to advise their scribe on what to write on the board. (Optionally, tell them that each group that gets the correct answer will receive bonus points or some other reward.) Watch and listen, answering questions if asked and optionally asking questions to put a group back on track if they have missed a concept. As the groups finish, have them check/correct other groups' results
  - Slide 10: Go through the mole balance for A, showing how the sums are expanded, etc. Remind them that reactants have negative stoichiometric coefficients. Do the same with the energy balance. Ask them what temperature the heats of reaction should be evaluated at (in this example they are constant), and explain that generally they need to substitute an expression for delta H as a function of T, as described in Unit 2.
- Learning Activity 17.2 (~15 minutes) This activity is analogous; it uses a steady state CSTR. Have them work individually or in groups of 2 on this problem to make sure they understand how to expand the sums, etc.
  - Slide 11: Circulate among them as they work, observing, answering questions, etc. When most appear to be done, proceed.
  - Slide 12: Go over the balances as was done for slide 10; emphasize the use of the overall fluid heat capacity in place of the individual molar heat capacities in the sensible heat term; ask if there are any questions or anyone who doesn't see how the results were obtained and explain.
- Learning Activity 17.3 (~15 minutes) Have them work in small groups on this
  - Slide 13: Put up the slide and give them ~ 5 minutes to jot down answers.
  - Slide 14: Then go through the items one by one asking what they think, getting a class consensus, and then explaining the answer. Then have them work for a few minutes to identify the terms that need to be added to the mole balance on A.

  - Slide 15: Ask them what terms needed to be added, then show them the result. Next ask them what terms need to be added to the energy balance and give them a few minutes to work
  - Slide 16: Ask them what terms they added, then show the result and explain differences/answer questions
- Slide 17: Put the material covered in this class into the overall context of the course.

After Class

- Provide the complete slides to the students.