University of Kentucky
Chemical & Materials Engineering Department

CME 550: Chemical Reactor Design
Homework 1

Due at *beginning* of class on Friday, September 2, 2005
Partial credit will be given in ½-point increments.

1) [1 pt] Levenspiel (OL) Chapter 1 problem 1.3 (p. 8)

2) [2 pt] In a catalytic flow reactor, CO and H_2 are converted to CH_3OH.

    a. If 1000 kg/h of CO is fed to the reactor, containing 1200 kg of catalyst, and 14% of the CO reacts, what is the rate of methanol production per gram of catalyst ($r'_{methanol}$)?

    b. If the catalyst has 55 m^2/g surface area, calculate the rate per m^2 of catalyst ($r''_{methanol}$).

3) [1 pt] OL problem 2.1 (p. 33)

4) [2 pt] The rate law for the reaction $C_2H_4Br_2 + 3\ KI \rightarrow C_2H_4 + 2\ KBr + KI_3$ in an inert solvent, which can be written as $A + 3B \rightarrow$ products, has been found to be $(-r_A) = k_A[A][B]$, with the rate constant $k_A = 1.34\ L\ mol^{-1}\ h^{-1}$ at 74.9 °C.

    a. What is the order of the reaction with respect to A, with respect to B, and overall?

    b. For the rate of disappearance of KI ($-r_B$), what is the rate constant k_B?

    c. At what rate is KI being used up when the concentrations are [A] = 0.022 and [B] = 0.22 mol / L?

5) [1 pt] OL 2.3

6) [1 pt] OL 2.9

7) [2 pt] OL 2.11