KSU – Chemical Engineering Department
ChE 320 (Chemical Reactor Engineering) – TUT #8
Name: **ID:** **SN:**

1. Consider the following simultaneous reactions:
   $A + B \rightarrow D \quad r_D = k_1 C_A^2 C_B$
   $A + B \rightarrow U \quad r_U = k_2 C_A C_B^2$

   a. What is the instantaneous selectivity $S_{D/U}$?

   b. Use three schematic drawings showing how you would run this system so that side reaction is minimum.

2.

Consider the following system of gas-phase reactions:

$$A \longrightarrow X \quad r_X = k_1 C_A^{1/2} \quad k_1 = 0.004(\text{mol/dm}^3)^{1/2} \cdot \text{min}^{-1}$$
$$A \longrightarrow B \quad r_B = k_2 C_A \quad k_2 = 0.3\ \text{min}^{-1}$$
$$A \longrightarrow Y \quad r_Y = k_3 C_A^2 \quad k_3 = 0.25\ \text{dm}^3/\text{mol} \cdot \text{min}$$

B is the desired product, and X and Y are foul pollutants that are expensive to get rid of. The specific reaction rates are at 27°C. The reaction system is to be operated at 27°C and 4 atm. Pure A enters the system at a volumetric flow rate of 10 dm^3/min.

(a) Sketch the instantaneous selectivities ($S_{B/X}, S_{B/Y}$, and $S_{B/XY} = r_B/(r_X + r_Y)$) as a function of the concentration of C_A.

(b) Consider a series of reactors. What should be the volume of the first reactor?