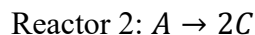
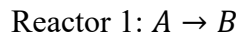


Name: \_\_\_\_\_

**Problem 1a: Residence time in a PFR (6 points)**

You have two PFR reactors with the following reactions:



Both are isothermal, isobaric, and irreversible gas-phase reactions. Assume that the rates of reaction for both are identical ( $-r_A = k_A C_A$ ) with the same value of the rate constants. Temperature and pressure are kept constant and identical in both reactors. The inlet molar flowrate of A ( $F_{A0}$ ) and the inlet volumetric flowrate ( $v_0$ ) are identical. Both reactors have the same total volume ( $V$ ). Only A is fed into both reactors.

**Will the outlet molar flowrate ( $F_A$ ) from reactor 1 be larger, equal, or smaller than that of reactor 2? Justify your answer in 1-2 sentences. Response without justification will not receive credit.**

*Hint: Recall that inside a PFR, the residence time can be expressed as  $\tau = \frac{V}{v_0}$  for constant volumetric flow rate and  $\tau = \int_0^V \frac{dV}{v}$  for varying volumetric flow rate.*