Q: The following complex gas-phase reactions

$$4A + 6B \longrightarrow 5C + 6D\ , -r_{1NO} = k_{1B}C_A C_B^{1.5}$$

$$2B \dashrightarrow C + E\ , r_{2C} = k_{2C}C_B^2$$

$$C + 2E \longrightarrow 2F\ , -r_{3E} = k_{3E}C_C C_E^2$$

and take place isothermally in a PBR. The feed is equimolar in A and B with F_{A0} = 10 mol/min and the volumetric flow rate is 100 dm^3/min. The catalyst weight is 100 kg, the pressure drop is $\alpha = 0.005\ kg^{-1}$, and the total entering concentration is C_{T0} = 0.2 mol/dm^3.volume). k_{1B}=100 , k_{2C}=1500 , and k_{3E}= 350. C and E are desired and other *products* are undesired.

$$\frac{dp}{dx} = -\frac{\alpha}{2p}\left(\frac{F_T}{F_{To}}\right)$$

a. What is the optimum catalyst weight?
b. What is the maximum overall yield?
c. Write the polymath code.

Q: Consider the following elementary and isothermal liquid-phase reactions:

$$A \rightleftarrows 2X + D\ , k_{1A}=4,\ K_{E1}=0.25$$

$$A \rightleftarrows B + U\ , k_{2A}=2.5,\ K_{E2}=1.2$$

$$2D + B \longrightarrow E\ , k_{3B}=10$$

Take place in a batch reactor. C_{Ao}=0.1 mol/dm^3

(a) Estimate the optimum reaction time if B is a desired product and other products are undesired products.

(b) Do you think adding 0.05 mol /dm^3 of both C_{Xo} and C_{Do} will affect the selectivity value and the required time of reaction (answer by comparing results before and after the change)

All equilibrium and rate constants are estimated at mole, dm^3, and hour units. Assume the final value time in polymath solution is 10 hours.

<u>Note (how to answer)</u>

- Write the Polymath solution-branch (a) (10Marks), and
- Write the required answers (30 Marks-10 for (a) and 20 for (b)).

Q: Two gas-phase reactions are occurring in a plug-flow reactor, which is operated isothermally at a temperature of 440°F and a pressure of 5 atm.

$$A \longrightarrow B\,, \qquad -r_A = k_1 C_A\,, \quad k_1 = 10\ \text{h}^{-1}$$

$$C \longrightarrow D + E, \qquad -r_C = k_2\,, \quad k_2 = 0.03\ \text{Ibmol ft}^{-3}.\ \text{h}^{-1}$$

The feed, which is equimolar in A and C, enters at a flow rate of 10 lbmol/h. What reactor volume is required for a 50% conversion of A to B? R=0.73 ft^3·atm/°R·lbmol