SSA = ?

Assume: steady state? fresh adsorbent

$$V_{L}(C_{0}-C) = W_{0}OO$$

$$V_{L}(C_{0}-C) = \frac{1}{3\times10^{-4}} \frac{38}{98} \left(60 \frac{m}{2} - 7 \frac{m}{2}\right)$$

$$SSA = \frac{8}{7} = \frac{1.7 \times 10^{7} \frac{m}{98}}{7 \frac{m}{2}}$$

$$SSA = 21428. \text{ le } m^{2}/98$$

3 a) Batch reactiv MB:

> change in total adsorbate mass in system from Badsorphian from D tr t

change in adsorbed change in dissolved 2 adsorbate mass adsorbatt mass

Assume: stoady slate

D = V<sub>L</sub> (C<sub>1n+1</sub> - C<sub>fin</sub>) + W (g<sub>1n+1</sub> - G<sub>fin</sub>)
$$\frac{W}{V_L} = -\frac{C_{1n+1} - C_{fin}}{g_{1n+1} - g_{fin}}$$

Assume: fresh advortent (
$$g_{ini} = 0$$
)
$$\frac{W}{V_L} = -\frac{C_{mi}t - C_{fin}}{-kC_{fin}}$$

$$k = \frac{V_L}{W} \left(\frac{C_{ini}t - C_{fin}}{C_{fin}}\right) = \frac{1}{2!.59^{A}} \left(\frac{0.8 \text{ mmol}}{L} - 0.01 \text{ mmol}}{0.01 \text{ mmol}}\right)$$

$$k = 0.419 \frac{L}{9^{A}}$$

$$V_{L} \frac{dC}{dt} + W \frac{dg}{dt} = Q(C_{in} - C_{out}) + X(g_{in} - g_{out})$$

$$X = \frac{-Q(C_{in} - C_{out})}{(g_{in} - g_{out})}$$

prsvme? steady state Qin= Qout Xin= Xout

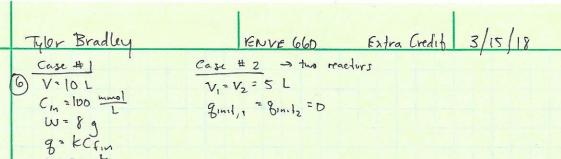
When is fresh advorbent entering rystim: 
$$g_{in}(0) = 0.01 = \frac{Q(C_{in} - C_{out})}{X} = \frac{1}{hr} \left(0.1 = \frac{m_{mol}}{L} - 0.01 = 0.0227 =$$

Let & Bout & Cout - Break & Exect = D

$$k = -\frac{But}{(gout Cout - gray Cout)} = \frac{0.0225 \frac{mmol}{5B}}{(D.0225 \frac{mmol}{5B})(D.01 \frac{mmol}{L}) - (0.6 \frac{mmol}{1B})(0.01 \frac{mmol}{L})}$$

## Pass # 2

$$\frac{V_{L}C_{In}+\omega_{q_{In}}}{V_{L}+\omega_{K}}=C_{fin}=\frac{(10L)(100\frac{m_{mol}}{L})+(8g)(83.25\frac{m_{mol}}{3})}{(10L)+(8g)(2.5\frac{L}{3})}$$



K=2.+ -

Case # 1 Asome steady state
$$D = V_L \left( C_{1n} - C_{fest} \right) + W \left( \frac{1}{2} \frac{1}{n!} - K_{fin} \right)$$

$$C_{fin} = \frac{V(C_{1n})}{V_L + Wk} = \frac{(10L)(100 \frac{mmol}{L})}{(10L)!(kg)(2.5\frac{L}{5})} = 33.3 \frac{mmol}{L}$$

$$\frac{4an^{\frac{1}{2} \pm 2}}{0 = V_{L}(C_{1n} - C_{f,in})^{\frac{1}{2}} + W(\frac{1}{2})^{\frac{1}{2}} - \frac{1}{2}} = V_{L}(\frac{V_{L}C_{in,1}}{V_{L} + wk} + C_{f,in})^{\frac{1}{2}} + \frac{1}{2} C_{f,in}^{\frac{1}{2}} + V_{L}(C_{f,in})^{\frac{1}{2}} + \frac{1}{2} C_{f,in}^{\frac{1}{2}} + \frac{1}$$

$$SSA_{clay} = 360 \frac{m^2}{5}$$

$$SSA_z = 50^{m^2/9}$$

$$g = \Gamma(SSA) = \left(S \frac{mg}{m^2} \times 350 \frac{m^2}{g}\right) = 1750 \frac{mg}{g}$$

second mixture

$$g = \prod (SSN) = \left(5 \frac{mg}{m^2}\right) \left(5 \frac{m^2}{9}\right) = 25 \frac{mg}{9}$$

Lo SSA and grown are directly proportional

&) Quiz question!

A waste stream containing 120 mg/L of contaminant A so flows into a reactor that behaves as a CFSTR. If regulatory standards require effluent concentrations of contaminant A to be to less than 25 mg/L, determine if the reactor will meet regulatory requirements. Assume adsorption follows a linear isotherm where k= 2 mg. volume of the reactor is 15 1/min and 12 g/min adsorbent is used.

## solution:

Cin = 120 mg/L Cout = 200000.? Q= 15 /min X=12 9/min 8= KCout

K-2 9

Assume sheady state and 
$$g_{init}=0$$

$$V \frac{dC}{dt} + U \frac{dg}{dt} = Q(C_{in}-C_{out}) + X(g_{in}^{p}-g_{out})$$

$$O = QC_{in} - QC_{out} - XkC_{out}$$

$$Cout = \frac{QC_{in}}{(Q+Xk)}$$

$$= \frac{(15\frac{L}{min})(120 \frac{mg}{k})}{(15\frac{L}{min})+(12\frac{g}{min})(2\frac{g}{gg})}$$

Cous = 46 mg/L 46 > 25 -> not in regulatory compliance.