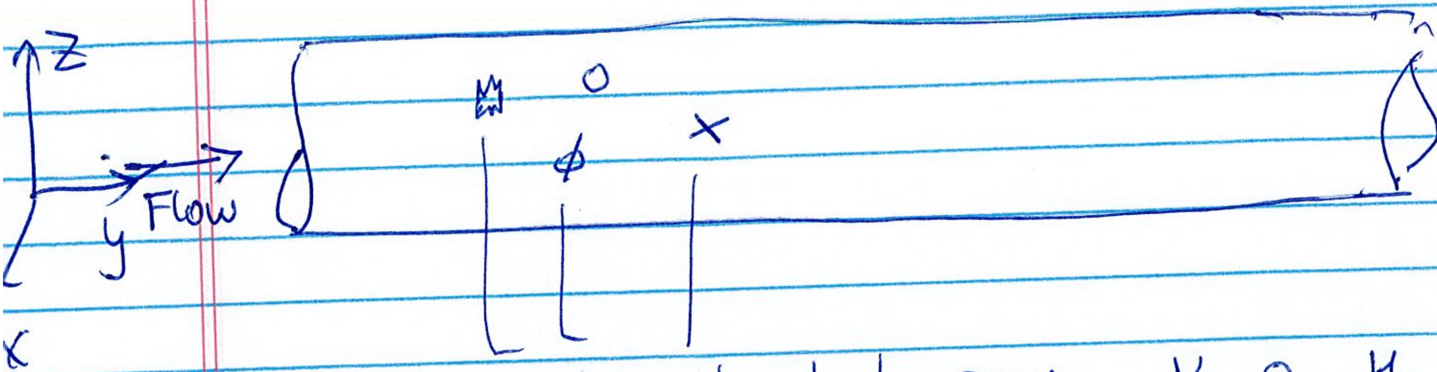
NOTES OF LECTURE 4-3-2018

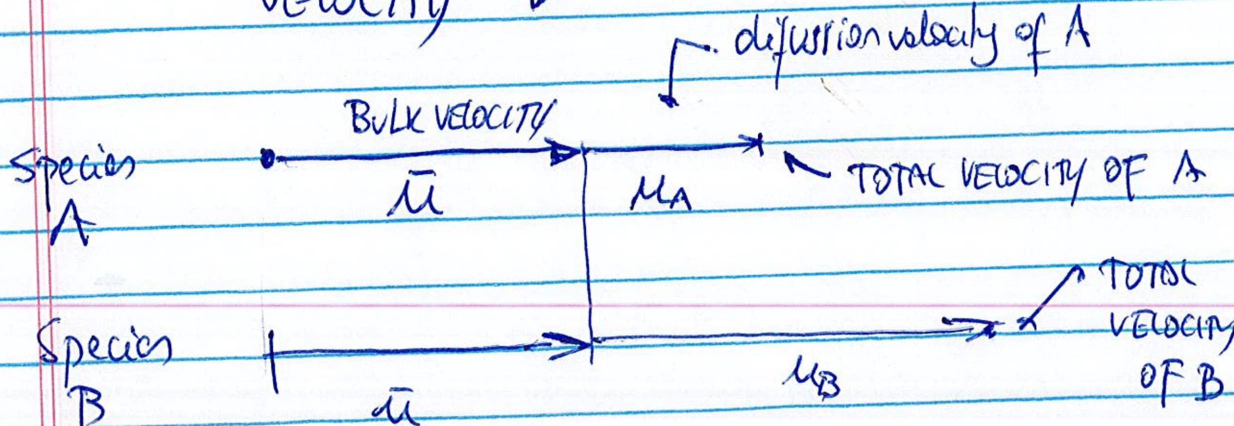


different molecular species. N_2, O_2, H_2, Na

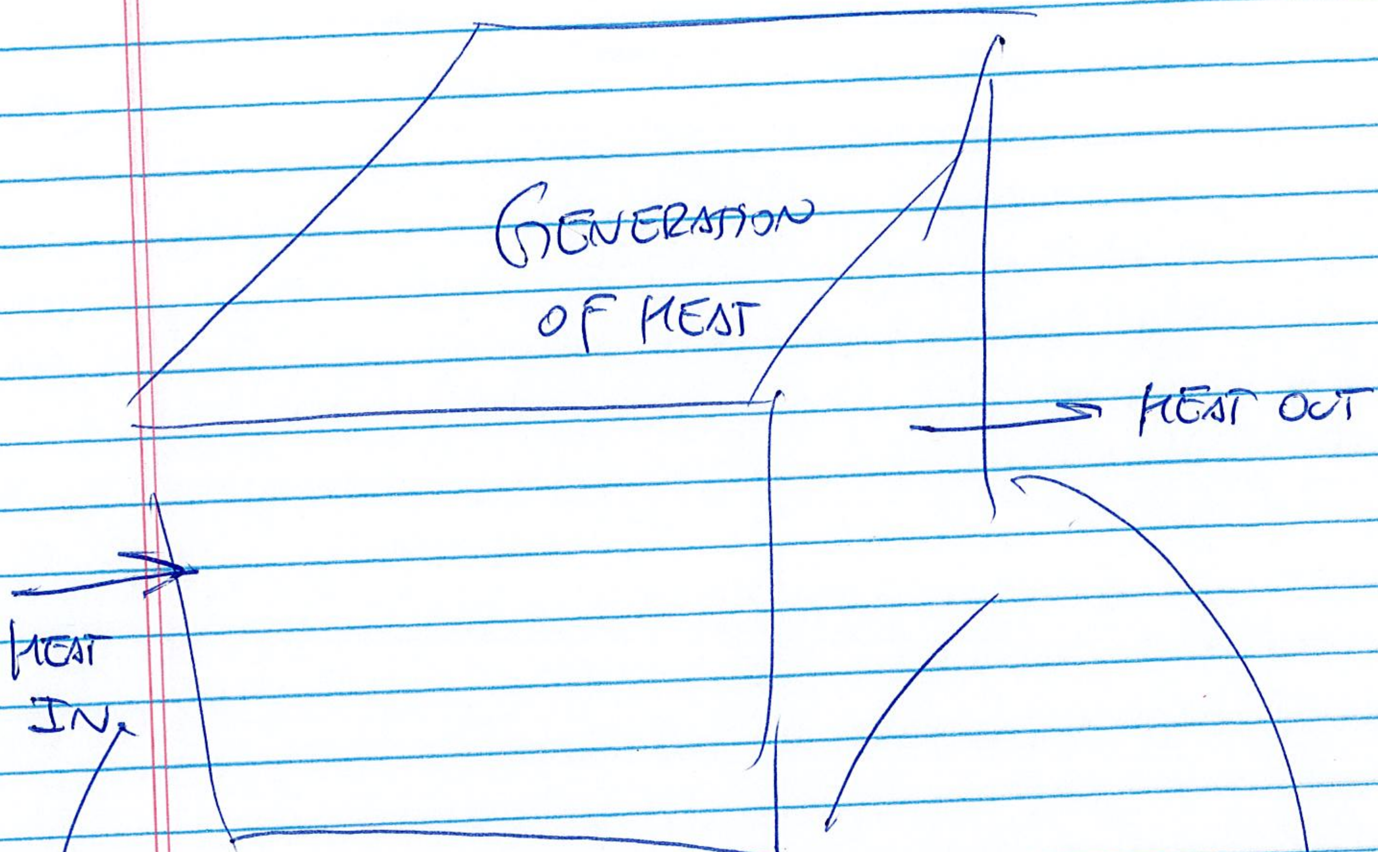
DIFFUSION is MOBILITY [velocity of the molecular species]

1) look the velocities of the molecular species using a fixed coordinate system. [NO PRACTICAL]

2) Define a reference that moves with a BULK VELOCITY ✓ AND THE ~~VEL~~ MOBILITY [DIFFUSION] of EACH SPECIES IS MEASURED RESPECT TO THE BULK VELOCITY ✓



How do we use Eqs in slides 9 (LECTURE 9) (2)

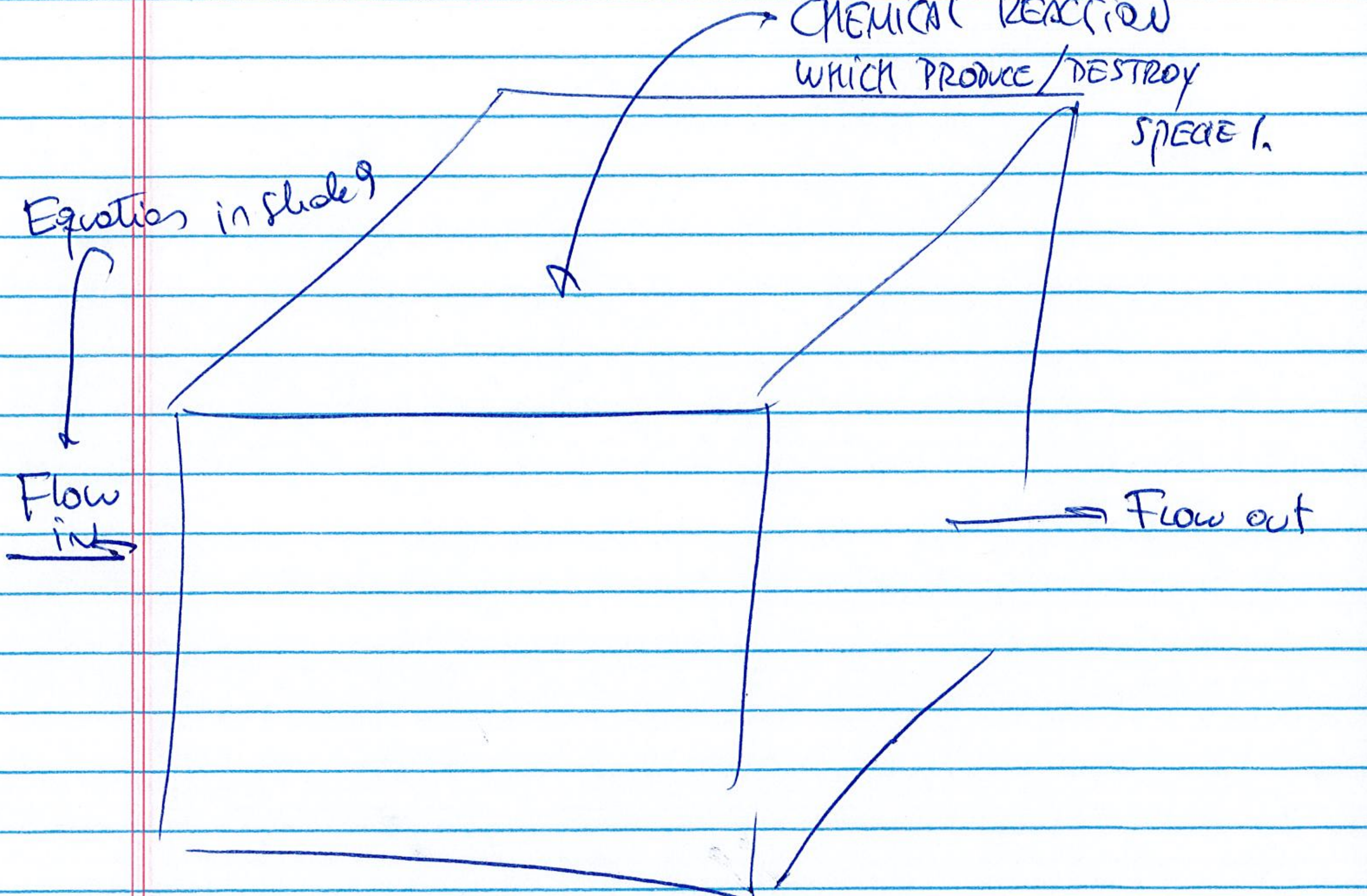


HEAT IN − HEAT OUT + GENERATION = ACCUMULATION

$$-k\frac{dT}{dx}\Big|_{inlet} + \rho C\,[T_{inlet} - T_{ref}]\cdot u_{inlet}$$

$$-k\frac{dT}{dx}\Big|_{out} + \rho C\,[T_{outlet} - T_{ref}]\cdot u_{outlet}$$

For a mass Balance



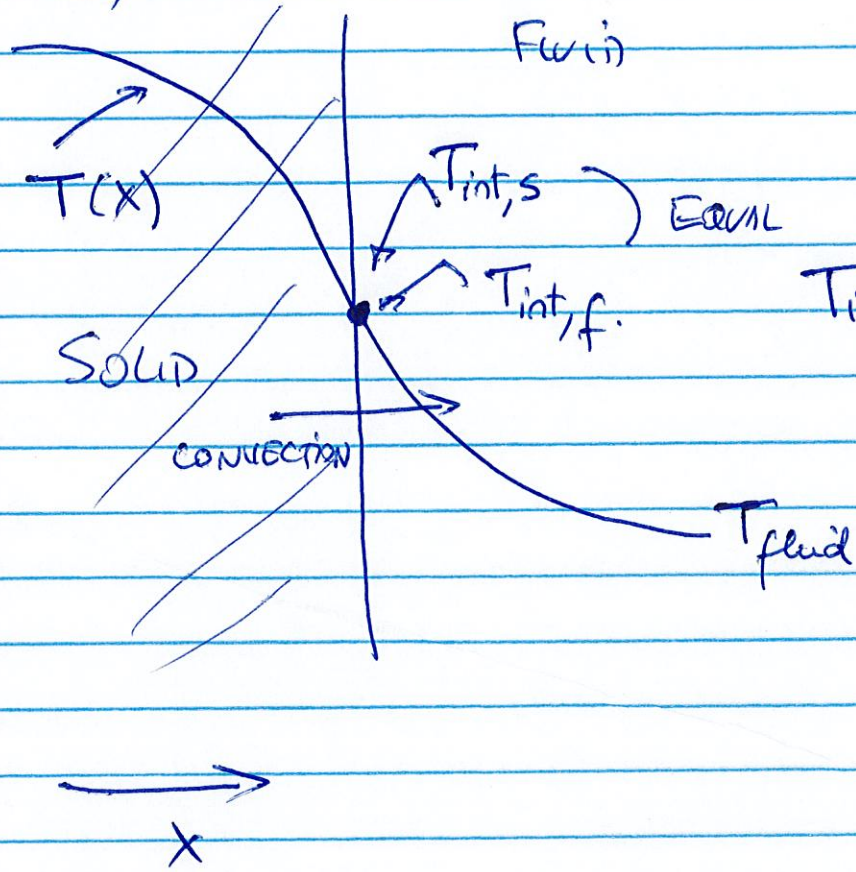
MASS FLOW IN − MASS FLOW OUT + REACTION = ACCUMULATION

It has to be written for each species.

in slide 9 we wrote for species A

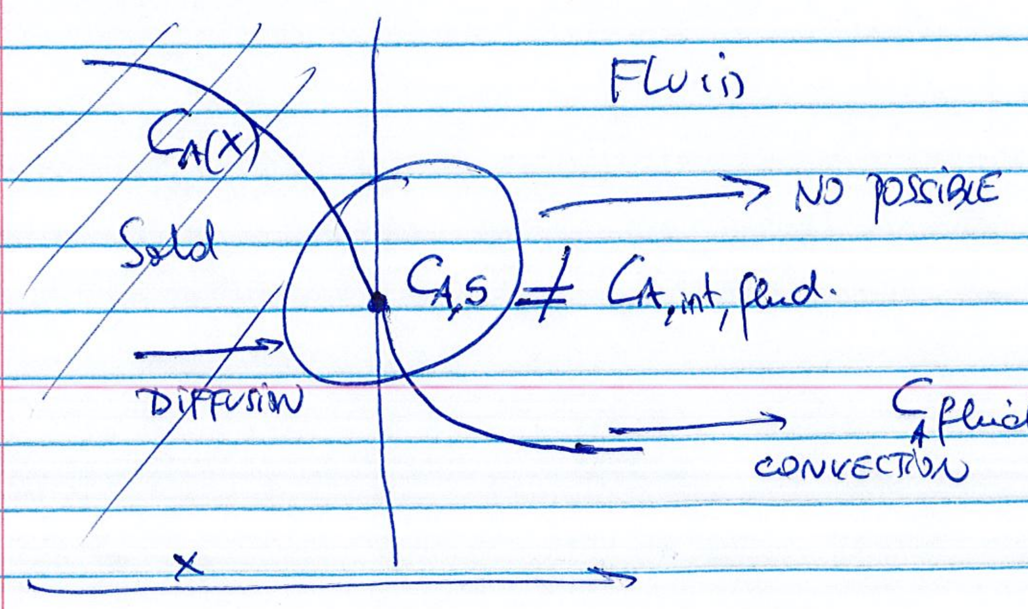
DIFFERENCES BETWEEN "ENERGY EQUATION" AND "MASS TRANSFER EQUATION"

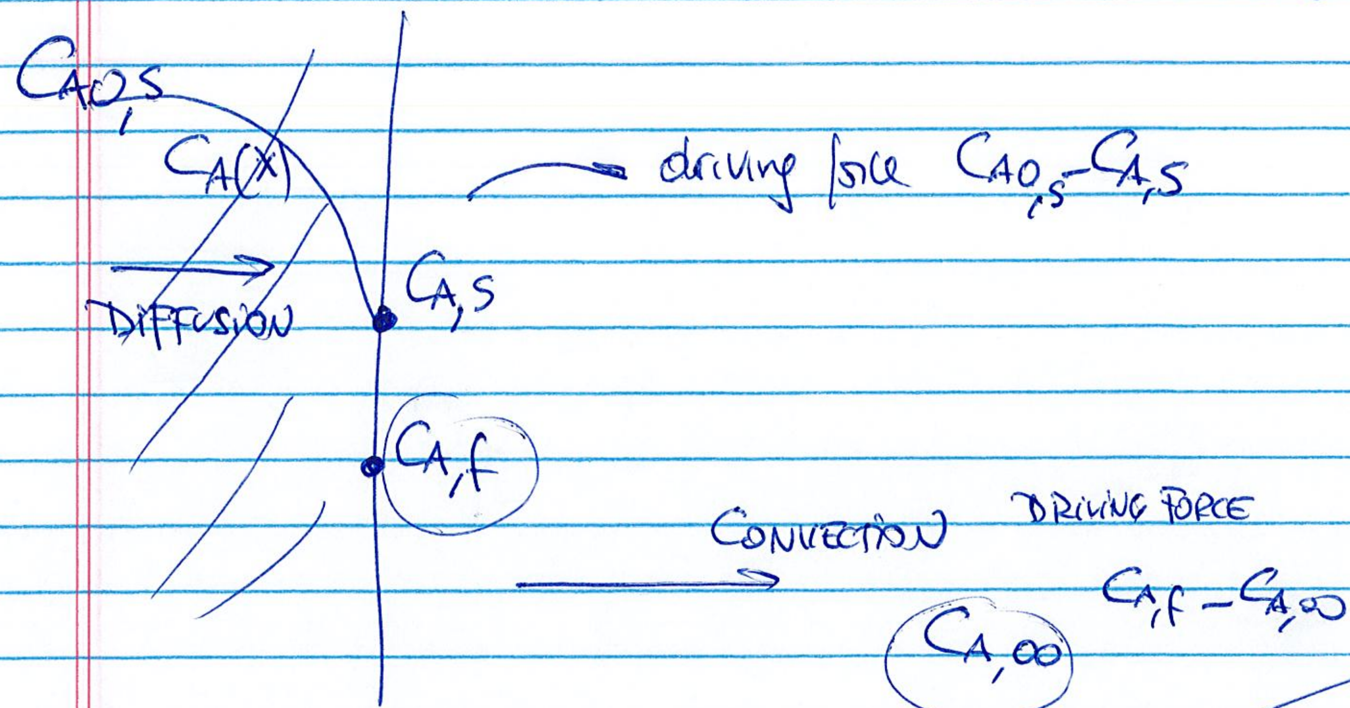
ENERGY EQUATION



$T_{int,s} \equiv T_{int,f.}$

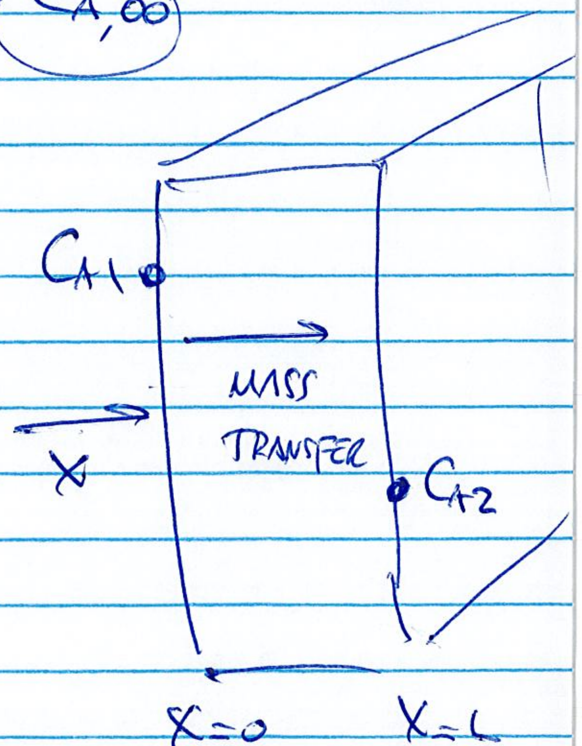
MASS EQUATION





MASS BALANCE WITH ALL ASSUMPTIONS $\rightarrow$

$$\begin{cases} \dfrac{d^2 C_A}{dX^2} = 0 \\ C_A(X=0) = C_{A1} \\ C_A(X=L) = C_{A2} \end{cases}$$



integrating once $\dfrac{dC_A}{dX} = C_1$

Integrating twice $C_A(x) = C_1 X + C_2$ General Solution

We estimate C_1 & C_2 with BC

For steady state

$$N_{A,x} = D_{AB} A \frac{C_{A1} - C_{A2}}{L} = \frac{C_{A1} - C_{A2}}{\left[\frac{L}{D_{AB} A}\right]}$$

~~Rest~~ Resistance to Mass transfer.

$$N_{A,x} = \frac{\overbrace{C_{A1} - C_{A2}}^{\text{DRIVING FORCE}}}{\underbrace{\frac{L}{D_{AB} A}}_{\text{Resistance to mass transfer.}}}$$

"CURRENT"
MASS FLOW RATE
or MOL FLOW RATE

$$q = \frac{T_1 - T_2}{\frac{L}{KA}}$$

$T_1 - T_2$ → driving force

$\frac{L}{KA}$ } Resistance to heat transfer

"Current"
ENERGY FLOW

$$I = \frac{V_1 - V_2}{R}$$