{ 4 MCQs 20%
  2 AQs 79%

1 Bonus Q 5% (extra)

* unit conv.
  conv. factor → Formula sheet ch. 2
  ↳ dimensional homogeneity

old unit (—)(—)...(—) = new unit
dim. eqn.

* Process Variables
  — extensive ; mass, vol., ...
  intensive ; density, T
  ↳ extensive / amount (mass or mol) = specific prop.

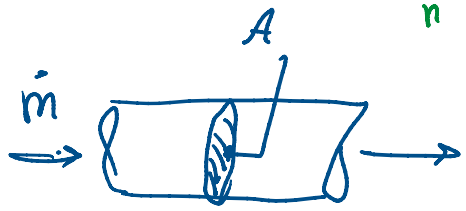
$\frac{V}{m} = \hat{V}$ specific vol.

$\frac{V}{n} = \bar{V}$ specific molar vol.

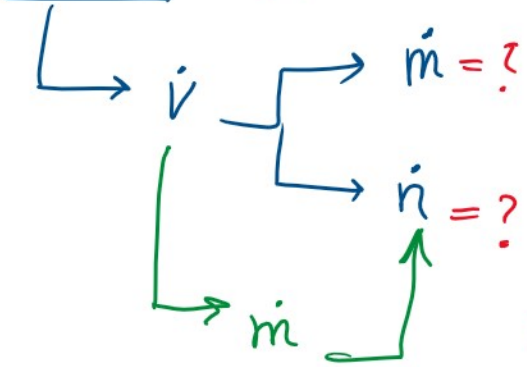
↳ flow rates
$\dot{m}, \dot{n}, \dot{V}$

↳ Flux = Rate / X-area

$\ddot{m} = \frac{\dot{m}}{A}$



⊛ How to measure/find flow rate?



$\Rightarrow$ density ; $S.G. = \frac{\rho}{\rho_{REF}}$

$\dot{n} = \frac{\dot{m}}{M}$ → ? (for mixtures)

$\bar{M} = \sum y_i M_i$; $\bar{M} = \frac{1}{\sum \frac{\omega_i}{M_i}}$

⊛ How to quantify relative amount of diff. comp. in a mixture?

CONC. ...

- mol. frac.
- weight frac.
- molarity
- ppm, ppb

⊛ Pressure
- absolute
- gauge : any pressure measured against atm press.

$P_g = P_a - P_{atm}$

⊛ Temperature
- regular scale ; °C, °F
- absolute scale ; K, R

↳ absolute scale: K, R

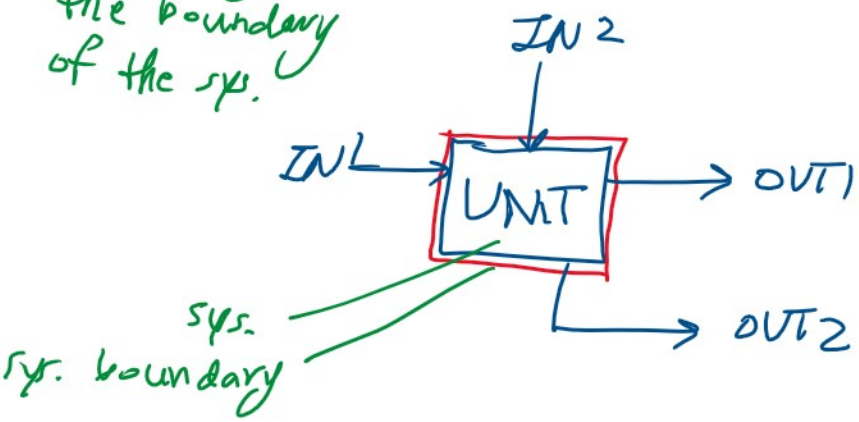
OR ΔT

CHAPTER 4 : M-bal.

$$IN + GEN - OUT - CONS = ACC$$

Crossing the boundary of the sys.

within the sys.



* Process types

based on time-charact.

based on stream config

- st. st
- transient (un st. st.)
- continuous
  - st. st.
    - Acc = 0
  - transient
- batch
- semi-batch

by nature, they are always transient

Acc = 0 ⟸

are always transient

Acc ≠ 0 ⟸

⊛ KEY to Success.

List assumptions
chose a basis of calc.
draw a fully labeled flowchart
D.F
Solve, verify

n_{df} = # of unknowns − # of indep. eqn.s

M_bal.
phys. constraints
given spec.
- Physical law

apply this directly on the flowchart

e.g. ~~$\sum_i y_i$ or $\sum_i w = 1$~~ ← phys. constraints