

Q1)

GIVEN

closed, rigid cylinder

>> diff. vols of "saturated"  $H_2O(l)$  and  $H_2O(g)$ >>  $T = 150^\circ C$ >> heights of cylinder,  $h_{cyl} = 50$  (assume cm)

\* saturated liquid = 20 cm

\* saturated vapor = 30 cm (20 ~ 50)

FINDquality of mixture,  $x$ , in %ASSUMP

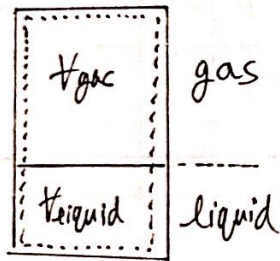
- closed sys.
- saturated states
- able to use SLTM
- Area is arbitrary

EQN

$$\frac{dm}{dt}|_{sys} = \dot{m}_{in} - \dot{m}_{out} = 0$$

$$x = \frac{m_{vapor}}{m_{liquid} + m_{vapor}}$$

$$V = Ah \text{ (Area} \times \text{height)}$$

FFDSOLNfrom SLTM @  $T = 150^\circ C$ 

$$v_f = 0.0010905 \text{ m}^3/\text{kg}, \quad v_g = 0.39245 \text{ m}^3/\text{kg}$$

if cross-sectional Area of cylinder is  $A \text{ m}^2$ 

$$\left. \begin{aligned} V_{gas} &= A \times (0.300 \text{ m}) = 0.300A \text{ m}^3 \\ V_{liquid} &= A \times (0.200 \text{ m}) = 0.200A \text{ m}^3 \end{aligned} \right\} \text{ since } m_{vapor} = \frac{V_{gas}}{v_g} = \frac{0.300A}{0.39245} \text{ kg}$$

$$m_{liquid} = \frac{V_{liquid}}{v_f} = \frac{0.200A}{0.0010905} \text{ kg}$$

$$x = \frac{\frac{0.300A}{0.39245} \text{ kg} \times 100}{\frac{0.200A}{0.0010905} + \frac{0.300A}{0.39245} \text{ kg}} \approx \frac{0.7644 \times 100}{0.7644 + 183.4021} \approx 0.4151\%$$

$$x = 0.415\%$$