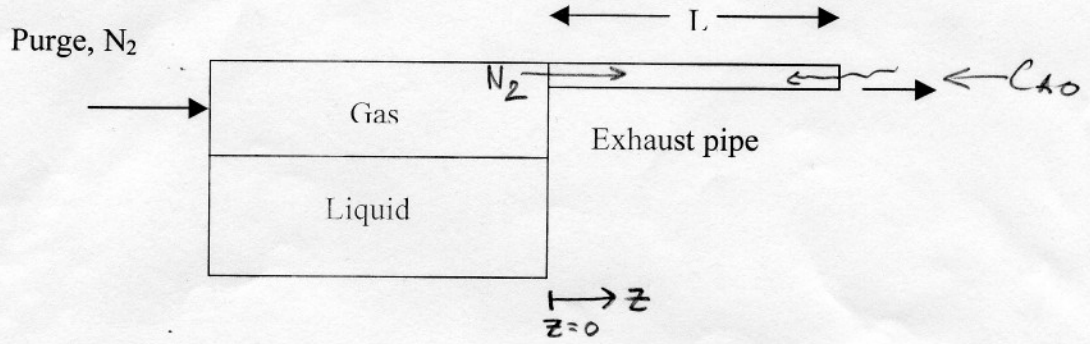
Name (Print) Solutions. ID No. _____

Signature _____

ChE 150B October 4, 2004

Midterm Examination I
(Closed Book but one page of notes)
Answer all questions in the space provided after each question

1. (30 pts.) A chemical reaction is being carried out in a vessel as shown below. Since the catalyst used to promote the reaction is very sensitive to moisture, the vessel is purged with a flow of pure N_2. To avoid ruining the catalyst the concentration of water vapor must be held below a specified level, $C_{A,\,min}$. The water vapor concentration in the air is C_{A0}



a. Define the flux of water vapor in the tube leaving the reactor and specify its magnitude. Does the flux change along the length of the tube leading from the reactor to the atmosphere? Why or why not?

$$N_{Az} = -D_{AB}\frac{dC_A}{dz} + CV_z \qquad N_{Az}|_{z=0} = -D_{AB}\frac{dC_A}{dz}\Big|_{z=0} + C_A V_z|_{z=0}$$

$$\vec{\nabla}\cdot\vec{N}_A + \frac{\partial C_A}{\partial t} - R_A = 0$$

$\frac{\partial C_A}{\partial t}$: s.s; R_A: no rxn in pipe

$$\frac{dN_{Az}}{dz} = 0 \quad (z\text{-dir MT only})$$

the flux is constant along the length of pipe since we are at steady-state & there is no rxn. in the control volume