Quiz # 1
Solution

$T = 300\ K$, $P = 100\ kPa$, $R = 8.314\ \frac{m^3 \cdot Pa}{mol \cdot K}$

Assume ideal gas behavior:

$PV = nRT$, $C = \frac{n}{V} = \frac{P}{RT}$, $\rho = \frac{P\bar{M}}{RT}$

$C_{N_2} = y_{N_2} C$, $C_{CO_2} = y_{CO_2} C$, $\rho_{N_2} = \omega_{N_2} \rho$, $\rho_{CO_2} = \omega_{CO_2} \rho$

1) Mass Fraction : Basis 1 mole of the gas mixture :

Comp	M_i (g/mol)	y_i	n_i	$m_i = n_i M_i$	$\omega_i = \frac{m_i}{m}$
N_2	28	0.5	0.5	14	0.3889
CO_2	44	0.5	0.5	22	0.6111
				36 = m	1.0000

$\bar{M} = \frac{m}{1} = 36\ g/mol$

2) $C = \frac{P}{RT} = 1062\ \frac{mol}{m^3}$

$\rho = C\bar{M} = 38{,}232\ g/m^3$

3) $C_{N_2} = y_{N_2} C = 531\ mol/m^3$

$C_{CO_2} = y_{CO_2} C = 531\ mol/m^3$

$\rho_{N_2} = \omega_{N_2} \rho = 14{,}868\ g/m^3$

$\rho_{CO_2} = \omega_{CO_2} \rho = 23{,}364\ g/m^3$