7) $2CH_3OH + 3O_2 \rightarrow 2CO_2 + 4H_2O$

$$50.0\text{ mL} \left|\frac{0.850\text{ g}}{1\text{ mL}}\right| \left|\frac{1\text{ mol}}{32.04\text{ g}}\right| = \frac{1.33\text{ mol } CH_3OH}{2}$$

$PV = nRT$

$(2.00\text{ atm})(22.8\text{ L}) = x\left(0.082\frac{\text{atm}\cdot\text{L}}{\text{mol}\cdot\text{K}}\right)(300\text{ K})$

$x = \frac{1.85\text{ mol } O_2}{3}$ ← limits

$$1.85\text{ mol } O_2 \left|\frac{4\text{ mol } H_2O}{3\text{ mol } O_2}\right| = 2.47\text{ mol } H_2O$$

8) $2CH_4 + 2NH_3 + 3O_2 \rightarrow 2HCN + 6H_2O$

- constant T and P
- volume directly prop. to moles
- balanced equation is mole & volume ratio

CH_4 $\frac{20.0\text{ L}}{2}$ NH_3 $\frac{20.0\text{ L}}{2}$ O_2 $\frac{20.0\text{ L}}{3}$ limit

$$20.0\text{ L } O_2 \left|\frac{2\text{ L } HCN}{3\text{ L } O_2}\right| = 13.3\text{ L } HCN$$

75) $MM = \frac{dRT}{P}$

$MM = \frac{(3.164\ g/L)(0.0821\ \frac{atm \cdot L}{mol \cdot K})(273.2K)}{1.000\ atm}$

$= 70.98\ g/mol$

gas is diatomic $\frac{70.98}{2} = 35.47$: Cl_2

77) $MM = \frac{dRT}{P}$

$352.0\ g/mol = \frac{x\ (62.4\ \frac{torr \cdot L}{mol \cdot K})(333K)}{745\ torr}$

$x = 12.6\ g/L$

79) CO_2 $\quad PV = nRT$

$$x(4.0\,L) = \left(7.8\,g \frac{1\,mol}{44.01\,g}\right)\left(0.0821 \frac{atm \cdot L}{mol \cdot K}\right)(300\,K)$$

$$x = 1.1\ atm = P_{CO_2}$$

$$P_{tot} = P_{CO_2} + P_{air}$$

$$P_{tot} = 1.1\ atm + \left(740\,torr \frac{1\,atm}{760\,torr}\right)$$

$$= 1.1\ atm + 0.97\,atm = 2.1\,atm$$

81) H_2: $\quad 475\,torr \dfrac{2.00\,L}{3.00\,L} = 317\,torr$

N_2: $\quad 0.200\,atm \dfrac{1.00\,L}{3.00\,L} = 0.0667\,atm$

$$0.0667\,atm \frac{760\,torr}{1\,atm} = 50.7\,torr$$

$$P_{tot} = P_{H_2} + P_{N_2}$$

$$317 + 50.7 = 368\,torr$$