83) He: $200.\ \text{torr} \times \frac{1.00\ \text{L}}{4.00\ \text{L}} = 50.0\ \text{torr}$

Ne: $0.400\ \text{atm} \times \frac{1.00\ \text{L}}{4.00\ \text{L}} = 0.100\ \text{atm}$

$0.100\ \text{atm} \times \frac{760\ \text{torr}}{1\ \text{atm}} = 76.0\ \text{torr}$

Ar: $24.0\ \text{kPa} \times \frac{2.00\ \text{L}}{4.00\ \text{L}} = 12.0\ \text{kPa}$

$12.0\ \text{kPa} \times \frac{760\ \text{torr}}{101.3\ \text{kPa}} = 90.0\ \text{torr}$

$P_{tot} = 50.0 + 76.0 + 90.0 = 216.0\ \text{torr}$

83) a) $\chi_{CH_4} = \frac{P_{CH_4}}{P_{tot}} = \frac{0.175}{0.175 + 0.250} = 0.412$

$\chi_{O_2} = 1.000 - 0.412 = 0.588$

b) $PV = nRT$

$(0.425\ \text{atm})(10.5\ \text{L}) = x\left(0.0821\ \frac{\text{atm} \cdot \text{L}}{\text{mol K}}\right)(338\ \text{K})$

$x = 0.161\ \text{mol}$

c) $\chi_{CH_4} = \frac{n_{CH_4}}{n_{tot}}$

$n_{CH_4} = \chi_{CH_4} \cdot n_{tot}$

$= 0.412 \times 0.161 \text{ mol} = 6.63 \times 10^{-2} \text{ mol } CH_4$

$6.63 \times 10^{-2} \text{ mol} \quad \frac{16.04 \text{ g } CH_4}{1 \text{ mol } CH_4} = 1.06 \text{ g } CH_4$

$n_{O_2} = 0.588 \times 0.161 \text{ mol} = 9.47 \times 10^{-2} \text{ mol } O_2$

$9.47 \times 10^{-2} \text{ mol } O_2 \quad \frac{32.0 \text{ g } O_2}{1 \text{ mol } O_2} =$

8) $P_{tot} = P_{H_2} + P_{H_2O}$

$1.032 = P_{H_2} + \left(32 \text{ torr} \frac{1 \text{ atm}}{760 \text{ torr}}\right)$

$P_{H_2} = 1.032 - 0.042 = 0.990 \text{ atm}$

$PV = nRT$

$(0.990 \text{ atm})(0.240 \text{ L}) = x\left(0.0821 \frac{\text{atm} \cdot \text{L}}{\text{mol K}}\right)(303 \text{ K})$

$x = 9.56 \times 10^{-3} \text{ mol } H_2$

$9.56 \times 10^{-3} \text{ mol } H_2 \quad \frac{1 \text{ mol Zn}}{1 \text{ mol } H_2} \left| \frac{65.38 \text{ g Zn}}{1 \text{ mol Zn}} \right. = 0.625 \text{ g Zn}$

89) $2\,NaClO_3 \longrightarrow 2\,NaCl + 3O_2$

$P_{tot} = P_{O_2} + P_{H_2O}$ $\quad x = 714\ torr$

$734\ torr = x + 19.8\ torr$

$PV = nRT$

$(714\ torr)(0.0572\,L) = x\,/\,62.4\ \frac{torr \cdot L}{mol\,K}(295\,K)$

$x = 2.22 \times 10^{-3}\ mol\ O_2$

$2.22 \times 10^{-3}\ mol\ O_2 \left| \frac{2\ mol\ NaClO_3}{3\ mol\ O_2} \right| \frac{106.44\ g\ NaClO_3}{1\ mole\ NaClO_3} =$

$0.158\ g\ NaClO_3$

$mass\ \% \quad \frac{0.158}{0.8765} \times 100 = 18.0\ \%$

a) $2\,HN_3 \longrightarrow 3\,N_2 + H_2$

constant V and T, P direct to n

2 mol reactant $\longrightarrow$ 4 mol product

n doubled ... P doubled ($P_{tot} = 6.0\,atm$)

$$P_{H_2} = 3.0\,atm \frac{1\,atm\,H_2}{2\,atm\,HN_3} = 1.5\,atm$$

$$P_{N_2} = 3.0\,atm \frac{3\,atm\,N_2}{2\,atm\,HN_3} = 4.5\,atm$$

a3) $150\,g\,(CH_3)_2N_2H_2 \left| \frac{1\,mol\,(CH_3)_2N_2H_2}{60.10\,g\,(CH_3)_2N_2H_2} \right| \frac{3\,mol\,N_2}{1\,mol\,(CH_3)_2N_2H_2} =$

$7.5\,mol\,N_2$

$$PV = nRT$$

$$(x)(2.50\,L) = (7.5\,mol)\left(0.0821 \frac{atm \cdot L}{mol \cdot K}\right)(300\,K)$$

$$x = 74\,atm$$