Gas Stoichiometry

① $ZnCl_2 \rightarrow Zn^{2+} + 2Cl^-$

$$2.50 \text{ mol } ZnCl_2 \times \frac{2 \text{ mol } Cl^-}{1 \text{ mol } ZnCl_2} = 5.00 \text{ mol } Cl^-$$

②
$$1.25 \text{ mol } C_6H_{12}O_6 \times \frac{6 \text{ mol } C}{1 \text{ mol } C_6H_{12}O_6} = 7.5 \text{ mol } C$$

$$1.25 \text{ mol } C_6H_{12}O_6 \times \frac{12 \text{ mol } H}{1 \text{ mol } C_6H_{12}O_6} = 15 \text{ mol } H$$

$$1.25 \text{ mol } C_6H_{12}O_6 \times \frac{6 \text{ mol } O}{1 \text{ mol } C_6H_{12}O_6} = 7.5 \text{ mol } O$$

③ $Fe_2(SO_4)_3 \rightarrow 2Fe^{3+} + 3SO_4^{2-}$

$$3.0 \text{ mol } Fe_2(SO_4)_3 \times \frac{3 \text{ mol } SO_4^{2-}}{1 \text{ mol } Fe_2(SO_4)_3} = 9.0 \text{ mol } SO_4^{2-}$$

④
$$5 \text{ mol } P_2O_5 \times \frac{5 \text{ mol } O}{1 \text{ mol } P_2O_5} = 25 \text{ mol } O$$

⑤
$$11.5 \text{ mol } H_2O \times \frac{2 \text{ mol } H}{1 \text{ mol } H_2O} = 23 \text{ mol } H$$

⑥
$$4000 \text{ L air} \times \frac{1 \text{ mol air}}{22.4 \text{ L air}} = 178.6 \text{ mol air}$$

(7) $0.82 \text{ mol } O_2 \times \frac{22.4 \text{ L } O_2}{1 \text{ mol } O_2} = 18.4 \text{ L } O_2$

(8) H_2S molar mass = 34.12 g/mol

$200 \text{ g } H_2S \times \frac{1 \text{ mol } H_2S}{34.12 \text{ g } H_2S} = 5.86 \text{ mol } H_2S$

$5.86 \text{ mol } H_2S \times \frac{22.4 \text{ L } H_2S}{1 \text{ mol } H_2S} = 131.3 \text{ L } H_2S$

(9) $P_1V_1 = P_2V_2$

$(89)(675) = (0.09)V_2$

$V_2 = 6675 \text{ L}$

(10) $PV = nRT$

$(1)(0.5 \text{ L}) = n(0.0826)(293 \text{ K})$

$n = 0.0208 \text{ mol}$

$0.0208 \text{ mol} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 0.47 \text{ L}$

(11) Find volume of 1 mol of CO_2

$PV = nRT$

$(0.98)V = (1)(0.0826)(338)$

$V = 28.3\ L$

Find mass of 1 mol of CO_2

molar mass = 44 g

$D = \frac{m}{V} = \frac{44\ g}{28.3\ L} = 1.55\ g/L$

(12)

$0.426\ L \times \frac{1\ mol}{22.4\ L} = 0.019\ mol$

$\text{molar mass} = \frac{\text{mass}}{\text{moles}} = \frac{2.929\ g}{0.019\ mol} = 154\ g/mol$

(13) $\frac{3.167\ g}{1\ L} \times \frac{22.4\ L}{1\ mol} = \frac{71\ g}{1\ mol} = \text{molar mass}$

Probably $Cl_2(g)$ (molar mass = 71 g/mol)

(14) $PV = nRT$

$(3)(0.082) = n(0.08206)(300)$

$n = 0.00999 \text{ mol}$

$\frac{0.30 \text{ g}}{0.00999 \text{ mol}} = 30 \text{ g/mol}$

(15) molar mass $= 146.1 \text{ g/mol}$

molar volume $= 22.4 \text{ L/mol}$

$D = \frac{m}{V} = \frac{146.1 \text{ g}}{22.4 \text{ L}} = 6.52 \text{ g/L}$