

Lösungen "Stöchiometrie I"

1.1 a) $n(\text{CH}_4) = \frac{m}{M} = 1.25 \text{ mol}$

b) $N = n(\text{CH}_4) \cdot N_0 \cdot \text{mol}^{-1} = 7.5 \cdot 10^{23}$

c) $n(\text{H}) = 4 \cdot n(\text{CH}_4) = 5 \text{ mol}$

d) $v = \frac{n \cdot R \cdot T}{p} = 31.41 \text{ l}$

1.2 $A_r(\text{Hg}) = \frac{m(\text{Hg}) \cdot A_r(\text{Cl}) \cdot v(\text{Cl})}{m(\text{Cl}) \cdot v(\text{Hg})} = \frac{3.716 \text{ g} \cdot 35.45 \cdot 2}{1.314 \text{ g} \cdot 1} = 200.5$

1.3 a) $\text{K}_4\text{FeC}_6\text{N}_6 = \text{K}_4[\text{Fe}(\text{CN})_6]$

b) $\text{K}_2\text{Cr}_2\text{O}_7$

z.B.

$$v(\text{K}) : v(\text{Cr}) : v(\text{O}) = n(\text{K}) : n(\text{Cr}) : n(\text{O}) = \frac{w(\text{K})}{M(\text{K})} : \frac{w(\text{Cr})}{M(\text{Cr})} : \frac{m(\text{O})}{M(\text{O})} = 1 : 1 : 3.5 = 2 : 2 : 7$$

1.4 a) 27.93% Fe, 24.06% S, 48.01% O

b) 40.00% C, 6.71% H, 53.29% O

$$w_i = \frac{m_i}{m} \cdot 100\%$$

1.5 $n(\text{H}) = 2 \cdot \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} = 2 \cdot \frac{1.635}{18.02} \text{ mol} = 0.181 \text{ mol}$

$$n(\text{C}) = \frac{m(\text{CO}_2)}{M(\text{CO}_2)} = \frac{2.995}{44.01} \text{ mol} = 0.068 \text{ mol}$$

$$n(\text{C}) : n(\text{H}) = 0.068 \text{ mol} : 0.181 \text{ mol} = 1 : 2.66 = 3 : 8$$

Die empirische Formel lautet C_3H_8

1.6 $n_1 = \frac{3}{2} n_2$ n_1 = Stoffmenge der Edukte; n_2 = Stoffmenge der Produkte

$$\frac{p_1 \cdot v_1}{R \cdot T_1} = \frac{3}{2} \cdot \frac{p_2 \cdot v_2}{R \cdot T_2} \rightarrow p_2 = \frac{2}{3} \cdot \frac{p_1 \cdot v_1 \cdot T_2}{v_2 \cdot T_1}$$

$$p_2 = \frac{2}{3} \cdot \frac{p_1 \cdot T_2}{T_1} \text{ da } v_1 = v_2$$

$$p_2 = \frac{2}{3} \cdot \frac{405 \text{ kPa} \cdot 573.15 \text{ K}}{298.15 \text{ K}} = 519.2 \text{ kPa}$$