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a) 6

b) calculez le montant de NH_3 qu'on peut produire assumant chaque réactif est limitant

NH_4Cl : $\frac{200.0}{53.49} = 3.7390 \xrightarrow{\times 2/2} 3.7390$ mol NH_3

CaO : $\frac{80.0}{56.08} = 1.4265 \xrightarrow{\times 2/1} 2.8530$ mol NH_3

$\Rightarrow CaO$ limitant $\Rightarrow (2.8530)(17.03) = \underline{\underline{48.6\ g}}$ de NH_3

montant de NH_4Cl qui a réagit :

$2\ NH_4Cl \longrightarrow 1\ CaO$

$x \longrightarrow 1.4265$ mol CaO

$x = 2.8530$ mol

NH_4Cl (excès) = moles NH_4Cl initiale − moles NH_4Cl qui a réagit

$= 3.7390 - 2.8530 = 0.8860$ mol

$\Rightarrow$ masse NH_4Cl (excès) $= (0.8860)(53.49) = \underline{\underline{47.4\ g}}$

Page 2

a) 20%

b) C: $42.85/12.01 = 3.5679/1.0194 = 3.50 \times 2 = 7$

O: $16.31/16.00 = 1.0194/1.0194 = 1.00 \times 2 = 2$

N: $35.70/14.01 = 2.5482/1.0194 = 2.50 \times 2 = 5$

H: $5.14/1.008 = 5.0992/1.0194 = 5.00 \times 2 = 10$

$\Rightarrow$ Formule empirique = $\underline{C_7O_2N_5H_{10}}$

$$M = \frac{\rho RT}{P} = \frac{(10.77)(0.082056)(888)}{(1.000)} = 784.8 \text{ g/mol}$$

$\Rightarrow$ la masse molaire de $C_7O_2N_5H_{10}$ est 196.2 g/mol

$\Rightarrow$ exactement 4 fois plus petit que 784.8 g/mol

$\Rightarrow$ Formule moléculaire = $\underline{C_{28}O_8N_{20}H_{40}}$

Page 3

a) IO_2^-

b) $n_T = \frac{P_T V}{RT} = \frac{(5.555)(20.00)}{(0.082056)(298.15)} = 4.5412 \text{ mol}$

$n_T = n_{CO_2} + n_{N_2} + n_X$

$n_X = n_T - n_{CO_2} - n_{N_2}$

$n_X = 4.5412 - \frac{33.3}{44.01} - \frac{66.6}{28.02} = 1.4077 \text{ mol}$

$M = 88.8 \text{ g} / 1.4077 \text{ mol} = \underline{\underline{63.1 \text{ g/mol}}}$

$v = \sqrt{\frac{3RT}{M}} = \sqrt{(3)(8.3145)(298.15) / 0.02802} = \underline{\underline{515.2 \text{ m/s}}}$

a) $C_3H_8O_3 + \frac{7}{2} O_2 \rightarrow 3CO_2 + 4H_2O$

ou

$2C_3H_8O_3 + 7O_2 \rightarrow 6CO_2 + 8H_2O$

b) $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(\ell)$

$\Delta H = (3)(-393.5) + (4)(-285.8) - (1)(-103.9) - (5)(0)$

$\Delta H = \underline{-2219.8\ kJ}$

$Q = \Delta H = \underline{-2219.8\ kJ}$

$\Delta U = \Delta H - RT\Delta n_g = -2219800 - (8.3145)(298.15)(3-6)$

$\Delta U = -2212363\ J = \underline{-2212.4\ kJ}$

$\Delta U = Q + W \Rightarrow W = \Delta U - Q = -2212.4 - (-2219.8) = \underline{+7.4\ kJ}$

$\Rightarrow$ à V constant, $Q = \Delta U$

$\Rightarrow Q = (2.222)(-2212.4) = \underline{-4916\ kJ}$

a) Thomson

b) égales

$$-Q_M = Q_{eau} + Q_{bécher}$$

$$-m_M s_M \Delta T_M = m_{eau} s_{eau} \Delta T_{eau} + C_{bécher} \Delta T_{bécher}$$

$$-m_M s_M \Delta T_M = (m_{eau} s_{eau} + C_{bécher}) \Delta T$$

$$\Delta T = \frac{-m_M s_M \Delta T_M}{m_{eau} s_{eau} + C_{bécher}}$$

$$\Delta T = \frac{-(100.0)(0.4444)(-77.00)}{(222.2)(4.184) + (2222)} = \frac{3421.88}{3151.68} = 1.09$$

$$\Delta T = T_F - T_i \Rightarrow T_i = T_F - \Delta T$$

$$= 23.00 - 1.09 = \underline{21.91\ ^\circ C}$$

c) $Q = +20.00\ kJ$ à V constant $\Rightarrow \Delta U = \underline{+20.00\ kJ}$

$$\Delta H = \Delta U + RT \Delta n_{gaz}$$

$$\Delta H = 20\,000 + (8.3145)(298.15)(2-1) = 22\,479\ J$$

$$\Delta H = \underline{22.48\ kJ}$$

à P constante : $Q = \Delta H = \underline{22.48\ kJ}$

$$W = \Delta U - Q = 20.00 - (22.48) = \underline{-2.48\ kJ}$$