

$\Delta_r G^0$ & $\Delta_r G^0 (W)$ and E_H^0 & $E_H^0 (W)$

$$E_H^0 = -\frac{\Delta_r G^0}{nF} = -\frac{-1200 \text{ kJ/mol}}{(10) \cdot (96.5 \text{ kJ/mol} - V)} = \mathbf{1.24 V}$$

$$E_H^0(W) = E_H^0 - \frac{2.303RT}{nF} \log Q_r = 1.24 V - \frac{0.059 V}{10} \log \left[\frac{\{H_2O\}^6 P_{N_2}}{\{NO_3^-\}^2 \{H^+\}^{12}} \right]$$

pH = 7, other species have unit activity

$$R = 8.314 \times 10^{-3} \text{ kJ/K-mol}$$

$$= 1.24 V - \frac{0.059 V}{10} \log \left[\frac{1}{(10^{-7})^{12}} \right] = \mathbf{0.74 V}$$

$$\Delta_r G^0(W) = -nFE_H^0(W) = -(10) \cdot \left(96.5 \frac{\text{kJ}}{\text{mole}} - V \right) \cdot (0.74 V) = \mathbf{-714 \text{ kJ/mol}}$$