Calcolare la fem della seguente pila:

$$Pt \,|\, Cr_2O_7^{=} = 0{,}01\,M;\ Cr^{+3} = 0{,}1\,M;\ pH = 4 \,\|\, Cl^- = 0{,}01\,M \,|\, Cl_2 = 1\,atm \,|\, Pt$$

SVOLGIMENTO:

$$\times 1 \;\; 2Cr^{+3} + 7H_2O \rightarrow Cr_2O_7^{=} + 6e^- + 14H^+ \quad \text{ANODO}$$

$$\times 3 \;\; Cl_2 + 2e^- \rightarrow 2Cl^-$$

$$2Cr^{+3} + 3Cl_2 + \cancel{6e^-} + 7H_2O \rightarrow Cr_2O_7^{=} + \cancel{6e^-} + 14H^+ + 6Cl^-$$

$$f.e.m. = \left(E^0_{CAT} - E^0_{ANODO}\right) + \frac{0{,}059}{6} \log \frac{[Cr_2O_7^{=}] \cdot [H^+]^{14} \cdot [Cl^-]^6}{[Cr^{+3}]^2 \cdot [Cl_2]^3}$$

$$f.e.m. = (1{,}36 - 1{,}33) + \frac{0{,}059}{6} \log \frac{0{,}01 \cdot (10^{-4})^{14} \cdot (0{,}01)^6}{(0{,}1)^2 \cdot (1)^3}$$

$$= 0{,}03 + 0{,}0098 \cdot \log 10^{-68}$$

$$= 0{,}03 + 0{,}0098 \cdot (-68) = 0{,}03 - 0{,}664 = -0{,}636\ volt$$