Answer on Question #77578 - Chemistry - Physical Chemistry

Question:

A cell with the potential of 0.74 V has the cell reaction

$2Cr + 6H^+ \rightleftharpoons 2Cr^{3+} + 3H_2$

If the concentrations of the ions were 1.0 molar and the pressure of H_2 were 1.0 atmosphere, then the Eo for the half-reaction

$Cr^{3+} + 3e^- \rightleftharpoons Cr$

would be

-0.74 V

-0.37 V

0.25 V

0.37 V

0.74 V.

Solution:

$E = E_0 + (RT/nF) \ln(a_{Ox}/a_{Red})$;

$E = E_0 + (0.059/n) \lg(a_{Ox}/a_{Red})$;

$E_0 = E - (0.059/n) \lg(a_{Ox}/a_{Red})$;

$E_0 = E - (0.059/n) \lg(1) = E_0 = E - 0 = E$

So, $E_0 = 0.74$ V.

Answer: $E_0 = 0.74$ V