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standard hydrogen electrode

For solutions in protic solvents, the universal reference electrode for which, under standard conditions, the standard electrode potential (H^+ / H_2) is zero at all temperatures. The absolute electrode potential of the hydrogen electrode under standard conditions can be expressed in terms of thermodynamic quantities by applying a suitable Born–Haber cycle, thus:

$$E^\circ(H^+/H_2)(\text{abs}) = \Delta_{at}G^\circ + \Delta_{ion}G^\circ + \frac{\alpha^{o,S}_{H^+}}{F}$$

where $\Delta_{at}G^\circ$ and $\Delta_{ion}G^\circ$ are the atomization and ionization Gibbs energies of H_2, $\alpha^{o,S}_{H^+}$ is the real potential of H_2 in solvent S and F is the Faraday constant. The recommended absolute electrode potential of the hydrogen electrode is:

$$E^\circ(H^+/H_2)^{H_2O}(\text{abs}) = (4.44 \pm 0.02)\ \text{V} \qquad \text{at} \quad 298.15\ \text{K}$$

Source:
PAC, 1986, *58*, 955 *(The absolute electrode potential: an explanatory note (Recommendations 1986))* on page 957

