

Answer on Question #42636 - Chemistry - Physical Chemistry

Question:

The potential of hydrogen electrode at pH=10 at 25 degree Celsius is?

Answer:

Nernst equation is an equation that describes the dependence of the equilibrium potential of the electrode from thermodynamic activity (concentration) of the potential-determining components of the electrolyte solution.

$$E = E^{\circ} - \frac{RT}{nF} \ln Q$$

E - total potential (in millivolts) between two electrodes

E^o - standard potential of the ion;

R - universal gas constant (in Joules/mol-Kelvin);

T - absolute temperature (in Kelvin);

n - is the number of moles of electrons transferred in the cell reaction or half-reaction;

F - is the Faraday constant;

Q - is the reaction quotient.

The Nernst equation is more commonly written in such form for 25°C:

$$E = E^{\circ} - \frac{.059}{n} \log Q$$

Hydrogen electrode is based on the redox half cell:



E^o (H₂)- standard hydrogen potential is equal to zero.

So total potential for hydrogen electrode at 25°C reduces to

$$E = E^{\circ} - (0.059/2) \times 2 \times \text{pH} = 0 - 0.059 \times \text{pH} = -0.059 \times 10 = -0.59$$

Answer: -0.59