Important EMF of Concentration Cell Formulas PDF

Formulas
Examples
with Units

List of 10
Important EMF of Concentration Cell Formulas

1) EMF of Cell using Nerst Equation given Reaction Quotient at Any Temperature Formula

Evaluate Formula

Formula

$$EMF = E0_{cell} - \left([R] \cdot T \cdot \frac{\ln(Q)}{[Faraday] \cdot z}\right)$$

Example with Units

$$0.3264\,\text{V} = 0.34\,\text{V} - \left(8.3145 \cdot 85\,\text{K} \cdot \frac{\ln(50)}{96485.3321 \cdot 2.1\,\text{C}}\right)$$

2) EMF of Cell using Nerst Equation given Reaction Quotient at Room Temperature Formula

Evaluate Formula

Formula

$$EMF = E0_{cell} - \left(0.0591 \cdot \log10\frac{Q}{z}\right)$$

Example with Units

$$0.2922\,\text{V} = 0.34\,\text{V} - \left(0.0591 \cdot \log10\frac{50}{2.1\,\text{C}}\right)$$

3) EMF of Concentration Cell with Transference given Activities Formula

Evaluate Formula

Formula

$$EMF = t_- \cdot \left(\frac{[R] \cdot T}{[Faraday]}\right) \cdot \ln\left(\frac{a_2}{a_1}\right)$$

Example with Units

$$0.211\,\text{V} = 49 \cdot \left(\frac{8.3145 \cdot 85\,\text{K}}{96485.3321}\right) \cdot \ln\left(\frac{0.36\,\text{mol/kg}}{0.2\,\text{mol/kg}}\right)$$

4) EMF of Concentration Cell with Transference given Transport Number of Anion Formula

Evaluate Formula

Formula

$$EMF = 2 \cdot t_- \cdot \left(\frac{[R] \cdot T}{[Faraday]}\right) \cdot \left(\frac{\ln(m_2 \cdot \gamma_2)}{m_1 \cdot \gamma_1}\right)$$

Example with Units

$$-1.417\,\text{V} = 2 \cdot 49 \cdot \left(\frac{8.3145 \cdot 85\,\text{K}}{96485.3321}\right) \cdot \left(\frac{\ln(0.13\,\text{mol/kg} \cdot 0.1)}{0.4\,\text{mol/kg} \cdot 5.5}\right)$$

5) EMF of Concentration Cell with Transference in Terms of Valencies Formula

Evaluate Formula

Formula

$$EMF = t_{-} \cdot \left(\frac{\nu}{Z\pm \cdot \nu\pm}\right) \cdot \left(\frac{[R] \cdot T}{[Faraday]}\right) \cdot \ln\left(\frac{a_2}{a_1}\right)$$

Example with Units

$$0.2001\,\text{V} = 49 \cdot \left(\frac{110}{2 \cdot 58}\right) \cdot \left(\frac{8.3145 \cdot 85\,\text{K}}{96485.3321}\right) \cdot \ln\left(\frac{0.36\,\text{mol/kg}}{0.2\,\text{mol/kg}}\right)$$

6) EMF of Concentration Cell without Transference for Dilute Solution given Concentration Formula

Evaluate Formula

Formula

$$EMF = 2 \cdot \left(\frac{[R] \cdot T}{[Faraday]}\right) \cdot \ln\left(\left(\frac{c_2}{c_1}\right)\right)$$

Example with Units

$$0.0206\,\text{V} = 2 \cdot \left(\frac{8.3145 \cdot 85\,\text{K}}{96485.3321}\right) \cdot \ln\left(\left(\frac{2.45\,\text{mol/L}}{0.6\,\text{mol/L}}\right)\right)$$

7) EMF of Concentration Cell without Transference given Activities Formula

Evaluate Formula

Formula

$$EMF = \left(\frac{[R] \cdot T}{[Faraday]}\right) \cdot \left(\ln\left(\frac{a_2}{a_1}\right)\right)$$

Example with Units

$$0.0043\,\text{V} = \left(\frac{8.3145 \cdot 85\,\text{K}}{96485.3321}\right) \cdot \left(\ln\left(\frac{0.36\,\text{mol/kg}}{0.2\,\text{mol/kg}}\right)\right)$$

8) EMF of Concentration Cell without Transference given Concentration and Fugacity Formula

Evaluate Formula

Formula

$$EMF = 2 \cdot \left(\frac{[R] \cdot T}{[Faraday]}\right) \cdot \ln\left(\frac{c_2 \cdot f_2}{c_1 \cdot f_1}\right)$$

Example with Units

$$0.0421\,\text{V} = 2 \cdot \left(\frac{8.3145 \cdot 85\,\text{K}}{96485.3321}\right) \cdot \ln\left(\frac{2.45\,\text{mol/L} \cdot 52\,\text{Pa}}{0.6\,\text{mol/L} \cdot 12\,\text{Pa}}\right)$$

9) EMF of Concentration Cell without Transference given Molalities and Activity Coefficient Formula

Evaluate Formula

Formula

$$EMF = 2 \cdot \left(\frac{[R] \cdot T}{[Faraday]} \right) \cdot \left(\ln \left(\frac{m_2 \cdot \gamma_2}{m_1 \cdot \gamma_1} \right) \right)$$

Example with Units

$$-0.0752\,\text{V} = 2 \cdot \left(\frac{8.3145 \cdot 85\,\text{K}}{96485.3321} \right) \cdot \left(\ln \left(\frac{0.13\,\text{mol/kg} \cdot 0.1}{0.4\,\text{mol/kg} \cdot 5.5} \right) \right)$$

10) EMF of Due Cell Formula

Evaluate Formula

Formula

$$EMF = E_{cathode} - E_{anode}$$

Example with Units

$$45\,\text{V} = 100\,\text{V} - 55\,\text{V}$$

Variables used in list of EMF of Concentration Cell Formulas above

- a_1 Anodic Ionic Activity *(Mole per Kilogram)*
- a_2 Cathodic Ionic Activity *(Mole per Kilogram)*
- c_1 Anodic Concentration *(Mole per Liter)*
- c_2 Cathodic Concentration *(Mole per Liter)*
- E_{anode} Standard Oxidation Potential of Anode *(Volt)*
- $E_{cathode}$ Standard Reduction Potential of Cathode *(Volt)*
- $E0_{cell}$ Standard Potential of Cell *(Volt)*
- **EMF** EMF of Cell *(Volt)*
- f_1 Anodic Fugacity *(Pascal)*
- f_2 Cathodic Fugacity *(Pascal)*
- m_1 Anodic Electrolyte Molality *(Mole per Kilogram)*
- m_2 Cathodic Electrolyte Molality *(Mole per Kilogram)*
- **Q** Reaction Quotient
- **T** Temperature *(Kelvin)*
- t_- Transport Number of Anion
- **z** Ionic Charge *(Coulomb)*
- **Z±** Valencies of Positive and Negative Ions
- γ_1 Anodic Activity Coefficient
- γ_2 Cathodic Activity Coefficient
- **v** Total number of Ions
- **v±** Number of Positive and Negative Ions

Constants, Functions, Measurements used in list of EMF of Concentration Cell Formulas above

- constant(s): **[Faraday]**, 96485.33212
  Faraday constant
- constant(s): **[R]**, 8.31446261815324
  Universal gas constant
- Functions: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Functions: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Measurement: **Temperature** in Kelvin (K)
  Temperature Unit Conversion
- Measurement: **Pressure** in Pascal (Pa)
  Pressure Unit Conversion
- Measurement: **Electric Charge** in Coulomb (C)
  Electric Charge Unit Conversion
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion
- Measurement: **Molar Concentration** in Mole per Liter (mol/L)
  Molar Concentration Unit Conversion
- Measurement: **Molality** in Mole per Kilogram (mol/kg)
  Molality Unit Conversion

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