Important Formulas of Ionic Activity PDF

Formulas
Examples
with Units

List of 13
Important Formulas of Ionic Activity

1) Ionic Strength for Bi-Bivalent Electrolyte Formula

Evaluate Formula

Formula

$$I = \left(\frac{1}{2}\right) \cdot \left(m_+ \cdot \left(\left(Z_+\right)^2\right) + m_- \cdot \left(\left(Z_-\right)^2\right)\right)$$

Example with Units

$$0.024\,\text{mol/kg} = \left(\frac{1}{2}\right) \cdot \left(0.01\,\text{mol/kg} \cdot \left(\left(2\right)^2\right) + 0.002\,\text{mol/kg} \cdot \left(\left(2\right)^2\right)\right)$$

2) Ionic Strength for Uni-Univalent Electrolyte Formula

Evaluate Formula

Formula

$$I = \left(\frac{1}{2}\right) \cdot \left(m_+ \cdot \left(\left(Z_+\right)^2\right) + m_- \cdot \left(\left(Z_-\right)^2\right)\right)$$

Example with Units

$$0.024\,\text{mol/kg} = \left(\frac{1}{2}\right) \cdot \left(0.01\,\text{mol/kg} \cdot \left(\left(2\right)^2\right) + 0.002\,\text{mol/kg} \cdot \left(\left(2\right)^2\right)\right)$$

3) Ionic Strength of Bi-Trivalent Electrolyte Formula

Evaluate Formula

Formula

$$I = \left(\frac{1}{2}\right) \cdot \left(2 \cdot m_+ \cdot \left(\left(Z_+\right)^2\right) + 3 \cdot m_- \cdot \left(\left(Z_-\right)^2\right)\right)$$

Example with Units

$$0.052\,\text{mol/kg} = \left(\frac{1}{2}\right) \cdot \left(2 \cdot 0.01\,\text{mol/kg} \cdot \left(\left(2\right)^2\right) + 3 \cdot 0.002\,\text{mol/kg} \cdot \left(\left(2\right)^2\right)\right)$$

4) Ionic Strength of Uni-Bivalent Electrolyte Formula

Evaluate Formula

Formula

$$I = \left(\frac{1}{2}\right) \cdot \left(m_+ \cdot \left(\left(Z_+\right)^2\right) + \left(2 \cdot m_- \cdot \left(\left(Z_-\right)^2\right)\right)\right)$$

Example with Units

$$0.028\,\text{mol/kg} = \left(\frac{1}{2}\right) \cdot \left(0.01\,\text{mol/kg} \cdot \left(\left(2\right)^2\right) + \left(2 \cdot 0.002\,\text{mol/kg} \cdot \left(\left(2\right)^2\right)\right)\right)$$

5) Ionic Strength using Debey-Huckel Limiting Law Formula

Evaluate Formula

Formula

$$I = \left(-\frac{\ln\left(\gamma_{\pm}\right)}{A \cdot \left(Z_i^{2}\right)} \right)^2$$

Example with Units

$$0.0307\,\text{mol/kg} = \left(-\frac{\ln\left(0.7\right)}{0.509\,\text{kg\^{}(1/2)/mol\^{}(1/2)} \cdot \left(2^{2}\right)} \right)^2$$

6) Mean Activity Coefficient for Uni-Bivalent Electrolyte Formula

Evaluate Formula

Formula

$$\gamma_{\pm} = \frac{A_{\pm}}{\left(4^{\frac{1}{3}}\right) \cdot m}$$

Example with Units

$$0.756 = \frac{0.06\,\text{mol/kg}}{\left(4^{\frac{1}{3}}\right) \cdot 0.05\,\text{mol/kg}}$$

7) Mean Activity Coefficient for Uni-Trivalent Electrolyte Formula

Evaluate Formula

Formula

$$\gamma_{\pm} = \frac{A_{\pm}}{\left(27^{\frac{1}{4}}\right) \cdot m}$$

Example with Units

$$0.5264 = \frac{0.06\,\text{mol/kg}}{\left(27^{\frac{1}{4}}\right) \cdot 0.05\,\text{mol/kg}}$$

8) Mean Activity Coefficient for Uni-Univalent Electrolyte Formula

Evaluate Formula

Formula

$$\gamma_{\pm} = \frac{A_{\pm}}{m}$$

Example with Units

$$1.2 = \frac{0.06\,\text{mol/kg}}{0.05\,\text{mol/kg}}$$

9) Mean Activity Coefficient using Debey-Huckel Limiting Law Formula

Evaluate Formula

Formula

$$\gamma_{\pm} = \exp\left(-A \cdot \left(Z_i^{2}\right) \cdot \left(\sqrt{I}\right) \right)$$

Example with Units

$$0.7498 = \exp\left(-0.509\,\text{kg\^{}(1/2)/mol\^{}(1/2)} \cdot \left(2^{2}\right) \cdot \left(\sqrt{0.02\,\text{mol/kg}}\right) \right)$$

10) Mean Ionic Activity for Bi-Trivalent Electrolyte Formula

Evaluate Formula

Formula

$$A_{\pm} = \left(108^{\frac{1}{5}}\right) \cdot \gamma_{\pm} \cdot m$$

Example with Units

$$0.0893\,\text{mol/kg} = \left(108^{\frac{1}{5}}\right) \cdot 0.7 \cdot 0.05\,\text{mol/kg}$$

11) Mean Ionic Activity for Uni-Bivalent Electrolyte Formula

Evaluate Formula

Formula

$$A_{\pm} = \left((4)^{\frac{1}{3}} \right) \cdot (m) \cdot (\gamma_{\pm})$$

Example with Units

$$0.0556\,\text{mol/kg} = \left((4)^{\frac{1}{3}} \right) \cdot (0.05\,\text{mol/kg}) \cdot (0.7)$$

12) Mean Ionic Activity for Uni-Trivalent Electrolyte Formula

Evaluate Formula

Formula

$$A_{\pm} = \left(27^{\frac{1}{4}} \right) \cdot m \cdot \gamma_{\pm}$$

Example with Units

$$0.0798\,\text{mol/kg} = \left(27^{\frac{1}{4}} \right) \cdot 0.05\,\text{mol/kg} \cdot 0.7$$

13) Mean Ionic Activity for Uni-Univalent Electrolyte Formula

Evaluate Formula

Formula

$$A_{\pm} = (m) \cdot (\gamma_{\pm})$$

Example with Units

$$0.035\,\text{mol/kg} = (0.05\,\text{mol/kg}) \cdot (0.7)$$

Variables used in list of Important Formulas of Ionic Activity above

- **A** Debye Huckel limiting Law Constant *(sqrt(Kilogram) per sqrt(Mole))*
- **$A_{\pm}$** Mean Ionic Activity *(Mole per Kilogram)*
- **I** Ionic Strength *(Mole per Kilogram)*
- **m** Molality *(Mole per Kilogram)*
- **m_{-}** Molality of Anion *(Mole per Kilogram)*
- **m_{+}** Molality of Cation *(Mole per Kilogram)*
- **Z_{-}** Valencies of Anion
- **Z_{+}** Valencies of Cation
- **Z_{i}** Charge Number of Ion Species
- **$\gamma_{\pm}$** Mean Activity Coefficient

Constants, Functions, Measurements used in list of Important Formulas of Ionic Activity above

- Functions: **exp**, exp(Number)
n an exponential function, the value of the function changes by a constant factor for every unit change in the independent variable.
- 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: **sqrt**, sqrt(Number)
A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Molality** in Mole per Kilogram (mol/kg)
Molality Unit Conversion
- Measurement: **Debye–Hückel limiting law constant** in sqrt(Kilogram) per sqrt(Mole) (kg^(1/2)/mol^(1/2))
Debye–Hückel limiting law constant Unit Conversion

Download other Important Electrochemistry PDFs

- Important Activity of Electrolytes Formulas
- Important Concentration of Electrolyte Formulas
- Important Conductance and Conductivity Formulas
- Important Electrochemical Cell Formulas
- Important Electrolytes & Ions Formulas
- Important EMF of Concentration Cell Formulas
- Important Equivalent Weight Formulas
- Important Ionic Strength Formulas
- Important Osmotic Coefficient & Current Efficiency Formulas
- Important Resistance and Resistivity Formulas
- Important Tafel Slope Formulas
- Important Temperature of Concentration Cell Formulas

Try our Unique Visual Calculators

- Percentage decrease
- HCF of three numbers
- Multiply fraction

This PDF can be downloaded in these languages

English Spanish French German Russian Italian Portuguese Polish Dutch

7/9/2024 | 1:58:55 PM UTC