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Important Formulas of Ionic Activity

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List of 13 Important Formulas of Ionic Activity

Important Formulas of Ionic Activity

1) Ionic Strength for Bi-Bivalent Electrolyte

Open Calculator

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

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

2) Ionic Strength for Uni-Univalent Electrolyte

Open Calculator

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

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

3) Ionic Strength of Bi-Trivalent Electrolyte

Open Calculator

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

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

4) Ionic Strength of Uni-Bivalent Electrolyte

Open Calculator

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

ex

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

5) Ionic Strength using Debey-Huckel Limiting Law

Open Calculator

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

ex

$$0.030689\text{mol/kg} = \left(-\frac{\ln(0.7)}{0.509\text{kg}\hat{}(1/2)/\text{mol}\hat{}(1/2) \cdot \left((2)^2\right)}\right)^2$$

6) Mean Activity Coefficient for Uni-Bivalent Electrolyte

Open Calculator

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

ex

$$0.755953 = \frac{0.06\text{mol/kg}}{\left(4^{\frac{1}{3}}\right) \cdot 0.05\text{mol/kg}}$$

7) Mean Activity Coefficient for Uni-Trivalent Electrolyte

Open Calculator

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

ex $$0.52643 = \frac{0.06\text{mol/kg}}{\left(27^{\frac{1}{4}}\right) \cdot 0.05\text{mol/kg}}$$

8) Mean Activity Coefficient for Uni-Univalent Electrolyte

Open Calculator

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

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

9) Mean Activity Coefficient using Debey-Huckel Limiting Law

Open Calculator

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

ex

$$0.749811 = \exp\left(-0.509\text{kg}\text{\^{}}(1/2)/\text{mol}\text{\^{}}(1/2) \cdot \left((2)^2\right) \cdot \left(\sqrt{0.02\text{mol/kg}}\right)\right)$$

10) Mean Ionic Activity for Bi-Trivalent Electrolyte

Open Calculator

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

ex $$0.08928\text{mol/kg} = \left(108^{\frac{1}{5}}\right) \cdot 0.7 \cdot 0.05\text{mol/kg}$$

11) Mean Ionic Activity for Uni-Bivalent Electrolyte

Open Calculator

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

ex $$0.055559\text{mol/kg} = \left((4)^{\frac{1}{3}}\right) \cdot (0.05\text{mol/kg}) \cdot (0.7)$$

12) Mean Ionic Activity for Uni-Trivalent Electrolyte

Open Calculator

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

ex $$0.079783\text{mol/kg} = \left(27^{\frac{1}{4}}\right) \cdot 0.05\text{mol/kg} \cdot 0.7$$

13) Mean Ionic Activity for Uni-Univalent Electrolyte

Open Calculator

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

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

Variables Used

- **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

- Function: **exp**, exp(Number)
  Exponential function
- Function: **ln**, ln(Number)
  Natural logarithm function (base e)
- Function: **sqrt**, sqrt(Number)
  Square root function
- 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

Check other formula lists

- Activity of Electrolytes Formulas
- Concentration of Electrolyte Formulas
- Conductance and Conductivity Formulas
- Debey Huckel Limiting Law Formulas
- Degree of Dissociation Formulas
- Dissociation Constant Formulas
- Electrochemical Cell Formulas
- Electrolytes & Ions Formulas
- EMF of Concentration Cell Formulas
- Equivalent Weight Formulas
- Gibbs Free Energy Formulas
- Gibbs Free Entropy Formulas
- Helmholtz Free Energy Formulas
- Helmholtz Free Entropy Formulas
- Important Formulas of Activity and Concentration of Electrolytes
- Important Formulas of Conductance
- Important Formulas of Current Efficiency and Resistance
- Important Formulas of Gibbs Free Energy and Entropy and Helmholtz Free Energy and Entropy
- Important Formulas of Ionic Activity
- Ionic Strength Formulas
- Mean Activity Coefficient Formulas
- Mean Ionic Activity Formulas
- Normality of Solution Formulas
- Osmotic Coefficient & Current Efficiency Formulas
- Resistance and Resistivity Formulas
- Tafel Slope Formulas
- Temperature of Concentration Cell Formulas
- Transport Number Formulas

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