Important Acidity and pH Scale Formulas PDF

Formulas
Examples
with Units

List of 14
Important Acidity and pH Scale Formulas

1) Activity of Hydrogen Ion given pH Formula

Evaluate Formula

Formula

$$aH^+ = 10^{-pH}$$

Example with Units

$$1E\text{-}9\,\text{mol/L} = 10^{-6}$$

2) Concentration of Hydrogen Ion given pH Formula

Evaluate Formula

Formula

$$H^+ = 10^{-pH}$$

Example with Units

$$1E\text{-}6\,\text{mol/L} = 10^{-6}$$

3) Concentration of Hydroxyl Ion given pOH Formula

Evaluate Formula

Formula

$$OH^- = 10^{-pOH}$$

Example with Units

$$1E\text{-}8\,\text{mol/L} = 10^{-8}$$

4) Dissociation Constant of Weak Acid given pKa Formula

Evaluate Formula

Formula

$$K_a = 10^{-pK_a}$$

Example

$$1E\text{-}5 = 10^{-5}$$

5) Dissociation Constant of Weak Base given pKb Formula

Evaluate Formula

Formula

$$K_b = 10^{-pK_b}$$

Example

$$1E\text{-}10 = 10^{-10}$$

6) pH given Activity of Hydrogen Ion Formula

Evaluate Formula

Formula

$$pH = -\log10\left(aH^+\right)$$

Example with Units

$$6 = -\log10\left(1E\text{-}9\,\text{mol/L}\right)$$

7) pH given Concentration of Hydrogen Ion Formula

Evaluate Formula

Formula

$$pH = -\log10\left(H^+\right)$$

Example with Units

$$6 = -\log10\left(1E\text{-}6\,\text{mol/L}\right)$$

8) pH of Mixture of Strong Acid and Strong Base when Solution is Acidic in Nature Formula

Evaluate Formula

Formula

$$pH = -\log10\left(\frac{N_1 \cdot V_1 - N_2 \cdot V_2}{V_1 + V_2}\right)$$

Example with Units

$$3.368 = -\log10\left(\frac{0.0008\,\text{Eq/L} \cdot 0.00025\,\text{L} - 0.0005\,\text{Eq/L} \cdot 0.0001\,\text{L}}{0.00025\,\text{L} + 0.0001\,\text{L}}\right)$$

9) pH of Mixture of Two Strong Acids Formula

Evaluate Formula

Formula

$$pH = -\log10\left(\frac{N_1 \cdot V_1 + N_2 \cdot V_2}{V_1 + V_2}\right)$$

Example with Units

$$3.1461 = -\log10\left(\frac{0.0008\,\text{Eq/L} \cdot 0.00025\,\text{L} + 0.0005\,\text{Eq/L} \cdot 0.0001\,\text{L}}{0.00025\,\text{L} + 0.0001\,\text{L}}\right)$$

10) pKa given Dissociation Constant of Weak Acid Formula

Evaluate Formula

Formula

$$pK_a = -\log10\left(K_a\right)$$

Example

$$5 = -\log10\left(1E\text{-}5\right)$$

11) pKb given Dissociation constant of Weak Base Formula

Evaluate Formula

Formula

$$pK_b = -\log10\left(K_b\right)$$

Example

$$10 = -\log10\left(1E\text{-}10\right)$$

12) pOH given Concentration of Hydroxyl Ion Formula

Evaluate Formula

Formula

$$pOH = -\log10\left(OH^-\right)$$

Example with Units

$$8 = -\log10\left(1E\text{-}8\,\text{mol/L}\right)$$

13) pOH of Mixture of Strong Acid and Strong Base when Solution is Basic in Nature Formula

Evaluate Formula

Formula

$$pOH = 14 + \log10\left(\frac{N_1 \cdot V_1 - N_2 \cdot V_2}{V_1 + V_2}\right)$$

Example with Units

$$13.632 = 14 + \log10\left(\frac{0.0008\,\text{Eq/L} \cdot 0.00025\,\text{L} - 0.0005\,\text{Eq/L} \cdot 0.0001\,\text{L}}{0.00025\,\text{L} + 0.0001\,\text{L}}\right)$$

14) pOH of Mixture of Two Strong Bases Formula

Evaluate Formula

Formula

$$pOH = -\log10\left(\frac{N_1 \cdot V_1 + N_2 \cdot V_2}{V_1 + V_2}\right)$$

Example with Units

$$3.1461 = -\log10\left(\frac{0.0008\,\text{Eq/L} \cdot 0.00025\,\text{L} + 0.0005\,\text{Eq/L} \cdot 0.0001\,\text{L}}{0.00025\,\text{L} + 0.0001\,\text{L}}\right)$$

Variables used in list of Acidity and pH Scale Formulas above

- aH^+ Activity of Hydrogen Ion *(Mole per Liter)*
- H^+ Concentration of Hydrogen Ion *(Mole per Liter)*
- K_a Dissociation Constant of Weak Acid
- K_b Dissociation Constant of Weak Base
- N_1 Normality of Solution 1 *(Equivalents per Liter)*
- N_2 Normality of Solution 2 *(Equivalents per Liter)*
- OH^- Concentration of Hydroxyl Ion *(Mole per Liter)*
- **pH** Negative Log of Hydronium Concentration
- pK_a Negative Log of Acid Ionization Constant
- pK_b Negative Log of Base Ionization Constant
- **pOH** Negative Log of Hydroxyl Concentration
- V_1 Volume of Solution 1 *(Liter)*
- V_2 Volume of Solution 2 *(Liter)*

Constants, Functions, Measurements used in list of Acidity and pH Scale Formulas above

- 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: **Volume** in Liter (L)
  Volume Unit Conversion
- Measurement: **Molar Concentration** in Mole per Liter (mol/L), Equivalents per Liter (Eq/L)
  Molar Concentration Unit Conversion

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