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# Acidity and pH Scale Formulas

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# List of 14 Acidity and pH Scale Formulas

## Acidity and pH Scale

### 1) Activity of Hydrogen Ion given pH

$$\text{fx } a_{\text{H}^+} = 10^{-\text{pH}}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b\_img.jpg\)](#)

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

### 2) Concentration of Hydrogen Ion given pH

$$\text{fx } \text{H}^+ = 10^{-\text{pH}}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d\_img.jpg\)](#)

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

### 3) Concentration of Hydroxyl Ion given pOH

$$\text{fx } \text{OH}^- = 10^{-\text{pOH}}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d\_img.jpg\)](#)

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

### 4) Dissociation Constant of Weak Acid given pKa

$$\text{fx } K_a = 10^{-\text{pK}_a}$$

[Open Calculator !\[\]\(83bbbd261710c59db0214aa27b2edc0d\_img.jpg\)](#)

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




5) Dissociation Constant of Weak Base given pK<sub>b</sub> 

$$\text{fx } K_b = 10^{-\text{p}K_b}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235\_img.jpg\)](#)

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

6) pH given Activity of Hydrogen Ion 

$$\text{fx } \text{pH} = -\log_{10}(\text{aH}^+)$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0\_img.jpg\)](#)


$$\text{ex } 6 = -\log_{10}(1\text{E}^{-9}\text{mol/L})$$

7) pH given Concentration of Hydrogen Ion 

$$\text{fx } \text{pH} = -\log_{10}(\text{H}^+)$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f\_img.jpg\)](#)

$$\text{ex } 6 = -\log_{10}(1\text{E}^{-6}\text{mol/L})$$

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

$$\text{fx } \text{pH} = -\log_{10}\left(\frac{N_1 \cdot V_1 - N_2 \cdot V_2}{V_1 + V_2}\right)$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754\_img.jpg\)](#)

$$\text{ex}$$

$$3.367977 = -\log_{10}\left(\frac{0.0008\text{Eq/L} \cdot 0.00025\text{L} - 0.0005\text{Eq/L} \cdot 0.0001\text{L}}{0.00025\text{L} + 0.0001\text{L}}\right)$$




9) pH of Mixture of Two Strong Acids 

$$\text{fx } \text{pH} = -\log_{10} \left( \frac{N_1 \cdot V_1 + N_2 \cdot V_2}{V_1 + V_2} \right)$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95\_img.jpg\)](#)

ex


$$3.146128 = -\log_{10} \left( \frac{0.0008 \text{Eq/L} \cdot 0.00025 \text{L} + 0.0005 \text{Eq/L} \cdot 0.0001 \text{L}}{0.00025 \text{L} + 0.0001 \text{L}} \right)$$

10) pKa given Dissociation Constant of Weak Acid 

$$\text{fx } \text{pK}_a = -\log_{10}(\text{K}_a)$$

[Open Calculator !\[\]\(aa53ad6fea213b8b2226d3077e30533a\_img.jpg\)](#)

$$\text{ex } 5 = -\log_{10}(1\text{E}^{-5})$$

11) pKb given Dissociation constant of Weak Base 

$$\text{fx } \text{pK}_b = -\log_{10}(\text{K}_b)$$

[Open Calculator !\[\]\(626ce8ac21792b9405bfddfea8e0c96a\_img.jpg\)](#)

$$\text{ex } 10 = -\log_{10}(1\text{E}^{-10})$$

12) pOH given Concentration of Hydroxyl Ion 

$$\text{fx } \text{pOH} = -\log_{10}(\text{OH}^-)$$

[Open Calculator !\[\]\(c1168d6a8b365d11e842ece304635fa7\_img.jpg\)](#)

$$\text{ex } 8 = -\log_{10}(1\text{E}^{-8} \text{mol/L})$$



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

$$\text{fx } \text{pOH} = 14 + \log_{10} \left( \frac{N_1 \cdot V_1 - N_2 \cdot V_2}{V_1 + V_2} \right)$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a\_img.jpg\)](#)
**ex**

$$13.63202 = 14 + \log_{10} \left( \frac{0.0008 \text{Eq/L} \cdot 0.00025 \text{L} - 0.0005 \text{Eq/L} \cdot 0.0001 \text{L}}{0.00025 \text{L} + 0.0001 \text{L}} \right)$$

### 14) pOH of Mixture of Two Strong Bases

$$\text{fx } \text{pOH} = -\log_{10} \left( \frac{N_1 \cdot V_1 + N_2 \cdot V_2}{V_1 + V_2} \right)$$

[Open Calculator !\[\]\(8bba887393ca45b761e5cb49e755e762\_img.jpg\)](#)
**ex**

$$3.146128 = -\log_{10} \left( \frac{0.0008 \text{Eq/L} \cdot 0.00025 \text{L} + 0.0005 \text{Eq/L} \cdot 0.0001 \text{L}}{0.00025 \text{L} + 0.0001 \text{L}} \right)$$





## Variables Used

- $aH^+$  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

- **Function:** **log10**,  $\log_{10}(\text{Number})$   
*Common logarithm function (base 10)*
- **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* 



## Check other formula lists

- [Acidity and pH Scale Formulas](#) 
- [Ostwald Dilution Law Formulas](#) 
- [Buffer Solution Formulas](#) 
- [Relative Strength of Two Acids Formulas](#) 

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