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Relative and Adjusted Retention and Phase Formulas

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List of 13 Relative and Adjusted Retention and Phase Formulas

Relative and Adjusted Retention and Phase

1) Adjusted Retention of First Component given Relative Retention

$$\text{fx } \text{trC1}' = \left(\frac{\text{tr2}'}{\alpha} \right)$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 1.111111\text{s} = \left(\frac{10\text{s}}{9} \right)$$

2) Adjusted Retention of Second Component given Relative Retention

$$\text{fx } \text{trC2}' = (\alpha \cdot \text{tr1}')$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 45\text{s} = (9 \cdot 5\text{s})$$

3) Mobile Phase Travel Time given Capacity Factor

$$\text{fx } t_{\text{CP}} = \frac{t_r}{k' + 1}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 3.25\text{s} = \frac{13\text{s}}{3 + 1}$$



4) Mobile Phase Travel Time through Column 

$$\text{fx } t_C = (t_r - t_{r'})$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$\text{ex } 11\text{s} = (13\text{s} - 2\text{s})$$

5) Molar Concentration of Third Component in First Phase 

$$\text{fx } C_{P1} = ((k_{DC}') \cdot C_{s2})$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)


$$\text{ex } 273\text{mol/L} = (10.5 \cdot 26\text{mol/L})$$

6) Molar Concentration of Third Component in Second Phase 

$$\text{fx } C_{P2} = \left(\frac{C_1}{k_{DC}'} \right)$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$\text{ex } 1.904762\text{mol/L} = \left(\frac{20\text{mol/L}}{10.5} \right)$$

7) Partition Coefficient of Solute 1 given Relative Retention 

$$\text{fx } K_{C1} = \left(\frac{K_2}{\alpha} \right)$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$\text{ex } 1.666667 = \left(\frac{15}{9} \right)$$



8) Partition Coefficient of Solute 2 given Relative Retention 

$$fx \quad K_{C2} = (\alpha \cdot K_1)$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$ex \quad 54 = (9 \cdot 6)$$

9) Relative Retention given Adjusted Retention Times 

$$fx \quad \alpha_R = \left(\frac{tr2'}{tr1'} \right)$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)


$$ex \quad 2 = \left(\frac{10s}{5s} \right)$$

10) Relative Retention given Capacity Factor of Two Components 

$$fx \quad \alpha_R = \left(\frac{k2'}{k1'} \right)$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 1.4 = \left(\frac{3.5}{2.5} \right)$$

11) Relative Retention given Partition Coefficient of Two Components 

$$fx \quad \alpha_R = \left(\frac{K_2}{K_1} \right)$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$ex \quad 2.5 = \left(\frac{15}{6} \right)$$



12) Total Concentration of Solute in Aqueous Phase

$$\text{fx } C_{\text{aqP}} = \left(\frac{C_o}{D} \right)$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$\text{ex } 83.33333\text{mol/L} = \left(\frac{50\text{mol/L}}{0.6} \right)$$

13) Total Concentration of Solute in Organic Phase

$$\text{fx } C_{\text{orgP}} = (D \cdot C_{\text{aq}})$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$\text{ex } 24\text{mol/L} = (0.6 \cdot 40\text{mol/L})$$



Variables Used

- C_1 Concentration of Solute in Solvent 1 (Mole per Liter)
- C_{aq} Concentration in Aqueous Phase (Mole per Liter)
- C_{aqP} Concentration in Aqueous Solvent (Mole per Liter)
- C_o Concentration in Organic Phase (Mole per Liter)
- C_{orgP} Concentration in Organic Solvent (Mole per Liter)
- C_{P1} Concentration of Solute in Phase1 (Mole per Liter)
- C_{P2} Concentration of Solute in Phase2 (Mole per Liter)
- C_{S2} Solute Concentration in Solvent2 (Mole per Liter)
- D Distribution Ratio
- K_1 Partition Coefficient of Solute 1
- K_2 Partition Coefficient of Solute 2
- K_{C1} Partition Coefficient of Comp 1
- K_{C2} Partition Coefficient of Comp 2
- k_{DC}' Distribution Coefficient of Solution
- k' Capacity Factor
- k_1' Capacity Factor of Solute 1
- k_2' Capacity Factor of Solute 2
- t_C Unretained Solute Travel Time through Column (Second)
- t_{CP} Unretained Solute Travel Time given CP (Second)
- t_r Retention Time (Second)



- tr' Adjusted Retention Time (Second)
- $tr1'$ Adjusted Retention Time of Solute 1 (Second)
- $tr2'$ Adjusted Retention Time of Solute 2 (Second)
- $trC1'$ Adjusted Retention Time of Comp 1 (Second)
- $trC2'$ Adjusted Retention Time of Comp 2 (Second)
- α Relative Retention
- α_R Actual Relative Retention




Constants, Functions, Measurements used

- **Measurement: Time** in Second (s)
Time Unit Conversion 
- **Measurement: Molar Concentration** in Mole per Liter (mol/L)
Molar Concentration Unit Conversion 



Check other formula lists

- [Distribution Ratio and Length of Column Formulas](#) 
- [Number of Theoretical Plates and Capacity Factor Formulas](#) 
- [Important formulae on Retention and Deviation Formulas](#) 
- [Relative and Adjusted Retention and Phase Formulas](#) 

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