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Important formulae on Retention and Deviation Formulas

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List of 10 Important formulae on Retention and Deviation Formulas

Important formulae on Retention and Deviation

1) Adjusted Retention Time given Retention Time

$$\text{fx } t'_{RT} = (t_r - t_m)$$

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

$$\text{ex } 8.2\text{s} = (13\text{s} - 4.8\text{s})$$

2) Average Width of Peak given Resolution and Change in Retention Time

$$\text{fx } w_{av_RT} = \left(\frac{\Delta t_r}{R} \right)$$

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

$$\text{ex } 1.090909\text{s} = \left(\frac{12\text{s}}{11} \right)$$

3) Average Width of Peak given Resolution and Change in Retention Volume

$$\text{fx } w_{av_RV} = \left(\frac{\Delta V_r}{R} \right)$$

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

$$\text{ex } 0.000818\text{s} = \left(\frac{9\text{L}}{11} \right)$$



4) Mass of Second Analyte according to Scaling Equation 

$$\text{fx } M_{2\text{nd}} = \left(\left(\frac{R_2}{R_1} \right)^2 \right) \cdot M_1$$

Open Calculator 

$$\text{ex } 2.222222\text{g} = \left(\left(\frac{2\text{m}}{3\text{m}} \right)^2 \right) \cdot 5\text{g}$$

5) Radius of First Column according to Scaling Equation 

$$\text{fx } R_{c1} = \left(\sqrt{\frac{M_1}{M_2}} \right) \cdot R_2$$

Open Calculator 


$$\text{ex } 1.414214\text{m} = \left(\sqrt{\frac{5\text{g}}{10\text{g}}} \right) \cdot 2\text{m}$$

6) Retention Factor 

$$\text{fx } RF = \frac{d_{\text{solu}}}{d_{\text{solv}}}$$

Open Calculator 

$$\text{ex } 3.2 = \frac{80\text{m}}{25\text{m}}$$

7) Retention Time given Capacity Factor 

$$\text{fx } T_{\text{cf}} = t_{\text{m}} \cdot (k^c + 1)$$

Open Calculator 

$$\text{ex } 21.6\text{s} = 4.8\text{s} \cdot (3.5 + 1)$$



8) Standard Deviation given Retention Time and Number of Theoretical Plates

$$\text{fx } \sigma_{\text{RTandNP}} = \frac{t_r}{\sqrt{N_{\text{TP}}}}$$

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

$$\text{ex } 4.596194 = \frac{13\text{s}}{\sqrt{8}}$$

9) Time for Diffusion given Standard Deviation

$$\text{fx } t_D = \frac{(\sigma)^2}{2 \cdot D}$$

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

$$\text{ex } 0.001106\text{s} = \frac{(1.33)^2}{2 \cdot 800\text{m}^2/\text{s}}$$

10) Width of Peak given Number of Theoretical Plates and Retention Time

$$\text{fx } w_{\text{NPandRT}} = \frac{4 \cdot t_r}{\sqrt{N_{\text{TP}}}}$$

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

$$\text{ex } 18.38478\text{s} = \frac{4 \cdot 13\text{s}}{\sqrt{8}}$$



Variables Used






- **D** Diffusion Coefficient (Square Meter Per Second)
- **d_{solu}** Solute Distance (Meter)
- **d_{solv}** Solvent Distance (Meter)
- **k^C** Capacity Factor for Analytical
- **M₁** Mass of 1st analyte (Gram)
- **M₂** Mass of 2nd analyte (Gram)
- **M_{2nd}** Mass of Analyte 2 (Gram)
- **N_{TP}** Count of Theoretical Plates
- **R** Resolution
- **R₁** Radius of 1st column (Meter)
- **R₂** Radius of 2nd column (Meter)
- **R_{c1}** 1st Column Radius (Meter)
- **RF** Actual Retention Factor
- **T_{cf}** Retention Time given CF (Second)
- **t_D** Diffusion Time (Second)
- **t_m** Unretained Solute Travel Time (Second)
- **t_r** Retention Time (Second)
- **t'_{RT}** Adjusted Retention Time given RT (Second)
- **W_{av_RT}** Average Width of Peaks given RT (Second)
- **W_{av_RV}** Average Width of Peaks given RV (Second)
- **W_{NPandRT}** Width of Peak NP and RT (Second)



- Δt_r Change in Retention Time (Second)
- ΔV_r Change in retention volume (Liter)
- σ Standard Deviation
- $\sigma_{RTandNP}$ Standard Deviation given RT and NP




Constants, Functions, Measurements used

- **Function:** **sqrt**, sqrt(Number)
Square root function
- **Measurement:** **Length** in Meter (m)
Length Unit Conversion 
- **Measurement:** **Weight** in Gram (g)
Weight Unit Conversion 
- **Measurement:** **Time** in Second (s)
Time Unit Conversion 
- **Measurement:** **Volume** in Liter (L)
Volume Unit Conversion 
- **Measurement:** **Diffusivity** in Square Meter Per Second (m^2/s)
Diffusivity 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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