Important Formulae on Retention and Deviation Formulas PDF

Formulas
Examples
with Units

List of 10
Important Formulae on Retention and Deviation Formulas

1) Adjusted Retention Time given Retention Time Formula

Evaluate Formula

Formula

$$t'_{RT} = \left(t_r - t_m \right)$$

Example with Units

$$8.2\,\text{s} = \left(13\,\text{s} - 4.8\,\text{s} \right)$$

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

Evaluate Formula

Formula

$$w_{av\_RT} = \left(\frac{\Delta t_r}{R} \right)$$

Example with Units

$$1.0909\,\text{s} = \left(\frac{12\,\text{s}}{11} \right)$$

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

Evaluate Formula

Formula

$$w_{av\_RV} = \left(\frac{\Delta V_r}{R} \right)$$

Example with Units

$$0.0008\,\text{s} = \left(\frac{9\,\text{L}}{11} \right)$$

4) Mass of Second Analyte according to Scaling Equation Formula

Evaluate Formula

Formula

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

Example with Units

$$2.2222\,\text{g} = \left(\left(\frac{2\,\text{m}}{3\,\text{m}} \right)^2 \cdot 5\,\text{g} \right)$$

5) Radius of First Column according to Scaling Equation Formula

Evaluate Formula

Formula

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

Example with Units

$$1.4142\,\text{m} = \left(\sqrt{\frac{5\,\text{g}}{10\,\text{g}}} \cdot 2\,\text{m} \right)$$

6) Retention Factor Formula

Evaluate Formula

Formula

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

Example with Units

$$3.2 = \frac{80\,m}{25\,m}$$

7) Retention Time given Capacity Factor Formula

Evaluate Formula

Formula

$$T_{cf} = t_m \cdot \left(k^c + 1 \right)$$

Example with Units

$$21.6\,s = 4.8\,s \cdot \left(3.5 + 1 \right)$$

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

Evaluate Formula

Formula

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

Example with Units

$$4.5962 = \frac{13\,s}{\sqrt{8}}$$

9) Time for Diffusion given Standard Deviation Formula

Evaluate Formula

Formula

$$t_D = \frac{\left(\sigma \right)^2}{2 \cdot D}$$

Example with Units

$$0.0011\,s = \frac{\left(1.33 \right)^2}{2 \cdot 800\,m^2/s}$$

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

Evaluate Formula

Formula

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

Example with Units

$$18.3848\,s = \frac{4 \cdot 13\,s}{\sqrt{8}}$$

Variables used in list of Important Formulae on Retention and Deviation above

- **D** Diffusion Coefficient *(Square Meter Per Second)*
- d_{solu} Solute Distance *(Meter)*
- d_{solv} Solvent Distance *(Meter)*
- k^c Capacity Factor for Analytical
- M_1 Mass of 1st analyte *(Gram)*
- M_2 Mass of 2nd analyte *(Gram)*
- M_{2nd} Mass of Analyte 2 *(Gram)*
- N_{TP} Count of Theoretical Plates
- **R** Resolution
- R_1 Radius of 1st column *(Meter)*
- R_2 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 in list of Important Formulae on Retention and Deviation above

- Functions: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- 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 (m²/s)
  Diffusivity Unit Conversion

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