Important Retention Time Formulas PDF

Formulas
Examples
with Units

List of 10
Important Retention Time Formulas

1) Adjusted Retention Time given Retention Time Formula

Evaluate Formula

Formula

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

Example with Units

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

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

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

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

Evaluate Formula

Formula

$$w_{1/2av} = \left(\sqrt{\frac{5.55}{N}} \right) \cdot \left(t_r \right)$$

Example with Units

$$9.6848\,s = \left(\sqrt{\frac{5.55}{10}} \right) \cdot \left(13\,s \right)$$

4) Retention Time given Adjusted Retention Time Formula

Evaluate Formula

Formula

$$t_{ART} = \left(tr' + t_m \right)$$

Example with Units

$$6.8\,s = \left(2\,s + 4.8\,s \right)$$

5) Retention Time given Capacity Factor Formula

Evaluate Formula

Formula

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

Example with Units

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

6) Retention Time given Number of Theoretical Plate and Half Width of Peak Formula

Evaluate Formula

Formula

$$t_{NP\_HP} = \left(w_{1/2av} \right) \cdot \left(\sqrt{\frac{N}{5.55}} \right)$$

Example with Units

$$8.0539\,s = \left(6\,s \right) \cdot \left(\sqrt{\frac{10}{5.55}} \right)$$

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

Evaluate Formula

Formula

$$t_{NP\_SD} = (\sigma) \cdot \left(\sqrt{N}\right)$$

Example with Units

$$129.1158\,s = (40.83) \cdot \left(\sqrt{10}\right)$$

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

Evaluate Formula

Formula

$$t_{NP\_WP} = \left(\frac{w}{4}\right) \cdot \left(\sqrt{N}\right)$$

Example with Units

$$2.4508\,s = \left(\frac{3.1\,s}{4}\right) \cdot \left(\sqrt{10}\right)$$

9) Retention Time given Retention Volume Formula

Evaluate Formula

Formula

$$t_{RV} = \left(\frac{V_R}{F_M}\right)$$

Example with Units

$$1.6\,s = \left(\frac{11.2\,L}{7\,L/s}\right)$$

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 Retention Time Formulas above

- F_M Flow Rate of Mobile Phase *(Liter per Second)*
- k^c Capacity Factor for Analytical
- **N** Number of Theoretical Plates
- N_{TP} Count of Theoretical Plates
- **R** Resolution
- t_{ART} Retention Time given ART *(Second)*
- T_{cf} Retention Time given CF *(Second)*
- t_m Unretained Solute Travel Time *(Second)*
- t_{NP_HP} Retention Time given NP and HP *(Second)*
- t_{NP_SD} Retention Time given NP and SD *(Second)*
- t_{NP_WP} Retention Time given NP and WP *(Second)*
- t_r Retention Time *(Second)*
- t'_{RT} Adjusted Retention Time given RT *(Second)*
- t_{RV} Retention Time given RV *(Second)*
- tr' Adjusted Retention Time *(Second)*
- V_R Retention Volume *(Liter)*
- **w** Width of Peak *(Second)*
- $w_{1/2av}$ Half of Average Width of Peaks *(Second)*
- w_{av_RT} Average Width of Peaks given RT *(Second)*
- $w_{NPandRT}$ Width of Peak NP and RT *(Second)*
- Δt_r Change in Retention Time *(Second)*
- σ Standard Deviation

Constants, Functions, Measurements used in list of Retention Time Formulas 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: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Volume** in Liter (L)
  Volume Unit Conversion
- Measurement: **Volumetric Flow Rate** in Liter per Second (L/s)
  Volumetric Flow Rate Unit Conversion

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