Important Kinetics for Set of Two Parallel Reactions Formulas PDF

Formulas
Examples
with Units

List of 11
Important Kinetics for Set of Two Parallel Reactions Formulas

1) Average Life-Time for Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$t_{1/2avg} = \frac{0.693}{k_1 + k_2}$$

Example with Units

$$7343.4354\,s = \frac{0.693}{0.00000567\,s^{-1} + 0.0000887\,s^{-1}}$$

2) Concentration of Product B in Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$R_b = \frac{k_1}{k_1 + k_2} \cdot A_0 \cdot \left(1 - \exp\left(-\left(k_1 + k_2\right) \cdot t\right)\right)$$

Example with Units

$$1.7306\,mol/L = \frac{0.00000567\,s^{-1}}{0.00000567\,s^{-1} + 0.0000887\,s^{-1}} \cdot 100\,mol/L \cdot \left(1 - \exp\left(-\left(0.00000567\,s^{-1} + 0.0000887\,s^{-1}\right) \cdot 3600\,s\right)\right)$$

3) Concentration of Product C in Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$R_C = \frac{k_2}{k_1 + k_2} \cdot A_0 \cdot \left(1 - \exp\left(-\left(k_1 + k_2\right)\right)\right)$$

Example with Units

$$0.0089\,mol/L = \frac{0.0000887\,s^{-1}}{0.00000567\,s^{-1} + 0.0000887\,s^{-1}} \cdot 100\,mol/L \cdot \left(1 - \exp\left(-\left(0.00000567\,s^{-1} + 0.0000887\,s^{-1}\right)\right)\right)$$

4) Concentration of Reactant A after time t in Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$R_A = A_0 \cdot \exp\left(-\left(k_1 + k_2\right) \cdot t\right)$$

Example with Units

$$71.1961\,mol/L = 100\,mol/L \cdot \exp\left(-\left(0.00000567\,s^{-1} + 0.0000887\,s^{-1}\right) \cdot 3600\,s\right)$$

5) Initial Concentration of Reactant A for Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$A_0 = R_A \cdot \exp\left(\left(k_1 + k_2\right) \cdot t\right)$$

Example with Units

$$84.9766\,\text{mol/L} = 60.5\,\text{mol/L} \cdot \exp\left(\left(0.00000567\,\text{s}^{-1} + 0.0000887\,\text{s}^{-1}\right) \cdot 3600\,\text{s}\right)$$

6) Rate Constant for Reaction A to B for Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$k_1 = \frac{1}{t} \cdot \ln\left(\frac{A_0}{R_A}\right) - k_2$$

Example with Units

$$5.1\text{E-}5\,\text{s}^{-1} = \frac{1}{3600\,\text{s}} \cdot \ln\left(\frac{100\,\text{mol/L}}{60.5\,\text{mol/L}}\right) - 0.0000887\,\text{s}^{-1}$$

7) Rate Constant for Reaction A to C in Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$k_2 = \frac{1}{t} \cdot \ln\left(\frac{A_0}{R_A}\right) - k_1$$

Example with Units

$$0.0001\,\text{s}^{-1} = \frac{1}{3600\,\text{s}} \cdot \ln\left(\frac{100\,\text{mol/L}}{60.5\,\text{mol/L}}\right) - 0.00000567\,\text{s}^{-1}$$

8) Ratio of Products B to C in Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$Rb{:}Rc = \frac{k_1}{k_2}$$

Example with Units

$$0.0639 = \frac{0.00000567\,\text{s}^{-1}}{0.0000887\,\text{s}^{-1}}$$

9) Time taken for Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$t_{1/2av} = \frac{1}{k_1 + k_2} \cdot \ln\left(\frac{A_0}{R_A}\right)$$

Example with Units

$$5325.0696\,\text{s} = \frac{1}{0.00000567\,\text{s}^{-1} + 0.0000887\,\text{s}^{-1}} \cdot \ln\left(\frac{100\,\text{mol/L}}{60.5\,\text{mol/L}}\right)$$

10) Time taken to form Product B from Reactant A in Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$T_{PR} = \frac{k_1}{k_1 + k_2} \cdot A_0$$

Example with Units

$$6008.2653\,\text{s} = \frac{0.00000567\,\text{s}^{-1}}{0.00000567\,\text{s}^{-1} + 0.0000887\,\text{s}^{-1}} \cdot 100\,\text{mol/L}$$

11) Time taken to form Product C from Reactant A in Set of Two Parallel Reactions Formula

Evaluate Formula

Formula

$$T_{CtoA} = \frac{k_2}{k_1 + k_2} \cdot A_0$$

Example with Units

$$93991.7347\,\text{s} = \frac{0.0000887\,\text{s}^{-1}}{0.00000567\,\text{s}^{-1} + 0.0000887\,\text{s}^{-1}} \cdot 100\,\text{mol/L}$$

Variables used in list of Kinetics for Set of Two Parallel Reactions Formulas above

- A_0 Initial Concentration of Reactant A *(Mole per Liter)*
- k_1 Reaction Rate Constant 1 *(1 Per Second)*
- k_2 Reaction Rate Constant 2 *(1 Per Second)*
- R_A Reactant A Concentration *(Mole per Liter)*
- R_b Concentration of Reactant B *(Mole per Liter)*
- R_C Concentration of Reactant C *(Mole per Liter)*
- **Rb:Rc** Ratio B to C
- **t** Time *(Second)*
- $t_{1/2av}$ Life Time for Parallel Reaction *(Second)*
- $t_{1/2avg}$ Average Life Time *(Second)*
- T_{CtoA} Time C to A for 2 Parallel Reaction *(Second)*
- T_{PR} Time for Parallel Reaction *(Second)*

Constants, Functions, Measurements used in list of Kinetics for Set of Two Parallel Reactions Formulas above

- Functions: **exp**, exp(Number)
  n an exponential function, the value of the function changes by a constant factor for every unit change in the independent variable.
- Functions: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Molar Concentration** in Mole per Liter (mol/L)
  Molar Concentration Unit Conversion
- Measurement: **First Order Reaction Rate Constant** in 1 Per Second (s^{-1})
  First Order Reaction Rate Constant Unit Conversion

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