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Kinetics for Set of Three Parallel Reactions Formulas

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List of 13 Kinetics for Set of Three Parallel Reactions Formulas

Kinetics for Set of Three Parallel Reactions

1) Average Life-Time for Set of Three Parallel Reactions

Open Calculator

fx $$t_{1/2av} = \frac{0.693}{k_1 + k_2 + k_3}$$

ex $$5377.512\text{s} = \frac{0.693}{0.00000567\text{s}^{-1} + 0.0000887\text{s}^{-1} + 0.0000345\text{s}^{-1}}$$

2) Concentration of Product B in Set of Three Parallel Reactions

Open Calculator

fx $$R_b = \frac{k_1}{k_1 + k_2 + k_3} \cdot A_0 \cdot (1 - \exp(-(k_1 + k_2 + k_3) \cdot t))$$

ex $$1.633172\text{mol/L} = \frac{0.00000567\text{s}^{-1}}{0.00000567\text{s}^{-1} + 0.0000887\text{s}^{-1} + 0.0000345\text{s}^{-1}} \cdot 100\text{mol/L} \cdot (1 - \exp(-(0.00000567\text{s}^{-1} + 0.0$$

3) Concentration of Product C in Set of Three Parallel Reactions

Open Calculator

fx $$C = \frac{k_2}{k_1 + k_2 + k_3} \cdot A_0 \cdot (1 - \exp(-(k_1 + k_2 + k_3) \cdot t))$$

ex $$25.54891\text{mol/L} = \frac{0.0000887\text{s}^{-1}}{0.00000567\text{s}^{-1} + 0.0000887\text{s}^{-1} + 0.0000345\text{s}^{-1}} \cdot 100\text{mol/L} \cdot (1 - \exp(-(0.00000567\text{s}^{-1} + 0.0$$

4) Concentration of Product D in Set of Three Parallel Reactions

Open Calculator

fx $$R_d = \frac{k_3}{k_1 + k_2 + k_3} \cdot A_0 \cdot (1 - \exp(-(k_1 + k_2 + k_3) \cdot t))$$

ex $$9.937287\text{mol/L} = \frac{0.0000345\text{s}^{-1}}{0.00000567\text{s}^{-1} + 0.0000887\text{s}^{-1} + 0.0000345\text{s}^{-1}} \cdot 100\text{mol/L} \cdot (1 - \exp(-(0.00000567\text{s}^{-1} + 0.0$$

5) Concentration of Reactant A at Time t for Set of Three Parallel Reactions

Open Calculator

fx $$R_A = A_0 \cdot \exp(-(k_1 + k_2 + k_3) \cdot t)$$

ex $$62.88063\text{mol/L} = 100\text{mol/L} \cdot \exp(-(0.00000567\text{s}^{-1} + 0.0000887\text{s}^{-1} + 0.0000345\text{s}^{-1}) \cdot 3600\text{s})$$

6) Initial Concentration of Reactant A for Set of Three Parallel Reactions

Open Calculator

$$A_0 = R_A \cdot \exp((k_1 + k_2 + k_3) \cdot t)$$

ex $$96.21405\text{mol/L} = 60.5\text{mol/L} \cdot \exp((0.00000567\text{s}^{-1} + 0.0000887\text{s}^{-1} + 0.0000345\text{s}^{-1}) \cdot 3600\text{s})$$

7) Rate Constant for Reaction A to B for Set of Three Parallel Reactions

Open Calculator

$$k_1 = \frac{1}{t} \cdot \ln\left(\frac{A_0}{R_A}\right) - (k_2 + k_3)$$

ex $$1.6\text{E}\hat{}\text{-5s}^{-1} = \frac{1}{3600\text{s}} \cdot \ln\left(\frac{100\text{mol/L}}{60.5\text{mol/L}}\right) - (0.0000887\text{s}^{-1} + 0.0000345\text{s}^{-1})$$

8) Rate Constant for Reaction A to C for Set of Three Parallel Reactions

Open Calculator

$$k_2 = \frac{1}{t} \cdot \ln\left(\frac{A_0}{R_A}\right) - (k_1 + k_3)$$

ex $$9.9\text{E}\hat{}\text{-5s}^{-1} = \frac{1}{3600\text{s}} \cdot \ln\left(\frac{100\text{mol/L}}{60.5\text{mol/L}}\right) - (0.00000567\text{s}^{-1} + 0.0000345\text{s}^{-1})$$

9) Rate Constant for Reaction A to D for Set of Three Parallel Reactions

Open Calculator

$$k_3 = \frac{1}{t} \cdot \ln\left(\frac{A_0}{R_A}\right) - (k_1 + k_2)$$

ex $$4.5\text{E}\hat{}\text{-5s}^{-1} = \frac{1}{3600\text{s}} \cdot \ln\left(\frac{100\text{mol/L}}{60.5\text{mol/L}}\right) - (0.00000567\text{s}^{-1} + 0.0000887\text{s}^{-1})$$

10) Time taken for Set of Three Parallel Reactions

Open Calculator

$$t = \frac{1}{k_1 + k_2 + k_3} \cdot \ln\left(\frac{A_0}{R_A}\right)$$

ex $$3899.486\text{s} = \frac{1}{0.00000567\text{s}^{-1} + 0.0000887\text{s}^{-1} + 0.0000345\text{s}^{-1}} \cdot \ln\left(\frac{100\text{mol/L}}{60.5\text{mol/L}}\right)$$

11) Time taken to form Product B from Reactant A in Set of Three Parallel Reactions

Open Calculator

$$t = \frac{k_1}{k_1 + k_2 + k_3} \cdot A_0$$

ex $$4399.783\text{s} = \frac{0.00000567\text{s}^{-1}}{0.00000567\text{s}^{-1} + 0.0000887\text{s}^{-1} + 0.0000345\text{s}^{-1}} \cdot 100\text{mol/L}$$

12) Time taken to form Product C from Reactant A in Set of Three Parallel Reactions

Open Calculator

fx $$T_{CtoA\_3} = \frac{k_2}{k_1 + k_2 + k_3} \cdot A_0$$

ex $$68829.05s = \frac{0.0000887s^{-1}}{0.00000567s^{-1} + 0.0000887s^{-1} + 0.0000345s^{-1}} \cdot 100mol/L$$

13) Time taken to form Product D from Reactant A in Set of Three Parallel Reactions

Open Calculator

fx $$T_{DtoA} = \frac{k_3}{k_1 + k_2 + k_3} \cdot A_0$$

ex $$26771.16s = \frac{0.0000345s^{-1}}{0.00000567s^{-1} + 0.0000887s^{-1} + 0.0000345s^{-1}} \cdot 100mol/L$$

Variables Used

- A_0 Initial Concentration of Reactant A *(Mole per Liter)*
- **C** Concentration of C at time t *(Mole per Liter)*
- k_1 Reaction Rate Constant 1 *(1 Per Second)*
- k_2 Reaction Rate Constant 2 *(1 Per Second)*
- k_3 Rate Constant of Reaction 3 *(1 Per Second)*
- R_A Reactant A Concentration *(Mole per Liter)*
- R_b Concentration of Reactant B *(Mole per Liter)*
- R_d Concentration of reactant D *(Mole per Liter)*
- **t** Time *(Second)*
- $t_{1/2av}$ Life Time for Parallel Reaction *(Second)*
- T_{CtoA_3} Time C to A for 3 Parallel Reaction *(Second)*
- T_{DtoA} Time D to A for 3 Parallel Reaction *(Second)*

Constants, Functions, Measurements used

- Function: **exp**, exp(Number)
  Exponential function
- Function: **ln**, ln(Number)
  Natural logarithm function (base e)
- 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

Check other formula lists

- **Kinetics for Set of Two Parallel Reactions Formulas**
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