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Zero Order followed by First Order Reaction Formulas

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List of 9 Zero Order followed by First Order Reaction Formulas

Zero Order followed by First Order Reaction

1) Initial Concentration of Reactant in Zero Order Reaction followed by First Order Reaction

Open Calculator

fx $C_{A0} = C_A + k_0 \cdot \Delta t$

ex $80\text{mol/m}^3 = 44\text{mol/m}^3 + 12\text{mol/m}^3\text{*s} \cdot 3\text{s}$

2) Initial Reactant Concentration by Intermediate Conc. for Zero Order followed by First Order Rxn

Open Calculator

fx $$C_{A0} = \frac{C_R}{\frac{1}{K} \cdot (1 - \exp(-(k_1 \cdot \Delta t)))}$$

ex $$84.10071\text{mol/m}^3 = \frac{10\text{mol/m}^3}{\frac{1}{1.593\text{mol/m}^3\text{*s}} \cdot (1 - \exp(-(0.07\text{mol/m}^3\text{*s} \cdot 3\text{s})))}$$

3) Initial Reactant Concentration using Intermediate Conc. for Zero Order followed by First Order Rxn

Open Calculator

fx $$C_{a0} = \frac{C_R}{\frac{1}{K} \cdot (\exp(K \quad - k_1 \cdot \Delta t) - \exp(-k_1 \cdot \Delta t))}$$

ex $$5.015333\text{mol/m}^3 = \frac{10\text{mol/m}^3}{\frac{1}{1.593\text{mol/m}^3\text{*s}} \cdot (\exp(1.593\text{mol/m}^3\text{*s} - 0.07\text{mol/m}^3\text{*s} \cdot 3\text{s}) - \exp(-0.07\text{mol/m}^3\text{*s} \cdot 3\text{s}))}$$

4) Intermediate Concentration for Zero Order followed by First Order with Greater Rxn Time

Open Calculator

fx $$C_R = \frac{C_0}{K} \cdot (\exp(K \quad - k_1 \cdot \Delta t'') - \exp(-k_1 \cdot \Delta t''))$$

ex $$10.2968\text{mol/m}^3 = \frac{5.5\text{mol/m}^3}{1.593\text{mol/m}^3\text{*s}} \cdot (\exp(1.593\text{mol/m}^3\text{*s} - 0.07\text{mol/m}^3\text{*s} \cdot 3.9\text{s}) - \exp(-0.07\text{mol/m}^3\text{*s} \cdot 3.9\text{s}$$

5) Intermediate Concentration for Zero Order followed by First Order with Less Rxn Time

Open Calculator

fx $$C_R = \left(\frac{C_{A0}}{K}\right) \cdot (1 - \exp(-(k_1 \cdot \Delta t')))$$

ex $$9.483899\text{mol/m}^3 = \left(\frac{80\text{mol/m}^3}{1.593\text{mol/m}^3\text{*s}}\right) \cdot (1 - \exp(-(0.07\text{mol/m}^3\text{*s} \cdot 2.99\text{s})))$$

6) Maximum Intermediate Concentration in Zero Order followed by First Order

Open Calculator

$$C_{R,max} = \left(\frac{C_{A0} \cdot (1 - \exp(-K\ ))}{K}\right)$$

$$40.0093\text{mol/m}^3 = \left(\frac{80\text{mol/m}^3 \cdot (1 - \exp(-1.593\text{mol/m}^3\text{*s}))}{1.593\text{mol/m}^3\text{*s}}\right)$$

7) Rate Constant of Zero Order Reaction in Zero Order Reaction followed by First Order Reaction

Open Calculator

$$k_0 = \frac{C_{A0} - C_A}{\Delta t}$$

$$12\text{mol/m}^3\text{*s} = \frac{80\text{mol/m}^3 - 44\text{mol/m}^3}{3\text{s}}$$

8) Reactant Concentration of Zero Order Reaction followed by First Order Reaction

Open Calculator

$$C_A = (C_{A0} - (k_0 \cdot \Delta t))$$

$$44\text{mol/m}^3 = (80\text{mol/m}^3 - (12\text{mol/m}^3\text{*s} \cdot 3\text{s}))$$

9) Time at Max Intermediate in Zero Order followed by First Order Reaction

Open Calculator

$$\tau_{R,max} = \frac{C_{A0}}{k_0}$$

$$6.666667\text{s} = \frac{80\text{mol/m}^3}{12\text{mol/m}^3\text{*s}}$$

Variables Used

- C_0 Initial Conc. of Reactant for Intermediate Conc. *(Mole per Cubic Meter)*
- C_A Reactant Concentration for Multiple Rxns *(Mole per Cubic Meter)*
- C_{a0} Initial Reactant Concentration using Intermediate *(Mole per Cubic Meter)*
- C_{A0} Initial Concentration of Reactant for Series Rxn *(Mole per Cubic Meter)*
- C_R Intermediate Concentration for Series Rxn *(Mole per Cubic Meter)*
- $C_{R,max}$ Maximum Intermediate Concentration *(Mole per Cubic Meter)*
- K Overall Rate of Reaction *(Mole per Cubic Meter Second)*
- k_0 Rate Constant for Zero Order Rxn *(Mole per Cubic Meter Second)*
- k_1 Rate Constant for 1st Order 2nd Step *(Mole per Cubic Meter Second)*
- Δt Time Interval *(Second)*
- $\Delta t'$ Time Interval for Less Reaction Time *(Second)*
- $\Delta t''$ Time Interval for Greater Reaction Time *(Second)*
- $\tau_{R,max}$ Time at Maximum Intermediate Concentration *(Second)*

Constants, Functions, Measurements used

- Function: **exp**, exp(Number)
  Exponential function
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Molar Concentration** in Mole per Cubic Meter (mol/m³)
  Molar Concentration Unit Conversion
- Measurement: **Reaction Rate** in Mole per Cubic Meter Second (mol/m³*s)
  Reaction Rate Unit Conversion

Check other formula lists

- **Basics of Potpourri Reactions Formulas**
- **First Order followed by Zero Order Reaction Formulas**
- **Zero Order followed by First Order Reaction Formulas**

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