CHM Kenetics

1. To measure the speed of a car, we use miles per hour (miles/hour \rm miles/houror mph \rm mph). To measure the rate of a reaction we use molar concentration per second (M/s M/\rm s).

Part B: What is the average rate of formation of Br 2 \rm Br_2= 0.030 M/s M/s

Part C: Based on your answer to Part B, what is the average rate of formation of HCl \rm HCl? Express your answer to three decimal places and include the appropriate units.

1. Consider the reaction: A(g)+1 2 B(g)→2C(g) {\rm{A(}}g)\; + \;{\textstyle{1 \over 2}}{\rm{B(}}g)\; \rightarrow \;2{\rm{ C(}}g). Rate=−Δ[A] Δt =−2Δ[B] Δt =1/2 Δ[C] Δt
2. When C {\rm C}is increasing at a rate of 4.0×10−2M⋅s −1 M \cdot s^{-1}, how fast is B {\rm B}decreasing? Express your answer using two significant figures.
3. How fast is A {\rm A}decreasing? Express your answer using two significant figures.
4. Part A

The rate of the reaction in terms of the "disappearance of reactant" includes the change in the concentration of the reactant, the time interval, and the coefficient of the reactant.

Consider the following reaction:

1. 2A+3B→3C+2D \rm 2A + 3B\rightarrow 3C + 2D

The concentrations of reactant A at three different time intervals are given. Use the following data to determine the average rate of reaction in terms of the disappearance of reactant A \rm Abetween time = 0 s \rm sand time = 20 s \rm s.

|  |  |  |  |
| --- | --- | --- | --- |
| **Time** (s \rm s) | 0 | 20 | 40 |
| [A](M) {\rm [A]}(M) | 0.0400 | 0.0240 | 0.0180 |

Express your answer in molar concentration per second to three significant figures.

Part B

The rate of the reaction in terms of the "appearance of product" includes the change in the concentration of the product, the time interval, and the coefficient of the product.

Consider the following reaction:

2A+3B→3C+2D \rm 2A + 3B\rightarrow 3C + 2D

The concentrations of product C \rm Cat three different time intervals are given. Use the following data to determine the rate of reaction in terms of the appearance of product C \rm Cbetween time = 0 s\rm sand time = 20 s \rm s.

|  |  |  |  |
| --- | --- | --- | --- |
| **Time** (s \rm s) | 0 | 20 | 40 |
| [C](M) {\rm [C]}(M) | 0.000 | 0.0240 | 0.0480 |

Express your answer in molar concentration per second to three significant figures.

Part C

The rate of reaction in terms of the "rate law expression" includes the rate constant (k k), the concentration of the reactants, and the orders of the reaction with respect to the different reactants.

Consider the following reaction:

A+B→C+D \rm A + B\rightarrow C + D

The initial concentrations of the reactants A \rm Aand B \rm Bare 0.400 M Mand 0.320 M M, respectively.

The rate of reaction is 0.060 M⋅s −1M\cdot{\rm s^{-1}} and the orders of the reaction, with respect to reactants A \rm Aand B \rm B, are 1 and 2, respectively.

Determine the rate constant (k k) for the reaction using the rate law.

Express your answer in M −2 ⋅s −1 M^{-2}\cdot{\rm s^{-1}}to three significant figures.