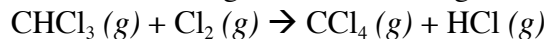


# LECTURE 30

1. Trichloromethane and chlorine gas react according to the following equation:



Tripling the concentration of  $\text{Cl}_2$  increases the rate by a factor of 1.7 (the square root of 3) and tripling the concentration of  $\text{CHCl}_3$  increases the rate by a factor of 3.

- (a) Determine the rate law for the reaction.  
(b) If  $[\text{CHCl}_3]$  is increased by a factor of 5 and  $[\text{Cl}_2]$  is increased by a factor of 4, estimate the change of rate observed.

(a)  $\text{rate} = k[\text{CHCl}_3][\text{Cl}_2]^{1/2}$

(b) The rate increases by a factor of 10

2. For the reaction  $\text{A} + \text{B} + \text{C} \rightarrow \text{products}$ , the following data were collected:

Experiment	Initial concentration ( $\text{mmol}\cdot\text{L}^{-1}$ )			Initial rate ( $\text{mmol}\cdot\text{L}^{-1}\cdot\text{s}^{-1}$ )
	$[\text{A}]_0$	$[\text{B}]_0$	$[\text{C}]_0$	
1	2.06	3.05	4.00	3.7
2	0.87	3.05	4.00	0.66
3	0.50	0.50	0.50	0.013
4	1.00	0.50	1.00	0.072

The initial rate given in the table above is for the rate of loss of A.

- (a) Write the rate law for the reaction.  
(b) Determine the overall order of the reaction.  
(c) Determine the value of the rate constant. Hint: convert mmol to mol first.

(a)  $\text{rate} = k[\text{A}]^2[\text{B}][\text{C}]^{1/2}$

(b) 3.5

(c)  $4.5 \times 10^6 \text{ mol}^{-2.5} \text{ L}^{2.5} \text{ s}^{-1}$

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