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~~Initial Rates
Method For
Determining
Reaction Order,
Rate Laws,
& Rate
Constant K,
Chemical
Kinetics~~

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Reaction Rate
Law (Example)

Writing Rate

Laws For

Reaction

Mechanisms Using

Rate Determining

Step - Chemical

Kinetics

Practice

Problem: Initial

Rates and Rate

Laws How to Find

the Rate Law and

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Rate Constant

(k) Integrated
Rate Law

Problems, Zero,
First \u0026

Second Order

Reactions, Half
Life, Graphs

\u0026 Units

Rate Law Problem

Reaction Order

Tricks \u0026

How to Quickly

Find the Rate

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~~Law 12.4 — With
Integrated Rate
Law (Example
Problems)~~

*Reaction Rate
Laws Solving a
Rate Law Using
the Initial
Rates Method
Kinetics:*

*Initial Rates
and Integrated
Rate Laws The
Laws of*

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~~Thermodynamics,
Entropy, and
Gibbs Free
Energy~~ **Zero,
First, and
Second Order
Reactions**

CHEMISTRY DK014

- TOPIC 9.1

(Part 1) -

Define and

*Determine Rate
of Reaction 14.5*

Integrated Rate

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Laws and Half

Lives *The Rate
of Reactions*

~~Rates of~~

~~Appearance,~~

~~Rates of~~

~~Disappearance~~

~~and Overall~~

~~Reaction Rates~~

DON'T MISS THIS

Rate Law and

Rate Constant

Question

Chemical

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*Equilibria and
Reaction*

Quotients 16.2d

~~Using a second
order integrated
rate law to find
concentration~~

~~change The Rate~~

~~Law Rate law and
reaction order |~~

~~Knetics |~~

~~Chemistry | Khan
Academy Reaction~~

~~Rate Problems Dr~~

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*Berry LIVE with
Dr Jason Fung;
THE CANCER CODE*

Chemical
Kinetics Rate
Laws – Chemistry
Review – Order
of Reaction
& Equations
**Integrated Rate
Law Problems |
Chemical
Kinetics First
Order Reaction**

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~~Chemistry
Problems - Half
Life, Rate
Constant k ,
Integrated Rate
Law Derivation
Second Order
Reaction
Chemistry
Problems - Half
Life, Units of
 k , Integrated
Rate Law
Derivation~~

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~~Reaction Rates
and
Stoichiometry
Chemistry~~

~~Tutorial~~ Rate
Law Problems

With Solutions

Write the rate law for this reaction. rate = $k[\text{SO}_2]^2[\text{O}_3]$

c. Determine the value and units of the rate

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constant, k .

plug and chug
using the rate
law & data from
exp't 1 and
solving for k ,
we get $k = 2.36$
 $\text{mol.L}^{-1} \cdot \text{s}^{-1}$ 8.

Consider the
following
mechanism. $A_2 +$
 $B_2 \rightarrow R + C$
(slow) $A_2 + R \rightarrow$
 C (fast) a.

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Write the overall balanced chemical equation.

KINETICS

Practice

Problems and

Solutions

What is the rate of cooling when it is at $30\text{ }^{\circ}\text{C}$ above the same surroundings?

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Solutions: With

Consider the cooling when the temperature is $50\text{ }^{\circ}\text{C}$ above the surroundings:

Rate of cooling
($d\theta/dt$) $1 = 0.5$
 $^{\circ}\text{C}$ per second,
the temperature
of the body
above

surroundings =
($\theta_1 - \theta_0$) = 50

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°C, By Newton's
law of cooling

Newton's law of
cooling:

Numerical
problems with
solutions

The experimental
rate law is.

Rate = k [Br -
][Br⁰ 3][H +] 2

(b). CH₃CHO(g)
) → Δ → CH₄(g)

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+ CO(g) the experimental rate law is.

$$\text{Rate} = k [\text{CH}_3\text{CHO}]^{3/2}$$

Solution: a)

First order with respect to Br⁻, first order with respect to BrO₃⁻ and second order with respect to H⁺. Hence the

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overall order of
the reaction is
equal to $1 + 1 +$
 $2 = 4$

Chemical
Kinetics: Solved
Example Problems
- Chemistry

KINETICS
Practice
Problems and
Solutions
Determining rate

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law from Initial Rates. (Use the ratio of initial rates to get the orders). 2.

KINETICS

Practice

Problems and

Solutions

Problem :

Describe the
difference

between the rate

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constant and the
rate of a
reaction. The
rate of a
reaction is the
change in
concentration
with respect to
time of a
product. The
rate equals the
rate constant
times the
concentrations

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of the reactants raised to their orders. A rate constant is a proportionality constant in the rate law that is a measure of the intrinsic reactivity of the reaction.

Reaction

Kinetics: Rate

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Laws: Problems With and Solutions

...

$k = \text{rate}$

$[NO][O_3] = 6.60$

$\times 10^{-5} \text{ mol L}^{-1} \text{ s}^{-1}$

$(1.00 \times$

$10^{-6} \text{ mol L}^{-1}$

$)(3.00 \times 10^{-6}$

$\text{mol L}^{-1}) =$

$2.20 \times 10^7 \text{ L mol}^{-1} \text{ s}^{-1}$

s^{-1} . The

large value of k

tells us that

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this is a fast reaction that could play an important role in ozone depletion if $[NO]$ is large enough. Exercise 4.4.1.

4.4: Determining Rate Laws from Initial Rates



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In general, a rate law (or differential rate law, as it is sometimes called) takes this form:
$$\text{rate} = k[A]^m[B]^n[C]^p \dots$$
 in which $[A]$, $[B]$, and $[C]$ represent the molar

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Problems With
Solutions

concentrations of reactants, and k is the rate constant, which is specific for a particular reaction at a particular temperature.

12.3 Rate Laws – Chemistry

Problem : If a

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Problems With
Solutions

reaction has an order of three, write three rate laws that could describe the reaction.

rate = $k [A]^3$

rate = $k [A]^2 [B]$

rate = $k [A] [B]^2$

rate = $k [A] [B] [C]$, etc.

Previous section
Fundamentals of
Rate Laws Next

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Problems With
Determining the
Rate Law.

Reaction

Kinetics: Rate

Laws: Problems

and Solutions 1

...

3) The rate law
is this: $\text{rate} =$
 $k [A] [B]^2$. 4)

Note that the
comparison in

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(2) can be reversed.

Consider that
the

concentration of
B is doubled as
you go from exp.
3 to exp. 1.

When the
concentration is
doubled, the
rate goes up by
a factor of 4
(which is 2^2).

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5) We can use any set of values to determine the rate constant:
rate = $k [A]^2 [B]$

ChemTeam:

Kinetics:

determine rate
law by method of

...

15. The rate law

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for the reaction of nitric oxide with hydrogen is

$$\text{Rate} = k[\text{NO}]^2$$

[H₂] What will

happen to the reaction rate if the

concentration of NO is doubled

and the

concentration of H₂ is doubled.

a. Don't know.

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Can only be determined experimentally.

- b. Rate is $4x$.
- c. Rate is $6x$.
- d. Rate is $8x$.

Reaction Kinetics – Practice Problems

The unknown rate law is given by
Rate = $k [NO]^m$

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[H₂] n. Using the Method of Initial rates will give the rate law and the value of the rate constant. Since the units cancel in the Method of Initial rates, we do not need to convert to molarity. To

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find the order in NO , use the first set of data where the pressure of H_2 is kept constant.

CHM 112 Kinetics
Practice

Problems Answers

The integrated rate law can be rearranged to a

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standard linear
equation format:

$$\ln[A] = (-k)(t) + \ln[A]_0$$
$$y = mx + b \quad \ln [A] = (- k) (t) + \ln [A]_0$$
$$y = m x + b$$

A plot of $\ln [A]$ versus t for a first-order reaction is a straight line with a slope of $- k$ and

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an intercept of
 $\ln [A]_0$.

Integrated Rate Laws | Chemistry

The rate law for this reaction is first order in A and first order in B. If the
-rate constant
at 25 C is $1.94 \times 10^2 \text{ s}^{-1}$, find
the rate of

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Problems With
Solutions

reaction when
the
concentration of
A is 0.68 M and
the
concentration of
B is 0.14M. 20.
Consider the
reaction $2A + B$
 $\rightarrow C + 2 D$. The
rate law for
this reaction is
first order in A
and first order

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Practice Rate

Law Problems -

Name Chapter 17

Differential

rate laws can be determined by the method of initial rates or other methods.

We measure

values for the initial rates of

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a reaction at different concentrations of the reactants. From these measurements, we determine the order of the reaction in each reactant.

12.4: Integrated Rate Laws -

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Chemistry With LibreTexts

Following are two statements pertaining to the reaction $2A + B \rightarrow 2C$, for which the rate law is $\text{rate} = k [A] [B]$.

Identify which statement is true and which is false, and

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Problems With
Solutions

explain your

reasoning. (a)

The value of k
is independent
of the initial
concentrations
 $[A]_0$ and $[B]_0$.

CHM 112 Kinetics Practice Problem

In order to
create equations
that can be used
to calculate

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Problems With
Solutions

this information, the rate laws must be integrated over time. We will not be doing the integration in this class, but we will be looking at the solutions to those integrations.

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The formulas below are the integrated rate laws. Each order of reaction has a specific equation, although rate laws can have orders that are not whole numbers, we will not be looking at their

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integrated rate
law.

Integrated Rate
Laws - Mr.

Beck's Chemistry

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Integrated Rate
Law Problems |
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Kinetics -
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Determining Rate
Laws and Rate
Constants This
is an exercise

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in the analysis of basic kinetic data. When you press "New Problem", a set of kinetic data for the reaction of three species A, B and C will appear in a table to the right of the scoring table.

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Determining Rate Laws and Rate Constants

This chemistry video tutorial provides the equations and formulas needed to solve zero order, first and second order integrated rate law problems including t...

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