$$2A + 1B \longrightarrow 1C + 2D$$

① If the concentration of B is dropping at a rate of 0.5 M/min, what is the rate of change for the following?

A:

C:

D:

② If A is dropping at 0.8 M/min, what is the rate of change for:

B:

C:

D:

③ Write the rate law, relative to each, beginning with B. Put +/− signs so that rate ends up being positive.

$2A \rightarrow B$

① If $\frac{\Delta A}{\Delta t} = -.010\ M/s$, what is $\frac{\Delta B}{\Delta t}$?

② $A \rightarrow B$

a. Calculate the average rate from $0 \rightarrow 10$ sec if $[A]$ goes from $0.1000 \rightarrow 0.0876\ M$?

b. If $[B]=0$ at 0 sec, what is it after 5 sec? $[B]$

$rate = k[A]^2$

① If rate is 3.6×10^{-3} M/s when $[A] = 0.20$ M, what is k?

② If $k = 0.090\ M^{-1}s^{-1}$ and $[A] = 0.60$ M, what is the rate?

Rate Law Examples	Effect on rate when [A] is doubled	Effect on rate when [A] is tenfold	"Order" of A	Overall Rxn Order	Rate Constant Units
$r = k[A]$					
$r = k[A][B]$					
$r = k[A]^2[B]$					
$r = k[A]^3[B]$					
$r = k[B]$					
$r = k[A]^{1/2}[B]$					

① $A + B \longrightarrow C + D$

	[A]	[B]	rate
1.	0.20	0.20	0.0078
2.	0.40	0.20	0.0156
3.	0.20	0.40	0.0078

order of A:

B:

Rate law:

k (number + units):

what is rate when [A] = 0.80, [B] = 0.80

② $A + B \longrightarrow C + D$

[A]	[B]	rate
0.20	0.20	0.15
0.40	0.20	0.30
0.20	0.40	0.30
0.40	0.40	0.60
0.80	0.40	
0.80	0.80	

Rate Law:

number for k:

③ $A + B + C \longrightarrow D + 2E$

[A]	[B]	[C]	rate
0.20	0.20	0.2	0.15
0.40	0.2	0.2	0.60
0.20	0.4	0.2	0.30
0.20	0.2	0.4	0.15

$k =$

④ $A + B \longrightarrow C$

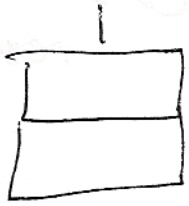
[A]	[B]	rate
0.1	0.1	1
0.2	0.1	4
0.1	0.2	1

⑤

[A]	[B]	rate
0.1	0.1	3
0.2	0.1	6
0.1	0.2	24

⑥ $r = k[A][B]$

moles A	moles B	Liters of Solvent	Relative Rate
.5	.5	1	
.5	.5	2	
.5	.5	0.5	



13-12

① ln practice

a. $\ln 1.8 =$ $\ln\left(\frac{100}{18}\right) =$ $\ln \frac{18}{7.2} =$

b. $\ln x = 1.43$ $\ln \frac{14}{x} = 1.86$ $\ln \frac{100}{x} = 1.13$

$x =$ $x =$ $x =$

Assume 1st Order Rate Laws for the Following

② what is the rate constant k if [A] goes from $1.0\ M \rightarrow 0.32\ M$ in 46 sec?

③ If $k = 113\ \text{years}^{-1}$, how long will it take for 10% of A to react?

④ If $k = 0.001\ \text{days}^{-1}$, what % of a spilled poison remains after 12 days?

13-14

① The half-life for A is 30 sec. If you start with 128 A, how many will be left after:

t (sec)	Amount
0	128
30	
60	
90	

t (sec)	Amount
120	
150	
180	
210	

② If k is 0.36 $days^{-1}$, what is $t_{1/2}$, and how long will it take for 75% to decay?

③ ^{14}C decomposes with $t_{1/2} = 5730$ years. What is k for decomposition?

13-19

For the Following, Classify Molecularity of Elementary Steps, Identify Intermediates, and Write Overall Rate Laws

① $A \longrightarrow B$

② $CH_3Br + {}^{\ominus}OH \longrightarrow CH_3OH + Br^{\ominus}$

③ $2A \longrightarrow B + C$ slow
$B + D \longrightarrow E$ fast

sum:

overall rate law $r =$

intermediate:

④ $A + B \rightleftharpoons C$ fast
$C + D \longrightarrow E + F$ slow

sum:
intermediate(s)
overall $r =$

⑤ $A \longrightarrow B + C$ slow
$B + C + D \longrightarrow E + F$ fast

⑤ $A + A \rightleftharpoons B$ fast
$B + C \longrightarrow D + E$ slow

13-21

Chem 160-Jasperse

Mechanisms and Rate Laws

Distinguishing among possible mechanisms, given a rate law:

1. Which mechanism is plausible for the reaction shown, given the rate law:

$$A + 2B \rightarrow C \qquad \text{rate} = k[A]$$

a. $A + B \rightarrow D$ (slow)
$D + B \rightarrow C$ (fast)

b. $B + B \rightarrow E$ (slow)
$A + E \rightarrow C$ (fast)

c. $A \rightarrow F$ (slow)
$F + B \rightarrow G$ (fast)
$G + B \rightarrow C$ (fast)

d. $B + B \rightarrow H$ (fast)
$A + H \rightarrow C$ (slow)

Identifying a Rate Law, given the Mechanism:

2. Given the mechanism shown, what is a reasonable rate law?

$$2A + 2B \rightarrow C$$

Mechanism: $A + B \rightarrow D$ (slow)
$D + B \rightarrow E$ (fast)
$A + E \rightarrow C$ (fast)

a. $r = k[A][B]$

b. $r = k[A][E]$

c. $r = k[A]^2[B]^2$

d. $r = k[A]^2[B]^2[D][E]$