

- ① A $k[A] = \text{rate}$ ② E $\text{Rate} = k[A][B]^2$
- ③ D $\text{Rate} = [A]^2[B]$
 $2 + 1 = 3$
- ④ D Pulg in sample data
 $\text{rate} = k[2]^2[2]$
 $4 \cdot 2 = 8$
- ⑤ A Trick there is no B to double $2^0 = 1$
 $\text{Rate} = k[A]$
 $2^1 = 2$
- ⑥ B changing A has no impact on the rate
- ⑦ C-C $A + B \rightarrow C + D$
 $A + C \rightarrow D + E$
- 8.) $2\text{NOCl} \rightarrow 2\text{NO} + \text{Cl}_2$
 look at ratios B
 $2\text{NOCl} \rightarrow 2\text{NO}$
 $1 : 1$

9.) rate = $k[H_2][I_2]$

14.) C

15.) A

↑ reactant ↑ rate
 (D) $k =$ it's a constant!



rate = $k[A]$

↑ T ↑ rate

(A)

$\ln k = \frac{-E_a}{R} \left(\frac{1}{T} \right) + \ln A$

rate law (#9) $K = A e^{\frac{-E_a}{RT}}$
 does is not influenced by T.

(1) (B)

$\frac{.2}{.1} = \frac{.6}{3}$

$2^x = 2$
 $x = 1$

(A)

$\frac{.4}{.2} = \frac{.6}{6}$

$2^y = 1$

$y = 0$

(C)

rate = $k[B]$

12.) C

I = ↑ [reactants] ↑ rate

III ↑ T ↑ rate

B is not in rate law: changes have no effect

13.)

B: $\frac{.2}{.1} = 2$

$\frac{.4}{2} = 2$

$2^x = 2$
 $x = 1$

BE careful!

A: $\frac{.2}{.4} \rightarrow \frac{.2}{.4}$

$\frac{4 \cdot 10^{-6}}{1.6 \cdot 10^{-5}}$

4

$4^x = 4$
 $x = 1$

net double

rate = $k[A][B]$



[B]

[A]

(2)

$\frac{.2}{.1} = \frac{2.4E^{-2}}{6.0E^{-3}}$

$\frac{.4}{.1} = \frac{6E^{-3}}{1.5E^{-3}}$

$2 = 4$

$4 = 4$

$2^B = 4$
 $B = 2$

$4^A = 4$
 $A = 1$

(C) rate = $[B]^2[A]$

15.) (A)

be careful, think of all of the half life rxns.

using rate = $-\frac{\Delta[A]}{t}$ just gives rate
 using \ln just gives k .

so look at how [A] changes over time

$.4 (1/2) = .2 (1/2) = .1 (1/2) = .05$

$\therefore \frac{\ln 2}{k} = \text{Half life for 1st order}$

$\therefore \text{rate} = k[A]$

Problems

[B]

$$1.2 \cdot \frac{.1}{1} = \frac{.1}{.05}$$

2

$$2^B = 2$$

$$B = 1$$

$$\frac{6E-3}{3E-3}$$

2

$$E_x = \frac{4}{3}$$

[A]

$$\frac{.2}{.1} = \frac{2.4}{1.2}$$

2 2

$$2^A = 2$$

$$A = 1$$

a.) rate = $k[A][B]$

b.) Exp 1 $3E-3 = k[.05][.05]$

$$k = \frac{1.2 \text{ L}}{\text{mol s}}$$

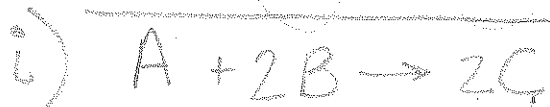
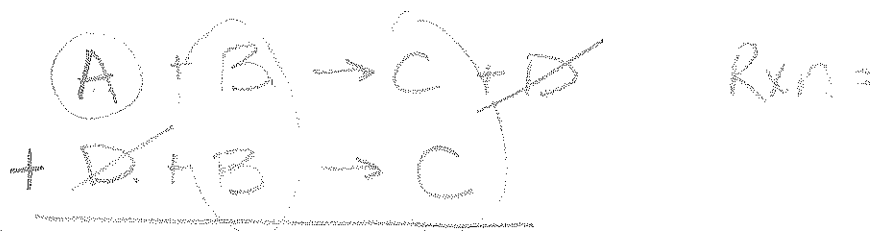
$$\frac{\text{mol}}{\text{L s}} = \frac{\text{mol}^2}{\text{L}^2}$$

$$\frac{\text{L}}{\text{mol s}}$$

c.) rate = $1.2[.02][.02]$

$$\text{rate} = 4.8E-4 \frac{\text{mol}}{\text{L sec}}$$

d.)



ii) only reactants are used in rate
 rate for rxn = A rate = $k[A][B]$
 rate for second rxn rate = $k[C][D][B]$
 $\therefore A + B \rightarrow C + D$ slow not in rate

Problem 2 APCH 12

(3)

2.) [NO]		[Br ₂]	
$\frac{.04}{.02}$	$\frac{3.8E-1}{9.6E-2}$	$\frac{.04}{.02}$	$\frac{1.9E-1}{9.6E-2}$
2	4	2	2
$2^{NO} = 4$		$2^{Br} = 2$	
NO = 2		Br = 1	

a.) rate = k [NO]² [Br]

b.) Exp 1 $9.6E-2 = k [.02]^2 [.02]$

$\frac{mol}{L \cdot s} = \frac{mol^2}{L^2} \frac{mol}{L}$

$\frac{L^2}{mol^2 \cdot s}$

$1.2E4 \frac{L^2}{mol^2 \cdot s}$

c.) Exp 2

[NO]	[Br ₂]	Rate
.04	.02	3.8E-1
?	1/2 = .01 consumed	



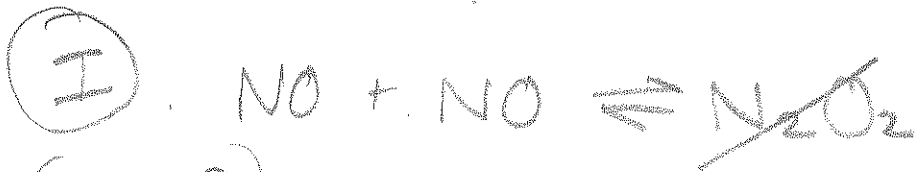
2 : 1

2 x NO ∴ if Br = .01 consumed 2x that

i-f $2(.01) = .02$ consumed at 0

$.04 - .02 = [.02]$ left

$$d.) \text{ rate} = k[\text{NO}]^2[\text{Br}_2]$$



slow

↑
rate determining
step

Problem 4

a.)	$\frac{3}{2}$	$\frac{[B]}{.2}$	$\frac{\text{Rate}}{.6}$
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$$\frac{2^B}{B} = 2$$

$$B = 1$$

Exp 1 + 2

Double A - double B
 .1 .1
 .2 .2

$\text{rate} = k[B]$

∴ rate double (no help)
 Exp 2 + 3

A constant B rate
 .2 .2 double
 .2 .4 ∴ A has

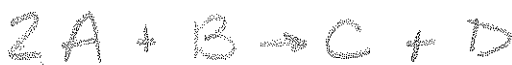
b.) Exp 1 $1.5 \times 10^{-3} = k[.1]$

$$\frac{\text{mol}}{k \text{ min}} = \frac{\text{mol}}{k}$$

$$\frac{1}{\text{min}}$$

$k = 0.015 \frac{1}{\text{min}}$

c.) hm m... lets look at the Rxn to find [D]

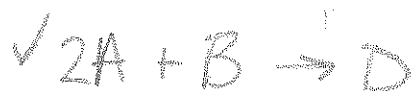
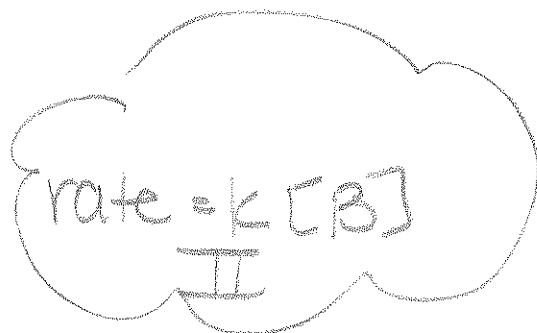


Exp 2 info	$\frac{[A]}{.2}$	$\frac{[B]}{.2}$	$\frac{\text{rate}}{3.0 \times 10^{-3}}$
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equal but not consumed equal
 A is consumed 2x as fast ∴ we will run out of it 1st ∴ LR

∴ for 2 mol A consumed 1 mol D formed

$\frac{2 \text{ mol A}}{2 \text{ mol A}} = 0.1 \text{ mol D formed}$



$$\therefore t_{1/2} = \frac{\ln 2}{k} = \frac{\ln 2}{0.015} = \boxed{46.2 \text{ min}}$$

Watch algebra + signs!! Problem 3

a.) Calculate rate constant (k)

- Given 1st order
- only given [] + time

$$\therefore \ln[A] - \ln[A]_0 = -kt$$

$$\ln[.289] - \ln[.40] = -k(20)$$

$$-1.241 - (-.916) = -k(20)$$

$$k = 0.01625 \text{ min}^{-1}$$

b.) $[N_2O_5] = 0.350M$ find t

$$\ln[.350] - \ln[.4] = -.01625 t$$

-.133

$$t = 8.2 \text{ min}$$

c.) $[N_2O_5]$ after 100 min's

$$\ln[A] - \ln[.4] = -.01625(100)$$

$$\ln[A] - .916 = -1.625$$

$$\ln[A] + .916 = -1.625$$
$$\ln[A] = -2.541$$

$$[A] = e^{-2.541}$$

$$[A] = 0.0787 \text{ M}$$

$$d.) \text{ rate} = .0163 \text{ l/min} \left[.4 \frac{\text{mol}}{\text{L}} \right]$$

$$\boxed{\text{rate} = 0.00652 \frac{\text{mol}}{\text{L min}}}$$

$$e.) \text{ 1st order Rxn. } \therefore t_{1/2} = \frac{\ln 2}{k}$$

$$t_{1/2} = \frac{\ln 2}{.0163} = \boxed{42.5 \text{ min}}$$