Optional Ch 12 Test Rev -

1) B
2) C
3) C
4) c
5) B
6) D
7) a) double rate
   b) 1/4 rate
   c) x 9 rate

#2) 3:2 ratio to SO_2, in which to = rate
it would be a $\frac{3}{2}$ ratio (inverse of coef

#5 $k = \frac{3.60}{M \cdot s} = 3.60\ M^{-1} \cdot s^{-1}$
2nd order

2nd order = 4x rate if doubled

2nd order = 4 x rate is doubled
so if triple the reactant
x8

8) a) F - only the same Avg. KE
   b) F - decreases
   c) T
   d) F - only generally
   e) F - also need proper orientation
   f) F - depends on bond energy
   g) F - decreases
   h) F - bond energy
   i) F - catalyst decreases E_A
   j) F - usually, not always

9) $CO + \cdot OH \rightarrow CO_2 + H\cdot$
$H\cdot + O_2 \rightarrow HOO\cdot$
$HOO\cdot + NO \rightarrow \cdot OH + NO_2$
$CO + O_2 + NO \rightarrow CO_2 + NO_2$

catalyst - $\cdot OH$
intermediate - $H\cdot$, $HOO\cdot$
single lone e⁻ is a "radical", very reactive

10) 1st order: $\ln[A] = -kt + \ln[A]_0$
100 - 85 = 15% (∴ [A] remains)
$\ln[15] = -k(79.0\ min) + \ln(100)$
$-1.897 = -k(79.0)$
$k = 0.024\ min^{-1}$

$$\ln\left(\frac{K_2}{K_1}\right) = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

$$\ln\left(\frac{1.0\times10^{-10}}{1.0\times10^{-5}}\right) = \frac{111{,}000\ \text{J/mol}}{8.314\ \text{J/mol·K}}\left(\frac{1}{x} - \frac{1}{300}\right)$$

(T_2)

$$-11.51 = 13350.97\left(\frac{1}{x} - \frac{1}{300}\right)$$

$$-8.62\times10^{-4} = \frac{1}{x} - \frac{1}{300}$$

$$0.002471 = \frac{1}{x} \qquad x = 405\ \text{K} = T_1$$

3) $\text{Rate} = k[N_2O_2][H_2]$ ← but you can't have an intermediate in rate law — plug in for

So use $K_f = K_r$ equil step

rate of forward = rate of reverse

$K_f[NO]^2 = K_r[N_2O_2]$ → $\frac{K_f[NO]^2}{K_r}[N_2O_2]$

$\therefore \text{Rate} = \frac{K\cdot K_f}{K_r}[NO]^2[H_2]$ = each other

$\text{Rate} = k[NO]^2[H_2]$

7) analysis of t vs $[C_4H_6]$: $r^2 = 0.8$

t vs $\ln[C_4H_6]$: $r^2 = 0.948$

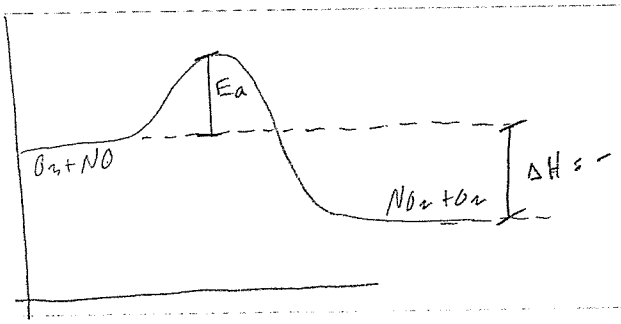
t vs $\frac{1}{[C_4H_6]}$: $r^2 = 0.999$ * ← 2nd order rxn ; $k = 0.0752\ \frac{L}{mol\cdot s}$

$$t'_{1/2} = \frac{1}{k[A]_0} = \frac{1}{(0.0752)(0.0100)}$$

$t'_{1/2} = 1330$ sec

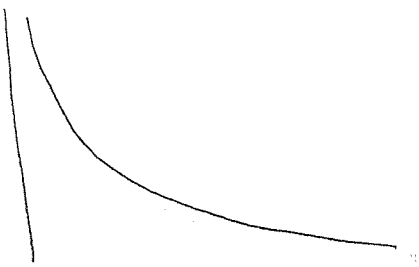
14)

a)



iv) If more N_2O_5 were added, K would not change; K is temp dependent

b)



ii) draw a line tangent to t desired, find slope of tangent line

iii) in 1st order

$\ln[\ ] = -kt + \ln[\ ]_0$ (slope of line) or $k = \frac{\text{Rate}}{[\ ]}$

14) c)

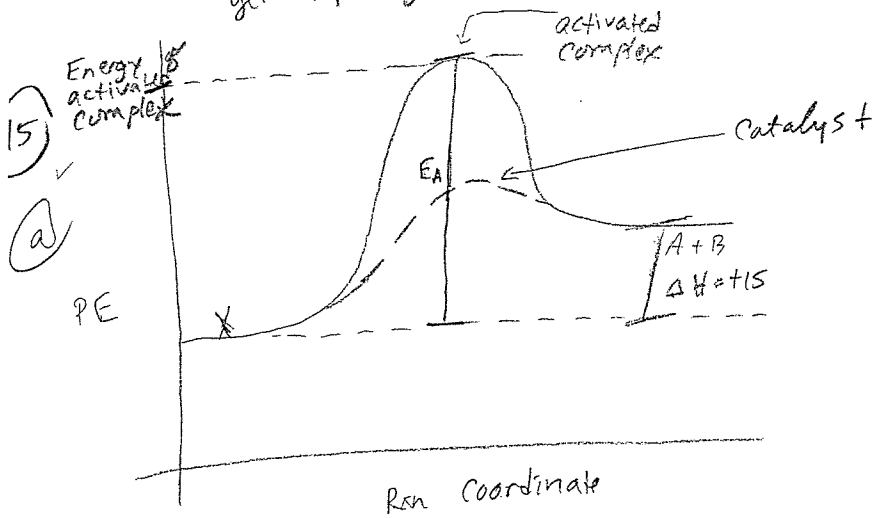
i) Rate = k[A] (1st order rxn for reactant A, linear line for ln[A] vs t (– slope))

ii) slope = –k , solve for k

↑ get slope of linear line in ln[A] vs t graph

15) ✓

a)



b) catalyst: – – – – line on graph

catalyst, lowers Ea by providing a rxn pathway with a lower Ea

- not consumed in rxn

∴ more Reactant molecules possess Ea energy and react, ↑ rxn rate

16) ✓

$$\text{Rate} = k[H_2SeO_3]^x[H^+]^y[I^-]^z$$

$$\frac{2}{1} = \frac{3.33\times10^{-7}}{1.66\times10^{-7}} = \frac{k(2.0\times10^{-4})^x(2.0\times10^{-2})^y(2.0\times10^{-2})^z}{k(1.0\times10^{-4})^x(2.0\times10^{-2})^y(2.0\times10^{-2})^z} = 2 = 2^x \quad x=1$$

$$\frac{4}{1} = \frac{6.66\times10^{-7}}{1.66\times10^{-7}} = \frac{k(1.0\times10^{-4})^1(4.0\times10^{-2})^y(2.0\times10^{-2})^z}{k(1.0\times10^{-4})^1(2.0\times10^{-2})^1(2.0\times10^{-2})^z} = 4 = 2^y \quad y=2$$

$$\frac{7}{5} = \frac{3.36\times10^{-7}}{0.42\times10^{-7}} = \frac{k(1.0\times10^{-4})^1(1.6\times10^{-2})^2(4.0\times10^{-2})^z}{k(1.0\times10^{-4})^1(1.0\times10^{-2})^2(2.0\times10^{-2})^z} \quad 8 = 2^z \quad z=3$$

$$\text{Rate} = k[H_2SeO_3]^1[H^+]^2[I^-]^3$$

find k - $(1.66\times10^{-7}) = k(1.0\times10^{-4})^1(2.0\times10^{-2})^2(2.0\times10^{-2})^3$

$$k = 5.19\times10^5 \ L^5/mol^5 \cdot s$$