AP Chemistry - Day 17 10.07.14

Objective: SWBAT explain the rates of reactions through mathematical representations.

Agenda:

1) Review Exam – corrections - due Thursday
2) Kinetics Notes
3) Practice Problem
4) POGIL - Kinetics - due Thursday

Corrections

Number	Your Org. Answer	Correct Answer	Reason
8	E; NaCl	A; PCl_5	both P, Cl are non-metals

a) $P_{O_2} = ?$

$P_{TOTAL} = P_{H_2O} + P_{O_2}$

$762.6 torr = 21.6 torr + P_{O_2}$ $\quad \frac{1}{1/2} = 2$

$P_{O_2} = 741.0 torr$

b) $PV = nRT$ $\quad n = \frac{PV}{RT}$

$P = 741.0 torr$

$V = .1824 L$

$n = n$

$R = 62.3 L\ torr/Mol \cdot K$

$T = 23.4°C + 273.15K = 296.6K$

$n = \frac{(741.0 torr)(.1824 L)}{(62.3 \frac{L\ torr}{Mol \cdot K})(296.6 K)}$

$n = 7.316 \times 10^{-3} mols$

c) mols O_2 → mols H_2O_2 → g H_2O_2

$7.316 \times 10^{-3} mols\ O_2 \times \frac{2\ mol\ H_2O_2}{1\ mol\ O_2} \times \frac{34.014 g}{1 mol\ H_2O_2} = 0.497 g\ H_2O_2$

d) $\frac{0.497 g}{6.951 g} = 7.15\%$

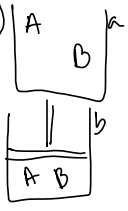
e) $\overset{+2}{H_2}\overset{-1}{O_2} = 0 = -1$ $\quad O_2 = \emptyset$

f) $\underset{+2\ -2}{H_2O_2(aq)} \rightarrow \underset{0}{O_2(g)} + \underset{+2}{2H^+} + 2e^-$

Kinetics = rate of chemical reactions

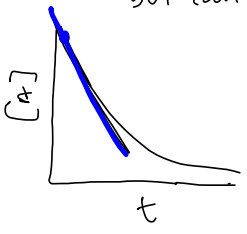
$A + B \rightarrow AB$

1) 

2) 

- Rates are affected by:
  1. Temperature
  2. E_{ACT} = activation energy
  3. Concentration
  4. Pressure
  5. Surface Area
  6. Catalyst - lower activation energy

- We look at rates through concentration
  - but can also look at pressure.



Method of initial rate
- take a measurement of slope of a reaction graph at the very beginning to approx actual rate.

rate = k[A] A → products

rate law → rate constant

1st order = rate is dependent to initial concentration.

rate = K = 0th order

- rate is not affected by concentrat. of A.

rate = k[A]^2 = 2nd order

$A + B \rightarrow C + D$

$\text{rate} = K[A][B]^2$ ⇒ overall 3rd order

order A = 1st - rate is affected proportionally by A

order B = 2nd

1) $K[1][1]^2 = \text{rate}$

2) $K[1][2]^2 = \text{rate}$

Zero = rate = k

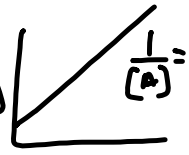
$y = mx + b$

$[A] = -kt + [A]_0$

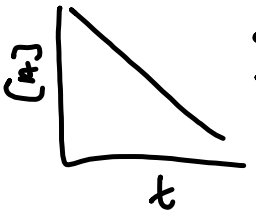
1st order rate = $k[A]$

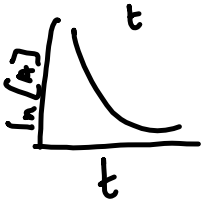
$\ln[A] = -kt + \ln[A]_0$

2nd order rate = $k[A]^2$



$\frac{1}{[A]} = kt + \frac{1}{[A]_0}$





$8H^+ + 6Cl^- + MnO_4^- \rightarrow 2Cl_2 + Mn^{+3} + 4H_2O$

+1 −1 +7 −8 0 +3 +1 −2 −8

ox reduced

$Cl_2 \rightarrow Na^{+1} + Cl^{-1}$

[.250M] = NaCl → Cl^- = [.250M]

$\frac{.250\ mols}{L} \times 0.025L = 6.25 \times 10^{-3}\ mol\ Cl^-$

ii) P = .950 atm
V = V
n = 3.125×10^{-3} mol
R = 0.0821L · atm/molK
T = 295K

$V = Cl_2$

$PV = nRT$

$V = \frac{nRT}{P}$

$Cl^{-1} = \frac{rate1}{rate2} = \frac{K[Cl^-]^x[MnO_4^-]^y[H^+]^z}{K[Cl^-]^x[MnO_4^-]^y[H^+]^2}$

$\frac{2.25\times10^{-8}}{2.03\times10^{-7}} = \frac{[0.0104]^x}{[0.0312]^x}$

$0.1108 = 1/3^x$

$1/9 = 1/3^x$

$9 = 3^x \quad x = 2$

c)i $rate = K[Cl^-]^2[MnO_4^-]^1[H^+]^3$

ii) Trial 1

$\frac{2.25\times10^{-8}\,M/s}{[0.0104]} = \frac{K[0.0104M]^2[.004_M][3.00_M]^3}{[0.0104M]^2[0.004M][3.00M]^3}$

$\frac{M}{s} = K M^2 \cdot M \cdot M^3 = \frac{K \cdot M^6}{M^6} = \frac{M}{s} / M^5$

$K = \frac{1}{M^5 \cdot s}$

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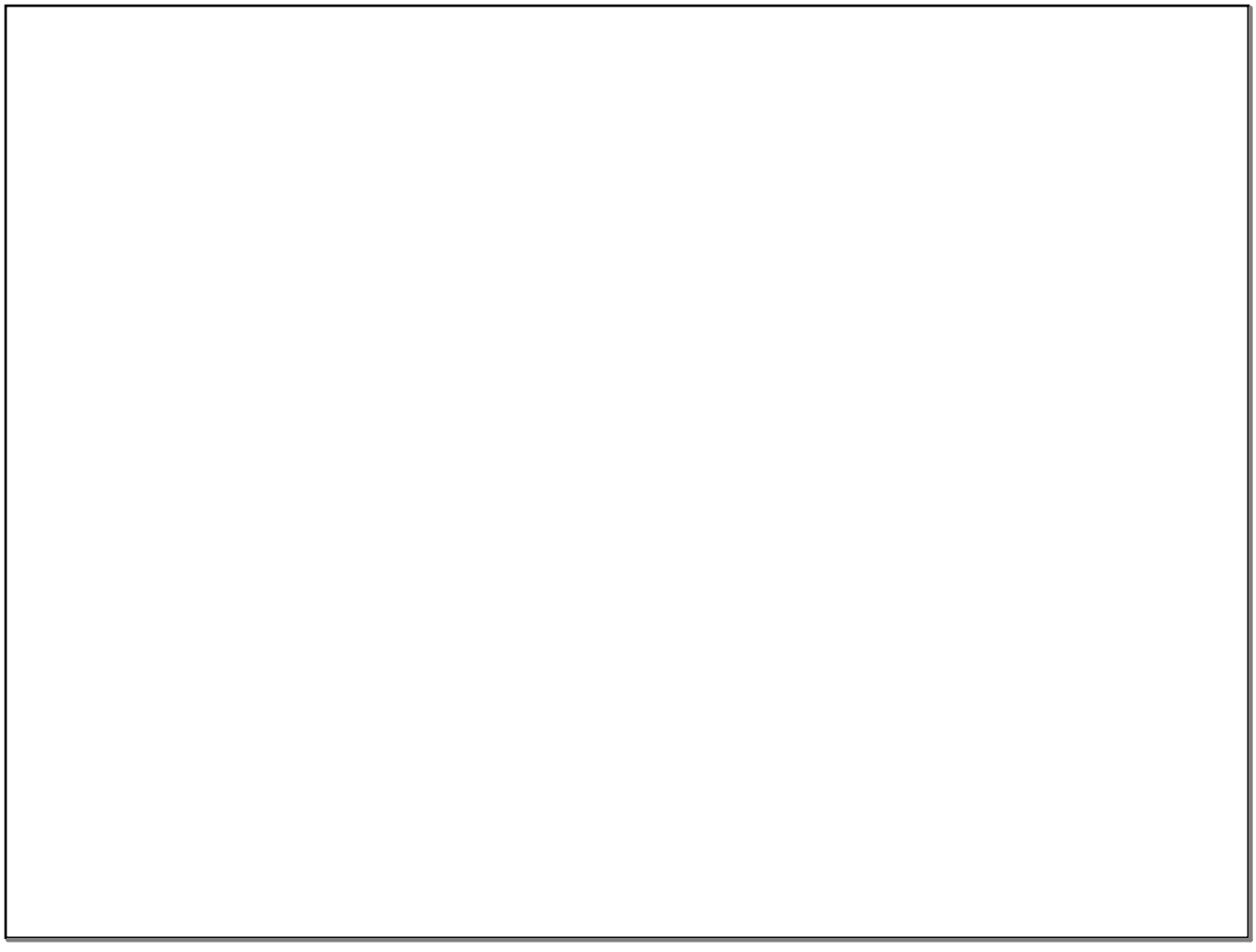

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