Dougherty Valley HS AP Chemistry
Kinetics – Extra Method of Initial Rates

WORKSHEET #2*

Name: **Date:** **Period:** **Seat #:**

Directions: Any worksheet that is labeled with an * means it is suggested extra practice. We do not always have time to assign every possible worksheet that would be good practice for you to do. You can do this worksheet when you have extra time, when you finish something early, or to help you study for a quiz or a test. If and when you choose to do this Extra Practice worksheet, please do the work on binder paper. You will include this paper stapled into your Rainbow Packet when you turn it in, even if you didn't do any of this. We want to make sure we keep it where it belongs so you can do it later if you want to (or need to). If you did the work on binder paper you can include that in your Rainbow Packet after this worksheet. If we end up with extra class time then portions of this may turn into required work. If that happens you will be told which problems are turned into required. Remember there is tons of other extra practice on the class website…and the entire internet! See me if you need help finding practice on a topic you are struggling with.

Show all work. Complete the following on binder paper and BOX your final answers.

[1] Hydrogen peroxide decomposes in the presence of iodide ion. The reaction is:

$$\mathbf{2H_2O_2(aq) \xrightarrow{I^-} 2H_2O\,(l) + O_2(g)}$$

Using the following data, determine the rate law and the value of the rate constant.

Rate ($M\ min^{-1}$)	**$[H_2O_2]$ ($mol\ L^{-1}$)**
1.01×10^{-3}	0.1
2.02×10^{-3}	0.2
4.04×10^{-3}	0.4
6.06×10^{-3}	0.6

Rate Law: Rate Constant:

[2] At 325ºC, $NO_2(g)$ reacts with $CO(g)$ to yield $NO(g)$ and $CO_2(g)$. The reaction is:

$$\mathbf{NO_2(g) + CO(g) \rightarrow NO(g) + CO_2(g)}$$

It is observed that the reaction rate does not depend upon the concentration of CO, and so the reaction rate law does not involve [CO]. The rate does depend upon $[NO_2]$, however, and the following data is obtained. Determine the rate law and the value of the rate constant.

Rate ($M\ sec^{-1}$)	**$[NO_2]$ ($mol\ L^{-1}$)**
1.1×10^{-2}	0.15
4.5×10^{-2}	0.3
1.8×10^{-1}	0.6
4.0×10^{-1}	0.9

Rate Law: Rate Constant

[3] Sucrose decomposes in aqueous solution into a mixture of two sugars, glucose and fructose.

$$\mathbf{C_{12}H_{22}O_{11}(aq) + H_2O(\mathit{l}) \rightarrow C_6H_{12}O_6(aq) + C_6H_{12}O_6(aq)}$$

The observed initial rates of decomposition of sucrose at two different initial sucrose concentrations at 25ºC are:

Rate ($M\ sec^{-1}$)	**[sucrose] ($mol\ L^{-1}$)**
8.5×10^{-3}	0.1
1.71×10^{-2}	0.2

Find the dependence of the reaction rate on the concentration of sucrose and compute the rate constant for the reaction.

Dependence on [ ]: Rate Constant

[4] Given: A + B → C

[A] (mol L^{-1})	[B] (mol L^{-1})	Rate (M sec^{-1})
0.1	0.1	4.0 x 10^{-5}
0.1	0.2	4.0 x 10^{-5}
0.2	0.1	16 x 10^{-5}

Determine the rate law
Calculate the rate constant
Determine the rate when [A] = 0.05 and [B] = 0.10

[5] Data for the reaction of ammonium and nitrite ions in water at 25ºC follows. Determine the rate law for this reaction.

$[NO_2^-]$	$[NH_4^+]$	Rate (M sec^{-1})
0.01	0.2	5.4 x10^{-7}
0.02	0.2	10.8 x10^{-7}
0.04	0.2	21.5 x10^{-7}
0.06	0.2	32.2 x10^{-7}
0.2	0.02	10.8 x10^{-7}
0.2	0.04	21.6 x10^{-7}
0.2	0.06	32.4 x10^{-7}
0.2	0.08	43.3 x10^{-7}

[6] Given: $2NO(g) + Br_2(g) \rightarrow 2NOBr(g)$. Determine the reaction rate law and the rate constant

[NO] (mol L^{-1})	[Br_2] (mol L^{-1})	Rate (M min^{-1})
0.1	0.1	4.0 x 10^{-5}
0.1	0.2	4.0 x 10^{-5}
0.2	0.1	16 x 10^{-5}