CHM152 Quiz 1 25 Pts Fall 2008 Name: Key

SHOW ALL WORK TO RECEIVE CEREDIT.

1. (4 Pts) Which of the statements concerning relative rates of reaction is correct for the decomposition of dinitrogen pentaoxide?

$2\ N_2O_5(g) \rightarrow 4\ NO_2(g) + O_2(g)$

a. The rate of disappearance of N_2O_5 is 1/2 the rate of appearance of O_2.
b. The rate of appearance of NO_2 is 1/4 the rate of appearance of O_2.
(c.) The rate of disappearance of N_2O_5 is 1/2 the rate of appearance of NO_2.
d. The rate of appearance of NO_2 equals the rate of appearance of O_2.
e. The rate of disappearance of N_2O_5 equals the rate of appearance of NO_2.

2. (10 Pts) Given the initial rate data for the reaction A + B → C, determine the rate expression for the reaction and the value of the rate constant along with its units.

General Rate law: $\text{rate} = k[A]^x[B]^y$

	[A], M	[B], M	$\Delta[C]/\Delta t$ (initial) M/s
Exp 1	0.10	0.20	4.20×10^{-4}
Exp 2	0.10	0.40	1.68×10^{-3}
Exp 3	0.20	0.40	3.36×10^{-3}

For A: use Exp 3 / Exp 2 : $\frac{\text{rate}_3}{\text{rate}_2} = \frac{k[A]_3^x[B]_3^y}{k[A]_2^x[B]_2^y}$

$\frac{3.36\times10^{-3}}{1.68\times10^{-3}} = \left(\frac{[0.20]}{[0.10]}\right)^x \Rightarrow 2 = 2^x$ $x = 1$

For B: Exp 2 / Exp 1 : $\frac{1.68\times10^{-3}}{4.20\times10^{-4}} = \left(\frac{0.40}{0.20}\right)^y \Rightarrow 4 = 2^y$ $y = 2$

rate law: $\text{rate} = k[A]^1[B]^2$ $k = \frac{\text{rate}}{[A][B]^2}$ $k = 0.105\ M^{-2}s^{-1}$

3. (3 Pts) What is the overall order of the reaction

$CO(g) + NO_2(g) \rightarrow CO_2(g) + NO(g)$

if it proceeds via the following rate expression? $\text{rate} = k[CO][NO_2]$ ans 2

4. (3 Pts) Nitric oxide reacts with hydrogen at a measurable rate at 1000 K according to the equation below.

$2\ NO(g) + 2\ H_2(g) \rightarrow N_2(g) + 2\ H_2O(g)$

What is overall order of the reaction?

a. first-order b. second-order c. third-order

d. fourth-order (e.) not enough information given to solve

5. (4) For the reaction A + B → C, the rate law is

$$\frac{\Delta[C]}{\Delta t} = k[A][B]$$

What are the units of the rate constant where time is measured in seconds? $M^{-1}s^{-1}$