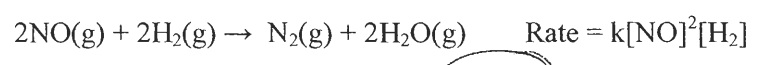


SHOW ALL WORK TO RECEIVE CREDIT. *takes care of - sign*

1. (5 Pts) The oxidation of ammonia produces nitrogen and water via the reaction $4\text{NH}_3 + 3\text{O}_2 \rightarrow 2\text{N}_2 + 6\text{H}_2\text{O}$. If the rate of formation of N_2 is $2.0 \text{ mol}/(\text{L} \cdot \text{s})$, then the rate at which O_2 disappears is $3 \text{ M} \cdot \text{s}^{-1}$?

$$\text{rate} = \frac{\Delta[\text{N}_2]}{2\Delta t} = \frac{-\Delta[\text{O}_2]}{3\Delta t} \text{ so: } \frac{\Delta[\text{O}_2]}{\Delta t} = \frac{-3[\text{N}_2]}{2\Delta t} = \frac{-3[2.0 \text{ M}]}{2 \cdot \text{s}}$$

2. The equation and the rate law for the reaction between $\text{NO}(\text{g})$ and $\text{H}_2(\text{g})$ are



a. (2 Pts) The overall reaction order is 3.

b. (2 Pts) What effect on the rate would tripling the concentration of NO and doubling the concentration of H_2 have? _____

$$\text{rate} = k [3]^2 [2] = \text{18 fold}$$

3. For the reaction $a\text{A} + b\text{B} + c\text{C} \rightarrow d\text{D} + e\text{E}$, the following data were obtained:

Initial Concentrations (mol/L)			Initial Rate (mol/(L · min))
[A]	[B]	[C]	
0.40	0.40	0.20	160
0.20	0.40	0.40	80.
0.60	0.10	0.20	15
0.20	0.10	0.20	5.0
0.20	0.20	0.40	20.
0.20	0.20	0.20	20.

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

a. (12 Pts) Determine the orders for each reactant, A, B, and C, are, respectively. **SHOW ALL WORK TO RECEIVE CREDIT**

for A: $\left(\frac{0.60}{0.20}\right)^x = \frac{15}{5} \quad 3^x = 3 \quad x = 1$

for B: $\left(\frac{0.40}{0.20}\right)^y = \frac{80}{20} \quad 2^y = 4 \quad y = 2$

for C: $\left(\frac{0.40}{0.20}\right)^z = \frac{20}{20} \quad 2^z = 1 \quad z = 0$

$$\text{rate} = k [\text{A}]^1 [\text{B}]^2$$

b. (4 Pts) Determine the value of the rate constant and its UNITS.

use any set: $160 = k [0.40] [0.40]^2$
 $k = 2500 \text{ M}^{-2} \cdot \text{min}^{-1}$