

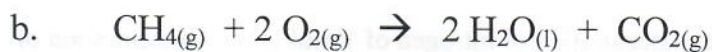
## Factors that Affect Reaction Rates:

name:

SOLUTIONS

### Concentration of Reactants Practice Quiz:

1. Place in decreasing order of rate (fast to slow): C > A > B



2. The rate of reaction of the below reaction is measured during an experiment and the following results are collected.



Experiment	[A] (mol/L)	[B] (mol/L)	r (mol/L · s)
1	0.3	0.2	0.042
2	0.6	0.2	0.084
3	0.3	0.1	?

But your lab partner blunders and you do not collect your last rate.

Determine:

a) The rate law expression:

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

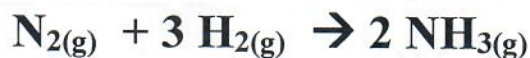
b) The rate for experiment 3.

$$\textcircled{1} \quad 0.042 = k[0.3][0.2]^2$$
$$k = 3.5$$

$$0.084 = k(0.6)(0.2)^2$$
$$k = 3.5$$

$$\textcircled{2} \quad r = 3.5(0.3)(0.1)^2$$
$$r = \underline{\underline{0.0105 \text{ mol/L} \cdot \text{s}}}$$

3. Nitrogen reacts with hydrogen to produce ammonia following this reaction:



- a. If the initial reaction rate is 21.2 mol/L·s with a concentration of nitrogen of 1 mol/L and concentration of hydrogen of 2 mol/L, Calculate the rate constant.

$$\begin{aligned} r &= k [\text{N}_2] [\text{H}_2]^3 \\ 21.2 &= k (1) (2^3) \\ k &= 2.65 \end{aligned}$$

- b. What will the reaction rate be if the concentrations are changed to  $[\text{N}_2] = 0.75 \text{ mol/L}$  and  $[\text{H}_2] = 2.2 \text{ mol/L}$ .

$$\begin{aligned} r &= k [\text{N}_2] [\text{H}_2]^3 \\ r &= 2.65 (0.75) (2.2)^3 \\ r &= 21.16 \text{ mol/L}\cdot\text{s} \end{aligned}$$

- c. What would be the production rate of ammonia with the new concentrations from question b.

$$\begin{aligned} r &= \frac{1}{2} r_{\text{NH}_3} \\ 21.16 &= \frac{1}{2} r_{\text{NH}_3} \end{aligned}$$

$$\underline{r_{\text{NH}_3} = 42.32 \text{ mol/L}\cdot\text{s}}$$