

Review

- How is a reaction rate measured?
$$\frac{\Delta \text{concentration}}{\Delta \text{time}} = \frac{M}{S}$$
- What must occur for successful reaction?
collide, enough energy, correct orientation
- What is the activation energy of a reaction?
energy required for a rxn to occur
- What is an activated complex?
 - aka transition state
 - old bonds are breaking; new bonds are forming
 - very unstable

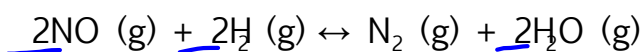
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Describe, in detail, how each of the following would affect the rate of a reaction:

- Heating the reaction.
↑, molecules move faster — more collisions
- Crushing the reactants.
↑, ↑ surface area, more likely to have
- Adding a catalyst.
↑, lowers activation energy (E_a)
correct orientation

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Calculate the equilibrium constant:



- Calculate K_{eq} if
- $[\text{NO}] = 1.5 \times 10^{-2} \text{M}$,
- $[\text{H}_2] = 2.35 \times 10^{-3} \text{M}$,
- $[\text{N}_2] = 8.24 \times 10^{-2} \text{M}$,
- $[\text{H}_2\text{O}] = 6.03 \times 10^{-2} \text{M}$.

$$K_{\text{eq}} = \frac{[\text{N}_2][\text{H}_2\text{O}]^2}{[\text{NO}]^2[\text{H}_2]^2}$$

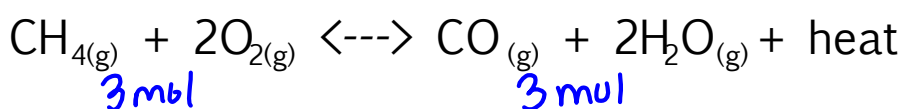
$$K_{\text{eq}} = \frac{[8.24 \times 10^{-2}][6.03 \times 10^{-2}]^2}{[1.5 \times 10^{-2}]^2[2.35 \times 10^{-3}]^2} = 2.4 \times 10^5$$

- Are the reactants or products favored at equilibrium? How do you know?
products > 1
- The magnitude (value) of K_{eq} is dependent only on which variable?

temp

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Answer the following with shift left or shift right or no change & explain your answer:



- Which way will the reaction shift if CH_4 added?
shift right, ↑ products
- Which way if the temperature is raised?
shift left, ↑ reactants
- Which way if water is removed?
shift right, ↑ products
- Which way if the volume is increased?
no change

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Rate Laws

- The following experimental data were obtained for reaction at 250 K, $F_2 + 2 ClO_2 \rightarrow 2 FClO_2$

$[F_2]$	$[ClO_2]$	Rate M/s
— 0.10	— 0.01	1.2×10^{-3}
0.10	— 0.04	4.8×10^{-3}
— 0.20	0.01	4.8×10^{-3}

- Write the rate law for this reaction.

$$[F_2] \times 2 \quad \text{rate} \times 4 \quad 2^x = 4 \quad x = 2$$

$$[ClO_2] \times 4 \quad \text{rate} \times 4 \quad 4^y = 4 \quad y = 1$$

$$\text{rate} = k [F_2]^2 [ClO_2]$$

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K_{sp}

Calculate the solubility (in mol/L) of barium sulfate. The solubility product ^{K_{sp}} constant for barium sulfate is 1.08×10^{-10}



$$K_{sp} = [Ba^{2+}][SO_4^{2-}]$$

$$K_{sp} = x^2$$

$$\sqrt{1.08 \times 10^{-10}} = \sqrt{x^2}$$

$$= 1.04 \times 10^{-5} M$$

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