AP Chemistry Daily Videos
5.1 Reaction Rates

Video #1

1. What does kinetics study? How does it relate to rate?

2. How can you use stoichiometry to determine the rate of change of react and product concentrations?

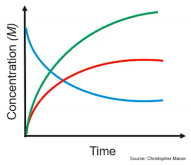
3. What happens to the concentration of reactants and products as a reaction occurs?

$A \rightarrow B + 2\,C$

$$Rate\ of\ disappearance\ of\ A = \frac{-\Delta[A]}{\Delta\ time}$$

$$Rate\ of\ appearance\ of\ B = \frac{\Delta[B]}{\Delta\ time}$$

$$Rate\ of\ appearance\ of\ C = \frac{\Delta[C]}{\Delta\ time}$$



The rate of disappearance of A is equal to the rate of appearance of B and ½ the rate of appearance of C.

4. What is the unit of reaction rate?

5. Pause the video at 2:22 and attempt the problem, then evaluate how you did and identify any errors.

$D + 3\,E \rightarrow 2\,F$

When the chemical reaction above is carried out under certain conditions, the rate of disappearance of D is $2.5 \times 10^{-2}\ Ms^{-1}$. What is the rate of disappearance of E and the rate of appearance of F under these same conditions?

6. Pause the video at 3:25 and attempt the problem, then evaluate how you did and identify any errors.

$X + 2\,Y \rightarrow Z + 3\,Q$

For the reaction represented above, the initial rate of decrease in [X] was 2.8×10^{-3} mol L^{-1} s^{-1}. What was the initial rate of decrease in [Y]?

(A) 7.0×10^{-4} mol L^{-1} s^{-1}
(B) 1.4×10^{-3} mol L^{-1} s^{-1}
(C) 2.8×10^{-3} mol L^{-1} s^{-1}
(D) 5.6×10^{-3} mol L^{-1} s^{-1}
(E) 1.1×10^{-2} mol L^{-1} s^{-1}

7. Pause the video at 4:12 and attempt the problem, then evaluate how you did and identify any errors.

$X(g) + 2\,Y(g) \rightarrow XY_2(g)$

In order to determine the order of the reaction represented above, the initial rate of formation of XY_2 is measured using different initial values of [X] and [Y]. The results of the experiment are shown in the table below.

In trial 2 which of the reactants would be consumed more rapidly, and why?

Trial	[X]	[Y]	Initial Rate of Formation of XY_2 ($M\ s^{-1}$)
1	0.50	0.50	8.0×10^{-3}
2	1.00	0.50	3.2×10^{-2}
3	1.00	1.00	6.4×10^{-2}

(A) X, because it has a higher molar concentration.
(B) X, because the reaction is second order with respect to X.
(C) Y, because the reaction is second order with respect to Y.
(D) Y, because the rate of disappearance will be double that of X.

Video #2

1. How does collision theory relate to reaction rates?

2. Explain how increasing aqueous concentration and decreasing volume of gases both increase reaction rates.

3. Why does increasing temperature increase reaction rates?

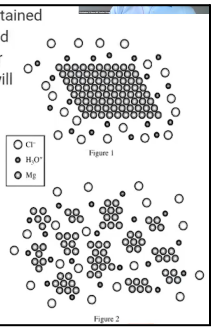
4. What does increasing surface area increase reaction rates?

5. Pause the video at 2:07 and attempt the problem, then evaluate how you did and identify any errors.

A kinetics experiment is set up to collect the gas that is generated when a sample of chalk, consisting primarily of solid $CaCO_3$, is added to a solution of ethanoic acid, CH_3COOH. The rate of reaction between $CaCO_3$ and CH_3COOH is determined by measuring the volume of gas generated at 25^oC and 1 atm as a function of time. Which of the following experimental conditions is most likely to increase the rate of gas production?

6. Pause the video at 3:27 and attempt the problem, then evaluate how you did and identify any errors.

Two samples of Mg*(s)* of equal mass were placed in equal amounts of HCl*(aq)* contained in two separate reaction vessels. Particle representations of the mixing of Mg*(s)* and HCl*(aq)* in the two reaction vessels are shown in Figure 1 and Figure 2 above. Water molecules are not included in the particle representations. Which of the reactions will initially proceed faster, and why?



A. The reaction in Figure 1, because the atoms of Mg are more concentrated than those in Figure 2

B. The reaction in Figure 1, because the Mg*(s)* in Figure 1 has a larger mass than the Mg*(s)* in Figure 2

C. The reaction in Figure 2, because more Mg atoms are exposed to HCl*(aq)* in Figure 2 than in Figure 1

D. The reaction in Figure 2, because the Mg*(s)* in Figure 2 has less surface area than the Mg*(s)* in Figure 1

7. **Key Takeaway**: Rate of a reaction is influenced by anything that affects the _____ of collision or the _____ of collision.