Factors that Affect the Rate of Chemical Reactions

SNC2D 06 - 07

The Affect of Temperature on the Rate of Reaction:

1) Place equal volumes of water at 4 different temperatures into beakers of the same size.
2) Measure the temperatures of the different waters.
3) Place ¼ of an Alka-Seltzer tablet of approximately the same size into each beaker simultaneously. Don't stir.
4) Record how long it takes for each tablet to completely dissolve and any other qualitative observations you can make in the following table:

Beaker	Temp (ºC)	Time (s)	Qualitative Observations
Ice water			
Cool water			
Warm water			
Hot water			

Questions:

1. What happened to the rate of the reaction as you increased the temperature?

2. Use the kinetic molecular theory to explain the change in rate you observed.

The Affect of Concentration on the Rate of Reaction:

1) Place 10 mL of different concentrations of hydrochloric acid into 3 test tubes of the same size.
2) Add a small piece of magnesium of the same size simultaneously to each test tube. Don't stir.
3) Record the time required for all of the magnesium to react and any other qualitative observations you can make in the following table.
4) Pour test tube contents down the drain with lots of water.

Test tube (mol/L)	Time (s)	Qualitative Observations
2		
4		
6		

Questions:

1. What happened to the rate of the reaction as you increased the concentration of acid?

2. Use the kinetic molecular theory to explain what happened to the rate.

The Affect of Surface Area on the Rate of Reaction:

1) Place 10 ml of 2 mol/L hydrochloric acid into two test tubes.
2) Add equivalent amounts of magnesium ribbon or magnesium powder to each tube.
3) Record the time required for all the magnesium to react and any other qualitative observations you can make in the following table.
4) Pour test tube contents down the drain with lots of water.

Test tube	Time (s)	Qualitative Observations
Mg ribbon		
Mg powder		

Questions:

1. What happened to the rate of the reaction as the surface area of the magnesium was increased?

2. Use the kinetic molecular theory to explain the observed effect of increasing the surface area on the rate of reaction.

Application Questions

1. Write down the name of the gas produced when:

a. magnesium reacts with hydrochloric acid

b. Calcium carbonate reacts with hydrochloric acid.

2. Limestone rock, chemically known as calcium carbonate, $CaCO_{3(s)}$, reacts with hydrochloric acid, $HCl_{(aq)}$, to produce a gas.

a. Write the name and the formula for the gas produced.

b. Write a word equation for the reaction of calcium carbonate with hydrochloric acid.

c. Write a balanced chemical equation for the reaction of calcium carbonate with hydrochloric acid.

d. Describe four factors that you would change in order to increase the rate of the reaction of calcium carbonate rock, $CaCO_{3(s)}$, with hydrochloric acid, $HCl_{(aq)}$.