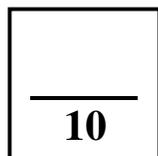


Science 9-Chemistry

Activity 4E

Concentration and Surface Area



Name _____
Due Date _____
Show Me <input type="checkbox"/> Hand In <input type="checkbox"/>
<i>Correct and Hand In Again By</i> _____

Purpose:

To find out how **concentration** and **surface area** affect **reaction rates**.

Materials:

three test tubes in a rack	3M hydrochloric acid
goggles and apron	marble (CaCO_3) chips
powdered CaCO_3	

IMPORTANT: Under NO circumstances are you to change the procedure or use different amounts than specified here. Doing so could mean losing credit for this lab and possibly giving up the right to do future labs!

Procedure: PART 1-EFFECT OF CONCENTRATION

1. Get two regular sized test tubes in a rack and bring them to your lab bench.
2. **Number** the test tubes 1 and 2.
3. Put on goggles and an apron. **WEAR GOGGLES THROUGHOUT THE REST OF THE PROCEDURE! HYDROCHLORIC ACID CAN DAMAGE EYES AND IS CORROSIVE TO THE SKIN! If you get any in your eyes, rinse them in the eyewash for 5-10 minutes!!**
4. To test tube #1, add **5 mL of 3M hydrochloric** acid and **5 mL of water** using a graduated cylinder.
5. Use a stirring rod to gently mix the water and the acid.
Put the test tube in your rack.
6. To test tube # 2, add **10 mL of 3M hydrochloric acid** and put it in your rack.
7. Turn to the table on the next page and fill in the “**Concentration of HCl**” column for each test tube.

Test Tube #	Acid Added	Water Added	Concentration of HCl	Relative Rate of Reaction
1	5 mL 3M HCl	5 mL H ₂ O	M	
2	10 mL 3M HCl	----	M	

8. Make sure your **goggles are on your eyes. NOW!**
9. Add **three pieces of marble chips** (CaCO₃) to test tube # 1 and observe the reaction.
What is happening? _____
10. Now add **three pieces of marble chips** (CaCO₃) to test tube # 2 and observe the reaction.
Would you say the reaction in test tube 2 is **slower**, **faster** or about the **same rate** as in test tube #1?
In test tube #2, the reaction is _____ than the reaction in test tube #1.
11. Empty and rinse out both of your test tubes in the sink. Save them for PART 2. **Wash off the unused marble chips and save them for PART 2!!**
12. Using your results for procedures 9 and 10, go back to the data table. In the last column (**Relative Rates of Reaction**), write the word "**faster**" in the line belonging to the test tube with the faster reaction.
Write the word "**slower**" in the line belonging to the test tube with the slower reaction.

Fill in the following summary:

As the **concentration** of an acid gets **higher**, the rate of reaction gets _____er.

As the **concentration** of an acid gets **lower**, the rate of reaction gets _____er

Procedure: PART 2-EFFECT OF SURFACE AREA

1. **Put on your Goggles!!!!**
2. Add **10 mL of 3M hydrochloric acid** to test tube #1.
Add **10 mL of 3M hydrochloric acid** to test tube #2.
3. Place the left over **marble chips** from Part 1 NEAR test tube #1, BUT DON'T ADD THEM YET!
4. From the place designated by your teacher, get a piece of paper with some **powdered calcium carbonate (CaCO₃)** on it and bring it back to your lab bench. Place it near test tube #2, BUT DON'T ADD IT YET!
5. **Make sure you all have goggles on your eyes!!!**
Now, one partner can add the **marble chips (CaCO₃)** to test tube #1 while the other partner adds the **powdered calcium carbonate (CaCO₃)** to test tube #2.
Observe the reactions.

Which appears to be reacting **faster**, the marble chips or the powdered calcium carbonate?

Answer: The _____ is/are reacting **faster**.

6. **Clean out test tubes.** Put unused marble chips in the beaker designated by the teacher!
7. Which has a **greater surface area**, marble chips or powdered calcium carbonate?

Answer: The _____ has the **greater surface area**.

8. **Fill in the following summary:**

As the **surface area** of a solid reactant gets **greater**, the **rate of reaction** gets _____er.

Questions:

1. The two **reactants** in this experiment were _____
and _____ acid.
2. The **products** of the reaction were **calcium chloride, water** and **carbon dioxide**. Write a **word equation** for the reaction taking place in this experiment:

3. We learned from this experiment that the **higher the concentration** of acid in a reaction, the (faster/slower) _____ the **rate of reaction**.
4. The **lower the concentration** of acid in a reaction, the (faster/slower) _____ the **rate of reaction**.
5. A **powdered** solid has a (greater/smaller) _____ **surface area** than a **chunky** solid.
6. If the **surface area** of a solid reactant is **increased**, this gives a (faster/slower) _____ **rate of reaction**.
7. Given the following three experimental set-ups:

Experiment #	Concentration of HCl	Form of Zinc
1	2 M	chunks
2	6 M	chunks
3	6 M	powdered

List the experiments in order of **Rates of Reaction** from **Fastest** to **Slowest**:

Fastest Rate of Reaction	Experiment # _____
2 nd Fastest Rate of Reaction	Experiment # _____
Slowest Rate of Reaction	Experiment # _____

8. 5 mL of water are added to 5 mL of 6M HCl. What is the final concentration of the HCl after mixing? _____M
9. The **more water** that is added to a solution, the (more/less) _____ the **concentration** becomes.
10. 15 mL of water are added to **5 mL** of 8M HCl bringing the total volume up to **20 mL**. What is the **final concentration** of the HCl after mixing? _____M (**HINT**: The **volume** is _____times what it was, so the **concentration** will be _____ times what it was.)
11. Give **three** possible ways of speeding up the reaction of solid iron with hydrochloric acid.
- _____
 - _____
 - _____