

# 12C Activity Series of Metals

## How reactive are different metals?

An activity series is a list of elements arranged from most reactive to least reactive. When you place a solid piece of metal in contact with a solution, there may or may not be a reaction. In order for a reaction to proceed, the solid metal that is touching the solution must be more reactive than the metal that is part of the ionic compound (solute) dissolved in the water. In this investigation, you will examine several metals and rank them from most to least active based on how many reactions take place for each metal.

### Materials

- Well plate (5x5) or overhead (lead acetate sheet)
- Copper solid
- Magnesium solid
- Zinc solid
- Lead solid
- Forceps
- Eyedroppers
- Goggles
- Apron



- $\text{Mg}(\text{NO}_3)_2$  solution
- $\text{Zn}(\text{NO}_3)_2$  solution
- $\text{Pb}(\text{NO}_3)_2$  solution
- $\text{AgNO}_3$  solution
- $\text{Cu}(\text{NO}_3)_2$  solution

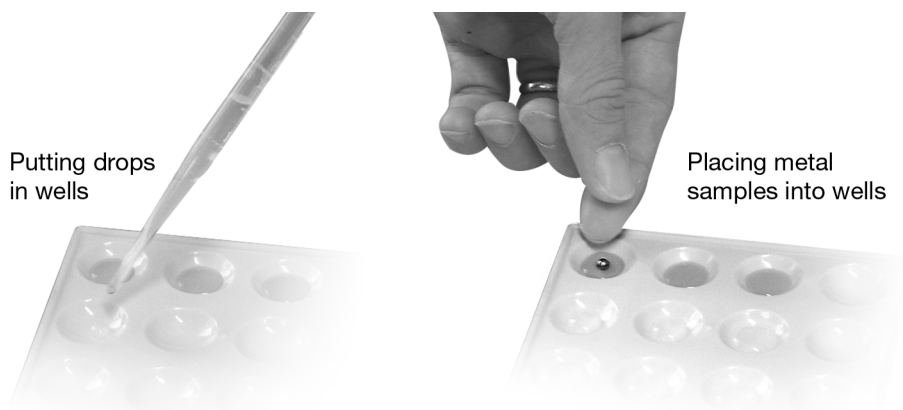
## 1 Stop and think

Based on the metals given in the materials list, which do you think will be the most reactive?

## 2 Doing the experiment

1. You will need a 5x5 well plate. It will be arranged similar to the layout of Table 1. With an eyedropper, place 7 drops of each solution into each of four wells. For example, place 7 drops of  $\text{Cu}(\text{NO}_3)_2$  solution in each of four wells across the top of the well plate
2. If you are using a clear plastic well plate, place a sheet of white paper underneath the it. It will allow you to see evidence of a potential chemical reaction more easily.
3. Place one sample of each metal into each solution. For example, place one sample of copper in the first well of the row containing the  $\text{Cu}(\text{NO}_3)_2$  solution. Then place a sample of copper into the first well of the row containing  $\text{Zn}(\text{NO}_3)_2$ , and so on until the first well in each row has a sample of copper in it. Repeat this process with one

sample of zinc placed in each of the second wells in each row, lead in the third, and magnesium in the fourth.



- After 15 minutes, use forceps to examine each metal. Be sure to turn the metal over and look at the underside for evidence of a chemical reaction.
- Place an "X" in any square of the data table where a reaction occurs.
- Clean up according to your instructor's directions and be sure to wash your hands.
- Add up the number of "X's" for each metal and write the total in the second data table.

**Table I: Reactivity data**

	<b>Cu</b>	<b>Zn</b>	<b>Pb</b>	<b>Mg</b>
<b>Cu(NO<sub>3</sub>)<sub>2</sub></b>				
<b>Zn(NO<sub>3</sub>)<sub>2</sub></b>				
<b>Pb(NO<sub>3</sub>)<sub>2</sub></b>				
<b>Mg(NO<sub>3</sub>)<sub>2</sub></b>				
<b>AgNO<sub>3</sub></b>				

<b>Metal</b>	<b>Cu</b>	<b>Zn</b>	<b>Pb</b>	<b>Mg</b>
<b>Number of Reactions</b>				

**3** Thinking about what you observed

- a. What evidence did you observe to indicate a chemical reaction had taken place in this experiment?

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- b. Rank the solid metals used in the experiment from most reactive to least reactive.

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- c. Even though silver solid was not used in this experiment, make a judgement as to where it would rank compared to the other metals. Explain.

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- d. Compare the activity series you just constructed with one provided by your teacher. How do they compare?

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