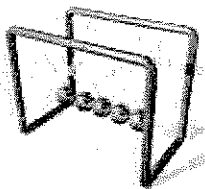
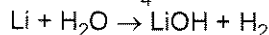
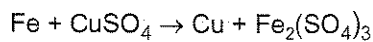


# The Activity Series



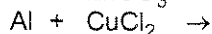
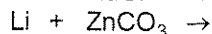
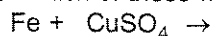
We have looked at several reactions:



Such experiments reveal trends. The activity series ranks the relative reactivity of metals.

It allows us to predict if certain chemicals will undergo single displacement reactions when mixed: metals near the top are most reactive and will displace metals near the bottom.

Q: Which of these will react?



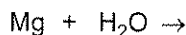
K
Na
Li
Ca
Mg
Al
Zn
Fe
Ni
Sn
Pb
H
Cu
Hg
Ag
Au

H is the only nonmetal listed.  $\text{H}_2$  may be displaced from acids or can be given off when a metal reacts with  $\text{H}_2\text{O}$  (producing  $\text{H}_2$  + metal hydroxide).

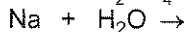
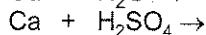
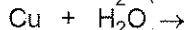
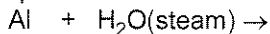
The reaction with  $\text{H}_2\text{O}$  depends on metal reactivity & water temp.

Q: will Mg react with  $\text{H}_2\text{O}$ ?

A:



Complete these reactions:



cold	K
$\text{H}_2\text{O}$	Na
	Li
	Ca
	Mg
	Al
hot $\text{H}_2\text{O}$	Zn
	Fe
steam	Ni
	Sn
	Pb
	H
acid	Cu
	Hg
	Ag
	Au

## Other Activity Series Information

- All metals will have a specific place in the activity series. For simplicity, only the most common metals are shown.
- The metals near the top of the activity series are more reactive because their valence electrons are more easily removed.
- On tests and exams the activity series may appear as K, Na, ... Ag, Au; you must remember that K is reactive, Au is not.
- If the valence of a metal is not indicated in the question, use its most common valence (in bold on your periodic table) to determine the correct chemical formula.

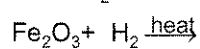
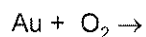
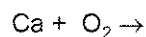
## Activity series lab

- On the next slide, place a check in the corner of boxes where you think reactions will take place.
- Get a plastic spot plate and a glass rod.
- Combine chemicals specified in the chart. Figure out a way to keep track of the chemicals. Use a  $\frac{1}{4}$  scoop for solids (the less, the better). Use 1 squeeze of an eyedropper for solutions.
- Write chemical equations for chemicals that reacted. Write NR where there was no reaction.
- Dump used chemicals into the large funnel at the front of the room (use a squirt bottle to rinse remaining chemicals into the funnel). Wash the spot plate and glass rod very well. Dry & return.

	Mg	Cu	Zn
$\text{AgNO}_3$	$\text{Mg} + \text{AgNO}_3 \rightarrow$ $\text{Ag} + \text{Mg}(\text{NO}_3)_2$		
$\text{H}_2\text{SO}_4$			
$\text{Fe}(\text{NO}_3)_3$			
$\text{CuCl}_2$			

## Oxides

The formation and behavior of oxides can also be predicted via the activity series. Complete these reactions:



Oxides form via the addition of oxygen:  
 $\text{K} + \text{O}_2 \rightarrow \text{K}_2\text{O}$

Oxides plus  $\text{H}_2$  (with heat) will change to metal and  $\text{H}_2\text{O}$ :  
 $\text{NiO} + \text{H}_2 \xrightarrow{\text{heat}} \text{Ni} + \text{H}_2\text{O}$

Oxides decompose with heat:  
 $\text{HgO} \xrightarrow{\text{heat}} \text{Hg} + \text{O}_2$

K
Na
Li
Ca
Mg
Al
Zn
Fe
Ni
Sn
Pb
H
Cu
Hg
Ag
Au