

### Arrange the metals in order of their reactivity

Potassium	K	K
Sodium	Na	Na
Lithium	Li	Li
Calcium	Ca	Ca
Magnesium	Mg	Mg
Aluminium	Al	Al
Zinc	Zn	Zn
Iron	Fe	Fe
Nickle	Ni	Ni
Tin	Sn	Sn
Lead	Pb	Pb
Copper	Cu	H
Mercury	Hg	Cu
Silver	Ag	Hg
Gold	Au	Ag
Platinum	Pt	Au

### Reactivity Series

Potassium (Pretty)	Lead (Lovely)
Sodium (Sally)	Hydrogen (Honolulu)
Lithium (Little)	Copper (Causing)
Calcium (Could)	Mercury (Many)
Magnesium (Marry)	Silver (Strange)
Aluminium (A)	Gold (Glances)
Zinc (Zulu)	
Iron (In)	

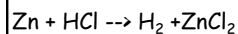
\*\* Based on reactions with acid, air and water

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

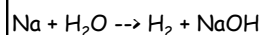
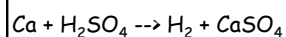
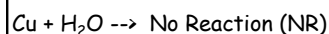
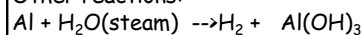
### Reactivity Series

The Reactivity Series puts the **metals** in order of **reactivity**. The highly reactive metals react with cold water, giving off **Hydrogen** gas and leaving an **alkaline** solution. Metals of medium reactivity only react very **slowly** with cold water, but they react well with **steam**. These metals fizz with dilute **acid** giving off **Hydrogen** gas. Metals of low reactivity, such as **Copper**, silver, **Gold** and platinum do not react with water or dilute **acid**. A more reactive metal can **displace** a less reactive metal from its compounds.

Q: will Mg react with H<sub>2</sub>O?  
No for cold, yes if it is hot/steam  
 $Mg + H_2O \rightarrow H_2 + Mg(OH)_2$



Other reactions:



cold H <sub>2</sub> O	K
	Na
	Li
	Ca
hot H <sub>2</sub> O	Mg
	Al
steam	Zn
	Fe
acid	Ni
	Sn
	Pb
	H
	Cu
	Hg
	Ag
	Au

### Hydrogen can be placed in the reactivity series also

Potassium	K	
Sodium	Na	Metals above
Lithium	Li	Hydrogen will
Calcium	Ca	displace it from
Magnesium	Mg	its compounds
Aluminium	Al	(will react with
Zinc	Zn	water, steam or
Iron	Fe	acid)
Tin	Sn	
Lead	Pb	
Copper	Cu	← <b>Hydrogen</b>
Silver	Ag	Metals below
Gold	Au	Hydrogen will
Platinum	Pt	not displace it

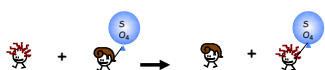
Carbon can be placed in the reactivity series also

Potassium	K	Metals above Carbon cannot be extracted from ores by heating with Carbon	
Sodium	Na		
Lithium	Li		
Calcium	Ca		
Magnesium	Mg		
Aluminium	Al		
Zinc	Zn		
Iron	Fe		Metals below Carbon can be extracted from ores by heating with Carbon
Tin	Sn		
Lead	Pb		
Copper	Cu		
Silver	Ag		
Gold	Au		
Platinum	Pt		

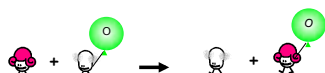
Lab involving reacting substance on top and sides...

	Mg	Cu	Zn
AgNO <sub>3</sub>	Mg + AgNO <sub>3</sub> → Ag + Mg(NO <sub>3</sub> ) <sub>2</sub> ✓	Cu + AgNO <sub>3</sub> → Ag + Cu(NO <sub>3</sub> ) <sub>2</sub> ✓	Zn + AgNO <sub>3</sub> → Ag + Zn(NO <sub>3</sub> ) <sub>2</sub> ✓
H <sub>2</sub> SO <sub>4</sub>	Mg + H <sub>2</sub> SO <sub>4</sub> → H <sub>2</sub> + MgSO <sub>4</sub> ✓	NR	Zn + H <sub>2</sub> SO <sub>4</sub> → H <sub>2</sub> + ZnSO <sub>4</sub> ✓
Fe(NO <sub>3</sub> ) <sub>3</sub>	Mg + Fe(NO <sub>3</sub> ) <sub>3</sub> → Fe + Mg(NO <sub>3</sub> ) <sub>2</sub> ✓	NR	Zn + Fe(NO <sub>3</sub> ) <sub>3</sub> → Fe + Zn(NO <sub>3</sub> ) <sub>2</sub> ✓
CuCl <sub>2</sub>	Mg + CuCl <sub>2</sub> → Cu + MgCl <sub>2</sub> ✓	NR	Zn + CuCl <sub>2</sub> → Cu + ZnCl <sub>2</sub> ✓

Zinc + Copper Sulphate → Copper + Zinc Sulphate



Magnesium + Iron oxide → Iron + Magnesium Oxide



### Making salts

- What acid would you react with Magnesium to form Magnesium Sulphate?
  - Sulphuric Acid
- What chemical would you react with nitric acid to form Zinc nitrate, Carbon dioxide and Water?
  - Zinc Carbonate
- What salt would form if Aluminium hydroxide was reacted with Nitric acid?
  - Aluminium nitrate

What will happen if silver is added to Hydrochloric acid? •No reaction

- Can Carbon be used to extract magnesium from Magnesium oxide?
  - No, Magnesium is more reactive than Carbon
- Can lead be extracted from its ore by Carbon?
  - Yes, Lead is less reactive than Carbon

### Rusting of Iron

Air and water are both present

The iron rusts

Only air is present

Rusting does not occur

Only water is present

(boiled water to remove the dissolved air in it)

Rusting does not occur

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

Ca + O<sub>2</sub> →

Au + O<sub>2</sub> →

Fe<sub>2</sub>O<sub>3</sub> + H<sub>2</sub> →

Oxides form via the addition of oxygen:  
K + O<sub>2</sub> → K<sub>2</sub>O

Oxides plus H<sub>2</sub> (with heat) will change to metal and H<sub>2</sub>O:  
NiO + H<sub>2</sub> → Ni + H<sub>2</sub>O

Oxides decompose with heat:  
HgO → Hg + O<sub>2</sub>

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