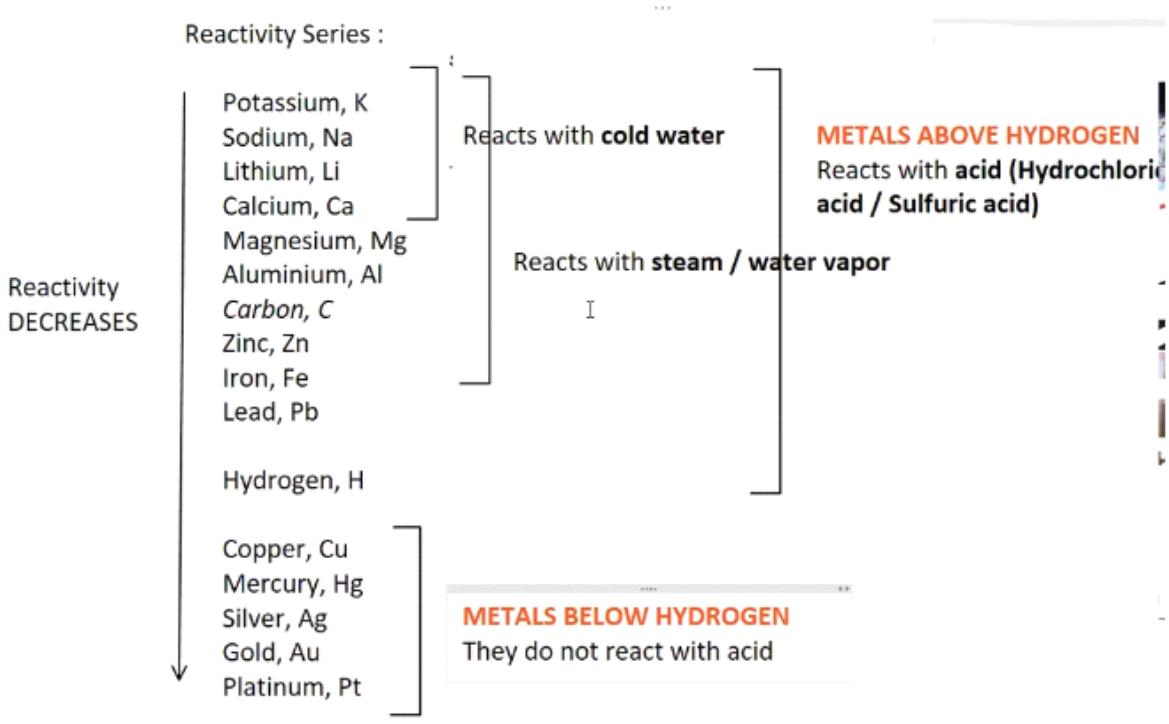
# REACTIVITY_SERIES_1

It is a list/family of metals arranged based on their reactivity. In this series/list, the most reactive metals are placed at the top and the less reactive ones are placed at the bottom. So , as moved down the series, the reactivity of the metals decreases.




The order of reactivity of these metals are determined by:

- Reaction of metals with cold water
- Reaction of metals with steam / water vapor
- Reaction of metals with dilute Hydrochloric acid
- Displacement reaction

1. Reaction of Metals with Cold Water -

Some metals react with cold water to form Metal Hydroxide solution and Hydrogen gas.

General Equation:

Metal (s) + Water (l) -------> Metal Hydroxide (aq) + Hydrogen (g)

The *more* reactive metal reacts more vigorously and violently with cold water.
These reactions releases heat energy.

Example:

a. Potassium + Water ----> Potassium Hydroxide + Hydrogen
   2 K (s) + 2 H2O (l) ----> 2 KOH (aq) + H2 (g)

b. Sodium + Water ----> Sodium Hydroxide + Hydrogen
   2 Na (s) + 2 H2O (l) ----> 2 NaOH (aq) + H2 (g)

c. Lithium + Water ----> Lithium Hydroxide + Hydrogen
   2 Li (s) + 2 H2O (l) ----> 2 LiOH (aq) + H2 (g)

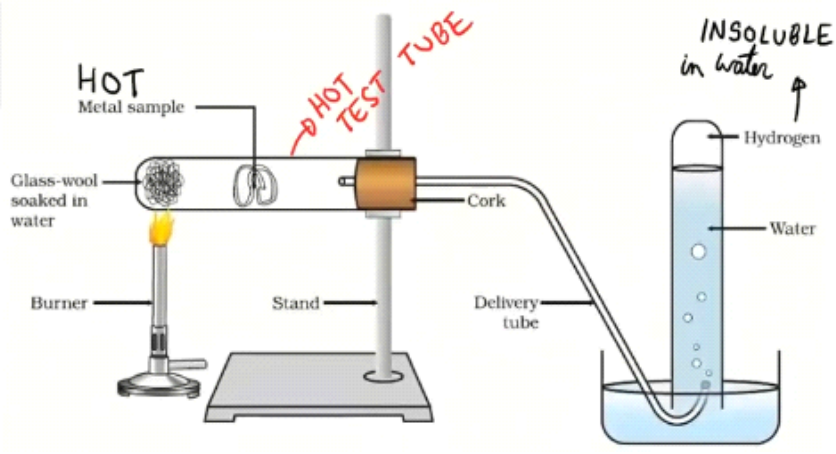
d. Calcium + Water ----> Calcium Hydroxide + Hydrogen
   Ca (s) + 2 H2O (l) ----> Ca(OH)2 + H2 (g)

2. Reaction Of Metals With Steam / Water Vapor -
   Zinc and Iron do not react with cold water but they do react with steam / water vapor. Some metals react with steam / water vapor but do not react with cold water.
   When the metals react with steam / water vapor, they produce Metal Oxide and Hydrogen gas.

   General Equation:
   Metal (s) + Water Vapor (g) ---------> Metal Oxide (s) + Hydrogen (g)

   The more reactive metal reacts more vigorously and more violently with steam / water vapor.

   The apparatus used to carry these reactions of metal with steam is as follows:

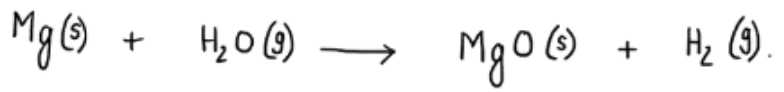



CAUTION :
To prevent water from being sucked back into the hot test tube (after the reaction is over), the delivery tube must be removed from the water trough first before turning off the Bunsen flame of the Bunsen Burner.

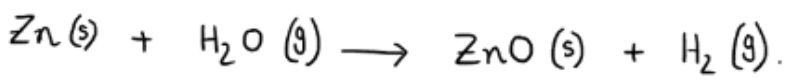
The glass wool soaked in water is heated to produce / generate a flow of steam / water vapor.

Example:

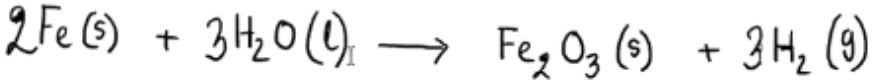
a. Magnesium + Steam / Water Vapor ----> Magnesium Oxide + Hydrogen



b. Zinc + Steam / Water Vapor ----> Zinc Oxide + Hydrogen



c. Iron + Steam / Water Vapor ----> Iron (III) Oxide + Hydrogen



| METALS | REACTION WITH COLD WATER | REACTION WITH STEAM / WATER VAPOR |
|---|---|---|
| 1. Potassium | Reacts very vigorously to form Potassium Hydroxide and Hydrogen gas.<br><br>Enough heat is released to cause the Hydrogen gas to catch fire and explode. | Reacts explosively |
| 2. Sodium | Reacts vigorously to form Sodium Hydroxide and Hydrogen gas. | Reacts very violently. |
| 3. Lithium | Reacts moderately to form Lithium Hydroxide and Hydrogen gas. | Reacts violently. |
| 4. Calcium | Reacts readily to form Calcium Hydroxide and Hydrogen gas. | Reacts moderately. |
| 5. Magnesium | Reacts very, very slowly with cold water to form Magnesium Hydroxide and Hydrogen gas.<br>The reaction is so slow that this gas forms only after few days. | Hot Magnesium reacts violently with steam to form Magnesium Oxide (white solid) and Hydrogen gas.<br><br>A **bright, dazzling white flame** is seen during the reaction. |
| 6. Zinc | No reaction occurs. | Hot Zinc reacts readily with steam to form Zinc Oxide (yellow when hot and white when cold) and Hydrogen gas. |
| 7. Iron | No reaction occurs. | Hot Iron reacts slowly with steam to form Iron Oxide and Hydrogen gas.<br><br>NOTE: the Iron must be constantly heated for the reaction to proceed. |