

अकार्बनिक रसायन विज्ञान  
Inorganic Chemistry ✓

**Metal and Non Metal**

धातु व अधातु

**Metals**  
and  
**Non-Metals**

# Introduction

Metals



Lead



Gold



Silver



Copper

Non-metals



Diamond



Carbon



Sulfur



Phosphorus

धातुएं

सोना

चांदी

कॉपर

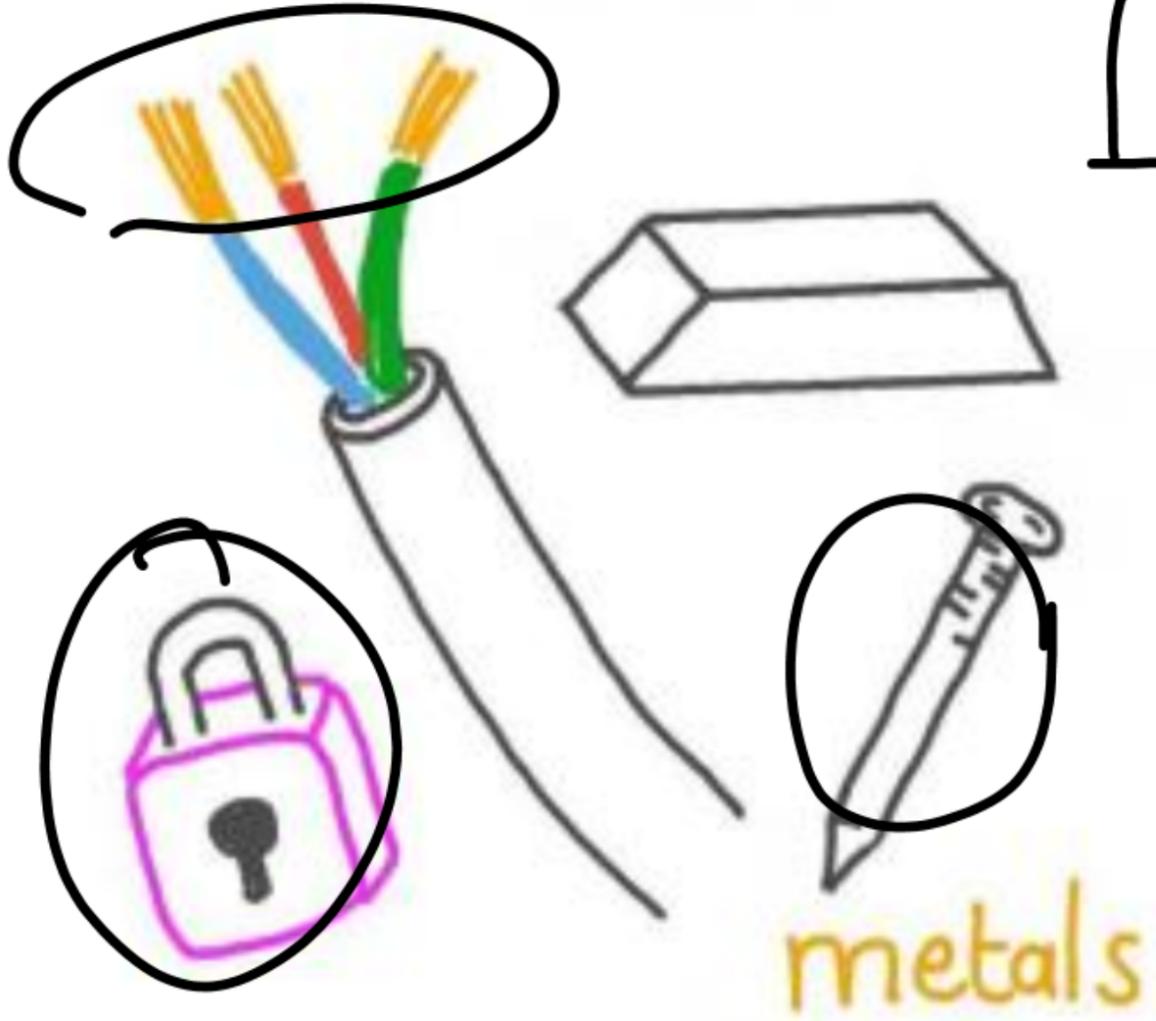
सुवर्णरूप

लोहा

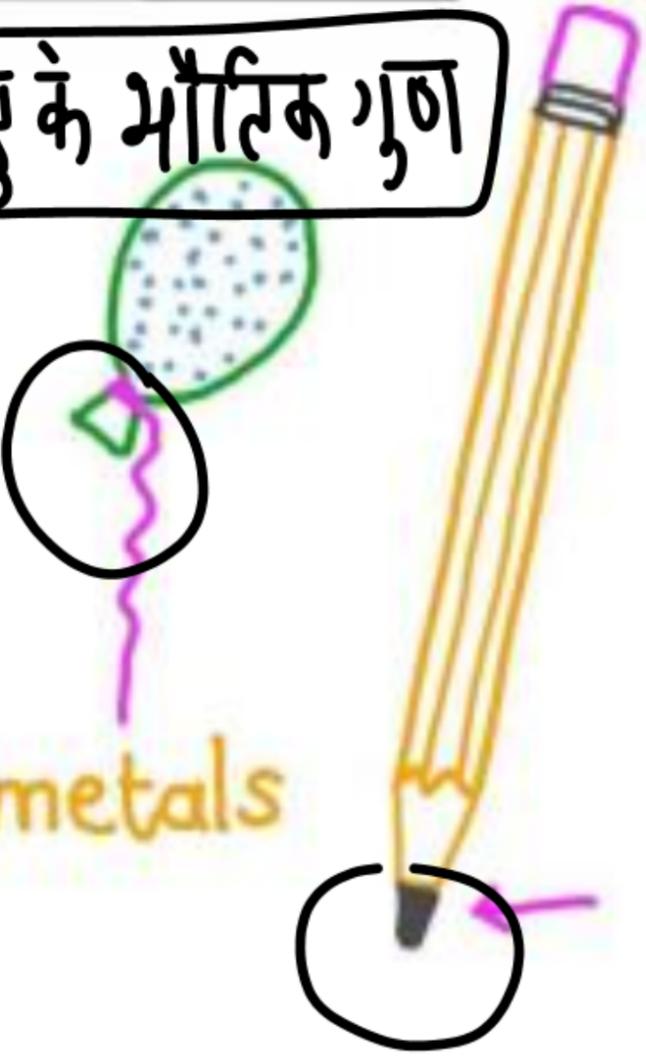
हीरा  
कोयला  
कार्बन  
H<sub>2</sub>S

# PHYSICAL PROPERTIES OF METALS AND NONMETALS

धातु व अधातु के भौतिक गुण



nonmetals



## Physical Properties of Metal

Properties	Metals	Non-metals
Appearance	Shiny (lustrous)	Dull (Non-lustrous)
Hardness	Very hard	Soft
Malleability	Malleable	Non-malleable
Ductility	Ductile	Non-ductile
Heat conduction	Good conductor of heat.	Poor conductor of heat
Conduction of Electricity	Good conductor of electricity	Poor conductor of electricity

Thin wire

I

कठोरता

नयता

पलकी पाडी

Ductility

Gold

यन्त्रियन

Sonorous ————— Metal ↑      Non Metal ↓  
(Sound)

पाकू में काटा

Sodium

Hg (Metal) → Room Temp — Liquid Phase

✓✓ Note: Metal (धातु) High Density (उच्च घनत्व होता है)

(Na/K को छोड़कर)

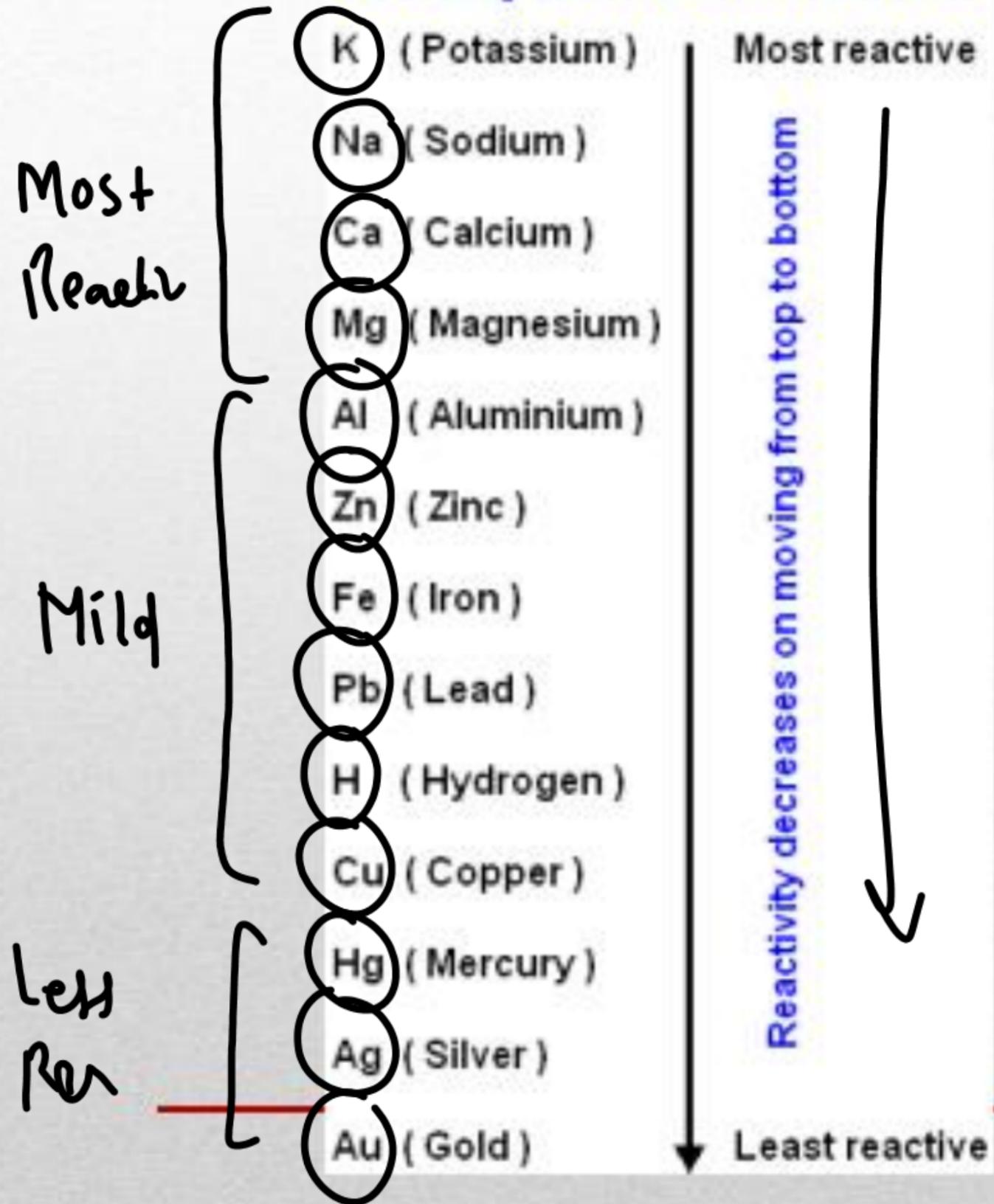
Note: Non-Metal is either Solid Phase or Gas Phase

હોલ અવસ્થા મેં ઘેલીરે અપવાં  
ગોલાં

(Br) બ્રોમીન → Non-Metal

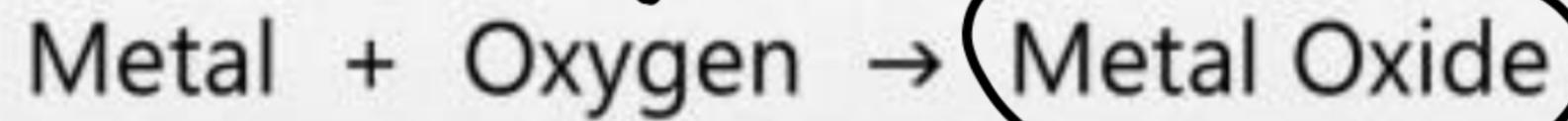
(દ્રવ અવસ્થા)

### Reactivity of some common metals



धातुओं की सक्रियता

## CHEMICAL PROPERTIES OF METALS

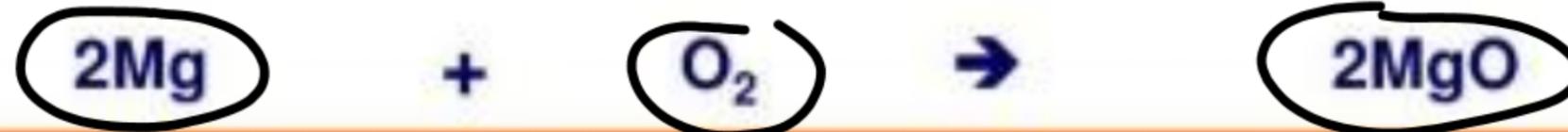


मेटल ऑक्साइड

When copper is heated in air it combines with oxygen to form copper oxide a black oxide .

What is the balanced symbol equation for each reaction?

magnesium + oxygen → magnesium oxide



copper + oxygen → copper oxide



iron + oxygen → iron oxide



मैंगनीय  
ऑक्साइड

## Atmospheric oxide

Metal oxides are basic in nature . but some metal oxide such as Aluminium oxide, zinc oxide so both acidic as well as basic behaviour such metal oxide which react with both acid as well as basis to produce salt and water are known as atmospheric oxide .

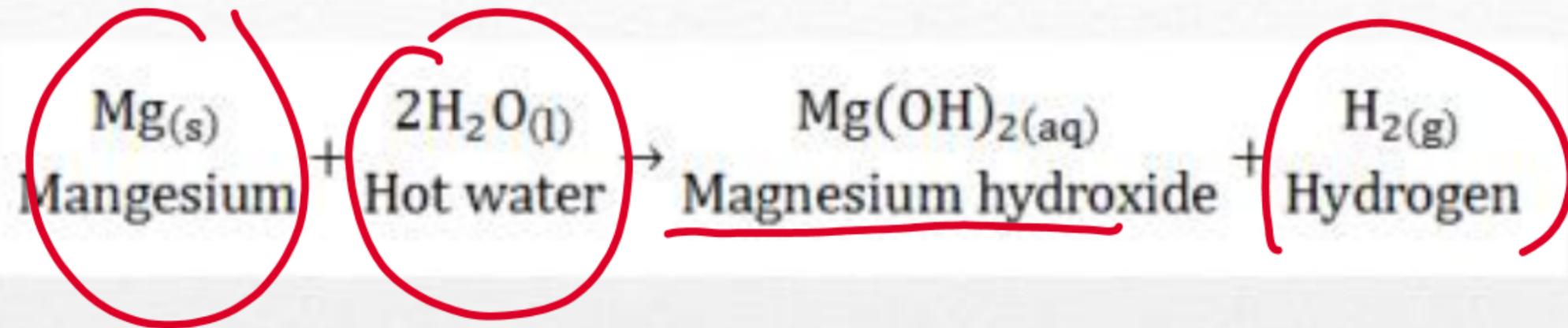
Most metal oxides are insoluble in water but some of these dissolve in water up to form alkalis. some sodium oxide and potassium oxide dissolve in water to produce alkalis .

← अक्षर

## Reactivity of metals with water

धातु का जल के साथ  
अभिक्रिया

- Metal react with water produce metal oxide and hydrogen gas  $H_2$
- some metal oxide are soluble in water, forming metal Hydroxides. Potassium and sodium react violently with cold water leading to immediate ignition of hydrogen gas
- Calcium react with water is less violent with you all heat not sufficient to catch hydrogen on fire



Al/Fe/Zn

Aluminium, iron and Zinc do not react with cold or hot water but they react with steam to form metal oxides and hydrogen.

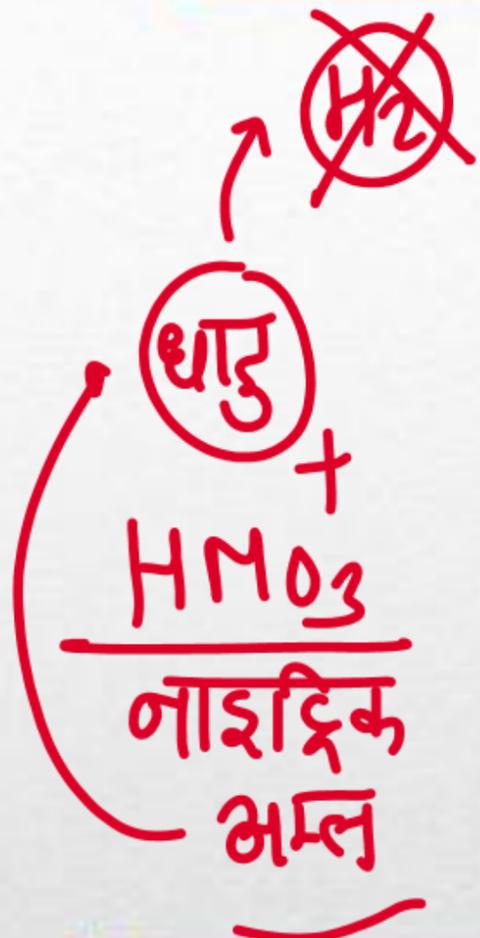
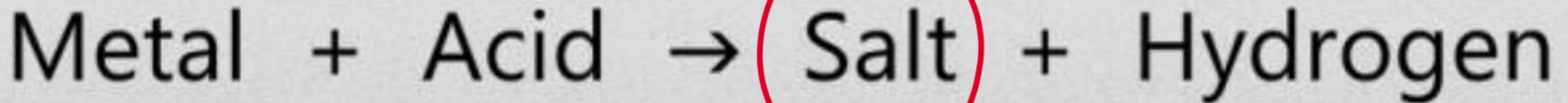
Metal like lead, copper, silver and gold do not react with water at all.

## Metal reactivity with acid

धातु की अम्ल के साथ  
प्रतिक्रिया

Metal react with acid to give a salt and hydrogen gas

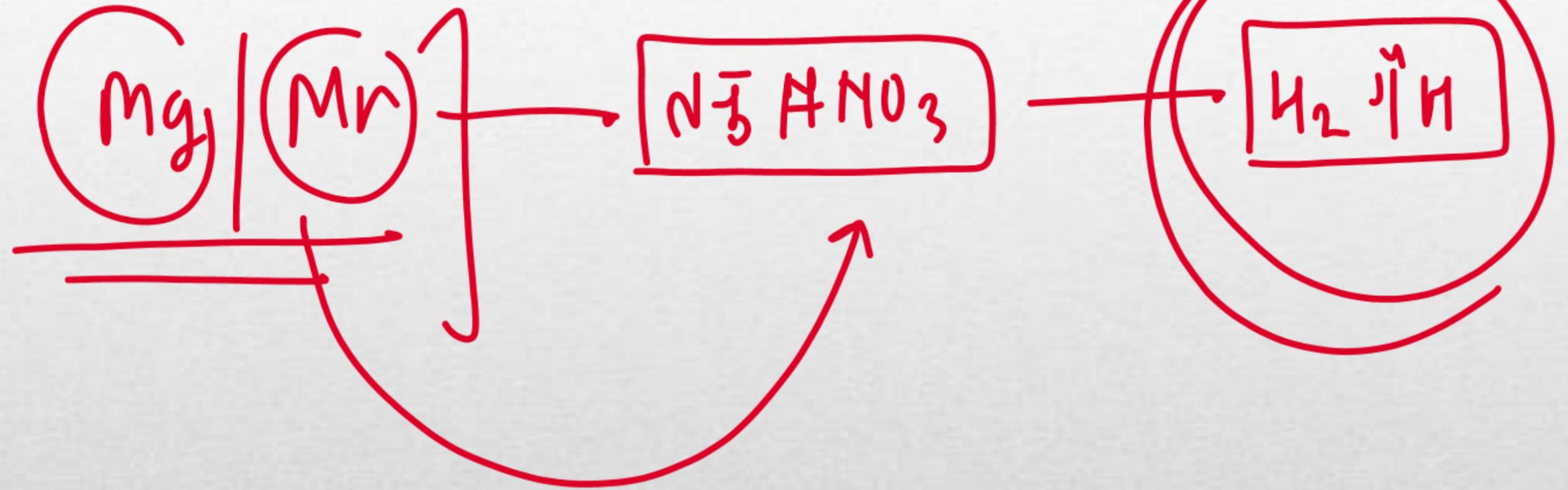
but hydrogen gas is not evolved when a metal react with nitric acid. this is due to the strong oxidizing nature of the nitric acid



लवण + Hydrogen gas

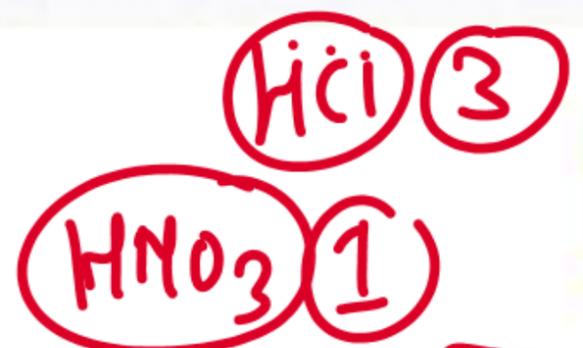
Note

✓✓  
Magnesium and Manganese react with very dilute nitric acid,  
evolving hydrogen gas.



घुल जाते हैं

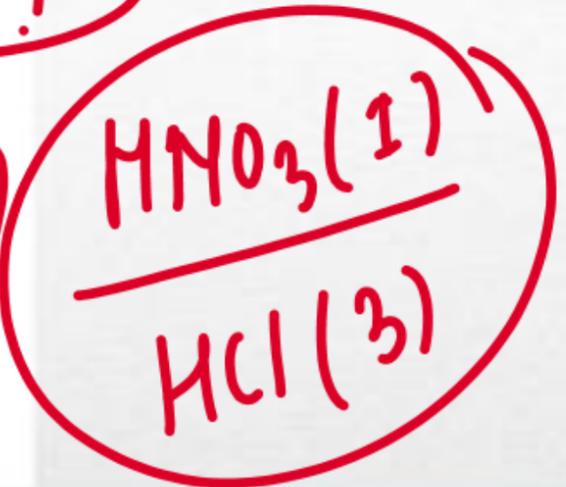
- Platinum
- Silver
- Gold



### Aqua Regia

अम्ल राज

- Aqua regia - 1 part conc.  $HNO_3$  + 3 parts conc.  $HCl$
- Piranha acid - 3 parts conc.  $H_2SO_4$  + 1 part  $H_2O_2$  (30% or less)
- 50%  $H_2O_2$  or greater can lead to explosions



रक्तवारेजिया

1: भाग  $HNO_3$  (नाइट्रिक अम्ल) व  
3 भाग  $HCl$  हाइड्रोक्लोरिक एसिड



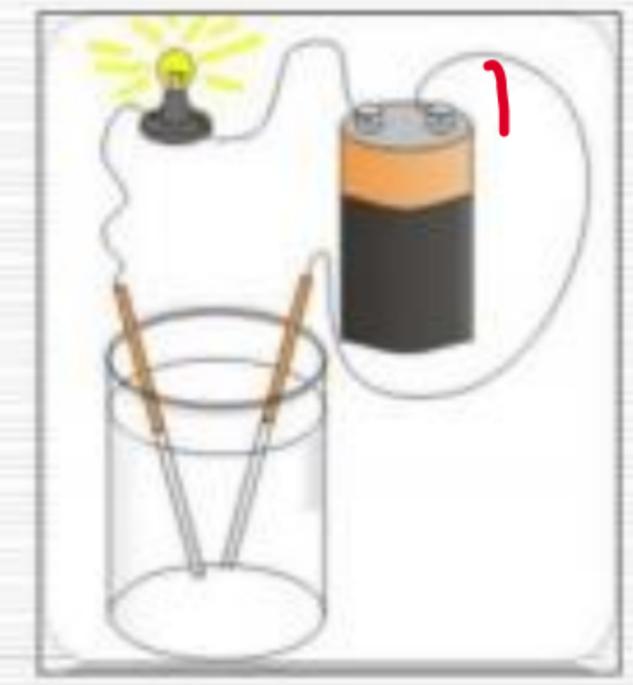
$Na^+ Cl^-$

आयनिक यौगिकों के गुण

कठनाई | गलनाई

# Properties of Ionic Compounds

- 1. High Melting and boiling points (indicating strong bond strength)
- 2. Most are crystalline solids at room temperature
- 3. ions in a regular, geometric pattern (crystal lattice)
- 4. hard, brittle
- 5. conduct electricity when molten or dissolved in water (aka **electrolyte**)



दा इलेक्ट्रोलाइट

## **Occurrence of Metals**

### **Minerals**

**the element or compounds which occur naturally in the earths crust are called minerals .**

### **Ores**

**Minerals that contain very high percentage of particular metal and the metal can be profitably extracted from it , such minerals are called ores**

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# Examples of Ores

## Iron Ore



Hematite



Magnetite

## Copper Ore



Pyrite



Bornite

## Zinc Ore



Sphalerite



Zinc Blende



Calamine