

CHAPTER 12

REACTIVITY SERIES:
Potassium (K)
Sodium (Na)
Calcium (Ca)
Magnesium (Mg)
Aluminium (Al)
Carbon (C)
Zinc (Zn)
Iron (Fe)
Lead (Pb)
Hydrogen (H)
Copper (Cu)
Silver (Ag)

REACTIONS

COLD WATER:

- Potassium reacts *very violently*
To form potassium hydroxide and hydrogen gas
- Sodium reacts *violently*
To form sodium hydroxide and hydrogen gas
- Calcium reacts *readily*
To form calcium hydroxide and hydrogen gas
- Magnesium reacts *very slowly*
To form magnesium hydroxide and hydrogen gas
- Zinc and BELOW **no reaction occurs.**

STEAM:

- Potassium, sodium, calcium **react explosively**
- Hot magnesium reacts *violently*
To form magnesium oxide and hydrogen gas
- Hot zinc reacts *readily*
To form zinc oxide and hydrogen gas
- Red-hot iron reacts *slowly*
To form iron oxide and hydrogen gas
- Lead and BELOW **no reaction occurs.**

DILUTE HYDROCHLORIC ACID:

- Potassium and sodium *react explosively*
$$2\text{K(s)} + 2\text{HCl (aq)} \longrightarrow 2\text{KCl (aq)} + \text{H}_2 \text{ (g)}$$
$$2\text{Na(s)} + 2\text{HCl (aq)} \longrightarrow 2\text{NaCl (aq)} + \text{H}_2 \text{ (g)}$$
 - Calcium reacts *violently*
$$\text{Ca(s)} + 2\text{HCl (aq)} \longrightarrow \text{CaCl}_2 \text{ (aq)} + \text{H}_2 \text{ (g)}$$
 - Magnesium reacts *rapidly*
$$\text{Mg(s)} + 2\text{HCl (aq)} \longrightarrow \text{MgCl}_2 \text{ (aq)} + \text{H}_2 \text{ (g)}$$
 - Zinc reacts *moderately fast*
$$\text{Zn(s)} + 2\text{HCl (aq)} \longrightarrow \text{ZnCl}_2 \text{ (aq)} + \text{H}_2 \text{ (g)}$$
 - Iron reacts *slowly*
$$\text{Fe(s)} + \text{HCl (aq)} \longrightarrow \text{FeCl}_2 \text{ (aq)} + \text{H}_2 \text{ (g)}$$
 - Lead and BELOW **no reaction occurs.**
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DEDUCING ORDER OF REACTIVITY OF METALS

A more reactive metal can displace a less reactive metal from its salt solution.

- $\text{Fe} > \text{Cu}$
- $\text{Fe(s)} + \text{CuSO}_4\text{(aq)} \longrightarrow \text{FeSO}_4\text{(aq)}$

A more reactive metal can displace a less reactive metal from its oxide

- $\text{Zn} > \text{Cu}$
 - $\text{Zn(s)} + \text{CuO(s)} \longrightarrow \text{ZnO(s)} + \text{Cu(s)}$
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METAL EXTRACTION

EXTRACTED BY **ELECTROLYSIS**

- Potassium (Na)
- Sodium (Na)
- Calcium (Ca)
- Magnesium (Mg)

EXTRACTED BY **REDUCTION WITH CARBON**

- Zinc (Zn)
- Iron (Fe)
- Lead (Pb)
- Copper (Cu)
- Silver (Ag)

E.G: $2\text{ZnO (s)} + \text{C(s)} \longrightarrow 2\text{Zn (s)} + \text{CO}_2 \text{ (g)}$

— (NOTE: Carbon is a reducing agent)

CONDITIONS FOR RUSTING:

Iron + oxygen + water $\longrightarrow$ hydrated iron (III) oxide [rust!!!]

The presence of both oxygen (in air) and water are necessary for rusting to occur.

BARRIER METHODS

- Painting
If paint is scratched, rusting will take place under the painted surface.
 - Oiling / greasing
Layer of oil / grease must be renewed.
 - Coating with plastic
If plastic layer is torn, iron will rust.
 - Chrome-plating
~~Ultra 10000 protection~~
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