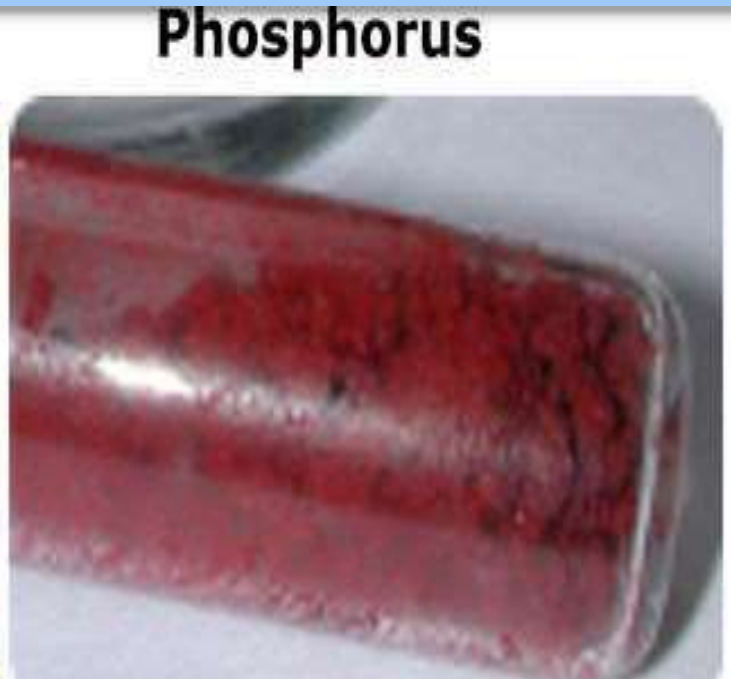
METALS AND NON METALS



PHYSICAL PROPERTIES

METALS

APPEARANCE- Solid, Lustrous

Solid, liquid or gas, Dull

DUCTILE

NON DUCTILE, brittle

PHYSICAL PROPERTIES

METALS
malleable

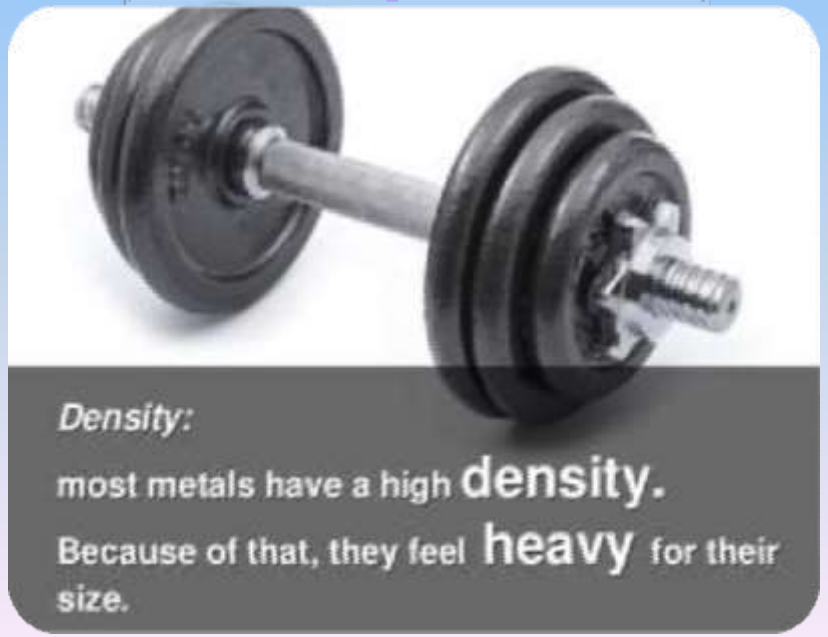
NON METALS
Non malleable

Sonorous

Non sonorous

PHYSICAL PROPERTIES

METALS
Generally Hard



NON METALS
Generally soft

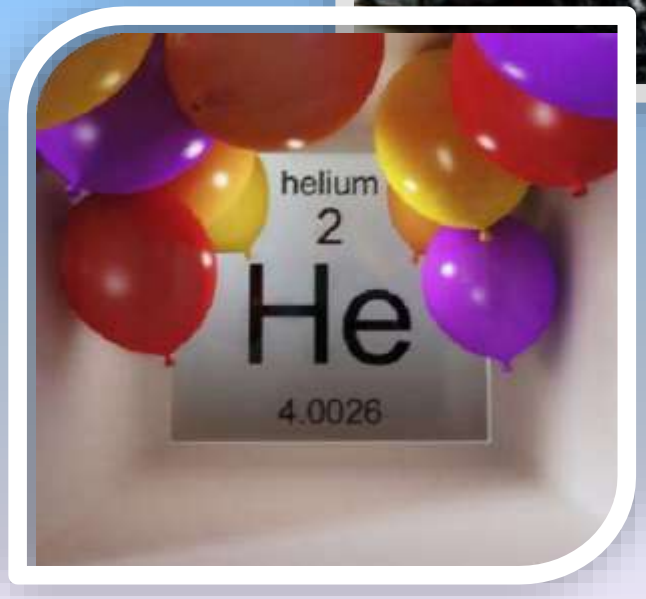
PHYSICAL PROPERTIES

METALS

Conductors of heat & electricity

NON METALS

Insulators of heat and electricity



PHYSICAL PROPERTIES

METALS

High melting & boiling point

NON METALS

Low melting & boiling point

EXCEPTIONAL CASES

Electrical Conductivity…

Carbon (in the form of Graphite) Is a non metal which conducts electricity , just like metals…

Lustre…

Iodine is a non-metal which is lustrous having a shining surface (just like metals)…

Hardness and Softness…

Alkali metals (lithium, sodium and potassium)are soft (just like non-metals)…
Carbon (in the form of Diamond) is a non metal which is extremely hard (just like metals)…

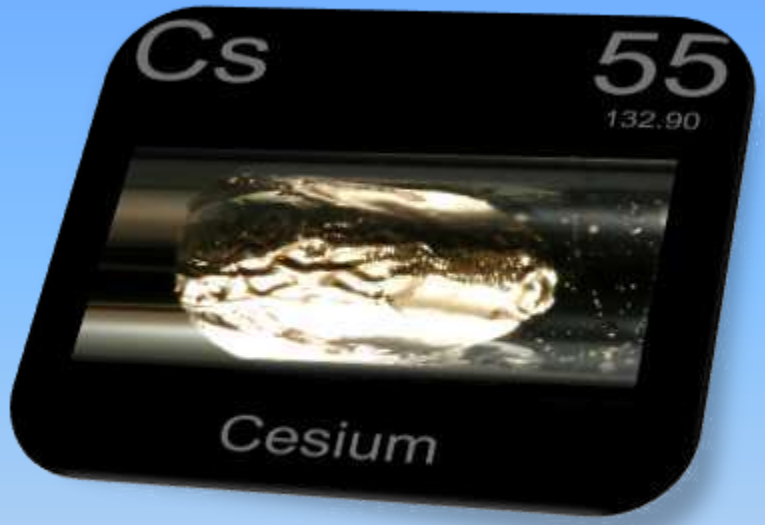
Physical State…

Mercury is a metal but it is liquid at room temperature…

Melting and Boiling Point…

Sodium, Potassium, Cesium and Gallium metals have low melting points

Diamond is a non metal which has a very high melting and boiling point…



Density…

Alkali metals (lithium, sodium and potassium) have low densities (just like non-metals) …

Chemical properties of metals and non metals

i) Reaction with oxygen :-

Example : **REACTION WITH METAL**

$$Mg + O_2 \rightarrow 2MgO$$

Magnesium + Oxygen → Magnesium Oxide (basic)

Example : **REACTION WITH NONMETAL**

$$S + O_2 \rightarrow SO_2$$

Sulphur + Oxygen → Sulphur dioxide (acidic)

https://youtu.be/tEmgAU0tabk

Reaction of Non metals with oxygen

Non metals react with oxygen to form acidic oxides.

$S + O_2 \longrightarrow SO_2$

$SO_2 + H_2O \longrightarrow H_2SO_3$ (sulphurous acid)

Non metals react with oxygen to form non-metallic oxides

Ex: $H_2 + O_2 \longrightarrow H_2O$

https://youtu.be/IfO0lPhcBFQ

Chemical properties of metals and non metals

Reaction with Water

Metals react with water to form metal oxides or metal hydroxides and hydrogen.

$$2Na + 2H_2O \longrightarrow 2NaOH + H_2$$
$$2K + H_2O \longrightarrow 2KOH + H_2$$
$$Ca + H_2O \longrightarrow Ca(OH)_2 + H_2$$
$$2Al + 3H_2O \longrightarrow Al_2O_3 + H_2$$
$$3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$$

- **Non metals do not react with water**

https://youtu.be/IM8WcnkuOR0

iii) Reaction with acids :-

Metal + Acid ⟹ Metal Salt +Hydrogen

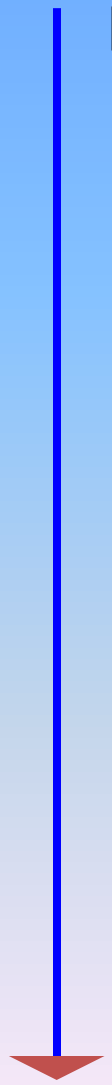
$Mg + HCl \Longrightarrow MgCl_2 + H_2$

Nonmetal + Acid ⟹ NO REACTION

Note: Refer fliplearn module 4.2

3) Reactivity series of metals :-

The arranging of metals in the decreasing order of their reactivity is called reactivity series of metals.



K - Potassium — **Most reactive**

Na - Sodium

Ca - Calcium

Mg - Magnesium

Al - Aluminium

Zn - Zinc — **Reactivity decreases**

Fe - Iron

Pb - Lead

H - Hydrogen

Cu - Copper

Hg - Mercury

Ag - Silver

Au - Gold — **Least reactive**

iv) Reaction of metals with metal salt solutions :-

A more reactive metal displaces a less reactive metal from its salt solution. (Displacement reaction)

Magnesium displaces copper from copper sulphate solution.

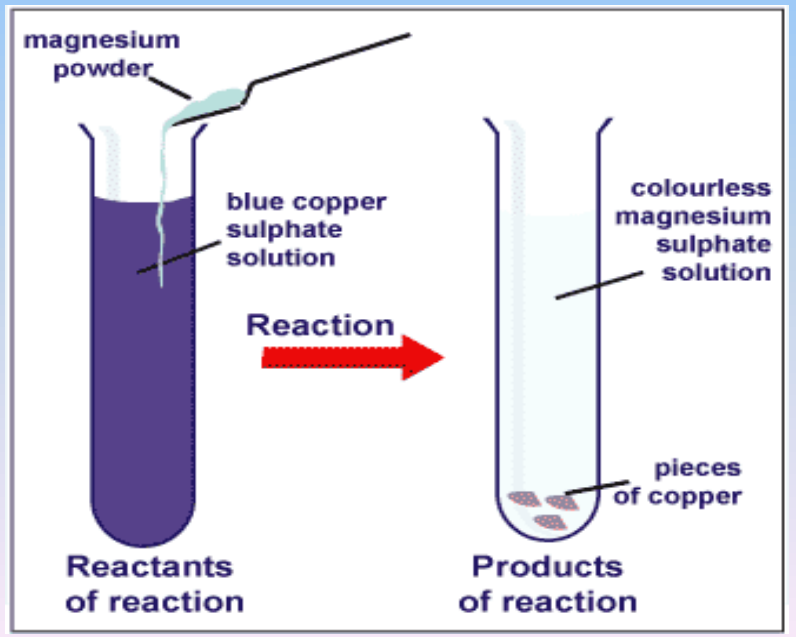
$$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu$$

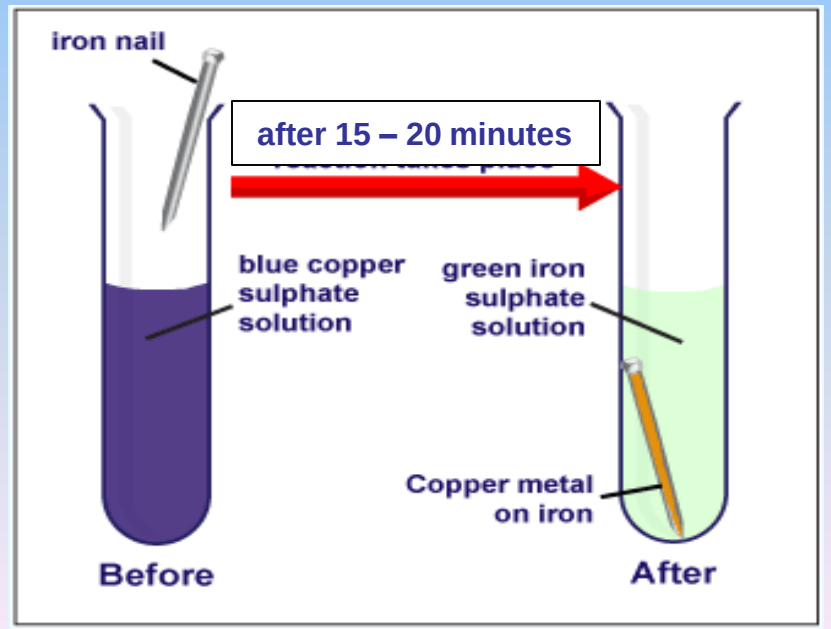
Zinc displaces copper from copper sulphate solution.

$$Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$$

Iron displaces copper from copper sulphate solution

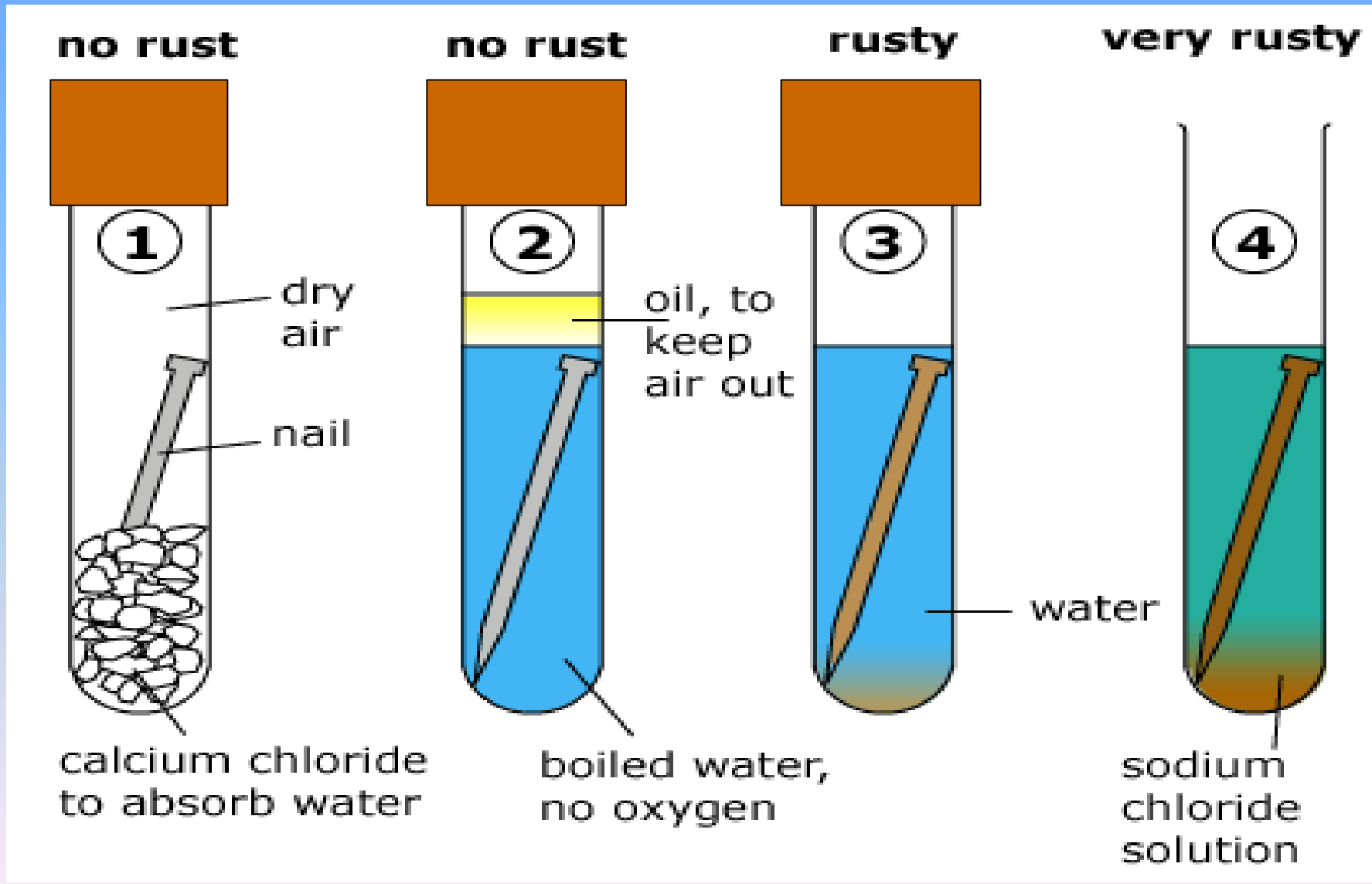
$$Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$$





10a) Corrosion :-

Corrosion is the damage caused to metals due to the reaction of metals with oxygen, moisture, carbon dioxide etc.



Painting

Galvanization

Alloying

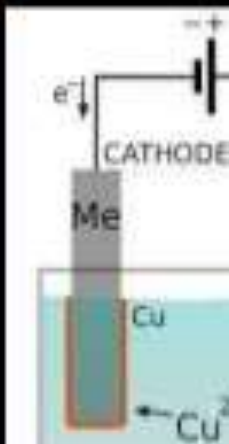
Electroplating

Store in moisture free environment

greasing

Enameling

Ways to prevent corrosion



CORROSION OF ALUMINIUM

Conditions – moist air, oxygen

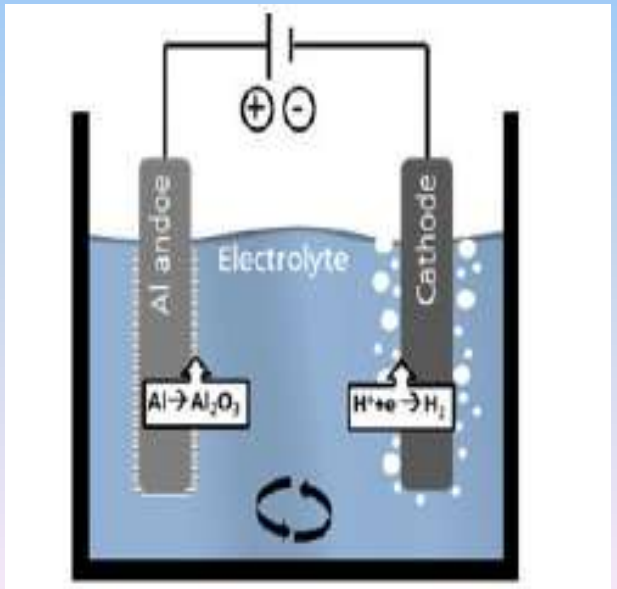
Layer formed of aluminium oxide

This thin layer of aluminium oxide protects the aluminium objects from further corrosion .

Thus aluminium is one such common metal which is highly resistant to corrosion

ANODISING

The layer of aluminium oxide on the surface of aluminium objects can be made thicker by electrolysis . This process is known as anodising



CORROSION OF COPPER

CONDITIONS OF CORROSION

When copper objects remain in damp air for a considerable time, then copper reacts slowly with carbon dioxide and water of air to form a green coating of basic copper carbonate on the surface of the object .

Basic copper carbonate – $CuCO_3.Cu(OH)_2$

The corroded copper vessels can be cleaned with dilute acid solutions which dissolves the green coloured basic copper carbonate.

Corrosion of copper is a slow process as the metal is less reactive .

CORROSION OF SILVER

Silver objects when exposed to air , they get tarnished and gradually turn black .
As silver is a highly un reactive metal it does not react with atmospheric oxygen but it reacts with hydrogen sulphide gas .
This reaction leads to the formation of a black coating of silver sulphide Ag_2S.

HOW TO PREVENT RUSTING ?

Painting
Applying grease or oil
Galvanisation (dipping iron objects in molten zinc)
Tin plating or chromium plating
Alloying

ALLOYING

An alloy is a homogeneous mixture of two or more metals (or a metal and a small amount of non metal)

Properties of alloys

- stronger than metals from which they are made
- harder than constituent metals
- more resistant to corrosion
- have low melting points than the constituent metals
- have low electrical conductivity

TYPES OF ALLOYS

Duralumin – Al with Cu, Mg, Mn
Magnalium – Al with Mg
Steel – Fe mixed with (0.1 to 1.5%) C
Stainless steel –Fe alloyed with Cr and Ni
Brass – alloy of 80% Cu and 20% Zn
Bronze – alloy of 90% Cu and 10% Sn
Solder – alloy of 50% Pb and 50% Sn
Amalgam – alloy of Hg with other metals.
Alloys of Au – Au is alloyed with silver and copper to make it hard .

ALLOYS

BRONZE

BRASS

SOLDER

DURALUMIN

Uses of metals and non metals

https://youtu.be/h424V0oUtSE

RECYCLING METALS

https://youtu.be/iQen-uq3eUk