

## Chapter 7. Metals and Non-metals

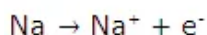
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**PAGE NO : 151**

### **Solution 1:**

Metals are the elements (except hydrogen) which form positive ions by losing electrons or donating electrons.

For example sodium metal forms positively charged sodium ion by losing one electron as follows:



Metals usually have 1, 2 or 3 electrons in the outermost shell.

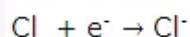
Metals can conduct heat and electricity and they are also malleable and ductile.

- Five metals are sodium, potassium, magnesium, aluminium, calcium.

### **Solution 2:**

Non-metals are the elements which form negative ions by accepting (or gaining electrons).

For example Chlorine forms negatively charged chloride ion by accepting one electron as follows:



Non-metals usually have 4, 5, 6 or 7 electrons in their outermost shell.

Non-metals do not conduct heat and electricity and are neither malleable nor ductile. These are brittle in nature.

- Five non-metals are oxygen, nitrogen, silicon, phosphorous, chlorine.

### **Solution 3:**

Metal which exist in liquid state is mercury.

Non-metal which exist in liquid state is bromine.

**Concept Insight:** Metals are usually solid while non-metals exist in all the three states.

### **Solution 4:**

The most abundant metal in the earth's crust is aluminium and the most abundant non-metal in the earth's crust is oxygen.

### **Solution 5:**

1. Metals.
2. Non-metals.
3. Platinum and Gold.
4. Potassium and Sodium.
5. Potassium, Sodium and Calcium.
6. Iron.
7. Potassium and Sodium.
8. Platinum.
9. Platinum and Gold.
10. Mercuric oxide (HgO) and Silver oxide (Ag<sub>2</sub>O).
11. Potassium hydroxide (KOH) and Sodium hydroxide (NaOH).
12. Potassium carbonate (K<sub>2</sub>CO<sub>3</sub>) and Sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>).

13. Potassium carbonate ( $K_2CO_3$ ) and Sodium carbonate ( $Na_2CO_3$ ).
14. Potassium nitrate ( $KNO_3$ ) and Sodium nitrate ( $NaNO_3$ ).
15. Mercuric nitrate ( $Hg(NO_3)_2$ ) and silver nitrate ( $AgNO_3$ )

### Solution 6:

The arrangement of metals in a vertical column in the order of decreasing reactivity is called reactivity series of metals or activity series of metals.

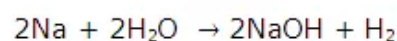
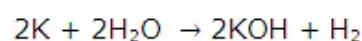
Activity of sodium	Activity of iron
<b>1) With air:</b> Sodium get oxidized to sodium oxide when exposed to air. It burns in air when heated. $4Na + O_2 \rightarrow 2Na_2O$	<b>1)With air:</b> Iron rusts in moist air. It burns when heated strongly. $4Fe + 3O_2 \rightarrow 2Fe_2O_3$ .
<b>2) With water:</b> Sodium reacts vigorously with cold water to form alkali sodium hydroxide and hydrogen gas. $2Na + 2H_2O \rightarrow 2NaOH + H_2$	<b>2)With water:</b> Red hot iron reacts with steam to form tri iron tetroxide and hydrogen. The reaction is reversible. $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$
<b>3) With dilute acids:</b> Sodium reacts with explosive violence and liberates hydrogen. $2Na + 2HCl \rightarrow 2NaCl + H_2$	<b>3)With dilute acids:</b> Iron reacts with acids gradually and less vigorously forming hydrogen. $Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$

### Solution 7:

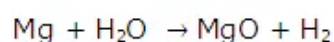
1.  $Fe < Zn < Mg < Na$ .
2.  $Na = Al < Cu < Fe$
3.  $Ca > Mg > Fe > Cu$ .

### Solution 8:

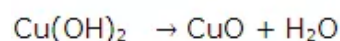
(i) When sodium and potassium are placed in cold water they react vigorously to form their respective alkalis and hydrogen gas is evolved.



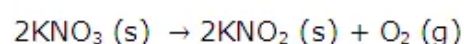
(ii) Burning magnesium continues to burn in steam to form oxide and hydrogen.



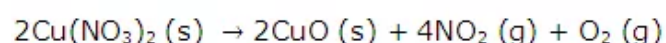
(iii) Copper hydroxide when heated forms copper oxide and water.



(iv) Potassium nitrate when heated strongly decompose to give potassium nitrite and oxygen gas.



(v) Copper nitrate when heated strongly decompose to give copper oxide, nitrogen dioxide gas and oxygen gas.



(vi) Mercuric nitrate when heated strongly decompose to yield mercury metal and nitrogen dioxide gas and oxygen gas.

