

CH- 3, METALS AND NON METALS

EXTRA QUESTIONS

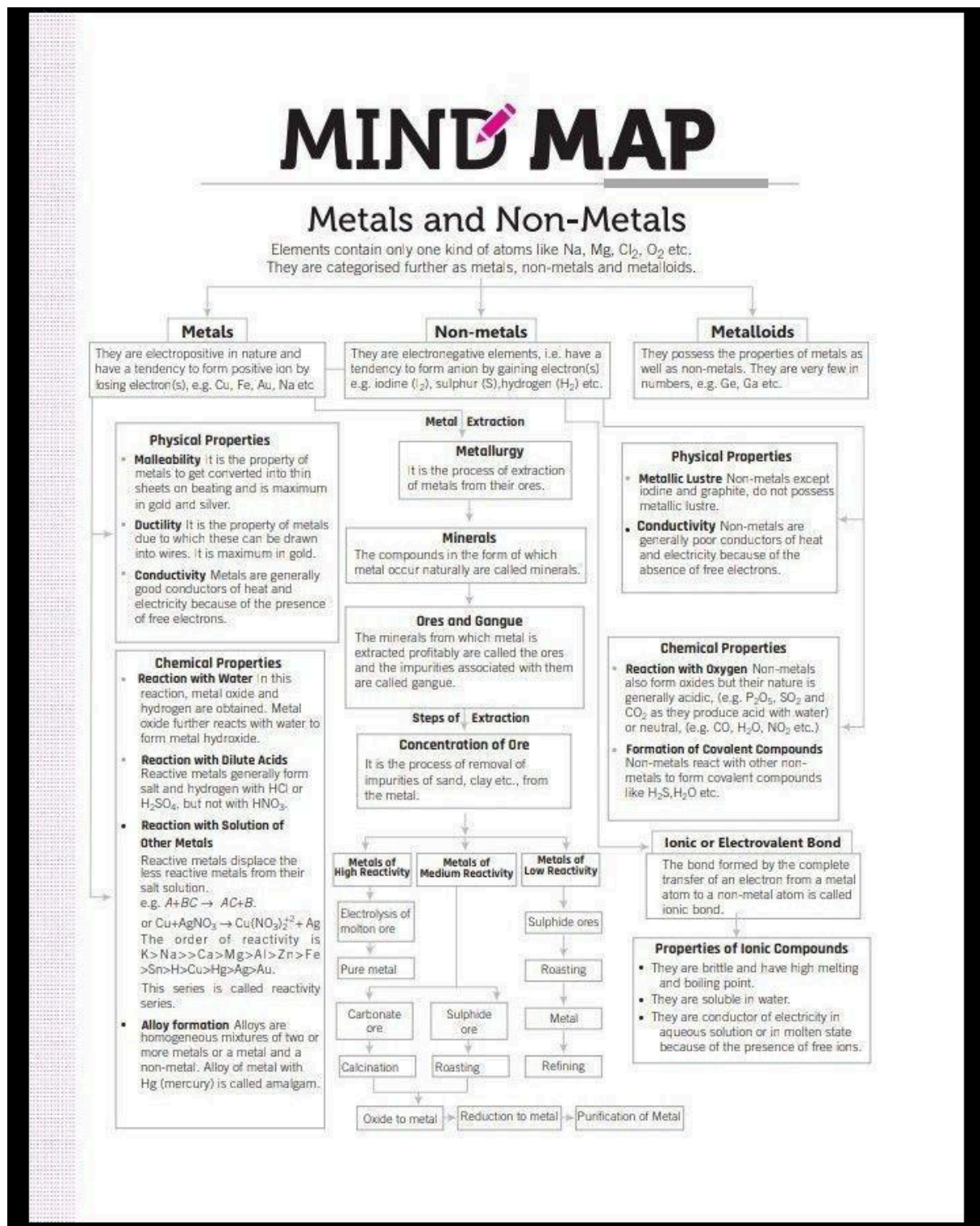
Q1. Difference between METALS and NON METALS on the basis of their physical properties.

Metals	Non-metals
1. These are solids at room temperature except mercury	1. These exist in all three states
2. These are very hard exception- sodium, potassium	2. These are soft except diamond
3. These are malleable and ductile	3. These are brittle and can break down into pieces
4. These are shiny	4. These are non-lustrous except iodine
5. Electropositive in nature	5. Electronegative in nature
6. Metals are good conductor of heat and electricity	6. Non-metals are poor conductor of heat and electricity

Q2. Write Difference between METALS and NON METALS on the basis of their CHEMICAL PROPERTIES

Metals	Non-metals
1. Metals combine with oxygen and form basic oxides. $4\text{Na}(s) + \text{O}_2(g) \rightarrow 2\text{Na}_2\text{O}(s)$ Basic oxides + Water $\rightarrow$ Bases $\text{Na}_2\text{O}(s) + \text{H}_2\text{O}(l) \rightarrow 2\text{NaOH}(aq)$ Sodium hydroxide Litmus test (turn red litmus blue)	1. Non-metals combine with oxygen and form acidic oxides or neutral oxides. $\text{C}(s) + \text{O}_2(g) \rightarrow \text{CO}_2(g)$ Acidic oxides + Water $\rightarrow$ Acids $\text{CO}_2(g) + \text{H}_2\text{O}(l) \rightarrow \text{H}_2\text{CO}_3(aq)$ Carbonic acid Litmus test (turn blue litmus red)
2. Metals react with water to liberate hydrogen gas.	2. Non-metals do not react with water.
3. (a) Metals react with dil HCl and H_2SO_4 to liberate H_2 gas. Metal + dil. Acid $\rightarrow$ Salt + Hydrogen (b) Metal + dil. Nitric acid $\rightarrow$ Metal salt + Water + Oxides of nitrogen. (Exception: Mg and Mn evolve H_2 gas with dil. HNO_3)	3. Non-metals do not displace H_2 from acids because non-metals are electron acceptor, they cannot supply electron to hydrogen.

1. MAKE A CONCEPT MAP OF CH METALS AND NONMETALS



Q. 4) Both calcium (Ca) and magnesium (Mg) are heavier than water but still float over it: Both calcium and magnesium float over water surface because hydrogen gas is evolved when these metals react with water. It is in the form of bubbles which stick

on the metal surface. Therefore, they float over it.



Q.5 Hydrogen (H₂) gas is not evolved when metal is treated with nitric acid (HNO₃), Why? Give reason .

Nitric acid is strong oxidising agent and it oxidises the hydrogen gas (H₂) liberated into water (H₂O) and itself get reduced to some oxide of nitrogen like nitrous oxide (N₂O), nitric oxide (NO) and nitrogen dioxide (NO₂).

Copper, gold, silver are known as noble metals. These do not react with water or dilute acids.

Q.6. Give equation for the formation of sodium aluminate.

Aluminium oxide gives sodium aluminate along with water when reacts with sodium hydroxide.



Q7. Write activity series of some common metal

Reactivity of some common metals

K (Potassium)	Most reactive
Na (Sodium)	
Ca (Calcium)	
Mg (Magnesium)	
Al (Aluminium)	
Zn (Zinc)	
Fe (Iron)	
Pb (Lead)	
[H] (Hydrogen)	
Cu (Copper)	
Hg (Mercury)	
Ag (Silver)	
Au (Gold)	Least reactive

Reactivity decreases on moving from top to bottom

Q8. Write Properties of Ionic compounds.

Properties of Ionic compound

- Ionic compounds are solid. Ionic bond has a greater force of attraction because of which ions attract each other strongly. This makes ionic compounds solid.
- Ionic compounds are brittle.

- Ionic compounds have high melting and boiling points because force of attraction between ions of ionic compounds is very strong.
- Ionic compounds generally dissolve in water.
- Ionic compounds are generally insoluble in organic solvents; like kerosene, petrol, etc.
- Ionic compounds do not conduct electricity in the solid state.
- The solution of ionic compounds in water conduct electricity. This happens because ions present in the solution of ionic compound facilitate the passage of electricity by moving towards opposite electrodes.
- Ionic compounds conduct electricity in the molten state.

Q.9. What are

a) **Minerals** b) **Ores** c) **Corrosion** d) **Alloys** e) **Amalgams** f) **Gangue**.

a) **Mineral**: Minerals are naturally occurring substances which have a uniform composition.

b) **Ores**: The minerals from which a metal can be profitably extracted are called Ores.

c) **Corrosion** : Most of the metals keep on reacting with the acids, bases, moisture and atmospheric air. In the long run, the underlying layer of metal keeps on getting lost due to conversion into oxides or sulphides or carbonate, etc. As a result, the metal gets eaten up. The process is called Corrosion.

d) **Alloys**: The homogeneous mixture of two or more metals, or a metal and a non-metal is called Alloy.

e) **Amalgams**: An alloy in which mercury (Hg) is present. For example Sodium amalgams [Na(Hg)] and Zinc amalgams [Zn(Hg)].

f) **Gangue**. The unwanted impurities like sand, rocky material, earth particles, lime stone, mica, etc in an ore are called gangue.

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NCERT TEXT BOOK QUESTIONS

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Q 1. Give an example of a metal which :

(i) is a liquid at room temperature.

ANS- Mercury

(ii) can be easily cut with a knife.

ANS- - Sodium

(iii) is the best conductor of heat

ANS- Silver

(iv) is a poor conductor of heat.

ANS- - Lead

Q.2 Explain the meanings of malleable and ductile.

Ans-

Malleable : A metal that can be beaten into thin sheets on hammering is called malleable.

Ductile : A metal which can be drawn into thin wires is called ductile

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Q 1) Why is sodium kept immersed in kerosene oil ?

Ans:

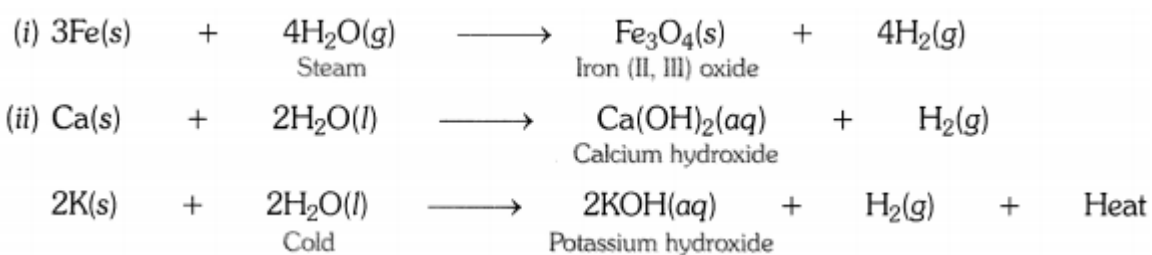
Sodium is highly reactive. So it is kept immersed in kerosene oil to prevent its reaction with oxygen, moisture and carbon dioxide of air to prevent accidental fires.

Q 2) Write equations for the reactions of

(i) iron with steam

(ii) calcium and potassium with water.

ANS



Q3) Samples of four metals A, B, C and D were taken and added to the following solution one by one.

The results obtained have been tabulated as follows :

Metal	Iron (II) sulphate	Copper (II) sulphate	Zinc sulphate	Silver nitrate
A	No reaction	Displacement		
B	Displacement		No reaction	
C	No reaction	No reaction	No reaction	Displacement

D	No reaction	No reaction	No reaction	No reaction
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Use the Table above to answer the following questions about metals A, B, C and D.

(i) Which is the most reactive metal?

ii) What would you observe if B is added to a solution of copper (II) sulphate?

(iii) Arrange the metals A, B, C and D in the order of decreasing reactivity.

ANS) (i) B is the most reactive metal because it gives displacement reaction with iron (II) sulphate.

(ii) When metal B is added to copper (II) sulphate solution, a displacement reaction will take place due to which the blue colour of copper (II) sulphate solution will fade and a red-brown deposit of copper will be formed on metal B.

(iii) Metal B is the most reactive because it displaces iron from its salt solution.

Metal A is less reactive because it displaces copper from its salt solution.

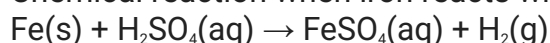
Metal C is still less reactive because it can displace only silver from its salt solution and metal D is the least reactive because it cannot displace any metal from its salt solution.

Hence, the decreasing order of reactivity of the metals is $B > A > C > D$.

Q 4) Which gas is produced when dilute hydrochloric acid is added to a reactive metal ? Write the chemical reaction when iron reacts with dilute H_2SO_4 .

ANS Hydrogen gas is produced when dilute hydrochloric acid is added to a reactive metal.

Chemical reaction when iron reacts with dilute H_2SO_4 :



Q 5) What would you observe when zinc is added to a solution of iron (II) sulphate ? Write the chemical reaction that takes place.

ANS Zinc is more reactive than iron. Therefore, when zinc is added to a solution of iron (II) sulphate, then the greenish colour of iron (II) sulphate solution fades gradually due to the formation of colourless zinc sulphate solution and iron metal is deposited on zinc.



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Q 1) (i) Write the electron dot structures for sodium, oxygen and magnesium.

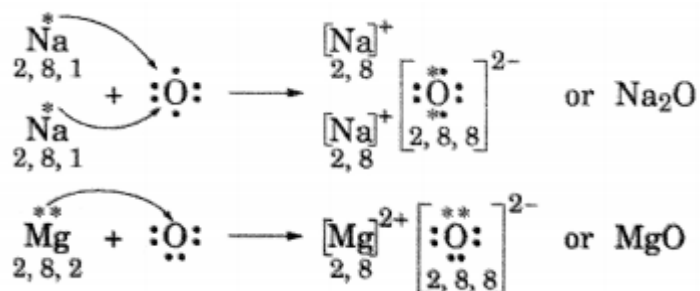
(ii) Show the formation of Na_2O and MgO by the transfer of electrons.

(iii) What are ions present in these compounds?

ANS

(i) Element	Sodium (Na)	Oxygen (O)	Magnesium (Mg)
Electron dot structure	$\begin{array}{c} \cdot Na \\ 2, 8, 1 \end{array}$	$\begin{array}{c} \cdot \ddot{O} \cdot \\ 2, 8, 6 \end{array}$	$\begin{array}{c} \ddot{Mg} \\ 2, 8, 2 \end{array}$

(ii) Formation of Na₂O and MgO



(iii) In Na₂O, ions present are Na⁺ and O²⁻.
In MgO, ions present are Mg²⁺ and O²⁻.

Q 2) Why do ionic compounds have high melting points ?

ANS The ionic compounds are made up of positive and negative ions. There is a strong force of attraction between the oppositely charged ions, so a lot of heat energy is required to break this force of attraction and melt the ionic compound. Due to this, ionic compounds have high melting points.

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Q 2) Which metals do not corrode easily ?

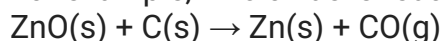
ANS) Gold and Platinum.

Q 3) What chemical process is used for obtaining a metal from its oxide.

ANS

Reduction process is used for obtaining a metal from its oxide.

For example, zinc oxide is reduced to metallic zinc by heating with carbon.



Chapter End Questions

Q 5) You are given a hammer, a battery, a bulb, wires and a switch.

(a) How could you use them to distinguish between samples of metals and non-metals?

(b) Assess the usefulness of these tests in distinguishing between metals and non-metals.

ANS)

(a) Metals can be beaten into thin sheets with a hammer without breaking. Non-metals cannot be beaten with a hammer to form thin sheets.

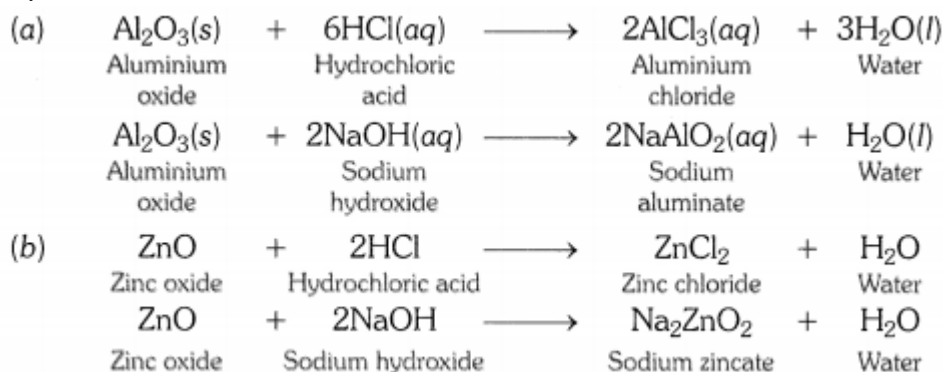
Metals are malleable, while non-metals are non-malleable.

When metals are connected into circuit using a battery, bulb, wires and switch, current passes through the circuit and the bulb glows. When non-metals (like sulphur) are connected, the bulb does not light up at all. Metals are good conductors of electricity.

(b) Because of malleability, metals can be casted into sheets. Metals are good conductors of electricity so these can be used for electrical cables.

Q6) What are amphoteric oxides ? Give two examples of amphoteric oxides ?]

ANS) Those metal oxides which show basic as well as acidic behaviour are known as amphoteric oxides. In other words, metal oxides that react with both acids and bases to form salt and water are called amphoteric oxides. Aluminium oxide and zinc oxide are amphoteric in nature.



Q7) Name two metals which will displace hydrogen from dilute acids and two metals which will not.

ANS: (i) Metals like sodium and magnesium displace hydrogen from dilute acids.
(ii) Metals like copper, silver do not displace hydrogen from dilute acids.

Q8) In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte ?

ANS

Cathode	–	Pure metal
Anode	–	Impure metal
Electrolyte	–	Metal salt solution

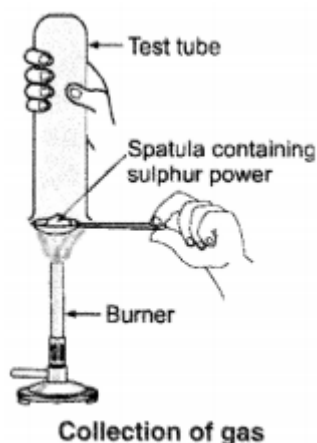
Q9) Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it, as shown in the figure.

(a) What will be the action of gas on

(i) dry litmus paper ?

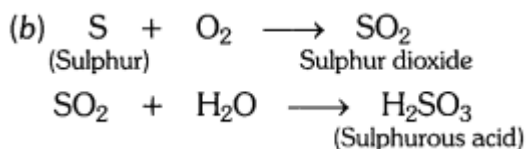
(ii) moist litmus paper ?

(b) Write a balanced chemical equation for the reaction taking place.



ANS (i) Dry litmus paper – no action.

(ii) Moist litmus paper – becomes red.



Q 10.) State two ways to prevent the rusting of iron.

ANS Ways to prevent rusting of iron are :

(a) By painting

(b) By galvanizing

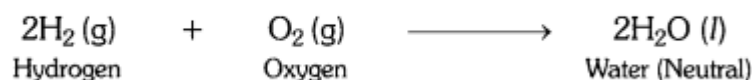
Q11.) What type of oxides are formed when non-metals combine with oxygen ?

ANS Non-metals combine with oxygen to form acidic oxides or neutral oxides.

Acidic oxide as sulphur dioxide



Neutral oxide as water



Q 12.) **Give reasons :**

(a) Platinum, gold and silver are used to make jewellery.

ANS Platinum, gold and silver are used to make jewellery because these are malleable, shiny, ductile and highly resistant to corrosion.

(b) Sodium, potassium and lithium are stored under oil.

ANS Sodium, potassium and lithium are very reactive, reacts vigorously with air and water and catch fire.

c) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.

ANS Aluminium forms a non-reactive layer of aluminium oxide on its surface. This layer prevents aluminium from reacting with other substances. That's why aluminium is used to make cooking utensils.

(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction

ANS It is easier to reduce a metal oxide into free metal. Since it is easier to obtain metals from their oxides than from their carbonates or sulphides directly,

Q 13.) You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.

ANS The sour substances such as lemon or tamarind juice contain acids. These acids dissolve the coating of copper oxide or basic copper carbonate present on the surface of tarnished copper vessels .

Q 15.) A man went door-to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty retreat. Can you play the detective to find out the nature of the solution he has used ?

ANS The goldsmith dipped the gold bangles in aqua-regia (which contains 1 part of concentrated nitric acid and 3 parts of concentrated hydrochloric acid, by volume). Aqua-regia dissolved a considerable amount of gold from gold bangles and hence reduced their weight drastically. The goldsmith can recover the dissolved gold from aqua-regia

Q16.) Give reasons why copper is used to make hot water tanks and not steel (an alloy of iron).

ANS