

# CHEMICAL REACTIONS AND EQUATIONS

## Introduction of Chemical reactions

The process in which from one or more substances, new substances with new properties are formed is called chemical reaction.

The substances which take part in a chemical reaction are called as reactants and the substances formed due to chemical reaction are called products.

### Common examples from daily life

Burning of coal to give heat and ash, curdling of milk to change into curd, ripening of fruits, cooking of food, burning of cracker are common examples of chemical reaction.

### Chemical change

In the chemical reaction, reactants form new products as a permanent change with new properties.

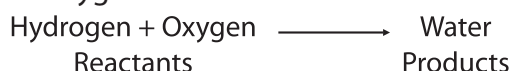
### Chemical Equation

A Chemical reaction is represented by a chemical equation. It involves use of symbols of elements, chemical formula of reactants and products with mention of physical state of substances.

### Rules for writing words equation

1. Write the names of the reactants on the left hand side (L.H.S) with (+) sign between reactants.
2. Write the names of the products on the right hand side (R.H.S) with (+) sign between them.
3. Put an arrow between the reactants and products, with showing direction of an arrow from reactants to products

When hydrogen combines with oxygen to form water we will write the reaction as-



Writing a skeletal chemical equation using the chemical formula of the reactants and products in place of words to represent them with the help of symbols and formula.

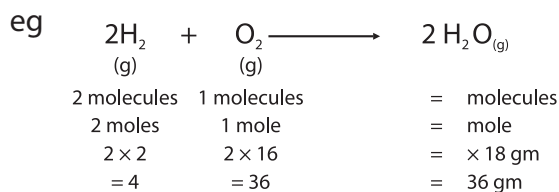
Thus an statement is converted to a chemical equation without keeping balance in terms of items of reactants and products in called as skeletal reaction.

### Writing balanced chemical equations

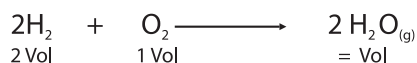
A Chemical equations in terms of number of atoms equal in both reactants and products is known as a balanced chemical equation.

### Hit and trial method of balancing chemical equation

The reaction is balanced by putting the coefficient 2,3,4 etc before a formula in both the side so that atoms in both the sides may be equal without a change in the chemical formula.



In case of gas, volume at S.T.P. is considered to balance the reaction.



### Step wise balancing of a equation

Sodium + water  $\longrightarrow$  sodium hydroxide + Hydrogen

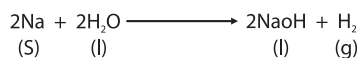
Step 1. Write the skeletal reaction



Step 2. Balance Hydrogen atoms



Step 3. Balance the sodium atoms.

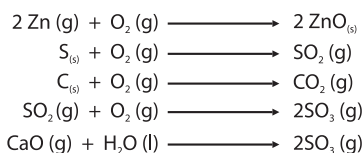


The equation is balanced.

### Type of chemical reactions

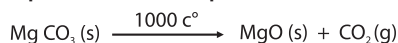
**Combination reaction :** The reaction in which two or more elements or compounds combine together through chemical bonds to form a single compound is called combination reaction

#### Some combination reactions



**Decomposition reaction :** The reaction in which a compound decomposes to more simpler compound.

It may be thermal, electrolyte or photo decomposition.



### Double displacement reactions

A reaction in which two compounds by mutual exchange of atoms or groups of atoms is called as double displacement

Example is an under



### Displacement reactions

A reaction in which an element and a compound react to form different substances by mutual exchange of atoms or group of atoms.



The displacement reaction strictly follow sale of reactivity series as per that

The arrangement of elements in a deveining order is called electro ohms' reactivity series:

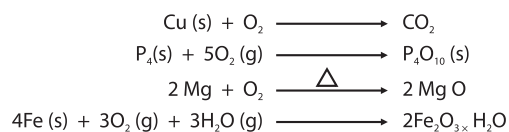
The strong metal replaces weak metal formats salt sultana:

Li – K – Na – Ba – Ca – Na – Mg – Al – Zn – H – Pb – Cu

### Oxidation – Reduction series:

Oxidation is a process which involves addition of oxygen or removal of hydrogen:

Examples are as under



Oxidation is facilitated by oxidizing agents of reduction is facilitated by reducing agent.

### Corrosion

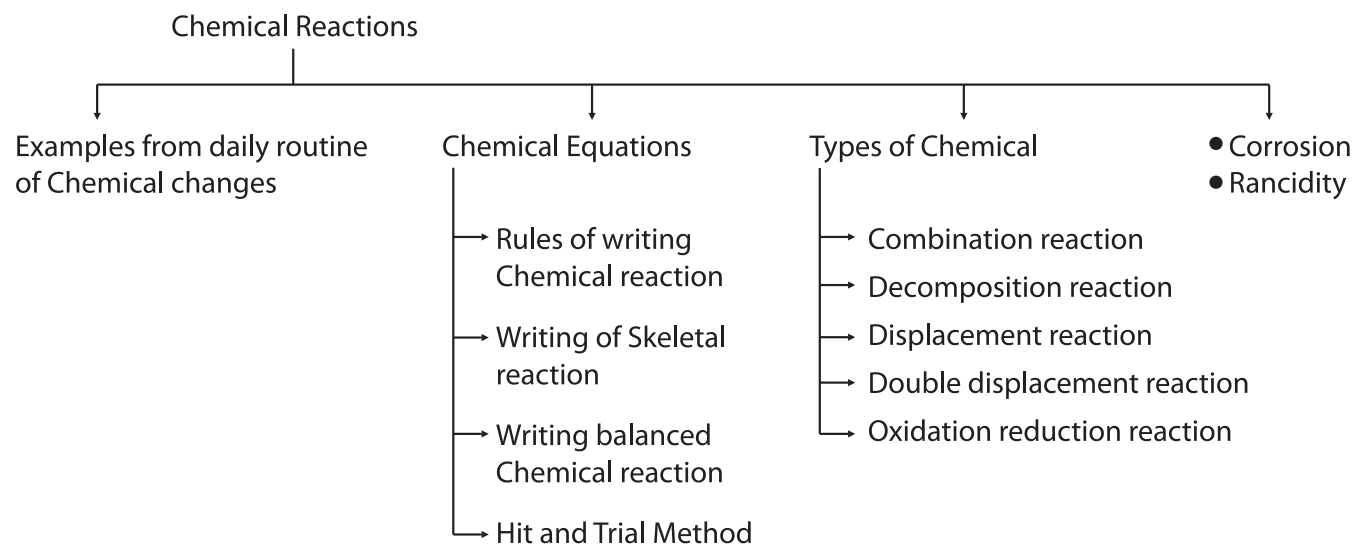
When metal is exposed to air and moisture after some time a layer of hydrated oxide is formed which weakens the metal corrosion can be checked by galvanization, electroplating or painting

### Rancidity

The oxidation of food stuff when exposed to air is rancidity. It spoils its food fat or oil splits into smaller organic compounds. Spoilage of meat is the example of rancidity.

## Concept Mapping

### Chemical Reactions and Equations



# LEARNING OBJECTIVES

After completing the chapter, learners will be able to:

- A chemical change occur in daily life
- A chemical reaction and chemical change
- A chemical equation
- To balance a chemical equation from skeleton reaction by Hit and Trial method.
- Type of chemical reactions
  - Combination reaction
  - Decomposition reaction
  - Displacement reaction
  - Double displacement reaction
  - Oxidation and reduction reaction
- Oxidation reaction in our daily life
  - Corrosion and protection of metal
  - Rancidity of food stuff

## TEACHING LEARNING MATERIALS (T.L.M.)

In order to perform and demonstrate a chemical reaction we need followings materials and apparatus

- Test tubes
- Test tube holder
- Bottle brush
- Spirit lamp
- Delivery tube
- Tongue

### **Following chemicals are required as T.L.M.-**

- Metal sodium preserved in kerosene oil.
- Metal powder of AL, Fe, Pb, Mg
- Metal copper turning and zinc granule or pellets
- Metal magnesium as in ribbon form
- Chemicals like  $\text{CuSO}_4$  (aq) ,  $\text{Al}_2(\text{SO}_4)_3$  (aq),  $\text{ZnSO}_4$  (aq),  $\text{FeSO}_4$  (aq) Freshly prepared, dilute  $\text{H}_2\text{SO}_4$ .
- Carbon as a coke or coal or charcoal

# CHEMICAL REACTIONS AND EQUATIONS

## Very short answer questions (V.S.A)

1. Arrange the following metals in the decreasing order of reactivity or electro positive character.  
K Zn Na Fe Pb Cu
2. Which of them will be a reducing agent a metal or non metal?
3. Balance the chemical equation  
$$\text{Na (s)} + \text{H}_2\text{O (aq)} \longrightarrow \text{NaOH (aq)} + \text{H}_2\text{(g)}$$
4. Select the combination reaction from following
  - (i)  $\text{KClO}_3 \longrightarrow \text{KCl} + 3\text{O}_2$
  - (ii)  $\text{S} + \text{O}_2 \longrightarrow \text{SO}_2$
5. Select the decomposition reaction from following
  - (i)  $2\text{H}_2\text{O} + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$
  - (ii)  $\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$
6. Select the double displacement reaction
  - (i)  $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \longrightarrow \text{BaSO}_4 + 2\text{HCl}$
  - (ii)  $2\text{KBr} + \text{Cl}_2 \longrightarrow 2\text{KCl} + \text{Br}_2$
7. Fill in the following about reactivity series of metal the ..... Metal replaces the ..... Metal from its salt solution.
8. Which of the following is not the necessary condition for rusting
  - (i) Presence of oxygen
  - (ii) Presence of catalyst
  - (iii) Presence of moisture
9. Which of the following is required for prevention of corrosion:
  - (i) coating of less electropositive metal
  - (ii) coating of more electropositive metal
10. Choose the correct about rancidity
  - (i) Rancidity is a reduction process
  - (ii) Rancidity is an oxidation process

## Answers

### V.S.A

1.  $K > Na > Zn > Fe > Pb > Cu$
2. Non metal
3.  $2 Na (s) + 2 H_2O \longrightarrow 2 Na OH (aq) + H_2 (g)$
4.  $S + O_2 \longrightarrow SO_2$
5.  $CaCO_3 \longrightarrow CaO + CO_2$
6.  $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2 HCl$
7. Strong, Weak
8. Presence of catalyst
9. Coating with more electropositive metal
10. Rancidity is an oxidation process

### S.A. Short Answer type Question (2 marks)

1. White precipitate of  $BaSO_4$  is obtained. Reaction will be as  
 $Na_2SO_4 (aq) + BaCl_2 (aq) \longrightarrow BaSO_4 (s) + 2 NaCl (aq)$
2. A is Zinc, B is  $ZnSO_4$  solutions C is  $H_2$  gas and reactions will be  
 $Zn (s) + H_2SO_4 (d) \longrightarrow ZnSO_4 (aq) + H_2 (g)$
3. A, B, C, and D are respectively-  
 $CuSO_4, 5 H_2O, CuSO_4, ZnSO_4 (aq), Cu (s)$
4. (i)  $Cr_2O_3 + 2 Al \longrightarrow Al_2O_3 + 2 Cr$   
(ii) This reaction is used in thermite welding
5. (i) Rusting is a slow electrochemical process in which hydrated oxide of metal is formed from metal when it comes in with air moisture  
(ii) By Painting, by galvanization, by tinning

### CCE on Science

- Objections 4
- Forum on learning outcomes

### Modacities

- Plant Practice
- New expectations — Best way to learn

### Short answer type questions SA, (2 marks)

- (i) What happens when aqueous solution of barium chloride is added to aqueous sodium sulphate solution?
- (ii) When silver coloured metal (A) is added to dilute sulphuric acid, solution (B) is formed which is colourless solution and a gas (C) is evolved which is colourless name 'A', 'B' and 'C' and write the equation?
- (iii) An 'A' blue coloured crystalline salt on heating decomposes to 'B' white substance. When in

blue salt solution, a metal (Zinc) is added, it gives rise to colourless solution 'C' with leaving behind 'D' reddish brown metal.

Name the compounds 'A', 'B', 'C' and 'D'

- (iv) A reaction mixture of chromium Oxide is heated with aluminum powder on strong heating
- Write the reactant?
  - Give one application of this reaction?
- (v) Define Rusting?
- Give two methods of protection of metal from rusting.

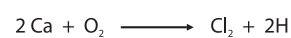
### Short Answer type Questions SA2 3 marks

- Convert the statement into balanced equations by hit and trial method.
  - Zinc + Sulphuric acid  $\xrightarrow{\text{Heat}}$  Zinc Sulphate + Hydrogen
  - Sodium carbonate + Hydrogen Peroxide  $\longrightarrow$  Sodium peroxide + carbon dioxide + water
  - Magnesium bicarbonate + Calcium hydroxide  $\longrightarrow$  Magnesium sulphate + water + Calcium Carbonate
- Balance the following skeleton equation by hit and trial method
  - $\text{Al}_2(\text{SO}_4)_3 + \text{NaOH} \longrightarrow \text{Al}(\text{OH})_3 + \text{Na}_2\text{SO}_4$
  - $\text{Cu}_2\text{S} + \text{O}_2 \longrightarrow \text{Cu}_2\text{O} + \text{SO}_2$
  - $\text{AlN} + \text{H}_2\text{O} \longrightarrow \text{Al}(\text{OH})_3 + \text{NH}_3$
- Select the oxidizing and reducing agent from the following:
- Define oxidation? Give equations showing addition of oxygen and removal of hydrogen.
- Define reduction? Give equations showing removal of oxygen addition of hydrogen.

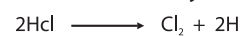
### Answer of SA2 type questions of 3 marks

- $\text{Zn} + \text{H}_2\text{SO}_4 \longrightarrow \text{ZnSO}_4 + \text{H}_2$
  - $\text{Na}_2\text{CO}_3 + \text{H}_2\text{O}_2 \longrightarrow \text{Na}_2\text{O}_2 + \text{CO}_2 + \text{H}_2\text{O}$
  - $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{OH})_2 \longrightarrow \text{MgCO}_3 + \text{CaCO}_3 + 2\text{H}_2\text{O}$
- $\text{Al}_2(\text{SO}_4)_3 + 6\text{NaOH} \longrightarrow 2\text{Al}(\text{OH})_3 + 3\text{Na}_2\text{SO}_4$
  - $2\text{Cu}_2\text{S} + 3\text{O}_2 \longrightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$
  - $\text{AlN} + 3\text{H}_2\text{O} \longrightarrow \text{Al}(\text{OH})_3 + \text{NH}_3$
- $\text{H}_2\text{S}$  is reducing agent and  $\text{I}_2$  is oxidizing agent
  - $\text{CuO}$  is oxidizing agent and  $\text{H}_2$  is reducing agent
  - $\text{Zn}$  is reducing agent and  $\text{CuSO}_4$  is oxidizing agent
- Oxidation is defined as addition of oxygen to an element or compound or the removal of hydrogen from a compound.

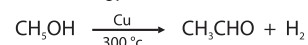
Addition of oxygen



Removal of Hydrogen

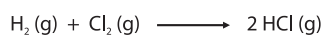


or



5. Reduction is addition of hydrogen or removal of oxygen from a compound.

Addition of Hydrogen



Removal of Oxygen



### L.A. Type Questions

- Explains the term 'corrosion'?
  - Write the chemical reaction of corrosion of Iron?
  - Name two metals which corrodes easily?
  - Aluminum corrodes in moist air but is widely used in making utensils.
  - What is galvanization and why do we use Zn for it?
- What is rancidity? Where does it happen?
  - What are anti oxidants? Why are they added to fat and oil containing food to prevent from rancidity?
  - Why do most items get puffed with nitrogen.

### Answer of long answer type questions

- The process of slow destruction of metals when exposed to air, moisture and pollutant gases, is called as corrosion
  - $$4\text{Fe} + 3\text{O}_2 + 2\text{H}_2\text{O} \longrightarrow 2\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$$
  - Formation of green coating on copper and formation of thin layer of oxide on aluminum are examples of corrosion.
  - Aluminum forms an oxide layer on exposure to air, this oxide layer further checks corrosion.
  - Galvanization is a process in which a zinc layer is applied on iron. It is used to protect iron from rusting.
- The oxidative deterioration of oils and fats leading to a stinking smell or stale taste is known as rancidity.
  - Anti Oxidants are those chemicals which, on addition to fat and oil, check it from rancidity. Addition of anti oxidants to fatty food is protected from staling.
  - Nitrogen is filled in potato chips & other food to create an anaerobic (air free atmosphere) which avoids rancidity.

# QUIZ COMPETITION

## Instructions :

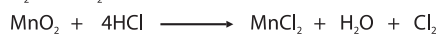
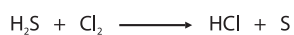
1. There will be four teams , team A, team B, team C and team D in all.
2. All the students will be equally divided in four rows of seating arrangement
3. There will be three rounds in all and 60 questions in M.C.Q., one ward and rapid fire round
4. First round will comprise of four alternatives, in which one will be the correct answer. Such 20 questions will be of 40 points.
5. The questions will be asked first to team A than to team B, team C and team D.
6. If one team fails to answer question will be asked by next team. If this team answers correctly, Bonus points will be given to this time other wise question will be passed to next teams, Bonus points is of one point.
7. Each team one by one will get an opportunity for M.C.Q type of questions in first round.
8. Second round will be of one board or one sentence. Answer and be asked as in first round from each team along with bonus pint criteria as above.
9. Thirst round will be rapid fire round, in which from each team 20 questions will be asked without any Bonus point round
10. In all the rounds, team will have 04 students for M.C.Q, 04 students for one ward and only one (01) students for rapid fire round from each team. i.e. on the stage from each team 09 students can participate.
11. Each team in between each round will have a break of 05 minutes for 9 team discussion.
12. For each question only thirty seconds will be limit to answer otherwise question will be passed for next time.

## 1. First Round M.C.Q

1. Choose the double displacement reaction
  - (a)  $X + YZ \longrightarrow XY + Z$
  - (b)  $X + Y \longrightarrow XY$
  - (c)  $XYZ \longrightarrow YZX$
  - (d)  $XY + AB \longrightarrow XA + YB$
2. When in a chemical reaction, a product is obtained as a precipitate, it is shown by the following sign
  - (a)  $\uparrow$
  - (b)  $\downarrow$
  - (c)  $\longrightarrow$
  - (d)  $\longleftarrow$
3.  $2\text{KClO}_3 \longrightarrow 2\text{KCl} + 3\text{O}_2$ 
  - (a) Combination Reaction
  - (b) Decomposition Reaction

- (c) Displacement reaction
- (d) Double displacement reaction

4. Only one below given reaction is balanced



The balanced reaction is

- (a) A reaction
  - (b) B reaction
  - (c) C reaction
  - (d) D reaction
5.  $\text{Fe}_2\text{O}_3 + 2 \text{Al} \longrightarrow \text{Al}_2\text{O}_3 + 2 \text{Fe}$
- The above reaction is an example of a
- (a) Combination reaction
  - (b) Double decomposition reaction
  - (c) Decomposition reaction
  - (d) Displacement reaction
6. On heating of Lead nitrate, a specific sound is observed in decomposition of lead nitrate.
- (a) musical sound
  - (b) thunder sound
  - (c) Crackling sound
  - (d) all are correct
7. Which one is not observed when a clean nail of iron is added to a solution of copper sulphate in water?
- (a) a brown material is deposited on iron nail
  - (b) blue colour of copper sulphate fades.
  - (c) after sometime blue solution become greenish.
  - (d) a blue material is deposited on iron nail?
8. Which is correct about exothermic reactions?
- (a) heat is absorbed.
  - (b) temperature of surrounding decreases
  - (c) heat is neither absorbed nor evolved
  - (d) heat is evolved in the reaction
9. Which of the below given reaction is thermite reaction
- (a)  $\text{Fe}_2\text{O}_3 + 2 \text{Al} \longrightarrow \text{Al}_2\text{O}_3 + 2 \text{Fe}$
  - (b)  $\text{H}_2 + \text{Cl}_2 \longrightarrow 2 \text{HCl}$
  - (c)  $\text{N}_2 + 3\text{H}_2 \longrightarrow 2 \text{NH}_3$
  - (d)  $2 \text{NaOH} + \text{H}_2\text{SO}_4 \longrightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$

10. Which is correct about skeleton reaction

- (a) skeleton reaction is balanced reaction
- (b) skeleton reaction is a translation of statement in equation form.
- (c) Skeleton reaction have statement and formula both.
- (d) all are correct.

11. What is most appropriate about decomposition reaction from below given

- (a) it is reverse of combination reaction
- (b) it may have thermal decomposition
- (c) it has electrolytic decomposition
- (d) all are correct

12. which of the following is not a decomposition reaction

- (a)  $\text{Zn CO}_3(\text{s}) \xrightarrow{\Delta} \text{Zn O}(\text{s}) + \text{CO}_2(\text{g})$
- (b)  $2\text{Pb}_3\text{O}_4(\text{s}) \xrightarrow{\Delta} 6\text{PbO}(\text{s}) + \text{O}_2(\text{g})$
- (c)  $\text{Ba}(\text{OH})_2(\text{s}) + 2\text{NH}_4\text{Cl}(\text{s}) \longrightarrow \text{BaCl}_2(\text{s}) + 2\text{NH}_4\text{OH}(\text{l})$
- (d)  $2\text{Pb}(\text{NO}_3)_2(\text{s}) \longrightarrow 2\text{Pb O}(\text{s}) + 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$

13. Which of the following is reaction which is incorrect as per reactivity series of metals.

- (a)  $\text{Cu SO}_4(\text{aq}) + \text{Fe}(\text{s}) \longrightarrow \text{Cu}(\text{s}) + \text{FeSO}_4(\text{aq})$
- (b)  $\text{Zn}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_2(\text{aq})$
- (c)  $\text{CuSO}_4(\text{aq}) + \text{Zn}(\text{s}) \longrightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu}_4(\text{s})$
- (d)  $\text{MgSO}_4(\text{aq}) + \text{Cu}(\text{s}) \longrightarrow \text{Mg SO}_4(\text{aq}) + \text{Cu}(\text{s})$

14. Which are not suitable conditions for rusting-

- (a) Presence of Oxygen
- (b) Absence of Oxygen
- (c) Presence of water or moisture
- (d) Presence of pollutant gases like  $\text{Cu}_2$ ,  $\text{So}_2$  and  $\text{No}_2$ .

15. What is not correct about rusting of iron?

- (a) It is an Oxidation Reaction
- (b) It is a slow reaction
- (c) It forms blue coloured oxide.
- (d) It is a hydrated oxide of iron.

16. Which one is a correct statement about the reaction.



- (a) Iron is more reactive than copper
- (b) Iron is less reactive than copper
- (c) In this reaction  $\text{Cu}^{2+}$  ion is oxidised
- (d) copper is more reactive than iron.

17. Which one is a correct statement about the reaction



- (a)  $\text{Cu}^{2+}$  (aq) is reduced to Cu (s)
- (b)  $\text{Zn}^{2+}$  (aq) is reduced to Zn (s)
- (c)  $\text{Cu}^{2+}$  is reduced to Cu (s) and a Zn (s) is oxidised to  $\text{Zn}^{2+}$  (aq)
- (d) All are correct

18. Which of the following is an electrocomposition reaction

- (a)  $\text{CO}_2 + \text{CaO} \longrightarrow \text{CaCO}_3$
- (b)  $\text{C} + \text{CO}_2 \longrightarrow 2 \text{CO}$
- (c)  $\text{NH}_4\text{Cl} \longrightarrow \text{NH}_3 + \text{HCl}$
- (d)  $2 \text{Mg} + \text{CO}_2 \longrightarrow 2 \text{MgO} + \text{C}$

19. What is incorrect about CuO,  $\text{H}_2$ , Cu &  $\text{H}_2\text{O}$  in a reaction.



- (a) reduction of CuO takes place
- (b) hydrogen is reducing agent.
- (c) hydrogen is reduced to  $\text{H}_2\text{O}$
- (d) CuO is reduced to Cu(S)

20.  $\text{Cr}_2\text{O}_3 + 2 \text{Al} \longrightarrow \text{Al}_2\text{O}_3 + 2 \text{Cr}$

The above reaction which is an exothermic thermite reaction is also an example of

- (a) Combination reaction
- (b) Double displacement reaction
- (c) Decomposition reaction
- (d) Displacement reaction

### Answer Key for 20 M.C.Q. Question

- |          |           |
|----------|-----------|
| (i) D    | (xi) D    |
| (ii) B   | (xii) C   |
| (iii) B  | (xiii) D  |
| (iv) A   | (xiv) B   |
| (v) D    | (xv) C    |
| (vi) C   | (xvi) A   |
| (vii) D  | (xvii) C  |
| (viii) D | (xviii) C |
| (ix) A   | (xix) C   |
| (x) D    | (xx) D    |

# ONE WORD ROUND

## Choose one alternative

1. A permanent change in which original substance give rise to one or more products with different property is called as a chemical change / physical change
2. In a chemically balanced equation the number of atoms of each element in both the sides of equation are equal/unequal.
3. In a skeleton reaction, we change the formula to balance the reaction? Yes/No
4. In combination reaction, combination of elements or compound combine to form one compound or more
5. In a reactivity series of metals, right hand side metals are less reactive / more reactive

## Choose and state as true or false

6. In exothermic reaction heat is evolved. True/False
7. Decomposition is possible by thermal decomposition, electrolytic decomposition and by photo chemical decomposition. True / False
8. Displacement reaction of metals is based on reactivity series of metals. T/F
9. Oxidising agent is a substance which causes addition of oxygen or removal of hydrogen from other substance. T/F
10. Reduction is a process which involves removal of hydrogen and addition of oxygen. T/F

## Give a word fill in the blank

11. substance which causes addition of oxygen or removal of hydrogen from other substance is ..... agent.
12. Presence of air, presence of moisture, presence of salt in water, electropositive metals leads a metal to .....
13. .... metals are less electropositive and hence they don't corrode in moist air.
14. A reaction in which an insoluble product formed during the reaction of two ionic compounds in aqueous solution is called ..... reaction.
15. A substance which causes additions of oxygen or removal of hydrogen from other substance is called .....
16. The arrangement of elements in decreasing order of their electro positive character is called .....
17. When sodium metal is added to water, it gets .....
18. A few elements in the order of decreasing order of reactivity in  $\text{Ca} > \text{Al} > \text{Zn} > \text{H} > \text{Ag} > \text{Pt}$   
The most reactive metal is .....
19. A few elements in the order of decreasing order of reactive metal is .....
20. In the order of  $\text{Ca} > \text{Al} > \text{Zn} > \text{H} > \text{Ag} > \text{Pt}$   
Choose the metal which from above can react with all the salt solutions. ....

## Answer one word true/false & fill in the blank answer key

1. Chemical change

2. Equal
3. No
4. One compound
5. More reactive
6. True (T)
7. T
8. T
9. T
10. F
11. Oxidising agent
12. Rusting
13. Noble metal or Ag, Au or Pt
14. Precipitation reaction
15. Oxidising agent
16. Reactivity series
17. Oxidised
18. Ca
19. Pt
20. Ca

### **Answer to activity based one line-two line quiz**

1. Sodium does not react with kerosene oil but reacts in water and air
2. Blue coloured copper sulphate crystals  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  loses water molecules on heating and turn to white/
3. Hydrogen liberates at cathode and hydrogen ion takes electrons from cathode.
4. Quick lime ( $\text{CaO}$ ) in water forms lime water  $\text{Ca(OH)}_2$  milky white substance by a combination reaction.
5. Green coloured ferrous sulphate crystals  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  loses and also decomposes to form brown oxide of Iron  $\text{Fe}_2\text{O}_3$  with evolution of  $\text{SO}_2$  and  $\text{SO}_3$ .
6. In a photochemical reaction  $\text{AgCl}$  decompose to  $\text{Ag(s)}$  grey coloured mass.
7. Silver or gold are least electropositive metals and hence not react easily when exposed to air, water or light.
8. Only strong metal can replace weak metal from salt solution but not vice versa.
9. When Iron nails are exposed to air and water, it forms brown colour on nails at least in 3-4 days.
10. When lime water stuck on walls react with  $\text{CO}_2$  of air to form a layer of  $\text{CaCO}_3$  which is white in colour.
11. Both burning of fuel and food are oxidation reaction, in burning of fuel  $\text{CO}_2$  and heat is released and in burning of food, A.T.P. energy and  $\text{CO}_2$  is formed.
12. Why Musical sound is observed due to formation of hydrogen gas with formation of Zinc

sulphate when zinc granules react with dilute sulphuric acid.

13. In cracker explosion, on burning fuel or material like charcoal, sulphur or potassium chloride react with oxygen in oxidation reaction
14. Iron is coated with zinc to protect it from direct contact of air and moisture to avoid rusting.
15. Utensils are coated with tin to avoid direct contact of water and air, thus protect utensils.
16. Platinum is noble metal and has place right to hydrogen, hence does not react with platinum.
17. In the reaction of  $\text{BaCl}_2(\text{aq})$  with  $\text{NaCl}(\text{aq})$ ,  $\text{BaSO}_4(\text{s})$  precipitate is formed which is heavy and insoluble in water.
18. Yes, silver nitrate solution reacts on heating with copper metal powder to form silver metal.
19. Magnesium plate provides electrons and avoid oxidation of Iron metal to protect heavy machines from rusting.
20. Stainless steel is directly exposed to moisture or air so rusting is avoided by alloy formation.

### Activity based one line quiz questions

1. Why do we preserve sodium metal in kerosene oil?
2. What happens when we heat coloured crystalline copper sulphate?
3. In electrolysis of water, on which electrode hydrogen migrates and why?
4. What happens when quick lime is added to water? Name the reaction and compounds formed.
5. What happens to green coloured Iron sulphate crystals on heating?
6. Why does white precipitate of  $\text{AgCl}$  changes to grey on exposure to light?
7. Why do silver or gold not react easily when exposed to air or light?
8. Why does  $\text{ZnSO}_4$  solution not react with  $\text{Cu}(\text{s})$ ?
9. How would you conclude that rusting is a slow electrochemical reaction?
10. Why does milky white lime water, on exposure to air on walls give white colour?
11. What type of reaction is common in burning of food and fuel?
12. Why do zinc granules give musical sound when reacts with dilute sulphuric acid?
13. In cracker of festivals, which reaction is involved.
14. Why does iron coated with zinc?
15. Why do utensils are layered with tin?
16. Why does platinum not react with dilute sulphuric acid?
17. Why does white mass settle down in a test tube when  $\text{BaCl}_2$  solution is added to  $\text{NaCl}$  solution?
18. Is it possible to get silver when  $\text{AgNO}_3(\text{aq})$  with copper when solution is heated?
19. In protection of steel heavy machines why do machines are joined with magnesium plate?
20. Why does stainless steel not rust easily?

# METALS AND NONMETALS

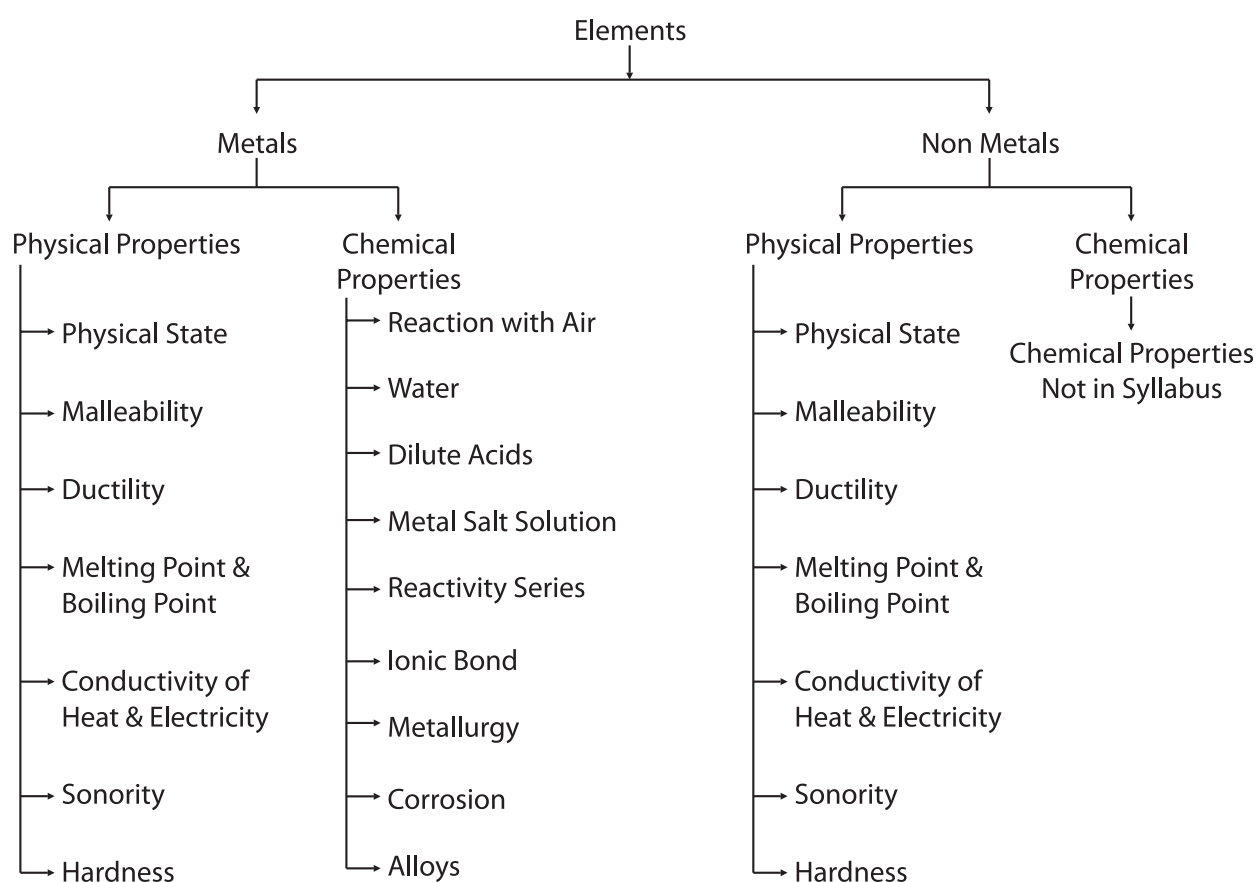
## Introduction:

There are 115 elements known till today. These elements can be classified into metals and Non metals on the basis of their properties. Metals are usually hard, malleable, ductile, sonorous, good conductor of heat and electricity.

Non metals are usually soft. They do not possess luster. They are not malleable and ductile rather they are brittle. They are bad conductor of heat and electricity.

Metals and nonmetals have wide application in industry, Agriculture, Construction of buildings, furniture & equipments etc & so on. They have brought revolution in every aspect of life.

## Concept Mapping



## Objectives

1. A students will be able to distinguish between metals & Non metals on the basis of physical & chemical properties.
2. Metals can be arranged in order of their activities in increasing order.
3. A student will be able to know how ionic bond is formed and what are properties of Ionic compounds.

4. A students will be familiar with occurrence of metals, their extraction brom their ores and ways of refining of metals.
5. A students will be able to know about causes of corrosion, and preventive measures of corrosion.
6. To familaise a student about alloys their importance and composition.
7. To Know how metals & Non metals react with O<sub>2</sub>, water, acids & Dilute salt solution etc.
8. To know importance and different applications of metals & Non metals.

### **Teaching learning materials (TLM)**

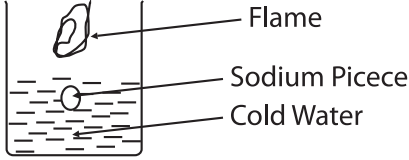
The following materials are required to study the reaction of metals with water

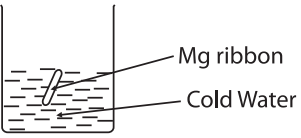
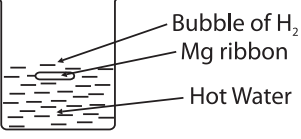
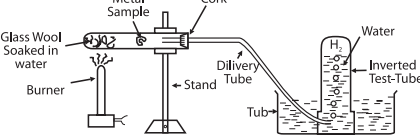
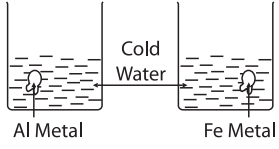
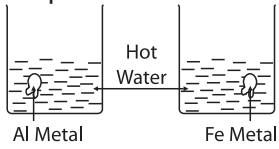
1. Samples of Metals like Na, K, Ca, Mg, Al, Fe, Cu, Au, Ag.
2. Test tubes with stand.
3. Beakers
4. Cold water, Hot water, Steam
5. Burner
6. Tripod Stand
7. Candle
8. Match box
9. Holder
10. Wire gauze
11. Glass Wool
12. Cork
13. Delivery tube
14. Tub
15. Tong
16. Filter papers

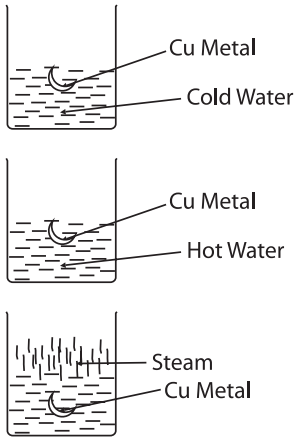
### **Reaction of Metals with water**

1. To understand physical state of metals
2. To familiarize the reactivity series of Metals.
3. To Develop skills of handling of equipments.
4. To creat scientific attitude & temper in students.
5. To know intensity of reaction of metals is different, metal to metal & metal with cold water, hot water & steam.
6. To know about noble metals. Which do not react with even steam at a higher temperature.
7. To develop opportunities of comprehensive development in child, instead of text book.

# LESSON PLAN

Teaching Points	Teacher Activities	Students Activities	Evaluation
Metals and Non metals	<p>Previous Knowledge</p> <ol style="list-style-type: none"> <li>Name a metal used for packing food items.</li> <li>Give examples of metals used for making jewellery.</li> <li>Which metals are used for making almirahs, windows, chair &amp; table etc.</li> <li>Tell a metal which is stored in kerosene oil safely.</li> </ol>	<ol style="list-style-type: none"> <li>Students tell that aluminum is used.</li> <li>Gold &amp; silver are used</li> <li>Students answer that iron &amp; Aluminum is used.</li> <li>Students are not able to answer the question.</li> </ol>	
Reaction with cold water	<p>The teacher will divide class into groups as A, B, C &amp; D etc. The teacher will demonstrate reaction of Na &amp; Ca with cold water</p> <p>Teacher calls students of Group A</p>  <p>Teacher takes a beaker, half filled with cold water. A small piece of Na is cut and put between Filter paper to dry it, and put into beaker.</p> <p>Observation: Sodium reacts violently with cold water and evolved H<sub>2</sub> catches fire immediately</p> <p>Teacher will write observation and chemical reaction on black board. Students are asked to touch the beaker.</p> $2 \text{Na} + 2 \text{H}_2\text{O} \xrightarrow{\text{[cold]}} 2 \text{NaOH} + \text{H}_2 + \text{Heat Energy}$ <p style="text-align: center;">Sodium Hydroxide</p> <p>Teacher explain exothermic reaction to students.</p> <p>Teacher illustrates why Na is put in kerosene oil</p>	<p>Students are asked to be cautious and write down observations on their notebook.</p> <ol style="list-style-type: none"> <li>Students write down the observation and chemical reaction in their note book.</li> <li>Students touch the beaker &amp; feel, it is hot</li> <li>Students ask, why sodium is put in kerosene oil.</li> </ol> <p>Students write about exothermic reaction in their note book.</p>	<ol style="list-style-type: none"> <li>name a metal which can be cut by knife.</li> <li>Why H<sub>2</sub> gas catches fire immediately</li> <li>Which gas is released when a metal react with water</li> <li>Give examples of some most reactive metals</li> <li>What will happen if Na is exposed to air.</li> </ol>
Reaction with hot water	<p>Teacher asks students of Group B</p> <p>Students are provided Mg ribbons and asked to put into cold water.</p>	<p>Students took a beaker half filled with cold water and put a piece of Mg ribbon in it.</p>	<ol style="list-style-type: none"> <li>Mg do not react with cold water why.</li> <li>Why Mg start Floating in water.</li> </ol>

	<p>Teacher writes chemical reaction of Mg ribbon with hot water on black board.</p> $\text{Mg} + 2\text{H}_2\text{O} \xrightarrow{\text{[Hot]}} \text{Mg}(\text{OH})_2 + \text{H}_2$ <p style="text-align: center;">Magnesium Hydroxide</p> <p>Students are asked to put Mg ribbon in hot water and Note down observation &amp; Chemical reaction in note Book Teacher may write unbalanced reaction on black board &amp; may ask students to balance reaction on their note books.</p>	<p>Observation: No reaction occurs.</p>  <p>Students put magnesium bi hot water and observe Observation :</p> <p>Bubbles of H<sub>2</sub> gas. Mg start floating in water &amp; write down these in their note books.</p>  <p>Students try to balance the reaction of Mg with hot water in their note books.</p>	<p>iii. Whether Mg is soft or hard.</p> <p>iv. name the products formed. Due to reaction of Mg with hot water.</p> <p>v. Which is more reactive Na or Mg.</p>
<p>Reaction with Steam</p>	<p>Teacher Asks students of Groups C</p> <p>Students are instructed to put Al &amp; Fe in cold water and hot water separately and to note down the observations in note books.</p> <p>Teacher instructs students be careful of hot water</p> $\text{Al} + \text{H}_2\text{O} \xrightarrow{\text{[cold]}} \text{No Reaction}$ $\text{Al} + \text{H}_2\text{O} \xrightarrow{\text{[hot]}} \text{No Reaction}$ <p>Teacher will asks some students to come and help in arranging the apparatus. The teacher will arrange the apparatus &amp; asks students to write down the material used in setting apparatus &amp; to note down the reaction in their note book.</p>  <p>Action of steam on a metal</p> <p>Teacher demonstrate that when metals like Al or Fe reacts with steam, forms metal oxide &amp; H<sub>2</sub> gas Teacher writes the involved reaction on blackboard &amp; asks students to write the reactions in their note book.</p>	<p>Students take two beaker of cold water &amp; two beaker half filled with hot water &amp; put Al &amp; Fe respectively &amp; note down observation</p>  <p>Observation: No Reaction take place</p>  <p>Observation : No reaction take place. Students write in their note book. Students help in arranging the apparatus and draw its diagramme in their note book.</p> <p>Students are asked to name &amp; label the marked the apparatus by teacher.</p>	<p>i. which is less reactive Mg or Al.</p> <p>ii. What is color of Aluminum.</p> <p>iii. Aluminum is heavy or light</p> <p>iv. Why water filled test-tube is puts in inverted position.</p> <p>v. Why H<sub>2</sub> is filled in a balloon.</p> <p>vi. What is the colour of Aluminum oxide</p> <p>vii. Arrange Na, Al and Mg in decreasing order of reactivity</p>

	<p>When Aluminum reacts with steam, forms aluminum oxide and H<sub>2</sub> gas  <b>Reaction</b>  Teacher describes that H<sub>2</sub> gas is obtained by downward displacement of water technique, because H<sub>2</sub> gas is insoluble in water and lighter than air.</p>	<p>Students write the chemical reaction in their note book &amp; may be asked to balance the chemical reaction  Students observe that level of water in invested test tube decreases &amp; H<sub>2</sub> gas is releasing in the form of bubbles &amp; is collecting in the invested test tube.</p>	
<p>Reaction of Cu, Ag &amp; Au with water</p>	<p>Teacher ask students of Group D  Students are asked to take cold water, hot water and steam and put Cu, Ag &amp; Au turn by turn &amp; note the observation in their record.</p> $\left\{ \begin{array}{l} \text{Cu} + \text{H}_2\text{O} \longrightarrow \text{No reaction} \\ \text{[cold]} \\ \text{Au} + \text{H}_2\text{O} \longrightarrow \text{No reaction} \\ \text{[cold]} \\ \text{Ag} + \text{H}_2\text{O} \longrightarrow \text{No reaction} \\ \text{[cold]} \end{array} \right.$ $\left\{ \begin{array}{l} \text{Cu} + \text{H}_2\text{O} \longrightarrow \text{No reaction} \\ \text{[Hot]} \\ \text{Au} + \text{H}_2\text{O} \longrightarrow \text{No reaction} \\ \text{[Hot]} \\ \text{Ag} + \text{H}_2\text{O} \longrightarrow \text{No reaction} \\ \text{[Hot]} \end{array} \right.$ $\left\{ \begin{array}{l} \text{Cu} + \text{H}_2\text{O} \longrightarrow \text{No reaction} \\ \text{[steam]} \\ \text{Au} + \text{H}_2\text{O} \longrightarrow \text{No reaction} \\ \text{[steam]} \\ \text{Ag} + \text{H}_2\text{O} \longrightarrow \text{No reaction} \\ \text{[steam]} \end{array} \right.$	<p>Students take cold water hot water and steam &amp; Put Cu, Ag &amp; Au turn by turn in them.  <b>Observation</b>  Nothing is visible to students observe that no reaction take place</p> 	<p>i. What is the colour of copper?  ii. Name the metals used for making electric wire.  iii. Metals can be hammered into sheet, name the term.  iv. Name a metal which is best conductor of heat &amp; electricity.</p>
<p>Conclusions:</p>	<p>The intensity of reaction of metals with water, differ metal to metal. The most reactive metals react even with cold water violently. Mg reacts with hot water. The moderately reactive metals react with steam. The least reactive metals do not react even with steam on strong heating  The order of reaction is as follows:  K &gt; Na &gt; Ca &gt; Mg &gt; Al &gt; Zn &gt; Fe &gt; Cu &gt; Au &gt; Ag.</p>		

### Very Short Answer Questions:

1. What would happen to a copper vessel if it is left for a few days in humid atmosphere.
2. Which one of the following is most reactive and least reactive metal
  - a. Au
  - b. Na
  - c. Cu
  - d. Ca
3. The process of electrolysis is used for obtaining such metals which are
  - a. Highly reactive
  - b. Moderately reactive
  - c. Low reactive
  - d. All types of metals
4. Write chemical equation for reaction taking place when zinc carbonate is calcined.
5. Name the constituents of stainless steel
6. Metals have very low melting points, will melt if you keep them on your palm, name them.
7. Choose amphoteric oxides out of the followings.
  - a. Sodium Oxide
  - b. Carbon dioxide
  - c. Aluminum Oxide
  - d. Potassium Hydroxide
8. Which metals do not corrode easily
9. Give reason why carbonate and sulphide ores are converted into oxides during the process of extraction.
10. Identify the substances that are getting oxidized and reduced.



### Short Answer type Questions

1. Define the term alloy. Write two advantages of making alloys.
2. Show what happens when iron reacts with steam and zinc is added to a solution of Iron (II) Sulphate.
3. Hydrogen gas is not evolved when a metal reacts with Nitric acid. Why.
4. Ionic compounds in the solid state do not conduct electricity but conduct in molten state – explain.
5. 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.
6. Show the formation of  $\text{MgCl}_2$  by the transfer of electrons.
7. Give reason Calcium starts floating when it is dropped in water.
8. Complete and balance the following reactions
  1.  $\text{Al}_2\text{O}_3 + \text{HCl} \longrightarrow$
  2.  $\text{Cu} + \text{O}_2 \longrightarrow$
9. What is galvanization. How does this process prevent rusting.
10. Write the various steps involved in extraction of a metal from its ore which is liquid at room temperature & is used in thermometers.

### Short Answer Questions

1. How metals towards the top of activity series extracted illustrate with example

2. What are essential conditions of rusting of iron elaborate it with activity.
3. Explain activity series of metals. Name one metal which is at top & one which is at the bottom.
4. Give reasons
  - a. why carbon is not used for making aluminum from aluminum oxide.
  - b. Aluminum easily combines with oxygen but still it can be used for making kitchen utensils.
5. Distinguish between followings
  - a. Ores and minerals
  - b. Calcination and Roasting
  - c. Metal and Non metal on the basis of chemical property
6. A student took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test-tube over it
  - a. What will be action of gas on
    - i. Dry litmus paper
    - ii. Moist litmus paper
  - b. Write a balanced chemical equation for the reaction taking place.

### Long Answer Questions

1. What is meant by refining of a metal. Name the most widely used method of refining impure metals. Describe with the help of a labelled diagram how this method may be used for refining of copper.
2. A more reactive metal can displace less reactive metal from its salt solution. Name the process & A solution of copper sulphate was kept in an iron vessel. After a few days, the iron vessel was found to have no. of holes in it. Explain giving the relevant chemical equation. Which of the following pairs will give reaction? Why.
  - a. NaCl solution and copper metal
  - b. MgCl<sub>2</sub> solution and Aluminium metal
  - c. FeSO<sub>4</sub> solution and silver metal
  - d. AgNO<sub>3</sub> solution and copper metal

### Expected Answer V.S.A.

1. A green layer is formed due to formation of copper carbonate due to corrosion of copper.
2. Sodium is most reactive & gold is least reactive
3. Highly reactive metals
4. 
$$\text{Zn(s)} + \underset{\text{Greenish}}{\text{FeSO}_4(\text{aq})} \longrightarrow \underset{\text{Colourless}}{\text{ZnSO}_4(\text{aq})} + \text{Fe(s)}$$
5. Iron, Nickel and Chromium
6. Gallium and caesium
7. Aluminium oxide
8. Gold, Platinum, Titanium (any one)
9. Because it is easier to obtain a metal from its oxide form.

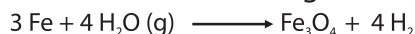
10. Al – is oxidized into  $Al_2O_3$ ,  $MnO_2$  – is reduced to Mn.

### S.A.

1. An Alloy is a homogeneous mixture of two or more metals or a non metals.

Advantages : To improve the properties of a metal like durability, resistance to corrosion etc.

2. Iron react with steam to form Iron (ii) (iii) oxide and  $H_2$  gas



Greenish  $FeSO_4$  solution becomes colourless due to formation of  $ZnSO_4$ .



Zn is more reactive than Fe & displaces it.

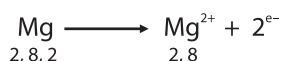
3. Because  $HNO_3$  is a strong oxidizing agent. It oxidises  $H_2$  produced to water and it self gets reduced to any of nitrogen oxides like  $N_2O$ ,  $NO$ , &  $NO_2$ .

4. Because movement of ions in solid is not possible due to their rigid structure. In the molten state, the electrostatic forces of attraction between oppositely charged ions are overcome due to heat. Thus ions move freely and conduct electricity.

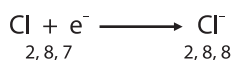
5. Lemon or tamarind juice contain acids. The copper vessel is tarnished due to formation of basic copper carbonate. The acid neutralize this basic copper carbonate and hence original shine of copper vessel returns.

6. Formation of ionic bond in  $MgCl_2$

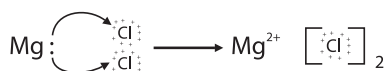
(i) Formation of cation



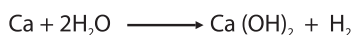
(ii) Formation of Anion



(iii) Transfer of electrons



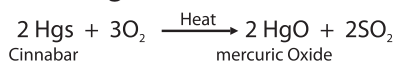
7. Calcium starts floating because the bubbles of Hydrogen gas formed, stick to the surface of the metal.



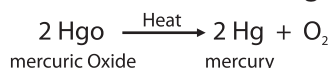
8. Aluminium Oxide + Hydrochloric Acid  $\longrightarrow$  Aluminium Chloride + water

9. The process of depositing a thin layer of zinc on the surface of iron.

10. Cinnabar ( $HgS$ ) is an ore of mercury. When ore is heated in Air, it is first converted into mercuric oxide ( $HgO$ ) &  $SO_2$

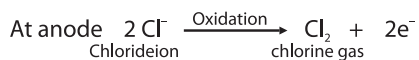
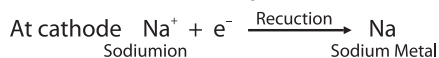


The mercuric oxide ( $HgO$ ) is reduced to mercury on further heating



## Short Answer

- The metals towards the top of activity series are obtained by electrolytic reduction. Metals like Na, Mg, Ca & Al are obtained by the electrolysis of their molten chlorides and oxides. The metals are deposited at the cathode and chlorine or oxygen gas at the anode. The reactions which occur at respective electrodes are as follows



- Conditions for rusting of Iron are

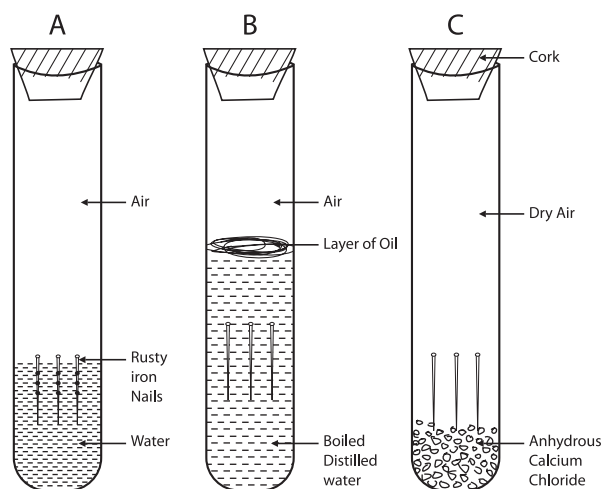
- Presence of Air (oxygen)
- Presence of Water (Moisture)

Take three test-tubes and place clean iron nails in each & label as A, B & C

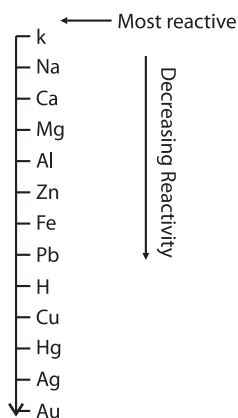
Pour some water in test tube A & cork it.

Pour boiled distilled water in test-tube B & add oil & cork it. Put anhydrous calcium chloride in test-tube C & cork it. Leave them for some days. Iron nails rust in test tube A. Only, as nails are exposed to both air and water. In test tube B, the nails are exposed to only water & nails in test tube C are exposed to dry air only.

## Rusting of Iron:



- The Reactivity series is a list of metals arranged in the order of their decreasing activities. The most reactive metals are found at the top and least reactive at the bottom of reactivity series.



Most reactive metal – Potassium

Least reactive metal – Gold

4. (a) Because aluminium has more affinity for oxygen than carbon. Hence carbon is not able to remove oxygen from aluminium oxide.

(b) Aluminium easily combines with oxygen to form a layer of aluminium oxide. This layer acts as a protective layer and does not allow the metal underneath to react further.

5.

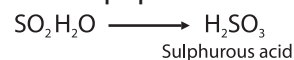
<b>Ore</b> i) The mineral from which metal can be extracted conveniently and economically. ii) Each ore is mineral	<b>Mineral</b> i) The Compounds which occur naturally in the earth is crust ii) Each Mineral is not ore
<b>Calcination</b> i) Conversion of Carbonate ore into metal oxide form. ii) Done in limited air iii) $\text{ZnCO}_3 \xrightarrow{\text{Heat}} \text{ZnO} + \text{CO}_2$	<b>Roasting</b> i) Conversion of sulphide ore into metal oxide form ii) Done in the presence of air iii) $2 \text{ZnS} + 3 \text{O}_2 \xrightarrow{\text{Heat}} 2 \text{ZnO} + 2 \text{SO}_2$
<b>Metal</b> i) Forms Electropositive ions i.e. Cations. ii) Evolve H <sub>2</sub> gas when reacts with oil acids. iii) Acts as reducing agent iv) Forms Basic oxides mainly	<b>Non Metal</b> i) Forms Electro negative ions. i.e. Anion. ii) Do not evolve H <sub>2</sub> as they do not react with acids. iii) acts as oxidising agent iv) Forms acidic oxides mainly.

6. When Sulphur is burnt, it produces sulphur dioxide gas.



There is no action of sulphur dioxide gas on dry litmus paper.

The sulphur dioxide gas dissolve in water present in moist litmus paper to form sulphurous acid which turns blue litmus paper red.



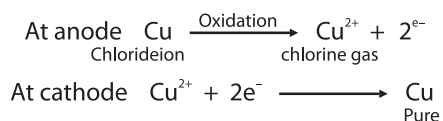
## Long Answer Questions

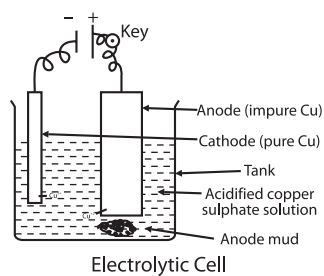
Refining of Metals: A process of removal of impurities from a crude metal.

Most widely used method is Electrolytic refining

### Description:

The impure copper is made anode and a thin strip of pure copper metal is made cathode. The acidified copper sulphate solution is taken electrolyte in a tank. On passing the current through electrolyte, the pure copper metal from anode dissolves into electrolyte. An equivalent amount of pure copper metal is deposited on the cathode. The soluble impurities go into the electrolyte and insoluble impurities settle down at the bottom of anode and are known as Anode mud. As process keeps on, anode becomes thinner and thinner and cathode becomes thicker and thicker. The reactions which occur of respective electrodes are as follows.



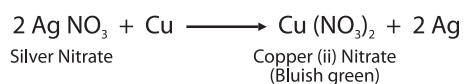


## 2. Displacement reaction

As Iron is more reactive metal than copper, it displaces copper from copper sulphate solution and get dissolve. As a result Iron pot becomes thinner and thinner and ultimately holes are formed.



The reaction of copper metal with  $\text{AgNO}_3$  solution will take place, as copper is more reactive than silver.



# LESSON PLAN

Teaching Point	Teaching – Learning Points		Evaluation
	Teacher Oriented Activities	Students oriented activities	
1. Combination reaction is explained with taking common example of lime	<p>Teacher shows slake lime to students which is white in nature</p> <p>Water is taken in a trough in good quantity.</p> <p>Add a pinch of quick lime or chuna to water.</p> <p>A evolves huge amount of heat and milky solution is formed</p> <p>Reaction involved</p> $\text{CaO}_{(s)} + \text{H}_2\text{O}_{(l)} \longrightarrow \text{Ca(OH)}_2 + \text{Heat}$		<p>By observation of chemicals involved as reactant and formed products, students manipulation, skill is observed.</p> <p>Heat evolved is felt by touching temperature of product.</p>
2. Magnesium on burning in light gives magnesium oxide with bang of light		<p>i) With the help of tongue, students hold a Mg ribbon.</p> <p>ii) Take burner and keeping tongue away from body start heating.</p> <p>iii) Mg ribbon burns with flash and glow to form ash like content MgO.</p>	<p>Ash formed is fasted ably addition it to water.</p> <p>A forms Magnesium hydroxide</p> <p>This solution turn red litmus solution to blue.</p>
3. Decomposition reaction is explained with burning at iron oxide and Iron sulphate on heating	<p>Teacher defines decomposition .</p> <p>He shows many chemicals which decompose easily.</p> <p>Teacher take a pinch of salt of iron oxide in a test tube and heat on burner. By using test tube holder</p> <p>After some time iron oxide decomposer and release brown gases of SO<sub>2</sub> and SO<sub>3</sub></p> <p>Similarly green salt of FeSO<sub>4</sub> H<sub>2</sub>O Decomposes.</p>		<p>Evaluation is done experimentally is first reaction brown tunes of So<sub>2</sub> and SO<sub>3</sub> comes out leaving behind black mass.</p> <p>Iron sulphate is available as FeSO<sub>4</sub>. 7H<sub>2</sub>O light green crystal wheels turns to brown mass with release of SO<sub>2</sub> brown gas.</p>
4. Decomposition reaction is explained by students in performing experiment of burning of lead nitrate is which brown gas releases with crackling sound.		<p>i) Students take a pinch of Pb (NO<sub>3</sub>)<sub>2</sub> salt in a test tube a hold the test tube with test tube holder and heat the same</p> <p>ii) On heating a crackling sound is observed on decomposition of salt , ana a light yellow (Pbo) salt is formed on test tube and</p>	<p>i) A erackling sound is and indication of starting of decomposition</p> <p>ii) A fellow mass remains in the test tube</p> <p>iii) Suffocating gas escaped is NO<sub>2</sub></p>

		a brown suffocating gas is escaped out from the mouth of test tube	
5. Rusting is the decay of iron metal in contact with moisture and air to form hydrated oxide, which is called as rusting	<ul style="list-style-type: none"> <li>i) Iron nails are placed in half filled test tube of water</li> <li>ii) This test tube is placed for 3-4 days openly.</li> <li>iii) On observation after 3-4 days, brown mass on iron nail is observed</li> <li>iv) Rust is brown powdery mass</li> </ul>		<ul style="list-style-type: none"> <li>i) Iron nails initially have silver like brilliance</li> <li>ii) on exposure to water and air, a brown mass of rust is observed</li> <li>iii) Brown mass is rust with formula <math>\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}</math></li> </ul>
6. (i) Double decomposition when two ionic compounds are mixed they exchange of ions to form new compounds (ii) The compounds can be identified as insoluble salt or precipitate.		<ul style="list-style-type: none"> <li>i) Students take salt of sodium sulfate and asked to dissolve the same in test tube till a colourless solution is observed.</li> <li>ii) Add few drops of barium chloride reagent solution</li> <li>iii) A curdy white precipitate is observed which settles down after some time</li> </ul>	<ul style="list-style-type: none"> <li>i) Colourless solution of <math>\text{Na}_2\text{SO}_4</math> in water is formed</li> <li>ii) On addition of <math>\text{BaCl}_2</math> another colourless reagent, a curdy white precipitate of <math>\text{BaSO}_4</math> is formed.</li> </ul>

## MCQ METAL & NON METALS

1. An element react with oxygen to give a compound with high melting points. This compound is also soluble in water the element is likely to be:  
a. Calcium                      b. Carbon                      c. Silicon                      d. Iron
2. Where are sodium & Potassium Kept for sofe storage  
a. Water                      b. Pine Oil                      c. Kerosene Oil                      d. Patrol
3. Which metal is best conductor of electricity.  
a. Lead                      b. Gold                      c. Copper                      d. Silver
4. Aqua regia is a mixture of  
a. HNO<sub>3</sub> & Hcl in ratio of 1:3                      b. HNO<sub>3</sub> & Hcl in ratio of 3:1  
c. HNO<sub>3</sub> & H<sub>2</sub>So<sub>4</sub> in ratio of 1:3                      d. HNO<sub>3</sub> & H<sub>2</sub>So<sub>4</sub> in ratio of 3:1
5. Brass Contains  
a. Copper and Tin                      b. Copper and Zinc  
c. Iron and Zinc                      d. Lead and fin
6. Which one is used for preventing an iron frying pan from rusting  
a. Applying grease                      b. Applying paint  
c. Applying a coating of Zinc.                      d. All the above.
7. Which metal is found in free state  
a. Sodium                      b. Magnesium                      c. Gold                      d. Iron
8. Which Non metal is liquid at room temperature.  
a. Iodine                      b. Sulphur                      c. Carbon                      d. Bromine
9. Which metal forms amphoteric oxide.  
a. Copper                      b. Calcium                      c. Zinc                      d. Potassium
10. Which metal can react with very dilate HNO<sub>3</sub> to evolve H<sub>2</sub> gas.  
a. Manganese                      b. Sodium                      c. Platinum                      d. Aluminium

### Answers of MCQ Metals & Non Metals

1. Calcium
2. Kerosene Oil
3. Silver
4. HNO<sub>3</sub> & Hcl in a ratio of 1 : 3
5. Copper and Zinc
6. Applying a coating of Zinc
7. Gold
8. Bromine
9. Zinc
10. Manganese

# CHEMICAL REACTIONS & EQUATIONS

## Brief of Lesson

Chemical Equations

Writing Chemical Reaction

Balanced chemical Equations

Teaching Lesson Plan

Identitiation / Prev. Know

# INTRODUCTION

# CONCEPT OF MAPPING

# TYPES OF CHEMICAL REACTIONS

**Combination reaction**

**Decomposition Reaction**

**Displacement Reaction**

**Double displacement reaction**

**Oxidation & Reduction**

**Effects of Oxidation reactions in every day life**

- Corrosion
- Rancidity

## Learning Objective

After Completing the chaptr, learner will be able to

- A chemical change occur in daily life
- Chemical Reaction
- Chemical equation
- How to balance a chemical reaction
- What are types of chemical reactions
  - Combination reaction
  - Decomposition reaction
  - Displacements reaction
  - Double displacement Reaction
  - Oxidation and Reduction
- Oxidation ractions in our daily life
  - Corrosion
  - Rancidity

## Teacher learning Material (T.L.M)

### Lesson plan

- Teaching Points
- Examples from daily life about changes in reactions
- Illustration of physical and chemical reactions with stress on chemical reaction
- Chemical equations illustration of changing a statement in to chemical reaction
- Skeleton reaction
- Balancing of chemical reactions
- Stepwise balancing of chemical reaction
- Types of chemical reactions
  - Combination reaction
  - Decomposition reaction
  - Displacement reaction
  - Double displacement reaction
  - Oxidation – reduction
- Effects of oxidations in our every day life?
  - Corrosion
  - Rancidity
- Teaching learning activities
  - (a) Activity to be demonstrated by teacher
  - (b) Activity to be performed by students

Activities is demonstration by teacher

- i. Burning of Mg ribbon
- ii. Formation of slaked ram.
- iii. Reaction of  $\text{CuSO}_4$  solution with Fe nails dipped in it.
- iv. So Observe rusting of trem.s.
- v. Heating of crystals of  $\text{FeSO}_4$   
 $\text{CuSo4}$  and  $\text{Pb}(\text{No}_3)_2$
- vi. Reaction between sodium sulphate solution and barium chlorite solutions
- vii. Oxidation of Cu to CuO
- viii. To observe the changes in colour, odour etc in cut fruits and vegetables.

## **ACTIVITIES TO BE PERFORMED BY STUDENTS**