

**Chapter – 3 Metals and Non-Metals**

**Multiple Choice Questions**

**Q1. Which of the following property is generally not shown by metals?**

- a) Electrical conduction
- b) Sonorous in nature
- c) Dullness
- d) Ductility

**Answer:** Option c)

A metal is not dull, metals have shining surface only when they are fresh.

**Q2. The ability of metals to be drawn into thin wire is known as**

- a) Ductility
- b) Malleability
- c) Sonorous
- d) Conductivity

**Answer:** Option a)

Ductility is property of metals to be drawn into thin wire.

**Q3. Aluminium is used for making cooking utensils. Which of the following properties of aluminium are responsible for the same?**

- i) Good thermal conductivity
- ii) Good electrical conductivity
- iii) Ductility
- iv) High melting point

- a) i) and ii)
- b) i) and iii)
- c) ii) and iii)
- d) i) and iv)

**Answer:** Option d)

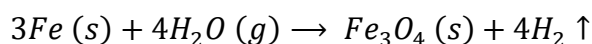
Good thermal conductivity, malleability, light weight and high melting point are the properties of aluminium so it is used for making cooking utensils.

**Q4. Which one of the following metals do not react with cold a well a hot water?**

- a) *Na*
- b) *Ca*
- c) *Mg*
- d) *Fe*

**Answer:** Option d)

Metals like lead, copper, silver and gold do not react with water, but the red-hot iron reacts with steam to form iron (II, III) oxide and hydrogen.

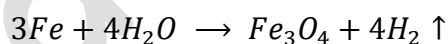


**Q5. Which of the following oxide(s) of iron would be obtained on prolonged reaction of iron steam?**

- a) *FeO*
- b) *Fe<sub>2</sub>O<sub>3</sub>*
- c) *Fe<sub>3</sub>O<sub>4</sub>*
- d) *Fe<sub>2</sub>O<sub>3</sub> and Fe<sub>3</sub>O<sub>4</sub>*

**Answer:** Option c)

Reaction of iron metal with water



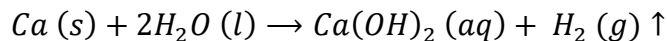
**Q6. What happens when calcium is treated with water?**

- i) It does not react with water.
- ii) It reacts violently with water.
- iii) It reacts less violently with water.
- iv) Bubbles of hydrogen gas formed stick to the surface of calcium.

- a) i) and iv)
- b) ii) and iii)
- c) i) and ii)
- d) iii) and iv)

**Answer:** Option d)

Calcium will react less violently with the water, and the bubbles of hydrogen gas which are produced stick to the surface of calcium. Due to which it will float over the water surface.



Less heat is being produced in this reaction due to which hydrogen gas formed does not catch fire.

**Q7. Generally, metals react with acids to give salt and hydrogen gas. Which of the following acids does not give hydrogen gas on reacting with metals (except *Mn* and *Mg*)?**

- a)  $H_2SO_4$
- b)  $HCl$
- c)  $HNO_3$
- d) All of these

**Answer:** Option c)

Nitric acid ( $HNO_3$ ) does not give hydrogen gas when reacting with metals, except *Mn* and *Mg* because nitric acid is a strong oxidising agent. Hence, as soon as hydrogen gas is formed in the reaction between metal and dil.  $HNO_3$ , the  $HNO_3$  oxidises the hydrogen to water.

**Q8. The composition of aqua-regia is**

- a) Dil.  $HCl$  : Conc.  $HNO_3$   
3 : 1
- b) Conc.  $HCl$  : Dil.  $HNO_3$   
3 : 1
- c) Conc.  $HCl$  : Conc.  $HNO_3$   
3 : 1
- d) Dil.  $HCl$  : Dil.  $HNO_3$   
3 : 1

**Answer:** Option c)

Aqua-regia is a highly corrosive, fuming liquid, which can dissolve all metals even gold and platinum. So, *Conc. HCl* and *conc. HNO<sub>3</sub>* in 3:1 ratio forms the aqua-regia.

**Q9. Which of the following are not ionic compounds?**

- i) *KCl*
- ii) *HCl*
- iii) *CCl<sub>4</sub>*
- iv) *NaCl*

- a) i) and ii)
- b) ii) and iii)
- c) iii) and iv)
- d) i) and iii)

**Answer:** Option b)

*HCl* is a popular covalent compound on the other hand *CCl<sub>4</sub>* is a non-polar covalent compound because both are formed by sharing of electrons.

**Q10. Which one of the following properties is not generally exhibited by ionic compounds?**

- a) Solubility in water
- b) Electrical conductivity in solid state
- c) High melting and boiling points
- d) Electrical conductivity in molten state

**Answer:** Option b)

Ionic compounds conduct electricity in molten or aqueous state. They are non-conductors of electricity in solid state due to absence of free ions.

The ions are held together in fixed position by strong electrostatic force and cannot move freely in solid ionic compounds.

**Q11. Which of the following metals exist in their native state in nature?**

- i) *Cu*
- ii) *Au*
- iii) *Zn*

iv) *Ag*

- a) i) and ii)
- b) i) and iii)
- c) ii) and iii)
- d) ii) and iv)

**Answer:** Option c)

*Au* and *Ag* are less reactive metals, hence they are found in free state in nature.

**Q12. Metals are refined by using different methods. Which of the following metals are refined by electrolytic refining?**

- i) *Au*
- ii) *Cu*
- iii) *Na*
- iv) *K*

- a) i) and ii)
- b) i) and iii)
- c) ii) and iii)
- d) ii) and iv)

**Answer:** Option a)

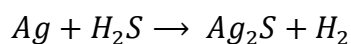
Electrolytic refining is used for metals like *Cu, Zn, Ag, Au* etc.

**Q13. Silver articles become black on prolonged exposure to air. This is due to the formation of**

- a) *Ag<sub>3</sub>N*
- b) *Ag<sub>3</sub>O*
- c) *Ag<sub>2</sub>S*
- d) *Ag<sub>2</sub>S* and *Ag<sub>3</sub>N*

**Answer:** Option c)

Silver article become black because silver reacts with *H<sub>2</sub>S* gas which is present in the air to form black coating of *Ag<sub>2</sub>S*.



**Q14. Galvanisation is a method of protecting iron from rusting by coating it with a thin layer of**

- a) Gallium
- b) Aluminium
- c) Zinc
- d) Silver

**Answer:** Option c)

Galvanisation is a method of protecting iron from the rusting by coating it with a thin layer of zinc (Zn) metal.

**Q15. Stainless steel is a very useful material for our life. In stainless steel, iron is mixed with**

- a) Ni and Cr
- b) Cu and Cr
- c) Ni and Cu
- d) Cu and Au

**Answer:** Option a)

Iron is mixed with Nickel (Ni), chromium (Cr) and carbon (C).

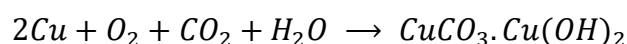
Since, stainless steel contains iron = ( $\approx 74\%$ ), chromium ( $\approx 18\%$ ) and nickel ( $\approx 8\%$ ).

**Q16. If copper is kept open in air, it slowly loses its shining brown surface and gains a green coating. It is due to the formation of**

- a)  $CuSO_4$
- b)  $CuCO_3$
- c)  $Cu(NO_3)_2$
- d)  $CuO$

**Answer:** Option b)

When copper is kept in air, it reacts with  $CO_2$  and forms a green coating on its surface because of the formation of basic copper carbonate [ $CuCO_3 \cdot Cu(OH)_2$ ] as



**Q17. Generally, metals are solid in nature. Which one of the following metals is found in liquid state at room temperature?**

- a) Na
- b) Fe

- c) Cr
- d) Hg

**Answer:** Option d)

Mercury (Hg) is the only metal which is found in liquid state at room temperature.

**Q18. Which of the following metals are obtained by electrolysis of their chlorides in molten state?**

- i) Na
- ii) Ca
- iii) Fe
- iv) Cu

- a) i) and iv)
- b) iii) and iv)
- c) i) and iii)
- d) i) and ii)

**Answer:** Option d)

Sodium (Na) and calcium (Ca) are very reactive and are obtained by electrolysis of their chlorides in molten state.

**Q19. Generally, non-metals are not lustrous. Which of the following non-metals is lustrous?**

- a) Sulphur
- b) Oxygen
- c) Nitrogen
- d) Iodine

**Answer:** Option d)

Iodine is a non-metal which is having lustrous appearance. It has a shining surface like metals.

**Q20. Which one of the following four metals would be displaced from the solution of its salts by other three metals?**

- a) Mg
- b) Ag
- c) Zn
- d) Cu

**Answer:** Option b)

Silver (Ag) metal would be displaced from the solution of its salts by other three metals because Ag is less reactive than Mg, Zn and Cu.

**Q21.** 2 mL each of *conc. HCl, HNO<sub>3</sub>* and a mixture of *conc. HCl and conc. HNO<sub>3</sub>* in the ratio 3:1 was taken in test tubes labelled as A, B and C. A small piece of metals was put in each test tube. No change occurred in test tubes A and B but the metal got dissolved in test tube C. The metal could be

- a) Al
- b) Au
- c) Cu
- d) Pt

**Answer:** Option b) and Option d)

A mixture of *conc. HCl and conc. HNO<sub>3</sub>* in the ratio of 3:1 is called as aqua-regia. In aqua-regia only Gold (Au) and Platinum (Pt) can dissolve.

**Q22.** An alloy is

- a) An element
- b) A compound
- c) A homogeneous mixture
- d) A heterogeneous mixture

**Answer:** Option c)

An alloy is a homogenous mixture of different metals/ a metal and a non-metal.

**Q23.** An electrolytic cell consists of

- i) Positively charged cathode
- ii) Negatively charged anode
- iii) Positively charged anode
- iv) Negatively charged cathode

- a) i) and ii)
- b) iii) and iv)
- c) i) and iii)
- d) ii) and iv)

**Answer:** Option b)



An electrolytic cell consists of positively charged anode and a negatively charged cathode.

**Q24. During electrolytic refining of zinc, it gets**

- a) deposited on cathode
- b) deposited on anode
- c) deposited on cathode as well as anode
- d) remains in the solution

**Answer:** Option a)

The pure zinc metal is deposited on cathode when electrolytic refining of zinc (Zn) is done. Zinc is joined to the negative terminal of the battery, so,  $Zn^{2+}$  ions from the solution move to negative charged cathode.

**Q25. An element A is soft and can be cut with a knife. This is very reactive to air and cannot be kept open in air. It reacts vigorously with water. Identify the element from the following.**

- a) Mg
- b) Na
- c) P
- d) Ca

**Answer:** Option b)

It is given that element is soft and can be cut with knife, also it is very reactive to air, and it reacts with water as well, so the element is a sodium (Na).

**Q26. Alloys are homogenous mixtures of a metal with a metal or non-metal. Which among the following alloys contain non-metal as one of its constituents?**

- a) Brass
- b) Bronze
- c) Amalgam
- d) Steel

**Answer:** Option d)

Steel is basically an alloy which consists of an iron and a carbon. On the other hand, Brass is an alloy of two metals copper and zinc. Bronze is alloy of Cu and Sn. Mixing mercury with other metals forms Amalgam.

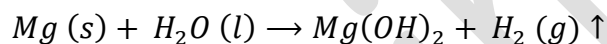
**Q27. Which among the following statements is incorrect for magnesium metal?**

- a) It burns in oxygen with a dazzling white flame.
- b) It reacts with cold water to form magnesium oxide and evolves hydrogen gas.
- c) It reacts with hot water to form magnesium hydroxide and evolves hydrogen gas.
- d) It reacts with steam to form magnesium hydroxide and evolves hydrogen gas.

**Answer:** Option b)

Magnesium does not react with cold water.

But it reacts with both hot water and steam to give magnesium hydroxide and hydrogen.



**Q28. Which among the following alloys contain mercury as one of its constituents?**

- a) Stainless steel
- b) Alnico
- c) Solder
- d) Zinc amalgam

**Answer:** Option d)

If mercury reacts with zinc metal, it produces the zinc amalgam.

**Q29. Reaction between X and Y, forms compound Z. X loses electron and Y gains electron. Which of the following properties is not shown by Z?**

- a) Has high melting point
- b) Has low melting point
- c) Conducts electricity in molten state
- d) Occurs as solid

**Answer:** Option b)

Compound Z is formed, during the reaction between X and Y, which is an ionic compound, since ionic compounds have high melting point, conduct electricity in molten state and usually occur as solids.

**Q30. The electronic configuration of three elements X, Y and Z are X – 2,8; Y – 2,8,7 and Z – 2,8,2. Which of the following is correct?**

- a) X is a metal
- b) Y is a metal
- c) Z is a non-metal
- d) Y is a non-metal and Z is a metal

**Answer:** Option d)

Here, Y is a non-metal since it needs one electron to complete its octate.

Z is a metal since it loses two electrons to complete its octate.

X is an inert gas as it has complete octate.

**Q31. Although metals form basic oxides, which of the following metals forms an amphoteric oxide?**

- a) Na
- b) Ca
- c) Al
- d) Cu

**Answer:** Option c)

Aluminium metal forms amphoteric oxide ( $Al_2O_3$ ) which shows basic as well as acidic behaviour.

**Q32. Generally, non-metals are not conductors of electricity. Which of the following is a good conductor of electricity?**

- a) Diamond
- b) Graphite
- c) Sulphur
- d) Fullerene

**Answer:** Option b)

Carbon in the form of graphite is a non-metal which conducts electricity.

**Q33. Electrical wires have a coating of an insulating material. The material, generally used is**

- a) Sulphur
- b) Graphite
- c) PVC

d) All can be used

**Answer:** Option c)

PVC is an insulating material, since it does not allow electric current to pass through it, so electrical wires have a covering of PVC around them.

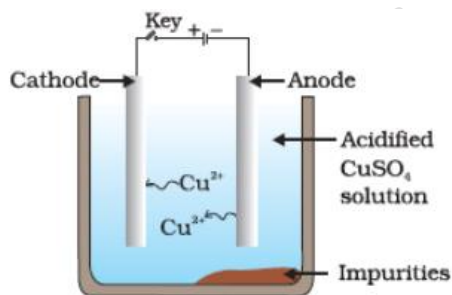
**Q34. Which of the following non-metal is a liquid?**

- a) Carbon
- b) Bromine
- c) Phosphorus
- d) Sulphur

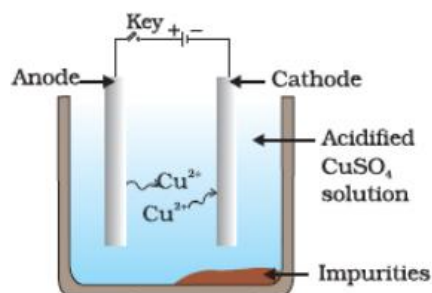
**Answer:** Option b)

Bromine is a non-metal which is liquid.

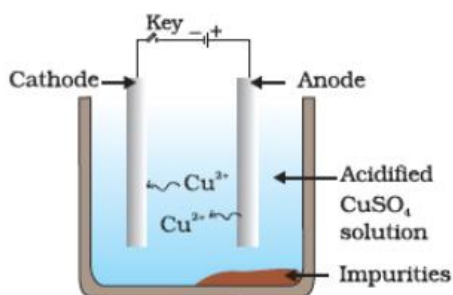
**Q35. Which one of the following figures correctly describes the process of electrolytic refining?**



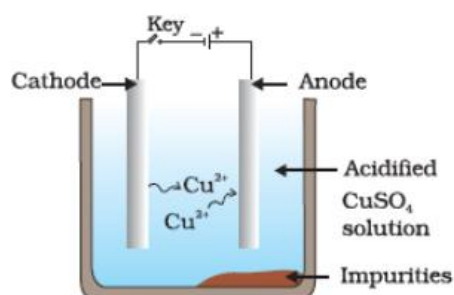
(a)



(b)



(c)



(d)

**Answer:** Option c)

For electrolytic refining, impure metal is made anode which is connected to the positive terminal of the battery. Pure metal is made cathode and is connected to the negative terminal of the battery.

$Cu^{2+}$  ions from the solution are deposited on the cathode and Cu from the impure anode dissolves into the solution, also impurities settle down below anode in the form of anode mud.

### Short Answer Type Questions

**Q37.** Iqbal treated a lustrous, divalent element M with sodium hydroxide. He observed the formation of bubbles in reaction mixture. He made the same observations when this element was treated with hydrochloric acid. Suggest how can he identify the produced gas. Write chemical equations for both the reactions.

**Answer:**

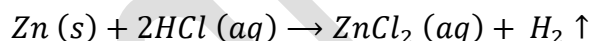
The divalent element M is Zinc (Zn)



Sodium hydroxide



Sodium Zincate



Dil. Hydrochloric acid



Zinc chloride

**Q38.** During extraction of metals, electrolytic refining is used to obtain pure metals. (a) Which material will be used as anode and cathode for refining of silver metal by this process? (b) Suggest a suitable electrolyte also. (c) In this electrolytic cell, where do we get pure silver after passing electric current?

**Answer:**

- Cathode is made up of a thin pure silver strip, which is connected to the negative terminal of the battery. Impure silver block is made the anode, which is connected to the positive terminal of the battery.
- The preferred electrolyte is  $Na[Ag(CN)_2]$ , that is sodium argentocyanide.
- Impure metal will get dissolved from anode and will go into the electrolyte solution and a pure metal from the electrolyte deposits on the cathode, when the electric current is passed.

**Q39. Why should the metal sulphide and carbonates be converted to metal oxides in the process of extraction of metal from them?**

**Answer:**

The metal sulphides and carbonates should be converted to metal oxides in the process of extraction of metal from them because it gets easier for us to obtain metals from their ores than from carbonate/sulphide ore's. Calcination or Roasting is done depending on the type or nature of the ore, to convert ore into oxide.

Also, the carbonate ore is converted into oxide by calcination and sulphide ore is converted into oxide by roasting.

**Q40. Generally, when metals are treated with minerals acids, hydrogen gas is liberated but when metals (except Mn and Mg) are treated with  $HNO_3$ , hydrogen is not liberated, why?**

**Answer:**

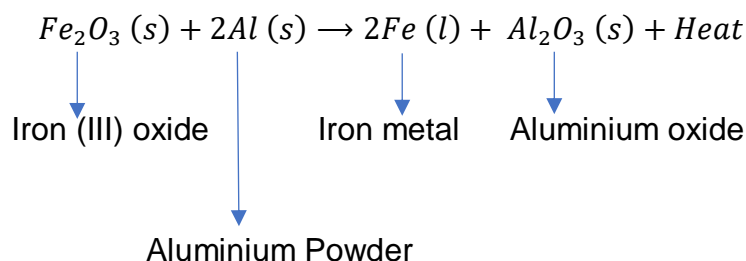
Nitric acid ( $HNO_3$ ) is a very strong oxidizing agent. When hydrogen is formed in the reaction between a metal and diluted nitric acid, the nitric acid oxidises the hydrogen into water and  $HNO_3$  gets reduced to  $NO_2$  or  $NO$  or  $N_2O$ .

Hence, when reaction of metals with dilute nitric acid takes place except Mn and Mg, no hydrogen gas is evolved.

**Q41. Compound X and aluminium are used to join railway tracks. (a) Identify the compound X (b) Name the reaction (c) Write down its reaction.**

**Answer:**

- Compound X is iron (III) oxide,  $Fe_2O_3$
- The reaction is called as thermite reaction or "alumino therym"
- The reaction is as follows"



**Q42. When a metal X is treated with cold water, it gives a basic salt Y with molecular formula  $XOH$  (molecular mass = 40) and liberates a gas Z which easily catches fire. Identify X, Y and Z and also write the reaction involved.**

**Answer:**

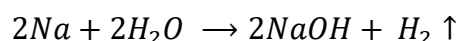
Molecular formula of Y = XOH

Let's assume the atomic weight of metal X to be "a".

So, molecular mass of XOH =  $a + 16 + 1 = 40$

$$a = 40 - 17 = 23$$

So, the metal is sodium (Na) since 23 is the atomic weight of sodium metal. Sodium reacts with water as



Sodium gives hydrogen gas (Z) on reaction with cold water

Hence, Y is NaOH (Sodium hydroxide), Z is H<sub>2</sub> (Hydrogen gas)

**Q43. A non-metal X exists in two different forms Y and Z. Y is hardest natural substance, whereas Z is a good conductor of electricity. Identify X, Y and Z.**

**Answer:**

A non-metal X is carbon (C). Carbon is present in two forms, called as allotropes of carbon. Diamond and Graphite are these allotropes.

Y is a diamond since diamond is the hardest natural substance. Z is a graphite which is good conductor of electricity.

**Q44. The following reactions takes place when aluminium powder is heated with MnO<sub>2</sub>**



- Is aluminium getting reduced?
- Is MnO<sub>2</sub> getting oxidized?

**Answer:**

- No, aluminium is getting oxidised since there is addition of oxygen.
- No, MnO<sub>2</sub> is getting reduced since there is removal of oxygen.

**Q45. What are the constituents of solder alloy? Which property of solder makes it suitable for wedding electrical wires?**

**Answer:**

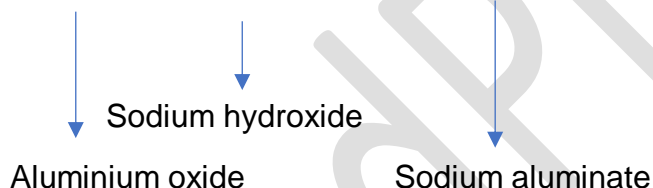
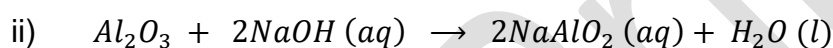
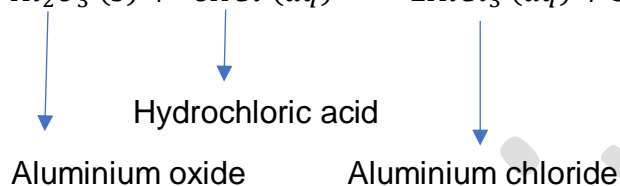
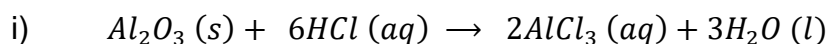
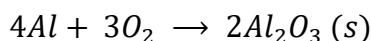
Solder is an alloy of lead (Pb) and tin (Sn). Its constituents have 50% of lead and 50% of tin. Solder has a low melting point. Since, it is used for soldering electrical wires together.

**Q46.** A metal A, which is used in thermite process, when heated with oxygen gives an oxide B, which is amphoteric in nature. Identify A and B. Write down the reactions of oxide B with HCl and NaOH.

**Answer:**

Metal A is aluminium (Al) is used in thermite process.

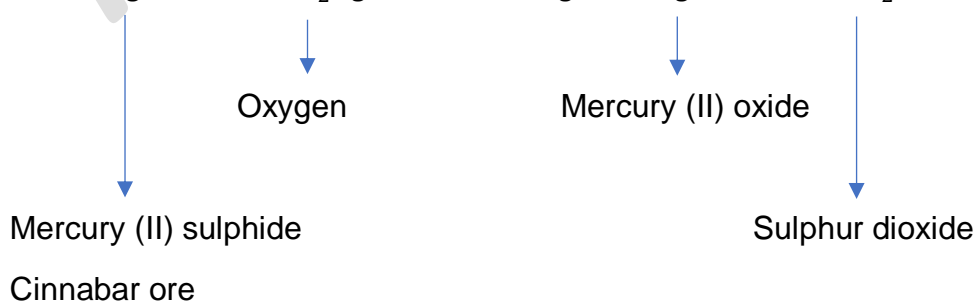
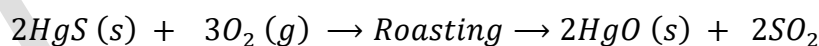
Al reacts with oxygen forming aluminium oxide  $Al_2O_3$  (B) which is amphoteric in nature.



**Q47.** A metal exists as liquid at room temperature is obtained by heating its sulphide in the presence of air. Identify the metal and its ore and give the reaction involved.

**Answer:**

The metal that exists as a liquid at room temperature is Mercury (Hg) because it's the only metal which exists in liquid state. It is obtained from the sulphide called cinnabar ore ( $HgS$ ).







**Q50. A non-metal A is an important constituent of our food and forms two oxides B and C. Oxide B is toxic whereas C causes global warming.**

- a) Identify A, B and C.
- b) To which group of periodic table does A belong?

**Answer:**

- a) Non-metal A is carbon and its two oxides are carbon monoxide and carbon dioxide.  
B is a carbon monoxide ( $CO$ ) because it is toxic and C is carbon dioxide ( $CO_2$ ) because it is responsible for global warming.
- b) The electronic configuration of C is 2, 4 and atomic weight of C = 6.  
So, it is present in 14<sup>th</sup> group that is IV A of the periodic table.

**Q51. Give two examples each of the metals that are good conductors and comparatively poor conductors of heat respectively.**

**Answer:**

Good conductors are: Silver and copper.

Poor conductors are: Lead and Mercury.

**Q52. Name one metal and one non-metal that exist in liquid state at room temperature. Also, name two metals having melting point less than 310 K ( $37^\circ C$ )**

**Answer:**

Mercury (Hg) metal and non-metal bromine (Br) exists in the liquid state at room temperature.

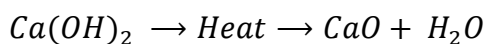
The metals which have melting point less than 310 K ( $37^\circ C$ ) are caesium (Cs) and gallium (Ga) which have melting point  $28.5^\circ C$  and  $30^\circ C$  respectively.

**Q53. An element A reacts with water to form a compound B which is used in white washing. The compound B on heating forms an oxide C which on treatment with water gives back B. Identify, A, B and C and give the reactions involved.**

**Answer:**

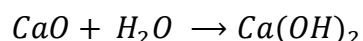
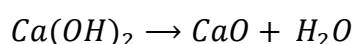
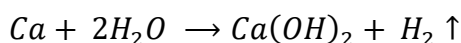
Element A is calcium (Ca) which reacts with water, forming calcium hydroxide. Hence, compound B is calcium hydroxide [ $Ca(OH)_2$ ], which is used in white washing.

Compound B on heating will give  $CaO$ .



So, C is a calcium oxide ( $CaO$ )

So, the reaction will be;



**Q54. An alkali metal A gives a compound B (molecular mass = 40) on reacting with water. The compound B gives a soluble compound C on treatment with aluminium oxide. Identify A, B and C and give the reaction involved.**

**Answer:**

Let's assume that the atomic weight of alkali metal A is  $x$ . When it reacts with the water it will form a compound B which will have molecular mass 40.

Let the reaction be;

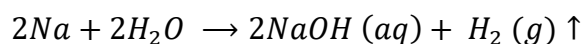


As per the given question, the molecular mass of compound

$$B = x + 16 + 1 = 40$$

$$x = 40 - 17 = 23$$

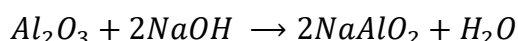
So,  $x = 23$  is the atomic weight of sodium (Na), so the alkali metal (A) is Na and the reaction will be;



Hence, compound B is sodium hydroxide ( $NaOH$ )

Sodium hydroxide reacts with aluminium oxide ( $Al_2O_3$ ) to give sodium aluminate ( $NaAlO_2$ ). Hence, C is sodium aluminate  $NaAlO_2$

The reaction which will take place here will be;

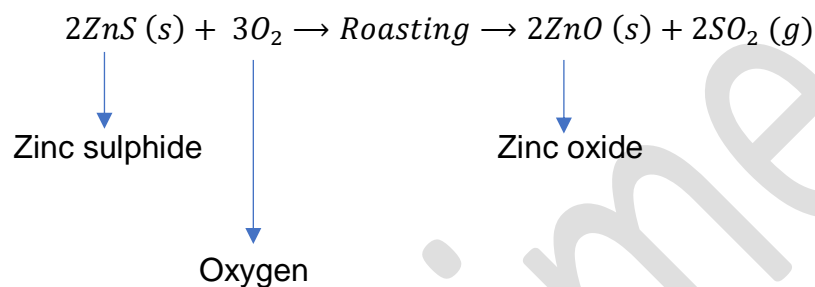


**Q55. Give the reaction involved during extraction of zinc from its ore by (a) roasting of zinc ore. (b) calcination of zinc ore.**

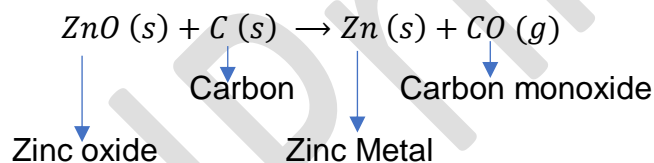
**Answer:**

a) Roasting of Zinc ore –

Roasting is carried out for the sulphide ore. Sulphide ore of zinc is zinc blende ( $ZnS$ ).

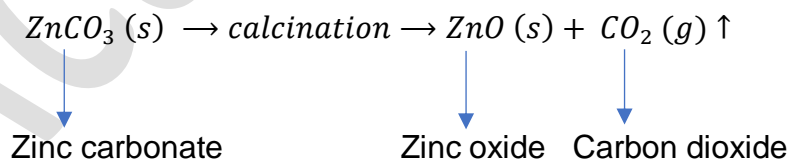


$ZnO$  is reduced to zinc by heating with carbon (which is a reducing agent).

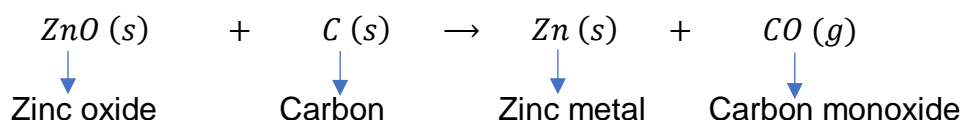


b) Calcination of zinc ore –

Calcination is carried out for carbonate ore. The carbonate ore of  $Zn$  is calamine  $ZnCO_3$ .



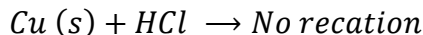
$ZnO$  is reduced to zinc by heating with carbon



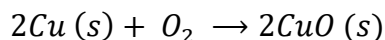
**Q56. A metal M does not liberate hydrogen from acids but reacts with oxygen to give a black colour product. Identify M and black coloured product and also explain the reaction of M with oxygen.**

**Answer:**

Metal M is copper (Cu) since copper is less reactive than hydrogen. So, it does not react with acid to liberate hydrogen.



Copper metal does not burn in air, even if we apply strong heating. After prolonged heating copper reacts with oxygen of air to form a black substance copper (II) oxide.



**Q57. An element forms an oxide  $A_2O_3$  which is acidic in nature. Identify A as a metal or non-metal.**

**Answer:**

Oxides of metals are basic in nature and oxides of non-metals are acidic in nature.

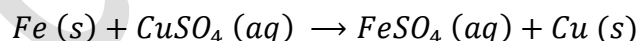
Here, element A forms an acidic oxide, so, A is a non-metal.

Also, it should have 3 valence electrons. Hence, element A is boron since its electronic configuration is 2, 3 and its oxide is  $B_2O_3$ .

**Q58. A solution of  $\text{CuSO}_4$  was kept in an iron pot. After few days the iron pot was found to have a number of holes in it. Explain the reason in terms of reactivity. Write the equation of the reaction involved.**

**Answer:**

Iron is more reactive metal compared to copper, it displaces copper from copper solution.



Here, iron is taking part in this reaction so holes are produced at places where iron metal has reacted to form iron (II) sulphate.

### Long Answer Type Question

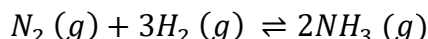
**Q59. A non-metal A which is the largest constituent of air, when heated with  $\text{H}_2$  in 1:3 ratio in the presence of catalyst (Fe) gives a gas B. On heating with  $\text{O}_2$  it gives an oxide C. If this oxide is passed into water in the presence of air it gives an acid D which acts as a strong oxidising agent.**

- a) Identify A, B, C and D  
b) To which group of periodic table does this non-metal belong?

**Answer:**

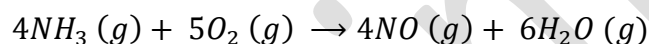
- a) Nitrogen gas is non-metal A because the percentage of  $N_2$  in air is largest, 78%.

As we heat  $N_2$  with  $H_2$  in 1:3 ratio in presence of  $Fe$  as catalyst, it forms ammonia ( $NH_3$ ).



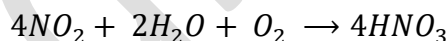
So, B is ammonia ( $NH_3$ ) gas

When we heat gas B with  $O_2$  it forms nitric oxide ( $NO$ ). Further  $NO$  gets oxidised to  $NO_2$  by  $O_2$  which is present in the atmosphere. Hence, C is nitrogen dioxide  $NO_2$ .



When we pass oxide into water in the presence of oxygen  $O_2$ , it gives nitric acid ( $HNO_3$ ) which acts as a strong oxidising agent.

Hence, D is nitric acid ( $HNO_3$ ).



- b) Non-metal belongs to group 15 (VA) because N has 5 valence electrons.

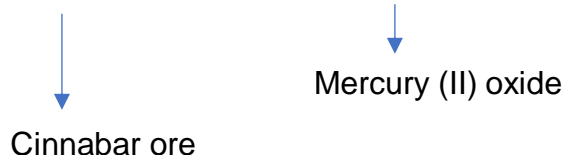
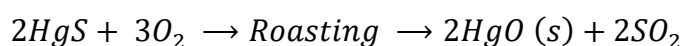
**Q60. Give the steps involved in the extraction of metals of low and medium reactivity from their respective sulphide ores.**

**Answer:**

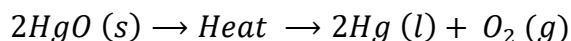
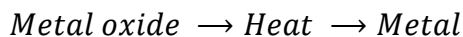
Metals of low in reactivity series such as mercury (Hg):

- i) Roasting – Metal sulphide is converted into metal oxide.

*Ore*  $\rightarrow$  *Metal oxide*



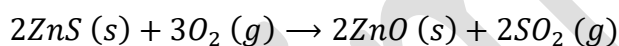
- ii) Reduction – Metal oxide is then reduced to metal by heating.



- iii) Refining of metal.

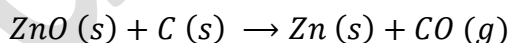
For metals those have medium reactive series such as Zinc (*Zn*);

- a) Roasting – the sulphide ore is converted into metal oxide by heating the sulphide strongly in presence of air.

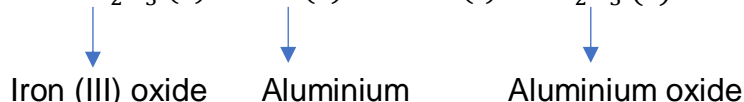
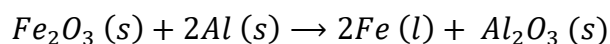


- b) Reduction – Metal oxides are reduced to metal by using a suitable agent. This done by two either ways:

- 1) Reduction by heating with carbon.



- 2) Reduction by heating with aluminium.



**Q61. Explain the following**

- a) Reactivity of *Al* decreases if it is dipped in *HNO*<sub>3</sub>.  
 b) Carbon cannot reduce the oxides of *Na* or *Mg*.

- c) *NaCl* is not a conductor of electricity in solid state whereas it does conduct electricity in aqueous solution as well as in molten state.
- d) Iron articles are galvanized.
- e) Metals like *Na*, *K*, *Ca* and *Mg* are never found in their free state in nature.

**Answer:**

- a)  $HNO_3$  is basically an oxidising agent – when aluminium is dipped into  $HNO_3$  then an oxide layer of aluminium is formed on the surface of the metal, which helps in preventing it from further reaction. Hence, reactivity of *Al* decreases.
- b) *Na*, *Mg* etc., metal is reactive and present towards the top of the reactivity series. So, the affinity with oxygen is higher than carbon and they become stable. In order to reduce them with carbon, very high temperature is required and that temperature will form their corresponding carbides.
- c) Ions of *NaCl* does not move to carry the charge in dry or solid state because they are fixed. But they are free in molten state so *NaCl* conducts electricity in molten state.
- d) In galvanization, a thin layer of zinc is formed over the iron articles by dipping them in molten zinc, which prevents iron from corrosion as zinc is more reactive than iron.
- e) *Na*, *K*, *Ca* and *Mg* metals are reactive so they cannot exist in free state and hence, they are found in nature in the form of their compounds.

**Q62.**

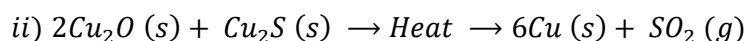
a) Give below are the steps for extraction of copper from its ore. Write the reaction involved.

- i) Roasting of copper sulphide (I) sulphide.
- ii) Reduction of copper (I) oxide with copper (I) sulphide.
- iii) Electrolytic refining

b) Draw a neat and well labelled diagram for electrolytic refining of copper.

**Answer:**

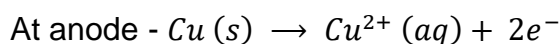
a)



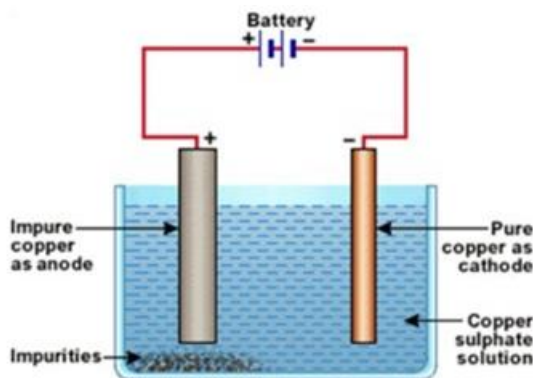
iii) Electrolytic refining

1. A thick block of impure metal is anode (+ve).
2. A thin strip of pure metal is made cathode (-ve).
3.  $CuSO_4$  solution is taken as electrolyte.  
At cathode -  $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$





b) The diagram of electrolytic refining of copper is shown below.



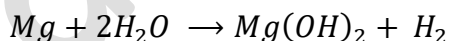
**Q63.** Of the three metals X, Y and Z, X reacts with cold water, Y with hot water and Z with steam only. Identify X, Y and Z and also arrange them in order of increasing reactivity.

**Answer:**

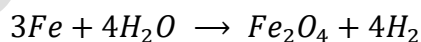
X is sodium or potassium as it reacts with cold water.



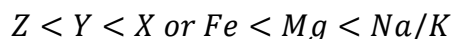
Y is magnesium as it reacts with hot water



Z is iron (Fe)



The increasing order of reactivity



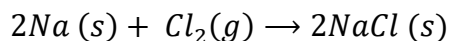
**Q64.** An element A burns with golden flame in air. It reacts with another element B, atomic number 17 to give a product C. An aqueous solution of product C on electrolysis gives a compound D and liberates hydrogen. Identify A, B, C and D. Also write down the equations for the reactions involved.

**Answer:**

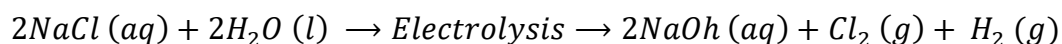
A is a sodium because it burns with golden flame in air.

B is the chlorine as its atomic number is 17. When sodium reacts with  $Cl_2$ ,  $NaCl$  is formed.

So, C is sodium chloride ( $NaCl$ ).



Aqueous solution of  $NaCl$ , on electrolysis gives sodium hydroxide, Hence D is sodium hydroxide ( $NaOH$ ).



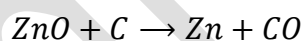
**Q65. Two ores A and B were taken. On heating, ore A gives  $CO_2$  whereas, ore B gives  $SO_2$ . What steps will you take to convert them into metals?**

**Answer:**

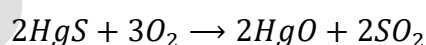
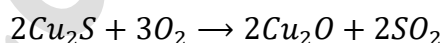
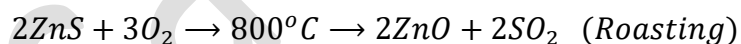
Ore A gives  $CO_2$  on heating, it must be a carbonate of moderately reactive metal like Zn. So, it will convert carbonate ore into metal oxide through calcination, which will be followed by reduction in which the metal oxide will be converted into metal, that is,  $ZnCO_3$  (calamine).



Converting it into metal treat it with carbon.



B gives  $SO_2$ , B must be a sulphide ore, example,  $Cu_2S, ZnS, HgS$  etc. Hence, it will be first subjected to roasting followed by reduction.



Oxide metals are obtained from these either by using reducing agent like C or by auto reduction.

