

- Q1.** A non-metal X exists in two different forms Y and Z. Y is the hardest natural substance, whereas Z is a good conductor of electricity. Identify X, Y and Z.
- Q2.** Give an example of a metal which is a liquid at room temperature.
- Q3.** Why do we use copper and aluminium wire for transmission of electric current?
- Q4.** Name a non-metal which conducts electricity.
- Q5.** An element X on reacting with oxygen forms oxide  $X_2O$ . This oxide dissolves in water and turns blue litmus red. State whether element X is metal or non-metal.
- Q6.** Name one metal and one non-metal which exist in the liquid state at room temperature.
- Q7.** Name the metal which has very low melting point and can melt with the heat of your palm.
- Q8.** From amongst the metals sodium, calcium, aluminium, copper and magnesium name the metal (a) which reacts with water only on boiling, and (b) another which does not react even with steam.
- Q9.** Balance the following chemical equation:  
$$Fe(s) + H_2O(g) \longrightarrow Fe_3O_4(s) + H_2(g)$$
- Q10.** Name any one metal which reacts neither with cold water nor with hot water but reacts with steam to produce hydrogen gas.
- Q11.** A green layer is gradually formed on a copper plate left exposed to air for a week in a bathroom. What could this green substance be?
- Q12.** Write the chemical equation to represent the reaction taking place between sodium metal and cold water.
- Q13.** What is seen to happen when a piece of sodium metal is dropped into water?
- Q14.** An element A forms two oxides AO and  $AO_2$ . The oxide AO is neutral whereas the oxide  $AO_2$  is acidic in nature. Would you call element A a metal or a non-metal?
- Q15.** Identify the most reactive and the least reactive metal amongst the following:  
Al, K, Cu, Au.
- Q16.** Why do silver ornaments lose their shine when kept for sometime?
- Q17.** Identify the most reactive and least reactive metals from the reaction below:  
$$CuSO_4 + Fe \longrightarrow FeSO_4 + Cu$$
$$FeSO_4 + Zn \longrightarrow ZnSO_4 + Fe$$
- Q18.** Choose the amphoteric oxides amongst the following:  
 $Na_2O$ , ZnO,  $Al_2O_3$ ,  $CO_2$ ,  $H_2O$
- Q19.** In nature, aluminium is found in combined state whereas silver/gold is found in free state. Give reason.
- Q20.** Name one metal which reacts with very dilute  $HNO_3$  to evolve hydrogen gas.

**Q21.** How do we know whether a given element is a non-metal if we know its electronic configuration?

**Q22.** What kind of compounds are called ionic compounds?

Or

How are ionic compounds formed?

**Q23.** What would happen to iron railings on the roadside if they are not painted? Why does it happen so?

**Q24.** Which property makes solder suitable for welding electrical wires?

**Q25.** Define metallurgy.

**Q26.** What is an ore?

**Q27.** Which method is used to reduce the oxides of highly reactive metals?

**Q28.** Choose a metal out of the following which reacts with hot water but not with cold water:

Sodium, Magnesium, Iron.

Mention the products formed during the reaction.

**Q29.** Choose the metal (from the list below) which can displace zinc from zinc sulphate solution:

Lead, Copper, Magnesium, Silver.

Write the equation of chemical reaction involved.

**Q30.** Write chemical equations for reactions taking place when

(a) manganese dioxide is heated with aluminium powder.

(b) steam is passed over red hot iron.

**Q31.** What is the activity series of metals? Rearrange the following metals in an increasing order of reactivity:

Aluminium, Zinc, Mercury.

**Q32.** A copper plate was dipped into a solution of  $\text{AgNO}_3$ . After sometime, a black layer was deposited on the copper plate. State the reason for it. Write the chemical equation of the reaction involved.

**Q33.** A substance X which is an oxide of a metal is used intensively in the cement industry. This element is present in bones also. On treatment with water it forms a solution which turns red litmus blue. Identify X and also write the chemical reactions involved.

**Q34.** If a strip of aluminium with scratched clean surface is dipped into an aqueous solution of copper sulphate for little time, the surface of the strip becomes brownish. What is the reason for this? Write the balanced chemical equation for this.

**Q35.** What are amphoteric oxides? Give two examples of amphoteric oxide with balanced chemical equation.

**Q36.** Name the reducing agent in the following reaction:



State which is more active, Mn or Al and why?

**Q37.** Zinc does not evolve hydrogen gas on reacting with  $\text{HNO}_3$ .

**Q38.** 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.

**Q39.** The oxide  $\text{X}_2\text{O}_3$  is unaffected by water. Outline a method by which a sample of metal X can be obtained from its ore. Give one reason as to why have you chosen this method.

**Q40.** What are the constituents of bronze? Write its two main uses. Name the common constituents of brass and bronze.

**Q41.** Why do we make alloys? State any two reasons.

**Q42.** Define the term alloy. Write two advantages of making alloys.

**Q43.** Differentiate between roasting and calcination processes giving one example of each.

**Q44.** Give reasons for the following:

- Gold and silver are used to make jewellery.
- Carbonate and sulphide ores are generally converted into oxide ores prior to reduction during the process of extraction.

**Q45.** Why do silver articles turn black and copper items turn green after sometime?

**Q46.** State four general properties of ionic compounds.

**Q47.** Why is carbon not used for reducing aluminium oxide to obtain aluminium?

Or

Metals placed high in the reactivity series cannot be obtained from their compounds by heating with carbon.

**Q48.** Explain why calcium metal after reacting with water starts floating on its surface. Write the chemical equation for the reaction.

**Q49.** Write four important purposes of making alloys.

**Q50.** Define the term 'alloy'. Write constituent elements of bronze.

**Q51.** The reaction of metal X with  $\text{Fe}_2\text{O}_3$  is highly reactive and is used to join railway tracks. Identify the metal X. Write the chemical equation of its reaction with  $\text{Fe}_2\text{O}_3$ .

**Q52.** How do properties of iron change when (a) a small quantity of carbon is mixed with it? (b) nickel and chromium are mixed with it?

**Q53.** Explain why the surface of some metals acquire dull appearance when exposed to air for a long time.

**Q54.** What is 24 carat gold? How will you convert it into 18 carat gold?

**Q55.** Which one of the methods given in Column I are used for extraction of each of the metals given in Column II.

Column I	Column II
1. Reduction with carbon	Al, Zn, Na
2. Electrolytic reduction	Fe, Mn
3. Reduction with Al	

**Q56.** Name two metals which react violently with cold water. Write any three observations which you would make when such a metal is dropped into water. How would you identify the gas evolved, if any, during the reaction?

**Q57.** State reasons for the following:

- Aluminium oxide is called an amphoteric oxide.
- Sodium and potassium metals are kept immersed under kerosene.
- Hydrogen gas is not evolved when most metals react with nitric acid.

**Q58.** Give reasons for the following:

- (a) Zinc can displace copper from copper sulphate solution.
- (b) Silver articles become black after sometime when exposed to air.
- (c) A metal sulphide is converted to its oxide to extract the metal from a sulphide ore.

**Q59.** (a) Name a metal for each case:

- (i) It does not react with cold as well as hot water but reacts with steam.
- (ii) It does not react with any physical state of water.
- (b) When calcium metal is added to water, the gas evolved does not catch fire but the same gas evolved on adding sodium metal to water catches fire. Why is it so?

**Q60.** (a) What are amphoteric oxides? Choose the amphoteric oxides from amongst the following oxides:



- (b) Why is it non-metal do not displace hydrogen from dilute acids.

**Q61.** Explain the following terms:

- (a) Mineral
- (b) Ore
- (c) Gangue

**Q62.** Give reasons for the following:

- (a) Sodium and potassium are stored under kerosene.
- (b) Aluminium is a highly reactive metal. Even then, it can be used for making utensils for cooking.
- (c) Ionic compounds have in general high melting points.

**Q63.** (a) Show the formation of  $\text{Na}_2\text{O}$  by transfer of electrons between the combining atoms.

- (b) Why are ionic compounds usually hard?
- (c) How is it that ionic compounds in the solid state do not conduct electricity and they do so when in molten state?

**Q64.** (a) Show the formation of  $\text{NaCl}$  from sodium and chlorine atoms by the transfer of electrons.

- (b) Why has sodium chloride a high melting point?
- (c) Name the anode and the cathode used in electrolytic refining of impure copper metal.

**Q65.** Explain how the following metals are obtained from their compounds by reduction proces:

- (a) Metal X which is low in reactivity series.
- (b) Metal Y which is in middle of series.
- (c) Metal Z which is high in the reactivity series.

**Q66.** A metal M found in nature as sulphide ore ( $\text{M}_2\text{S}$ ) is one of the good conductors of heat and electricity and used in making electric wires.

- (a) Identify the metal M.
- (b) Write the balanced chemical equations involved in the process of extraction of the metal

**Q67.** With reference to the electrorefining of impure copper, answer the following:

- (a) What is the electrolyte used?
- (b) Name the cathode and anode used.
- (c) What happens at cathode and anode?

**Q68.** In a thermit reaction, a compound of iron reacts with a metal.

- (a) Name the metal used in this reaction.
- (b) After completion of this reaction a metal is obtained in the molten state. Identify the metal.
- (c) Represent this reaction in the form of a balanced chemical equation.
- (d) Mention the most common use of this reaction

**Q69.** Give reasons for the following:

- (a) Platinum, gold and silver are used to make jewellery.
- (b) To make hot water tanks, copper is used and not steel (an alloy of iron).
- (c) Lemon is used for restoring the shine of tarnished copper decorations.

**Q70.** (a) Sodium is a highly reactive metal and it cannot be obtained from its oxide by heating with carbon. Give reason.

- (b) How can sodium be obtained from sodium chloride?

**Q71.** What is concentration of an ore? Why is it necessary to concentrate an ore before processing? Name an ore of mercury and copper.

**Q72.** (a) Compare the properties of a typical metal and a non-metal on the basis of the following:

- (i) Nature of the oxide formed by them. (ii) Conductivity.
- (b) Name a non-metal which is lustrous and a metal which is liquid at room temperature.

**Q73.** State reasons for the following:

- (a) Metals are good conductors of heat.
- (b) Addition of some silver to pure gold for making ornaments.
- (c) Inability of non-metals for displacing hydrogen from dilute sulphuric acid.

**Q74.** Give reasons:

- (a) Silver metal does not easily combine with oxygen but silver jewellery tarnishes after sometime.
- (b) Iron grills are frequently painted.
- (c) Gold ornaments retain their lustre even after several years of use.

**Q75.** List in a tabular form, the changes in colour observed and the name of the compound formed when silver, copper and iron are said to be corroded.

**Q76.** (a) What do you see when a magnesium ribbon is burnt? Is magnesium oxidised or reduced in this reaction?

- (b) Define corrosion.

**Q77.** Give reasons for the following:

- (a) Zinc oxide is considered an amphoteric oxide.
- (b) Non-metals in general do not displace hydrogen from dilute acids.
- (c) Metals conduct electricity.

**Q78.** (a) Why metals are not found in their free state generally?

- (b) If a strip of aluminium with scratched clean surface is dipped into an aqueous solution of copper sulphate for little time, the surface of the strip becomes brownish. What is the reason for this? Write the balanced chemical equation for the reaction.

**Q79.** Carbon cannot reduce the oxides of sodium, magnesium, calcium etc., to the respective metals. Justify the statement giving appropriate reason. State the method used for obtaining these metals from their salts. For obtaining sodium by this method.

- (a) Name the salt of sodium used and the rod at which sodium metal is deposited.
- (b) Identify the gas produced during the process.
- (c) Show the chemical reactions taking place at both the electrodes.
- (d) Suggest two other metals which can be obtained from their compounds using same method.

**Q80.** (a) Define the term 'alloy' and 'amalgam'. Name the alloy used for welding electric wires together. What are its constituents?

(b) Name the constituents of the following alloys:

(i) Brass

(ii) Stainless steel

(iii) Bronze.

State one property in each of these alloys, which is different from its main constituents.

**Q81.** Sample pieces of 5 metals *A, B, C, D* and *E* were added to the tabulated solution separately. The results observed are shown in the table:

Metal	Solution				
	FeSO <sub>4</sub>	CuSO <sub>4</sub>	ZnSO <sub>4</sub>	AgNO <sub>3</sub>	Al <sub>3</sub> (SO <sub>4</sub> ) <sub>3</sub>
<i>A</i>	No change	No change	No change	A coating on the metal	No change
<i>B</i>	A grey deposit on the metal	A brown coating on the metal	No change	A coating on the metal	No change
<i>C</i>	No change	No change	No change	No change	No change
<i>D</i>	No change	—	No change	A coating on the metal	No change
<i>E</i>	—	Brown coating	New coating	New coating	No change

Based on the observations recorded in the table, answer the following:

(a) Which is the most reactive metal?

(b) Which is the least reactive metal?

(c) What would be observed if metal *D* were added to a solution of Copper(II) sulphate?

(d) What would be observed if metal *E* were added to a solution of iron(II) sulphate?

(e) Arrange the metals *A, B, C, D* and *E* in order of decreasing activity.

**Q82.** (a) Differentiate between metals and non-metals on the basis of any two physical properties.

(b) Explain why metals have a tendency to lose electrons.

(c) Name the type of compounds formed by the transfer of electrons between metals and non-metals by giving one example

- S1.** X = Carbon.  
Y = Diamond.  
Z = Graphite.
- S2.** Mercury.
- S3.** They have got low resistivity and are good conductors of electricity.
- S4.** Graphite, a form of carbon, conducts electricity.
- S5.** The element X is a non-metal.
- S6.** Metal: Mercury. Non-metal: Bromine.
- S7.** Gallium/Caesium.
- S8.** (a) Magnesium react with water only on heating.  
(b) Copper does not react even with steam.
- S9.** 
$$3\text{Fe}(s) + 4\text{H}_2\text{O}(g) \longrightarrow \text{Fe}_3\text{O}_4(s) + 4\text{H}_2(g)$$
- S10.** Iron.  
$$3\text{Fe}(s) + 4\text{H}_2\text{O}(g) \longrightarrow \text{Fe}_3\text{O}_4(s) + 4\text{H}_2(g)$$
- S11.** It is due to the formation of copper carbonate.
- S12.** 
$$2\text{Na}(s) + 2\text{H}_2\text{O}(l) \longrightarrow 2\text{NaOH}(aq) + \text{H}_2(g)$$
- S13.** Sodium metal catches fire because of violent reaction.  
$$2\text{Na}(s) + 2\text{H}_2\text{O}(l) \longrightarrow 2\text{NaOH}(aq) + \text{H}_2(g)$$
- S14.** Element A is a non-metal. Only non-metals form neutral and acidic oxides.
- S15.** Potassium (K) is the most reactive.  
Gold (Au) is the least reactive.
- S16.** They get tarnished by reacting with atmospheric gases to produce silver sulphide.
- S17.** Zinc is most reactive and copper is least reactive.
- S18.** ZnO and Al<sub>2</sub>O<sub>3</sub>.
- S19.** Aluminium is a reactive metal while silver and gold are unreactive metals.
- S20.** Magnesium and manganese react with very dilute HNO<sub>3</sub> to evolve hydrogen gas.
- S21.** If there are four or more than four electrons in the valence cell of the given element, it is a non-metal.
- S22.** Compounds formed by the transfer of electrons from one atom to the other, are called ionic compounds.
- S23.** Iron railing get rusted. Iron reacts with moisture and air to form the oxide layer.

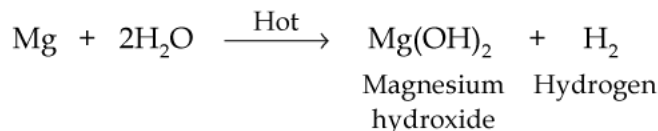
**S24.** Low melting point makes solder suitable for welding electrical wires.

**S25.** The process of extraction of a metal from its ore is called metallurgy.

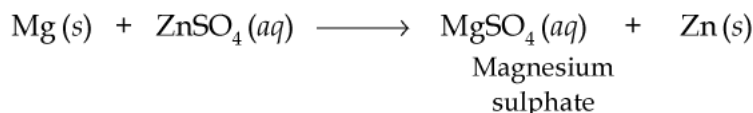
**S26.** Minerals from which a metal can be extracted profitably are called ores.

**S27.** By electrolysis of the oxides in the molten state.

**S28.** Magnesium reacts with hot water producing magnesium hydroxide and hydrogen.



**S29.** Magnesium can displace zinc from the solution of zinc sulphate.



**S30.** (a)  $3\text{MnO}_2(\text{s}) + 4\text{Al}(\text{s}) \longrightarrow 3\text{Mn}(\text{l}) + 2\text{Al}_2\text{O}_3(\text{s}) + \text{Heat}$

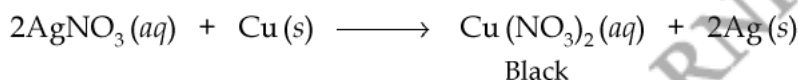
(b)  $3\text{Fe}(\text{s}) + 4\text{H}_2\text{O}(\text{g}) \longrightarrow \text{Fe}_3\text{O}_4(\text{s}) + 4\text{H}_2(\text{g})$

**S31.** The list of metals arranged in the order of their increasing or decreasing activities is called activity series.

The given metals can be arranged in increased order of reactivity as:

Mercury < Zinc < Aluminium.

**S32.** Black layer was deposited due to the formation of silver.



**S33.** The substance X is calcium oxide, CaO.

The element calcium is present in bones.

On treatment with water, it produces calcium hydroxide as under:



Calcium hydroxide is a base. It turns red litmus blue.

**S34.** Aluminium being more reactive than copper displaces it from the solution of copper sulphate. The displaced copper is deposited on the surface of aluminium as brown deposit.



**S35.** An oxide which reacts with acids as well as bases to produce salt and water is called amphoteric oxide.



**S36.** Aluminium is reducing agent in the given reaction. Aluminium is more active because it lies higher than Mn in the activity series.

**S37.** Nitric acid is a strong oxidising agent. It oxidises hydrogen produced to form water and is itself reduced to oxide of nitrogen.



**S38.** The metal *A* is aluminium Al.

The substance *B* is  $\text{Al}_2\text{O}_3$  which is amphoteric because it reacts with both acid and base.



**S39.** As  $\text{X}_2\text{O}_3$  is unaffected by water, it must be  $\text{Al}_2\text{O}_3$ . Aluminium metal can be obtained by electrolysis of molten  $\text{Al}_2\text{O}_3$ . This is because  $\text{Al}_2\text{O}_3$  cannot be reduced by carbon.

**S40.** Bronze is an alloy of copper and tin.

**Uses:**

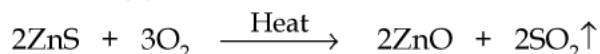
1. It is used for making medals.
2. It is used for making statues.

Copper is the common metal in brass and bronze.

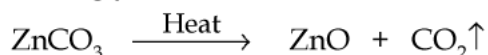
**S41.** We make alloys to improve the qualities of a metal and to prevent it from corrosion.

**S42.** An alloy is a homogeneous mixture of two or more metals or metal and a non-metal. Iron can be made hard by mixing carbon with it. Stainless steel can be made by alloying nickel and chromium with iron. Alloys are resistant to corrosion.

**S43. Roasting:** Sulphide ore is strongly heated in the presence of air into metal oxide.



**Calcination:** Carbonate ore is strongly heated in the absence of air into metal oxide.



**S44.** (a) Gold and silver are the most malleable and ductile metals. They are the least reactive and hence retain their shine on exposure to the atmosphere.

(b) Metal oxide is easier to reduce to the metal than the metal sulphide or metal carbonate.

**S45.** Silver articles turn black after sometime due to the formation of silver sulphide,  $\text{Ag}_2\text{S}$  layer on it.

Copper items turn green after sometime due to the formation of copper carbonate layer on it.

**S46.** Properties of ionic compounds are as given below:

- (a) They are hard, brittle and crystalline solids.
- (b) They are soluble in water.
- (c) They have high melting and boiling points.
- (d) They are good conductors of electricity in solution and molten states.

**S47.** Carbon cannot reduce oxide of aluminium because aluminium has higher affinity for oxygen than for carbon.

**S48.** Calcium reacts with water to form hydrogen gas. The bubbles of hydrogen formed stick to the surface of calcium. Hydrogen gas being lighter, calcium starts floating on water.



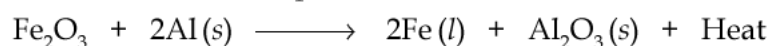
**S49.** Purposes of making alloys are:

- |                           |   |
|---------------------------|---|
| (a) To increase hardness. | (b) To increase resistance towards corrosion. |
| (c) To modify reactivity. | (d) To lower melting point.                   |

**S50.** Mixture of two metals or a metal and a non-metal is called alloy.

Constituents of bronze are copper and tin.

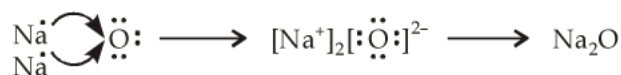
**S51.** The metal *X* is Al. The reaction that takes place is as under:



- S52.** (a) Iron becomes hard and strong when a small quantity of carbon is mixed with it.  
 (b) Iron becomes hard and rustfree on mixing nickel and chromium with it.
- S53.** This is because of corrosion. Iron acquires a dull brown colour due to the formation of iron oxide. Copper acquires a green colour due to the formation of copper carbonate. Silver acquires a black colour due to the formation of sulphide.
- S54.** 24 carat gold is pure gold. 18 carat gold is obtained by mixing 18 parts of gold with 6 parts of copper or silver metal.
- S55.** Reduction with carbon                      Zn, Fe  
 Electrolytic reduction                            Al, Na  
 Reduction with Al                                 Mn
- S56.** Sodium and potassium metals react violently with cold water.  
 Three observations that we make are:  
 (a) The metal floats on the surface of water.  
 (b) The reaction is exothermic.  
 (c) Hydrogen gas evolved catches fire.  
 To identify the gas evolved, we pass the gas through soap solution. Soap bubbles are formed which rise up. When a burning candle is brought near the bubbles, hydrogen gas burns with a 'pop' sound.
- S57.** (a) An oxide which reacts with an acid as well as with a base is called amphoteric oxide. Aluminium oxide also reacts with an acid and a base both. Therefore, it is an amphoteric oxide.
- $$\text{Al}_2\text{O}_3 + 6\text{HCl} \longrightarrow 2\text{AlCl}_3 + 3\text{H}_2\text{O}$$
- $$\text{Al}_2\text{O}_3 + 2\text{NaOH} \longrightarrow 2\text{NaAlO}_2 + \text{H}_2\text{O}$$
- (b) Sodium and potassium metals catch fire when kept in the open. This is because the reaction with oxygen is violent. The metals catch fire due to the energy produced in the reaction. To prevent this, these metals are kept immersed under kerosene.  
 (c) This is because, the hydrogen produced initially reacts with nitric acid to produce oxides of nitrogen.
- S58.** (a) Zinc can displace copper from copper sulphate solution because zinc is more reactive than copper.  
 (b) Silver articles become black after sometime when exposed to air. This is because silver reacts with sulphur present in air (in the form of H<sub>2</sub>S gas), to form silver sulphide which is black.  
 (c) It is easier to reduce an oxide than the sulphide to extract the metal from the ore.
- S59.** (a) (i) Al, Fe and Zn do not react with cold as well as hot water but react with steam.  
 (ii) Lead, copper, silver, gold, etc., do not react with any physical state of water.  
 (b) The reaction of calcium with water is less violent. The heat evolved is not sufficient for hydrogen gas evolved to catch fire.
- S60.** (a) Metal oxides which react both with acids and bases to form salt and water are known as amphoteric oxides. Out of the given list, ZnO and Al<sub>2</sub>O<sub>3</sub> are amphoteric oxides.  
 (b) Elements which lie higher than hydrogen in the activity series are capable of displacing hydrogen from dilute acids. Non-metals lie below hydrogen in the activity series. Therefore, they do not displace hydrogen from dilute acids.
- S61.** (a) **Mineral:** Elements or compounds which occur in their natural form in the Earth's crust are called minerals.  
 (b) **Ore:** Minerals from which a metal can be extracted profitably are called ores.  
 (c) **Gangue:** Impurities such as soil and sand which are present in the minerals or ores are called gangue.

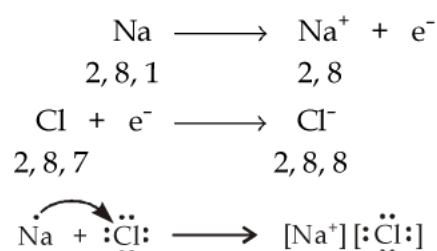
- S62.** (a) Sodium and potassium are highly reactive metals. They catch fire when kept in the open, That is why they are stored under kerosene to prevent contact with air.
- (b) Although aluminium is a highly reactive metal, it is still being used to make cooking utensils. In fact, it is coated with a layer of aluminium oxide. The protective oxide layer prevents aluminium from further oxidation. Thus, it can be safely used for cooking.
- (c) Ionic compounds have high melting points because inter-ionic attractive forces are strong and a considerable amount of energy is required to break this attraction.

- S63.** (a) Formation of  $\text{Na}_2\text{O}$  is shown below:



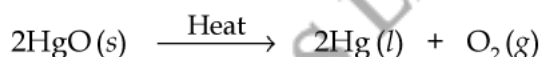
- (b) Ionic compounds are usually hard because of strong force of attraction between the ions.
- (c) Due to rigid structure in the solid state, movement of ions is not possible. Hence, ionic compounds do not conduct electricity in the solid state. In the molten state, ions become mobile and conduct electricity.

- S64.** (a) Formation of  $\text{NaCl}$  from sodium and chlorine atoms by the transfer of electrons is shown as under:



- (b) Sodium and chlorine ions attract each other and are held by strong force of attraction. A considerable amount of energy is required to overcome force of attraction. Therefore, sodium chloride has a high melting point.
- (c) Impure copper is made the anode and a thin strip of pure copper is made the cathode.

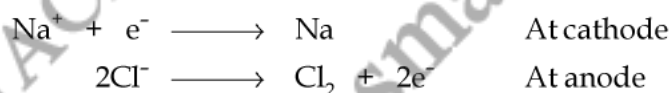
- S65.** (a) Metal X is obtained simply by heating their oxides. For example, mercury can be obtained by heating mercuric oxide.



- (b) Metals in the middle of series can be obtained by heating their oxides with carbon. For example,

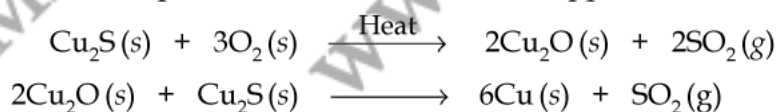


- (c) The metals high in the reactivity series cannot be obtained by reduction of their oxides, with carbon. These are obtained by the electrolytic reduction of molten chlorides (in case of sodium, potassium, magnesium and calcium) and molten oxides in case of say aluminium. The reaction in case of  $\text{NaCl}$  is as follows:



- S66.** (a) The metal M is copper, Cu.

- (b) Balanced chemical equations for the extraction of copper are:

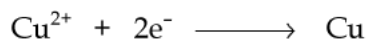


**S67.** (a) The electrolyte used in the refining of copper is acidified  $\text{CuSO}_4$  solution.

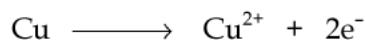
(b) Anode consists of impure copper.

Cathode consists of a strip of pure copper.

(c) Pure copper is deposited at cathode.



Copper dissolves into the solution at the anode.



**S68.** (a) The metal is aluminium, Al.

(b) Iron (Fe) is obtained in the molten state.

(c)  $\text{Fe}_2\text{O}_3 + 2\text{Al} \longrightarrow 2\text{Fe} + \text{Al}_2\text{O}_3 + \text{Heat}$ .

(d) The reaction is most commonly used in to join railway tracks or cracked heavy machine parts.

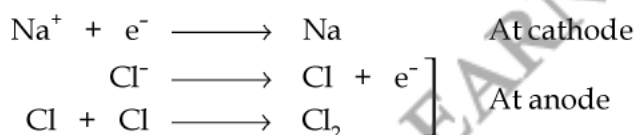
**S69.** (a) Platinum, gold and silver are used to make jewellery because these are the least reactive metals. They are least corroded and maintain their shine when exposed to atmosphere.

(b) Copper is better conductor of heat than steel. Steel is an alloy of iron and carbon. Alloys are poor conductors of heat, that is why copper is used to make hot water tanks.

(c) Copper articles wear a green coating of copper carbonate. This layer of copper carbonate is removed by rubbing the surface with lemon. Citric acid present in lemon reacts with copper carbonate to form soluble copper citrate and the shine of the copper article is restored.

**S70.** (a) Sodium has a greater affinity for oxygen than carbon. Therefore, carbon cannot reduce sodium oxide to sodium metal.

(b) Sodium is obtained by the electrolytic reduction of molten sodium chloride. Sodium metal is deposited at the cathode and chlorine gas at the anode.



**S71.** The process of removing unwanted impurities like sand, soil, etc., present in an ore is called concentration of the ore.

We need to concentrate the ore so that the impurities do not interfere in the extraction of the metal.

**Ore of mercury:** Cinnabar ( $\text{Hg}_2\text{S}$ ).

**Ore of copper:** Copper pyrite ( $\text{Cu}_2\text{S}$ ).

**S72.** (a) (i) Sodium is metal, it forms basic oxide while carbon is a non-metal. It forms acidic oxide.

(ii) Copper is a metal. It is a good conductor of heat and electricity. Sulphur is a non-metal. It is a non-conductor of heat and electricity.

(b) Graphite, a form of carbon is a non-metal and is lustrous. Mercury, (Hg) a metal is a liquid at room temperature.

**S73.** (a) Metals possess free or mobile electrons which are responsible for conduction of heat.

(b) Addition of some silver to pure gold makes it hard which is necessary for making ornaments.

(c) Non-metal cannot provide electrons to convert  $\text{H}^+$  ions to hydrogen gas.

**S74.** (a) Silver metal reacts with the  $\text{H}_2\text{S}$  gas present in traces in the atmosphere to form silver sulphide which tarnishes the metal.

(b) Iron forms a layer of rust ( $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ ) on combination with oxygen and moisture present in the atmosphere. This weakens the metal. To prevent this loss iron grills are frequently painted.

(c) Gold is an unreactive metal. It does not react with atmospheric oxygen and acids. So the lustre of gold jewellery is retained even after several years.

**S75.** The information in the tabular form is given as under:

<i>Metal</i>	<i>Change in colour when they corrode</i>	<i>Compound formed</i>
Silver	Black	Silver sulphide, Ag <sub>2</sub> S
Copper	Green	Copper carbonate, CuCO <sub>3</sub>
Iron	Reddish Brown	Iron oxide, Fe <sub>2</sub> O <sub>3</sub> . xH <sub>2</sub> O

**S76.** (a) Magnesium burns with a dazzling light producing white ash of magnesium oxide.



Magnesium is oxidised because it combines with oxygen.

(b) Corrosion is defined as the combination of a metal with atmospheric oxygen, carbon dioxide and moisture to form an oxide, carbonate, etc. Corrosion causes damage to car bodies, bridges, etc.

**S77.** (a) Zinc oxide reacts with both acids and alkalis. Therefore, it is an amphoteric oxide.



Sodium zincate

(b) Non-metals cannot provide electrons to convert H<sup>+</sup> ions into hydrogen gas.

(c) Metals conduct electricity with the help of free or mobile electrons.

**S78.** (a) Metals are reactive atoms as they are highly electropositive. They readily react with other atoms during their formation in Earth and become compounds.

(b) Displacement reaction takes place as Al is more reactive than Cu. Copper displaced will stick on the Al rod making it brownish.

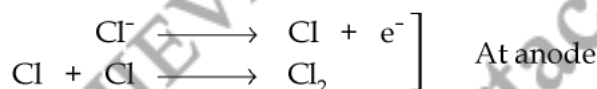


**S79.** Carbon cannot reduce the oxides of active metals like sodium, magnesium, calcium, etc., because these active metals have greater affinity for oxygen than carbon. These metals would therefore not lose oxygen and be reduced to the metal. These metals are obtained by electrolytic reduction of their salts in molten state.

(a) Sodium chloride is used for extraction of sodium and it is obtained at cathode.

(b) Chlorine gas is produced in the process.

(c)  $\text{Na}^+ + e^- \longrightarrow \text{Na}$  At cathode



(d) Potassium and calcium can be obtained from their salts by similar method.

**S80.** (a) A homogeneous mixture of two or more metals or a metal and a non-metal in definite proportion is called an alloy.

If one of the constituents of an alloy is mercury, then that alloy is called amalgam.

Solder which is an alloy of lead and tin is used for welding electrical wires together.

(b) (i) Constituents of brass are copper and zinc.

(ii) Constituents of stainless steel are iron, nickel and chromium.

(iii) Constituents of bronze are copper and tin.

Brass and bronze has lower electrical conductivity than their constituents.

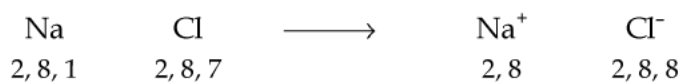
Stainless steel does not get corroded easily as iron does.

- S81.** (a) *E* is the most reactive metal.  
(b) *C* is the least reactive metal.  
(c) A brown coating will be formed if the metal is more reactive than Cu, for example, Sn, Pb etc.  
(d) A grey deposit on the metal will take place.  
(e)  $E < B < D < A < C$ .

- S82.** (a) Metals can be differentiated from non-metals on the basis of the following two properties: (i) Lustre and (ii) Conductivity

For example, copper, a metal shows metallic lustre and is a good conductor of heat and electricity. Sulphur, a non-metal, does not have lustre and is not a good conductor of heat and electricity.

- (b) Metal have 1, 2 or 3 electrons in the outermost orbit. After losing these electrons, they get the stable inert gas structure.  
(c) Ionic compounds are formed when a metal donates its electron to the non-metal. For example, sodium having the electronic configuration 2, 8, 1 donates one electron to chlorine which has the electronic configuration 2, 8, 7 thereby giving inert (noble) gas stable structure to both.



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