5. 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) (ii) and (iii)
(c) (ii) and (iv) (d) (iii) and (iv)

Ans. (c) (ii) and (iv)

6. An alloy is

(a) and element
(b) a compound
(c) a homogeneous mixture
(d) a heterogeneous mixture

Ans. (c) a homogeneous mixture

7. 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

Ans. deposited on cathode.

8. Alloys are homogeneous 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

Ans. (d) Steal

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

(a) It burns in oxygen with a dazzling while 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.

Ans. (b) It reacts with cold water to form magnesium oxide and evolves hydrogen gas.

10. 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

Ans. (c) PVC

Intext Exercises

Page No. 40

1. Give an example of a metal which
(i) is a liquid at room temperature.
(ii) can be easily cut with a knife.
(iii) is the best conductor of heat.
(iv) is a poor conductor of heat.

Ans. (i) Mercury, (ii) Sodium, (iii) Silver, (iv) Astatine is the poorest conductor of heat. Its conductivity is less than even some non-metals such as graphite.

2. Explain the meanings of malleable and ductile.

Ans. Malleable : Some metals can be beaten into thin sheets. This property is known as malleability.

Ductile : The ability of metals to be drawn into thin wires is known as ductility.

Page No. 46

1. Why is sodium kept immersed in kerosene oil?

Ans. Sodium reacts with oxygen and moisture at room temperature. But, it neither reacts nor dissolves in kerosene. Therefore, sodium is kept in kerosene.

2. Write equations for the reactions of
(i) iron with steam
(ii) calcium and potassium with water

Ans. (i) $2Fe + 3H_2O \rightarrow Fe_2O_3 + 3H_2$
(ii) $2K + 2H_2O \rightarrow 2KOH + H_2 + \text{Heat energy}$
$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

3. Samples of four metals A, B, C and D were taken and added to the following solution one by one. The results obtained have been tabulated as follows.

Ans. Metal	**Iron(II) sulphate**	**Copper(II) sulphate**	**Zinc sulphate**	**Silver nitrate**
A	No reaction	Displacement		
B	Displacement	No reaction		
C	No reaction	No reaction reaction	No	Displa-cement
D	No reaction	No reaction	No reaction	No reaction

Use the Table above to answer the following questions about metals A, B, C and D.
(i) Which is the most reactive metal?
(ii) What would you observe if B is added to a solution of Copper (II) sulphate?
(iii) Arrange the metals A, B, C and D in the order of decreasing reactivity.

Ans. (i) Metals B is most reactive
(ii) Displacement reaction
(iii) Metal B > metal A ? metal C > metal D

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

Ans. Hydrogen gas is produced along with salt of the metal.
$Fe + H_2CO_4 \rightarrow FeSO_4 + H_2$

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

Ans. Zinc will displace iron from iron (II) sulphate.

$Zn + FeSO_4 \rightarrow ZnSO_4 + Fe$

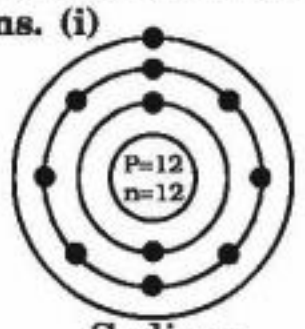
Page No. 49

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

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

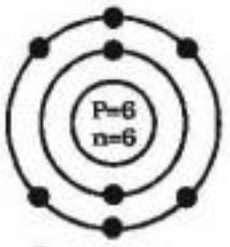
(iii) What are the ions present in these compounds?

Ans. (i)

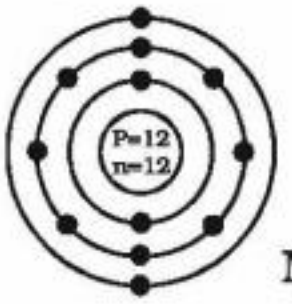


Nucleus

Sodium



Oxygen



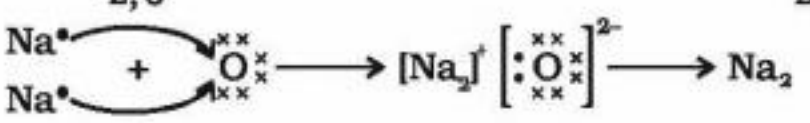
Magnesium

(ii) Na → $Na^+ + e$

2,8,1 2,8

O + $2e^-$ → O^{--}

2,6 2,8



Mg → Mg^{2+} $+2e^-$

2,8,2, 2,8

O + 2e– → O2–

2,6 2,8

(iii) $Na_2O \rightarrow Na^+$ and O^{2-}

$MgO \rightarrow Mg_2+$ and O^{2-}

2. Why do ionic compounds have high melting points?

Ans. Ionic compounds have high melting points because the molecules of ionic compounds are bounds by strong electrostatic force.

Page No. 53

1. Define the following terms.
(i) Mineral (ii) Ore (iii) Gangue

Ans. **(i) Mineral :** The elements or compounds which occur naturally in the earth's crust are called minerals.
(ii) Ore : At some places, minerals have a very high percentage of particular metal and the metal can be profitably extracted from it. These minerals are known as ore.
(iii) Gangue : Ores mined from the earth are usually contaminated with large amounts of impurities like soil, sand, etc. are known as gangue.

2. Name two metals which are found in nature in the free state.

Ans. Platinum, Gold.

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

Ans. Reduction by carbon.

Page No. 55

1. Metallic oxides of zinc, magnesium and copper were heated with the following metals.

Metal	Zinc	Magnesium	Copper
Zinc oxide			
Magnesium oxide			
Copper oxide			

In which cases will you find displacement reactions taking place?

Ans.

Metal	Zinc	Magnesium	Copper
Zinc oxide	No	Yes	No
Magnesium oxide	No	No	No
Copper oxide	Yes	Yes	Yes

2. Which metals do not corrode easily?

Ans. Metals low in activity series, such as gold, silver, etc. do not corrode easily.

3. What are alloys?

Ans. An alloy is a homogeneous mixture of two or more metals, or a metal and a non-metal.

Exercise

1. Which of the following pairs will give displacement reactions?
(a) NaCl solution and copper metal
(b) $MgCl_2$ solution and aluminium metal
(c) $FeSO_4$ solution and silver metal
(d) $AgNO_3$ solution and copper metal.

Ans. (d) $AgNO_3$ solution and copper metal.

2. Which of the following methods is suitable for preventing an iron frying pan

from rusting?
(a) Applying grease (b) Applying paint
(c) Applying a coating of zinc
(d) All of the above.

Ans. (c) Applying a coating of zinc

3. An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be
(a) calcium (b) carbon
(c) silicon (d) iron.

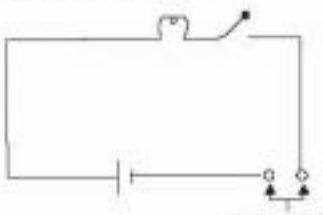
Ans. (a) calcium

4. Food cans are coated with tin and not with zinc because
(a) zinc is costlier than tin.
(b) zinc has a higher melting point than tin.
(c) zinc is more reactive than tin.
(d) zinc is less reactive than tin.

Ans. (c) zinc is more reactive than tin.

5. You are given a hammer, a battery, a bulb, wires and a switch.
(a) How could you use them to distinguish between samples of metals and non-metals?

Ans. We will make a circuit as shown in the figure.



If with the test material, then the bulb glows on turning the switch on, the material is likely to be a metal.

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

Ans. The method is very useful except for graphite which is a good conductor of electricity although it is a non-metal.

6. What are amphoteric oxides? Give two examples of amphoteric oxides.

Ans. The oxides which react with both acids and bases to produce salt are known as amphoteric oxide.

For instance, aluminium oxide reacts with acids and bases in the following manner.

$$Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$$

$$Al_2O_3 + 2NaOH \rightarrow \underset{\text{(Sodium alminate)}}{2NaAlO_2} + H_2O$$

Zinc oxide and bad oxide are other amphoeteric oxides.

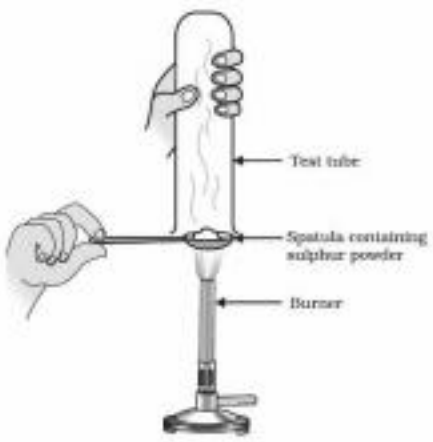
7. Name two metals which will displace hydrogen from dilute acids, and two metals which will not.

Ans. Metals which displace hydrogen are magnesium and zinc. Metals which do not displace hydrogen are copper and gold.

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

Ans. In the electrolytic refining of a metal M, the impure metal is taken as anode and a thin strip of pure metal is made the cathode. A solution of the metal salt is used as an electrolyte.

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



Collection of gas

(a) What will be the action of gas on
(i) dry litmus paper?
(ii) moist litmus paper?
(b) Write a balanced chemical equation for the reaction taking place.

Ans. (a) (i) No effect on dry litmus paper.
(ii) Turns blue litmus red in moist state.

Ans. (b) $S + O_2 \rightarrow SO_2$

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

Ans. (i) **Painting :** In this method, a coating of paint is given on the iron article.
(ii) **Galvanisation :** In this method, a coating of zinc is given on the iron articles.

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

Ans. Basic and amphoteric

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

Ans. Gold, silver and platinum are very less reactive and do not corrode. They also posses brilliant lustre. Thus, they are used to make jewellery.

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

Ans. Metal like potassium and sodium react so vigorously that they catch fire if kept in the open. Therefore, to protect them and to prevent accidential fires, they are kept immersed in kerosene oil.

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

Ans. Aluminium does not corrode and is a very good conductor of heat. So, it is used to make utensils for cooking.

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

Ans. It is easier to get a metal from its oxide, as compared to its sulphides and carbonates. So, prior to reduction, the metal sulphides and carbonates must be changed into metal oxides.

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

Ans. Copper oxides reacts with acids but copper itself does not react. Therefore, the copper can be washed by acidic substances. It removes the corroded part (Copper oxide) and pure copper is left behind.

14. Differentiate between metal and non-metal on the basis of their chemical properties.

Ans. **(i) Ion formation :** Metals form positive ions while non-metals form negative ions.
(ii) Acidic nature : Metals form basic oxides while non-metals form acidic oxide.
(iii) Reaction with water : Metals react with water while non-metals do not react with water.

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

The solution used was aqua regia.

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

Ans. Hot iron reacts with steam produced by boiling water. But, copper does not react with water.

Additional Questions

1. Why do ionic compounds conduct electricity in molten state?

Ans. In solid state, ionic compounds do not conduct electric current because the ions are held together in fixed positions by strong electrostatic forces and cannot move freely. When ionic solid is dissolved in water or melted, the crystal structure is broken down and ions become free to move and conduct electricity.

2. Name two metals that catch fire when put in water and why?

Ans. Sodium and potassium. Sodium and potassium are highly negative metal which react vigorously with cold water to evolve hydrogen gas. The reaction is highly violent and exothermic and evolved gas catches fire.

3. Name two metals that start floating after some time when immersed in water and why?

Ans. Calcium and Magnesium. Calcium and magnesium react with hot and cold water to evolve hydrogen gas. The bubbles of the gas evolved stick to the surface of the metal and thus being lighter floats on the surface.

4. What are amphoteric oxides ? Choose the amphoteric oxides amongst the following oxides :
Na_2O, Zno, Al_2O_3, Co, H_2O

Ans. Amphoteric oxide: Those metal oxides which show basic as well as acidic behaviour are known as amphoteric oxides.
ZnO, Al_2O_3 are amphoteric oxides.

5. "All ores are minerals but all minerals are not ores," Justify the statement with examples.

Ans. The natural materials in which the metals or their compounds are found in earth are called minerals. Those minerals from which the metals can be extracted conveniently and profitably are called ores. Thus, all the ores are minerals but all the minerals are not ores.
Some minerals may contain objectionable impurities which hamper the extraction of metals. Such minerals are not the ores.

6. Why are aluminium and copper metals used for making cooking vessels?

Ans. Aluminium and copper metals are used for making cooking vessels because they are very good conductors of heat.

7. Hydrogen gas is not evolved when most metals react with nitric acid. State reason to justify this statement.

Ans. Nitric acid is a strong oxidising agent. So as soon as hydrogen gas is formed in the reaction between a metals and dilute nitric acid, the nitric acid oxidises this hydrogen to water.

8. What is an alloy ? State the constituents of solder. Which property of solder makes it suitable for welding electric wires?

Ans. An alloy is a mixture of a metal with other metals or non-metals.
Constituents of solder : Lead and tin.
Solder has a low melting point. So it is used for welding electrical wire together.

9. Aluminium occurs in combined state in nature whereas gold is found in free state. Why ?

Ans. Aluminimum is quite reactive and hence it does not occur as free element in nature.
Gold is less reactive metal, hence it is found in free state as metal.

10. Ionic compounds do not conduct electricity in the solid state but do so in the molten state. Explain.

Ans. This is due to the fact that in the solid ionic compounds, the ions are held together in fixed positions by strong electrostatic forces and cannot move freely. So, solid ionic compounds are non-conductirs of electricity. When we melt it, the crystal structure is broken down and ions become free to move and conduct electricity.

Multiple Choice Questions

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

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

Ans. (c) Dullness

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

(a) ductility (b) malleability
(c) sonorousity (d) conducstivity

Ans. (a) ductility

3. Which one of the following metals do not react with cold as well as hot water?

(a) Na (b) Ca
(c) Mg (d) Fe

Ans. (d) Fe

4. 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 solid state

Ans. (b) Electrical conductivity in solid state

3

Metals and Non-Metals

In the Chapter

- Elements can be classified in metals and non-metals.
- Metals are lustrous, ductile, malleable and are good conductors of heat and electricity. They are found in solid form at room temperature, except mercury which is a liquid.
- Metals can form positive ions by losing electrons to non-metals.
- Metals combine with oxygen to produce basic oxides. Aluminium oxide and zinc oxide show the properties of both basic and acidic oxides. These oxides are said to be amphoteric oxides.
- Different metals show different reactivities with water and dilute acids.
- A list of common metals arranged in order of their decreasing reactivity is called an activity series.
- A more reactive metal can displace a less reactive metal from its salt solution.
- Metals above hydrogen in the activity series displace hydrogen from dilute acids.
- Metals occur in nature as free elements or in the form of their compounds.
- The extraction of metals from their ores and then refining them for use is called metallurgy.
- An alloy is a homogeneous mixture of two or more metals, or a metal and a non-metal.
- The surface of some metals, like iron, is corroded when they are exposed to moist air for a long period of time. This phenomenon is called corrosion.
- Non-metals have properties opposite to that of metals. They are neither malleable nor ductile. They are bad conductors of electricity and heat, except for graphite, which is a good conductor of electricity.
- Non-metals produce negatively charged ions by gaining electrons when reacting with metals.
- Non-metals produce oxides which are either acidic or neutral.
- Non-metals do not displace hydrogen from dilute acids. They react with hydrogen to produce hydrides.