

Chapter-3

Metals and Non-Metals

2 MARKS QUESTIONS

1. Give an example of metal which

- (i) is a liquid at room temperature.**
- (ii) can be easily cut with knife.**
- (iii) is best conductor of heat.**
- (iv) is poor conductor of heat.**

Solution :

- (i) Mercury
- (ii) Sodium
- (iii) Silver
- (iv) Lead

2. Explain the meaning of malleable and ductile.

Solution :

A substance that can be beaten into thin sheets is said to be malleable. For example, iron, copper etc. A substance that can be drawn into wires is called ductile. For example, gold, silver etc.

3. Why is sodium kept immersed in kerosene oil?

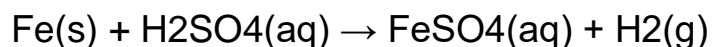
Solution :

Sodium reacts so vigorously with oxygen that it catches fire when kept in the opens. Hence, to protect accidental fires, it is kept immersed in kerosene oil.

4. Which gas is produced when dilute hydrochloric acid is added to reactive metal?

Solution :

Hydrogen gas is evolved when dilute hydrochloric acid is added to a reactive metal. When iron reacts with dilute H_2SO_4 , iron (II) sulphate with the evolution of hydrogen gas is formed.



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

Solution :

Gold and Platinum

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

Solution :

A metal is obtained from its oxide by the process of reduction.

7. Which metals do not corrode easily?

Solution :

Metals which are placed at the bottom of activity series like silver, gold, platinum do not corrode easily.

8. What are alloys?

Solution :

An alloy is homogenous mixture of two or more metals or metal and non-metal. It is obtained by first melting primary metal and then dissolving the other element in it in definite proportion.

9. Which of the following pairs will give displacement reactions?

- (a) NaCl solution and copper metal**
- (b) MgCl₂ solution and aluminum**
- (c) FeSO₄ solution and silver metal**
- (d) AgNO₃ solution and copper**

Solution :

- (d) AgNO₃ solution and copper**

10. Which of the following method is suitable for preventing an iron fry pan from rusting?

- (a) Applying grease
- (b) applying paint
- (c) Applying coating of zinc
- (d) All of the above

Solution : (c) Applying coating of zinc

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

Solution :

Metal oxides which show both acidic as well as basic behavior are called amphoteric oxides. Such metal oxides react with both acids and bases.

Example: Aluminum oxide, zinc oxide

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

Solution :

Magnesium and zinc metals displace hydrogen from dilute acids. Copper and silver do not displace hydrogen from dilute acids.

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

Solution : Impure metal M is made the anode, thin strips of pure metal M as cathode and a salt solution of metal M as electrolyte.

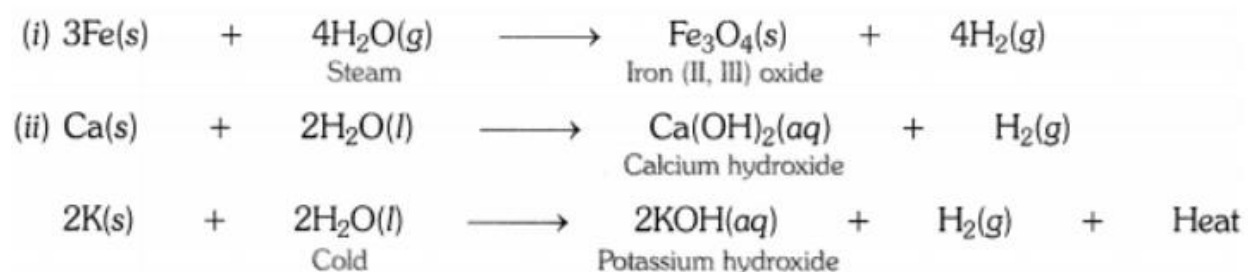
4 MARKS QUESTIONS

1. Write equation for the reaction of

(i) Iron with steam

(ii) Calcium and potassium with water

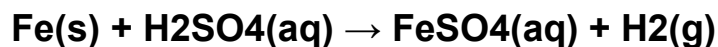
Solution :



2. Which gas is produced when dilute hydrochloric acid is added to reactive metal?

Solution :

Hydrogen gas is evolved when dilute hydrochloric acid is added to a reactive metal. When iron reacts with dilute H_2SO_4 , iron (II) sulphate with the evolution of hydrogen gas is formed.



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

Solution :

As zinc is more reactive than iron, displacement reaction will take place



4. Why do ionic compounds have high melting points?

Solution :

There are strong forces of attraction between oppositely charged ions in ionic compounds. Considerable amount of energy is required to break strong inter-ionic force of attraction. Therefore, they have high melting points.

5. Define the following terms :

(i) Minerals

(ii) Ores and

(iii) Gangue

Solution :

(i) Minerals- the element or compounds which occur naturally in the earth's crust are known as minerals.

(ii) Ores- Minerals from which metal can be extracted profitably and easily are called ores.

(iii) Gangue- Impurities such as soil and sand which are present in the minerals are called gangue.

6. 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.

Solution :

Copper, on keeping in air reacts with atmospheric carbon dioxide to form a green layer of copper carbonate. Copper carbonate reacts with citric acid present in lemon or tartaric acid present in tamarind to form soluble copper citrate or copper tartarate. The vessels are thus cleaned using water.

7. A man went door to door posing as a goldsmith. He promised to bring back the glitter of the old and dull 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?

Solution :

Aqua regia, which is a mixture of 3 parts concentrated HCl and part of concentrated nitric acid dissolves gold. The man put the gold bangles in this solution. The outer dirty layer of gold bangles dissolved in aqua regia bringing out the shining bangles.

As the outer layer of bangles dissolved in aqua regia, the weight was reduced drastically.

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

Solution :

Electrical conductivity of a metal is decreased when it is alloyed with another metal or non-metal. Thus, the electrical conductivity of steel is much less than that of pure. That is why copper is used to make hot water tanks and not steel.

7 MARKS QUESTIONS

1. Give reasons :

- (a) Platinum, gold and silver are used to make jewellery.**
- (b) Sodium, potassium and lithium are stored under oil.**
- (c) Aluminum is highly reactive metal, yet it is used to make utensils for cooking.**
- (d) Carbonate and sulphides ores are usually converted into oxides during the process of extraction.**

Solution :

- (a) These metals are un-reactive. They do not react with oxygen and other gases present in air and with moisture. Thus, their shine is maintained. That is why these metals are used to make jewellery.
- (b) Reaction of sodium, potassium and lithium with oxygen is so violent that they catch fire. To prevent accidental fire, they are stored under kerosene oil.
- (c) This is because aluminum is a good conductor of heat. Aluminum forms a layer of aluminum oxide at high temperature which prevents further corrosion.
- (d) It is easier to reduce oxide than the carbonates and sulphide to the metals.

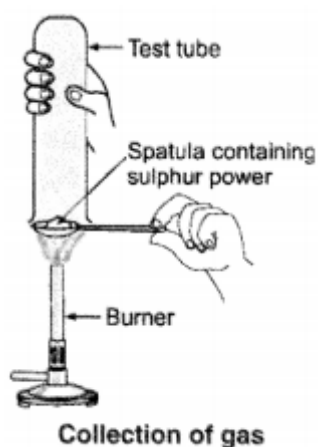
2. Pratyush took Sulphur powder on spatula and heated it. He collected the gas evolved by inverting a test tube over it as shown in fig. 3.12 below :

(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.

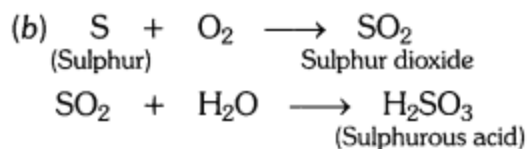


Solution :

(a) Sulphur is a non-metal. Oxides of non-metals are acidic. In this case sulphur dioxide is produced which is acidic.

(i) No action of the gas

(ii) wet litmus paper will turn red.



3.. You are given a hammer, a battery, a bulb, wires and switch.

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

(b) Asses the usefulness of these tests in distinguishing between metals and non-metals?

Solution :

(a) Place the sample on an iron block. Strike with hammer. If the sample takes the shape of a sheet, it is a metal. If it breaks into pieces, it is a non-metal.

Set up the arrangement by using a bulb, a battery, wires and switch. Insert the samples of metals and non-metals in the clips one by one and turn the switch on. If the bulb glows, the sample is a metal, if not, then the sample is non-metal.

(b)The above two methods can, in general, be used to distinguish between metals and non-metals.

4. Metallic oxide of zinc, magnesium and copper were heated with following metals :

	Metal	Zinc	Magnesium	Copper
1.	Zinc oxide			
2.	Magnesium oxide			
3.	Copper oxide			

In which case will you find displacement reactions taking place?

Solution :

Based on the activity series of metals, the displacement reactions will take place as below:

	Metal	Zinc	Magnesium	Copper
1.	Zinc oxide	–	Displacement	–
2.	Magnesium oxide	–	–	–
3.	Copper oxide	Displacement	Displacement	–

5. Define the following terms :**(i) Minerals****(ii) Ores and****(iii) Gangue****Solution :**

(i) Minerals- the element or compounds which occur naturally in the earth crust are known as minerals.

(ii) Ores- Minerals from which metal can be extracted profitably and easily are called ores.

(iii) Gangue- Impurities such as soil and sand which are present in the minerals are called gangue.

6.(i) Write the electro-dot structures for sodium, oxygen, and magnesium.

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

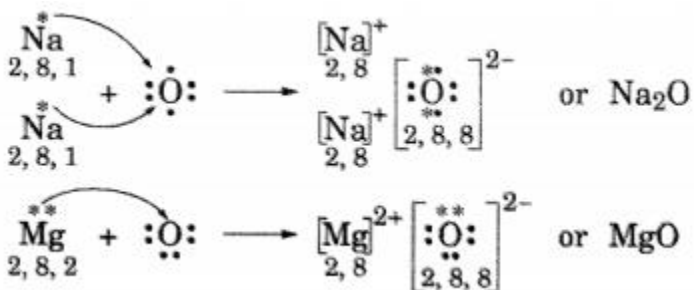
(iii) What are the ions present in these compounds?

Solution :

(i) Electron-dot structure for sodium, oxygen and magnesium are

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

(ii)



(iii) Ions present in Na_2O are Na^+ and O^{2-}

Ions present in MgO are Mg^{2+} and O^{2-}

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

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

Use the table given 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 order of decreasing reactivity.

Solution :

(i) B is the most reactive metal

(ii) If B is added to a solution of copper (II) sulphate, displacement reaction will take place. Blue colour of copper sulphate will fade and red –brown copper will settle down.

(iii) The decreasing order of reactivity is:

B > A > C > D

MULTIPLE CHOICE QUESTIONS

1. Which of the following oxides of iron would be obtained on the prolonged reaction of iron with steam?

- a) FeO
- b) Fe₂O₃
- c) Fe₃O₄
- d) Fe₂O₃ and Fe₃O₄

Correct Answer: Option (c)

2) A non-metal used to preserve food material is:

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

Correct Answer: Option (d)

3) The arrangement for Copper, Tin, Lead and Mercury, according to the reactivity series, is:

- a) Tin > Lead > Copper > Mercury
- b) Lead > Copper > Mercury > Tin
- c) Copper > Mercury > Tin > Lead

d) Mercury> Tin> Lead> Copper

Correct Answer: Option (a)

4) The metals that float when treated with water are:

a) Manganese and sodium

b) Sodium and calcium

c) Magnesium and sodium

d) Magnesium and calcium

Correct Answer: Option (d)

5) 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)

Correct Answer: Option (d)

6) When hydrochloric acid is added to barium hydroxide, a white-coloured compound is formed. Which of the following option gives the complete chemical reaction?

- a) $\text{HCl} + \text{Ba}(\text{OH})_2 \rightarrow \text{BaCl}_2 + 2\text{HOH}$
- b) $2\text{HCl} + \text{Ba}(\text{OH})_2 \rightarrow \text{BaCl}_2 + 2\text{HOH}$
- c) $2\text{HCl} + \text{Ba}(\text{OH})_2 \rightarrow \text{BaH}_2 + 2\text{HCl} + \text{O}_2$
- d) $\text{HCl} + 2\text{Ba}(\text{OH}) \rightarrow 2\text{BaCl}_2 + 2\text{HOH} + \text{O}_2$

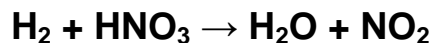
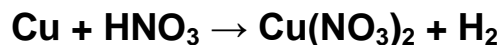
Correct Answer: Option (b)

7) What happens when a pellet of sodium is dropped in water?

- (a) It catches fire and forms oxide
- (b) It absorbs heat and forms oxide
- (c) It catches fire and forms hydroxide
- (d) It absorbs heat and forms hydroxide

Correct Answer: Option (c)

8) The chemical reaction between a piece of copper and nitric acid is given by the chemical equations,



What can be inferred from the chemical equation?

- a) Copper causes the oxidation of HNO_3 to form NO_2
- b) Hydrogen gas gets oxidised by HNO_3 to form water

- c) Gas reacts with oxygen in the air to form water
- d) Nitrate reacts with hydrogen to form NO_2 and H_2O

Correct Answer: Option (b)

9) Which of the following options gives the process of extraction of mercury from its ore cinnabar?

- (a) Cooling cinnabar in the presence of excess air
- (b) Cooling cinnabar to convert it into mercuric oxide and then heating it
- (c) Cinnabar to convert it into mercuric oxide and then heating it again
- (d) Cinnabar in the presence of limited air, and then adding a small amount of water

Correct Answer: Option (c)

10) When calcium oxide is added to water, it completely dissolves in water without forming bubbles. What products are formed in this reaction?

- (a) Ca and H_2
- (b) Ca and H_2O_2
- (c) Ca(OH)_2
- (d) CaH_2

Correct Answer: Option (c)

FILL IN THE BLANKS

1. Metals generally form _____ ions.

Answer: positive/cation

2. The property of metals to be drawn into thin wires is known as _____.

Answer: ductility

3. Non-metals are generally _____ conductors of electricity.

Answer: poor

4. The outermost shell of non-metals usually contains _____ electrons.

Answer: 4-8

5. _____ is a metal that is a liquid at room temperature.

Answer: Mercury

6. The metal that does not react with water or steam is _____.

Answer: Gold

7. Non-metals generally form _____ ions.

Answer: negative/anion

8. Metals are usually solid at room temperature, except for _____.

Answer: Mercury

9. The property of metals to be hammered into thin sheets is known as _____.

Answer: malleability

10. Non-metals are typically _____ at room temperature.

Answer: gases