

Chapter 3: Metals and Non-metals

Question 1:

Define amphoteric oxides. Give two examples.

Answer:

Oxides that react with both acids and bases to form salt and water are known as amphoteric oxides.

Examples: PbO and Al_2O_3 .

Question 2:

Write two metals that

1. Displaces hydrogen from dilute acids.
2. Does not displace hydrogen from dilute acids.

Answer:

1. Mg and Zn as they are very reactive.
2. Ag, Cu, etc. as they are less reactive.

Question 3:

In the process of electrolytic refining of a metal called 'M', what will be considered as?

1. The anode
2. The cathode
3. The electrolyte

Answer:

1. Impure and thick block of metal M.
2. Thin strip or wire of pure metal M.
3. Suitable salt solution of metal M.

Question 4:

How to prevent iron from the process of rusting? Give two ways.

Answer:

1. Rust proof paints can be used as a coat on the surface of iron.

2. Oil/grease can be applied on the surface of iron objects as it will prevent the iron surface to get in contact with air consisting of moisture.

Question 5:

When non-metals combine with oxygen, what types of oxides are formed?

Answer:

It forms either acidic or neutral oxides. N_2O_5 or N_2O_3 is an acidic oxide; CO is a neutral oxide.

Question 6:

Give reasons for the following statements below:

1. Metals replace hydrogen from dilute acids and non-metals do not.
2. During the process of extraction, ores of sulphide and carbonate are converted into oxides.

Answer:

1. As metals readily lose electrons they are electropositive in nature. These electrons reduce the number of protons liberated from the acid to further liberate hydrogen gas, whereas the non-metals gain electrons and they do not allow liberation of electrons to protons from acids. Therefore, H_2 gas cannot be liberated.
2. Before reduction takes place metal sulphides and carbonates has to be converted to oxides because it is easier to reduce metal oxides to metal.

Question 7:

On the basis of chemical properties, write the difference between metals and non-metals.

Answer:

Metals	Non-metals
When metals are heated with oxygen, they form ionic oxides which are basic in nature and dissolve in water to form of bases, turning red litmus to blue.	When non-Metals are heated with oxygen, they form covalent oxides which are acidic in nature and dissolve in water to form acids, turning blue litmus to red.
They are electro positive, lose electrons readily and become a positive ion.	They are electro negative, gain electrons and become negative ions.

Metals are lustrous.	Non-metals are non-lustrous; exception is graphite.
Reducing agents.	Good oxidizing agents.
Metals are conductor of electricity and heat.	Non-metals are non-conductor of electricity and heat; exception is graphite.
All metals are solid except mercury.	Non-metals are solid-liquid gaseous

Question 8:

Why do the surface of few metals have a dull appearance when they are exposed to air for a long period of time?

Answer:

This is because metals undergo surface oxidation when exposed to moist air. E.g. Copper (Cu) turns green on its surface because of the formation of copper carbonate ($\text{Cu}(\text{OH})_2 \cdot \text{CuCO}_3$). Silver turns black on its surface because of the formation of black Ag_2S . Aluminum turns white on its surface because of Al_2O_3 .

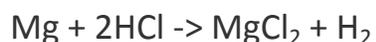
Question 9:

In the following metals which will give hydrogen when it is added to dilute hydrochloric acid.

1. Iron
2. Copper
3. Magnesium

Answer:

Copper (Cu) does not react with dilute hydrochloric acid which means that copper is less reactive than iron.



Question 10:

Write down a non-metallic element that conducts electricity.

Answer:

Carbon in the form of graphite conducts electricity because of the free electron in each of the carbon atom, as it moves freely in between the hexagonal layers.

Question: 11

Write down the name of metals that do not corrode easily.

Answer:

Noble metals like gold, platinum, etc. do not corrode in air.

Question 12:

Define alloys.

Answer:

Homogenous mixtures of two or more metals, or a metal and a non-metal are known as alloys. E.g. brass, steel, bronze and etc.

Question 13:

What do you mean by following terms?

1. Minerals
2. Ores
3. Gangue

Answer:

1. Minerals are compounds also known as elements, which are naturally in the earth's crust. E.g. Alums, $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$, etc.
2. Ores are minerals from which metal can be extracted and as a result they are called ores. Bauxite $Al_2O_3 \cdot 2H_2O$ is the ore of Al, copper pyrite $CuFeS_2$. All minerals are not considered as ores but all ores are also minerals.
3. Ores mined from the earth are naturally contaminated with sand rocky materials. There are impurities present in the ore which is known as gangue.

Question 14:

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

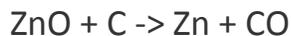
Answer:

In nature, Platinum and Gold are found to be in the free state.

Question 15:

While obtaining a metal from its oxide, what is the chemical process used?

Answer:



Question 16:

Name two metals which can form hydrides with metals.

Answer:

Two metals that can form stable hydrides on reacting with hydrogen are sodium and calcium.

Question 17:

Explain that "Every mineral have a definite and a fixed composition".

Answer:

Mineral can be widely distributed in the earth's crust in the form of carbonates, oxides, sulphates, sulphides, nitrates, etc. These minerals can be formed as a result of chemical changes taking place during the formation of the earth. Therefore we can say that all minerals have a definite and fixed composition.

Question 18:

Define the terms:

Answer:

1. Malleable is being able to be beaten/hammered into thin sheets.
2. Ductile is being able to be drawn into thin wires.

Question: 19

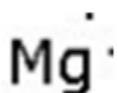
1. Write the electron dot structure or sodium, oxygen and magnesium.
2. Show the formation of MgO and Na₂O by the transfer of electrons.
3. What are the ions present in these compounds?

Answer:

1.Sodium:

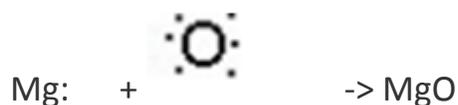
2.Oxygen:

3.Magnesium:



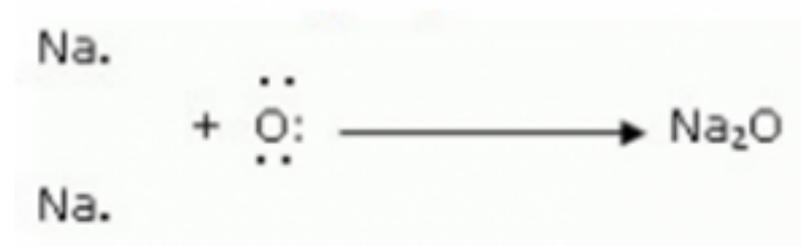
2. Formation of Magnesium oxide:

When magnesium reacts with oxygen, the magnesium atom transfers its two outermost electrons to an oxygen atom. By losing two electrons, the magnesium atoms form a magnesium ion (Mg^{2+}) and by gaining two electrons, the oxygen atom forms an oxide ion (O^{2-}).



Formation of Sodium oxide:

Two sodium atoms transfer their 2 outermost electrons to an oxygen atom. By losing two electrons, the two sodium atoms form two sodium ions (2Na^+). And by gaining two electrons, the oxygen atom forms an oxide ion (O^{2-}).



3.The ions present in sodium oxide compound (Na_2O) are sodium ions (2Na^+) and oxide ions (O^{2-}).

The ions present in Magnesium oxide compound (MgO) are magnesium ions Mg^{2+} and oxide ions (O^{2-}).

Question 20:

Tarnished copper vessels are being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.

Answer:

These sour substances contain acids. These acids dissolve the coating of copper oxide or basic copper carbonate present on the surface or tarnished copper vessels and make them shining red-brown again.

Question 21:

Give an example of a metal which –

1. Is a liquid at room temperature.
2. Can be easily cut with a knife.
3. Is the best conductor of heat.
4. Is a poor conductor of heat.

Answer:

1. Mercury.
2. Sodium and potassium.
3. Silver
4. Mercury

Question 22:

Why is sodium, kept immersed in kerosene?

Answer:

Sodium metal is kept immersed in kerosene to prevent their reaction with oxygen, moisture and carbon dioxide of air.

Question 23:

Ionic compounds have high melting points. Why?

Answer:

Ionic compounds are made up of positive and negative ions. There is a strong force of attraction between the oppositely charged ions, so a lot of heat energy is required to break this force of attraction and melt the ionic compounds. This is why ionic compounds have high melting points.

Question 24:

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?

Answer:

Aqua regia (By volume, this contains three parts of concentrated hydrochloric acid and one part of concentrated nitric acid) is the solution, which is used to sparkle the bangles like new but their weight will be reduced drastically.

Question 25:

Write equations for the reactions of

1. Iron with water
2. Calcium and potassium with water.

Answer:

1. Iron reacts with steam to form magnetic oxide of Fe with the liberation of H₂.
 $3\text{Fe}(\text{s}) + 4\text{H}_2\text{O}(\text{g}) \rightarrow \text{Fe}_3\text{O}_4(\text{s}) + 4\text{H}_2(\text{g})$

2. Calcium reacts with water to form calcium hydroxide and hydrogen.



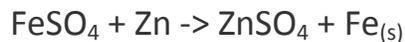
Potassium reacts with cold water violently immediately with evolution of H₂ which catches fire.

**Question 26:**

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

Answer:

Zinc is more reactive (more electro positive) than iron. Therefore it displaces iron from its salt solution. The colour of ferrous sulphate is pale green, which becomes colorless.



Light green Zinc sulphate

Question 27:

Pratyush took Sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over the burning Sulphur. What will be the action of this gas on:

1. Dry litmus paper?
2. Moist litmus paper?

Write a balanced chemical equation for the reaction taking place.

Answer:

1. When Sulphur is burnt in air then Sulphur dioxide gas is formed.
2. Sulphur dioxide gas has no action on dry litmus paper.
3. Sulphur dioxide gas turns moist blue litmus paper to red.
4. $\text{S}_{(s)} + \text{O}_{2(g)} \rightarrow \text{SO}_{2(g)}$