
Chapter – 3 (Metals and No-metals) (Class 10)

Questions:

Question:1 Which of the following pairs will give displacement reactions?

- a.) NaCl solution and copper metal.
- b.) MgCl₂ solution and aluminium metal.
- c.) FeSO₄ solution and silver metal.
- d.) AgNO₃ solution and copper metal.

Answer:

Option (d) i.e. AgNO₃ solution and copper is correct answer. Copper displace the silver cations, in the process copper itself being oxidised to Copper (II) cations and going into solution. So silver metal precipitating out and a copper II nitrate solution will be remaining.



Question:2 which of the following methods is suitable for preventing an iron frying pan from rusting?

- a.) Applying grease
- b.) Applying paint
- c.) Applying's a coating of zinc
- d.) All of the above.

Answer:

(c.) option is correct.

Though applying grease and applying paint prevents iron from rusting but we cannot apply these methods on frying pan hence applying a coat of Zinc is most appropriate method to prevent an iron pan from rusting.

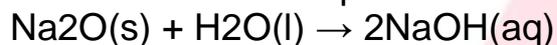
Question:3 An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be

-
- a.) Calcium
 - b.) Carbon

 - c.) Silicon
 - d.) Iron

Answer:

Metal oxides are basic in nature. Hence, answer could be options A and D. But most metal oxides are insoluble in water and only some of these dissolve in water to form alkalis. Sodium oxide and potassium oxide dissolve in water to produce alkalis as follows –



So, the correct option is A

Question: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.

Answer:

Answer is c. Food cans are coated with tin and not zinc because Zinc is more reactive that is electropositive than tin.

Question:5 You are given a hammer, a battery, a bulb, wires and a switch.

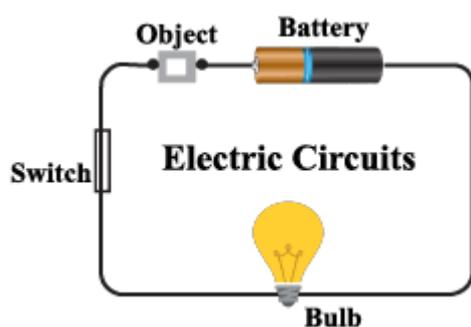
- a.) How could you use them to distinguish between samples of metals and non-metals?
- b.) Assess the usefulness of these tests in distinguish between metals and non-metals.

Answer:

(a) If the substance can be hammered to convert into sheets then it is metal if it is broken into pieces then it is non-metal.

(b) Set up the circuit arrangement using bulb, battery, wire and switch. Place the object between the ends of circuit. If the bulb starts glowing then the substance is a metal otherwise it is non-metal because metals are good conductor of electricity.

Generally above methods can be used to identify metals and non-metals. But there are some exceptions also for example sodium is metal which is not malleable in fact it is brittle. Graphite, allotrope of non-metal carbon, is a good conductor of electricity.



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

Answer:

Amphoteric oxides are the one which reacts with both acids and bases to form salt and water.

Example: Lead oxide – PbO, Aluminium oxide – Al₂O₃.

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

Answer:

Metals that are more reactive than hydrogen displace it from dilute acids.

For example: sodium and potassium.

Metals that are less reactive than hydrogen do not displace it.

For example: gold and silver.

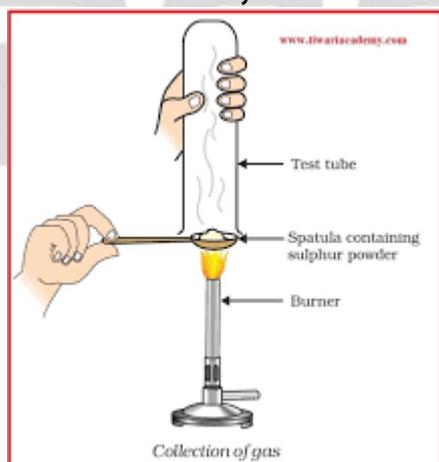
| | | |
|-----------|----------------|----|
| potassium | most reactive | K |
| sodium | | Na |
| calcium | | Ca |
| magnesium | | Mg |
| aluminium | | Al |
| carbon | | C |
| zinc | | Zn |
| iron | | Fe |
| tin | | Sn |
| lead | | Pb |
| hydrogen | | H |
| copper | | Cu |
| silver | | Ag |
| gold | | Au |
| platinum | least reactive | Pt |

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

Answer:

In the process of electrolytic refining of a metals called 'M' , an impure and thick block of metal M, is considered as anode, Thin strip or wire of pure metal M is taken as anode A suitable salt solution of metal M is considered as the electrolyte.

Question: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.



a.) What will be the action of gas on

-
- i.) Dry litmus paper?
ii.) Moist litmus paper?
b.) Write the balanced chemical equation for the reaction taking place.

Answer:

- a.) When sulphur is heated in air, sulphur dioxide gas is formed.
i.) Sulphur dioxide has no action on dry litmus paper.
ii.) Sulphur dioxide turns blue litmus paper to red.
- b.) $S(s) + O_2(g) \rightarrow SO_2(g)$ Sulphur Oxygen Sulphur dioxide.
 $SO_2(g) + H_2O \rightarrow H_2SO_3$

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

Answer:

1. Iron can be prevented from rusting by coating the surface of the iron with rust proof paints.
2. By applying oil/grease on the surface of iron objects as it will prevent the iron surface to get in contact with air consisting of moisture.

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

Answer:

When non-metals combine with oxygen it forms either acidic or neutral oxides,

Example: N_2O_5 OR N_2O_3 is an acidic oxide; CO is a neutral oxide.

Question:12 Give reasons

- a.) Platinum, gold and silver are used to make jewellery.
b.) Sodium, potassium, and lithium are stored under oil.

-
- c.) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.**
- d.) Carbonate and sulphide ores are usually converted into oxides during the process of extraction.**

Answer:

(a) Platinum, gold and silver are used to make jewellery because these are low reactive metals. So they rarely corrode and hence do not lose their shine and lustre.

(b) The reaction of these substances with oxygen is highly exothermic which may cause fire, also they react with water to form base so they are kept in oil.

(c) This is because aluminium is good conductor of heat and electricity. To prevent its reaction with food at high temperature a protective layer of aluminium oxide (Al_2O_3) is formed which prevent further corrosion.

(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction because it is easier to obtain metal from its oxide as compared with its sulphides or carbonates ore.

Question: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.

Answer:

Copper reacts with moist carbon dioxide in air to form copper carbonate and as a result, copper vessel loses its shiny brown surface forming a green layer of copper carbonate. The citric acid present in the lemon or tamarind neutralises the basis copper carbonate and dissolves the layer. That is why, tarnished copper vessels are cleaned with lemon or tamarind juice to give the surface of the copper vessel its characteristic lustre.

Question:14 Difference between metal; and non-metal on the basis of their chemical properties.

Answer:

| Metals | Non-metals |
|---|--|
| When metals are heated with oxygen, they form ionic oxides which are basic in nature and form bases on dissolving with water. This turn red litmus paper to blue. | When non-metals are heated with oxygen, they form covalent oxides which are acidic in nature which form acid on dissolving with water. This turn blue litmus paper to red. |
| They are electropositive, 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; graphite is the exception. |
| Reducing agents. | Good oxidizing agents. |
| Metals are the good conductors of electricity and heat. | Non-metals are non-conductors of electricity and heat; graphite is the exception. |
| All metals are solids except mercury. | Non-metals are in solid-liquid and gaseous states. |

Question: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?

Answer:

The man had used the solution of aqua-regia is a mixture of nitric acid and hydrochloric acid, optimally in a molar ratio of 1:3. On dipping the gold jewellery in the acid solution, the outer layer of gold dissolves and the inner shiny layer appears. This causes a loss in its weight.

Question:16 Give reasons why copper is used to make hot water tanks and not steel.

Answer:

Copper does not react with cold water, hot water, or steam. However, iron reacts with steam. If the hot water tanks are made of steel (an alloy of iron), then iron would react vigorously with the steam formed from hot water. That is why copper is used to make hot water tanks, and not steel.

In-text questions:

Que.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 is the metal which is liquid at room temperature.

(ii) Sodium & Potassium are the metals that can be cut with a knife.

(iii) Silver is the metal which is the best conductor of heat.

(iv) Lead and Mercury are the metal that are poor conductors of heat.

Que.2 Explain the meanings of malleable and ductile.

Ans.

i.) Metals which can be beaten to sheets are said to be malleable.

ii.) Metals which can be drawn into thin wires are said to be ductile.

Que.3 Why is sodium kept immersed in kerosene oil?

Ans.

Sodium is a reactive metal, if kept open it will react with oxygen to explode and catch fire. Sodium metal is kept immersed in kerosene to prevent their reaction with oxygen, moisture and carbon dioxide of air.

Que.4 Write equations for the reactions of**i.) Iron with steam.****ii.) Calcium and potassium with water.**

Ans.

An equation for the reaction of:

a) Iron with steam

When a metal reacts with steam then the products formed are metal oxide and hydrogen gas.

Metal + steam -----> Metal oxide + Hydrogen

When red hot iron reacts with steam to form iron(II,III) oxide and hydrogen.

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

b) Calcium with water:

When a metal reacts with water(cold water or hot water) then the products formed are metal hydroxide and hydrogen gas.

Metal + steam -----> Metal hydroxide + Hydrogen

Calcium reacts with cold water to form calcium hydroxide and hydrogen gas:

$\text{Ca(s)} + 2\text{H}_2\text{O(l)} \xrightarrow{\quad\quad\quad} \text{Ca(OH)}_2\text{(aq)} + \text{H}_2\text{(g)}$

c) Potassium with water.

Potassium reacts violently with cold water to form potassium hydroxide and hydrogen gas:

$2\text{K(s)} + 2\text{H}_2\text{O(l)} \xrightarrow{\quad\quad\quad} 2\text{KOH(aq)} + \text{H}_2\text{(g)} + \text{heat.}$

In this reaction so much heat is produced get hydrogen gas formed catches fire and burns explosively.

Que.5 Which gas is produced when dilute hydrochloric acid is added to a reactive metal? Write the chemical reaction when iron reacts with dilute H₂SO₄.

Ans.

Hydrogen gas is liberated when dilute HCl is added to a reactive metal.

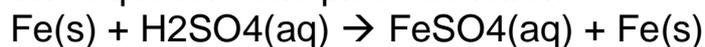
$\text{Fe(s)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{FeSO}_4\text{(aq)} + \text{H}_2\text{(g)}$

Que.6 What would you observe when zinc is added to a solution of iron (II) sulphate? Write the chemical reaction that takes place.

Ans.

We observed that the green color solution of iron sulphate changes its color and becomes colorless. The silver color zinc changes into black.

The equation takes place as follows--



Que.7

- i.) Write the electron-dot structures for sodium and oxygen.
- ii.) Show the formation of Na₂O and MgO by the transfer of electrons.
- iii.) What are the ions present in these compounds?

Ans.

(i) Electron dot structure is representation of elements with valence electrons as dots around the elements.

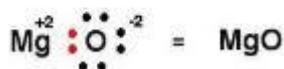


(ii) Formation of Magnesium oxides:

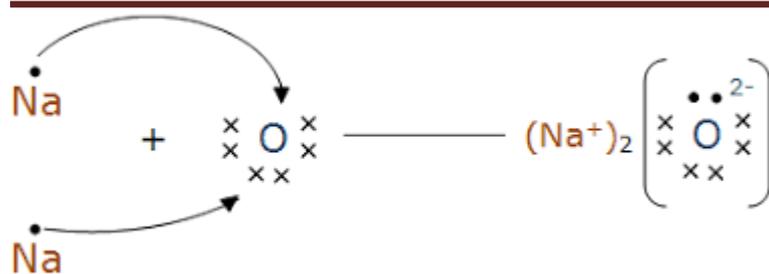
Magnesium Oxide



Magnesium loses 2 electrons, and Oxygen gains 2 electrons to have an Octet.



Formation of Sodium oxide:



(iii) The ions present in Na_2O are Na^+ and O^{2-} ions and in MgO are Mg^{2+} and O^{2-} ions.

Que.8 Why do ionic compounds have high melting points?

Ans.

Ionic compounds are formed by strong electrostatic forces of attraction between the ions. So, it requires a lot of energy to overcome these forces. So ionic compounds have high melting points.

Que.9 Define the following terms.

i.) Mineral

ii.) Ore

iii.) Gangue

Ans.

i.) Mineral: The naturally occurring compounds of elements are known as mineral.
Example – Alums, K_2SO_4 etc.

ii.) Ore: The mineral from which an element can be extracted easily and profitably is called an ore. Example – Bauxite $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ is the ore of Al, copper pyrite CuFeS_2 . All minerals are not considered as ores but all ores are also minerals.

iii.) Gangue: The impurities present in ore such as sand, rock etc. is known as gangue.

Que.10 Name two metals which are found in nature in the Free state.

Ans.

Gold and platinum are the two metals found in Free state in nature.

Que.11 What chemical process is used for obtaining a metal from its oxide?

Ans.

We can obtain metal from its oxide by using reduction process. The metal oxides are reduced using reducing agents such as highly reactive metals so that they can displace the metal from its oxide.

For e.g. From zinc oxide we can get zinc by using reducing agent carbon.



Que.12 Which metals do not corrode easily?

Ans.

Gold and platinum are the metals which do not corrode easily.

Que.13 What are alloys?

Ans.

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

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