

Class 8 Chapter – 04 Metals and Non - metals Study Notes

FOR FORMATIVE AND SUMMATIVE ASSESSMENT

A. MULTIPLE-CHOICE QUESTIONS:

- Which of the following is true for all metals?
 - They are hard solids.
 - They have high melting and boiling points.
 - They have 1-3 valence electrons.
 - They are malleable and ductile.
- Gold normally occurs in nature
 - in free state.
 - as carbonate ore.
 - as sulphate ore.
 - as sulphide ore.
- Which of these is the most reactive metal?
 - magnesium
 - gold
 - platinum
 - sodium
- Which of these metals cannot displace hydrogen from a dilute acid?
 - iron
 - zinc
 - silver
 - calcium
- Which one of the following alloys is light and strong?
 - brass
 - stainless steel
 - duralium
 - bronze
- Which of these metals can displace a. copper b. iron c. silver d. zinc
- Metal A dipped in a salt of metal B displaces B from the solution their salt solution. This shows that
 - A is more reactive than B.
 - B is more reactive than A.
 - both A and B are equally reactive
 - no such conclusion 1 i can be drawn.
- Metals react with oxygen to form
 - acidic oxides.
 - basic oxide
 - either acidic or basic oxide depending on the metal.
 - There is no reaction
- The metal most used in the construction industry is
 - iron.
 - copper.
 - aluminum.
 - tin.
- Pieces of copper, silver and gold are dropped into a solution of iron sulphate. The piece that will get a coating of copper is
 - iron.
 - silver.
 - gold.
 - none of them

Answer: 1. c. 2. a 3. d 4. c 6. d 7. a 8. b 9.a 10. d

B. VERY SHORT-ANSWER QUESTIONS: Give one-word answers.

- Name a metal which is liquid at room temperature. Ans: Mercury
- Metals generally have a low specific gravity. True or false? Ans: False
- If a material can be drawn into thin wires, it is said to be Ans: Ductile
- Aluminium does not react with water. True or false? Ans: True
- $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ is an example of a ----- reaction. Ans: Displacement
- Which metal is higher up in the reactivity series—sodium or silver? Ans: Sodium
- Any rock containing metallic mineral is called an ore. True or false? Ans: False
- is the most abundant element in the universe, whereas ----- is the most abundant element in the earth's crust. Ans: Hydrogen, oxygen
- Sand contains the non-metals ----- and ---- Ans: silicon, oxygen
- Which non-metal has very high melting and boiling points? Ans: Graphite
- Metal food containers have a coating of ----- Ans: tin
- Name a soft metal. Ans: Sodium
- What is the black material inside a pencil? Ans: Lead
- Metals react with oxygen to produce ----- oxides and non-metals react with oxygen to produce ----- oxides. Ans: Basic, acidic
- Do non-metals react with water? Ans: No.

16. A metal X can replace another metal Y from its metal salt. Is X above or below Y in the reactivity series?

Ans: X is above Y in the reactivity series

17. The presence of air and -----necessary for iron to rust. True or false? Ans: water

18. Galvanized iron starts rusting if there is a scratch on the zinc laver Ans: True

19. Copper corrodes in the presence of ----- and water Ans: carbon dioxide

20. Name a metal that does not corrode in air. Ans: Gold

C. SHORTANSVVER QUESTIONS (TYPE I): Answer in a sentence or two

1 What is the difference between the physical state of metals and non-metals at room temperature?

Ans: Difference between the physical state of metals and non-metals:

Metals are solid at room temperature except mercury which is liquid whereas non-metals are found in solid, liquid and gaseous state at room temperature like carbon, phosphorus, etc., are solids; bromine is a liquid while hydrogen, nitrogen, etc., are gases.

2. What do you mean by reactivity series of metals?

Ans: The reaction of metals with oxygen, water and acids shows that metals have different reactivities.

Potassium and sodium are the most reactive whereas silver and gold are the least reactive.

An arrangement of metals in decreasing order of reactivity is called the reactivity series of metals.

3. What is the advantage of galvanized iron over tin-plated iron?

Ans: Tin is electroplated on iron to make food containers. However, if the tin layer gets scratched, the iron starts rusting at that place. The tin can is then no longer suitable for storing food.

Whereas galvanized iron does not rust even if there is a scratch on the zinc layer. This is the advantage of galvanized iron over tin-plated iron.

4. What is an alloy? How alloys are generally made?

Ans: An alloy is a mixture of two or more metals or one or more metals and a non-metal. An alloy is usually made by mixing together metals in their molten form. They are also sometimes made by mixing metal powders together.

5. What are noble metals? Why are they used to make ornaments?

Ans: The metals which do not react with water, acids and alkalis, occur in the free state in nature are known as noble metals. Examples: gold, silver, platinum. As they are unreactive, they are used to make ornaments. They do not lose their shine easily.

6. Can a wire be drawn out of wood? Why not?

Ans: No, a wire cannot be drawn out of wood because wood is not a metal, thus it does not have ductility property.

7. Can alloying be used to lower the melting point? Give an example.

Ans: Yes. Solder an alloy of lead and tin has a melting point much lower than that of lead and tin.

8. How is anodizing of aluminium carried out?

Ans: It is done by passing an electric current through sulphuric acid using aluminium rod as anode. Oxygen is evolved at the anode which reacts with aluminium to form a uniform protective layer of aluminium oxide.

D.SHORT-ANSWER QUESTIONS (TYPE II) : Answer in about 30 words.

1. What do you mean by malleability and ductility? How are these properties different in metals and non-metals?

Ans: The property of metals by which they can be beaten into thin sheets is known as malleability, e.g. copper, aluminium.

The property of metals by which they can be drawn into thin wires is known as ductility, e.g. gold, silver. Metals are malleable and ductile in nature whereas non-metals are neither malleable nor ductile; they are brittle.

2. Give three examples of reactions between metals and water, to show that different metals have different reactivities.

Ans: Metals react with water to form oxides or hydroxides and hydrogen.

Different metals have different reactivities with water.

(i) Sodium reacts vigorously with water, giving off a lot of heat. $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2\uparrow$

(ii) Magnesium reacts with hot water or steam. $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2\uparrow$

(iii) Zinc reacts only with steam. $\text{Zn} + \text{H}_2\text{O} \rightarrow \text{ZnO} + \text{H}_2\uparrow$

3. Give the important uses of copper.

Ans: (a) It is widely used to make electric wires and cables. Copper coils are used in several electrical appliances.

(b) It is also used to make heating utensils, car radiators and calorimeters.

(c) It forms useful alloys.

4. Aluminium protects itself against corrosion. Discuss why it is necessary to anodize aluminum to make it corrosion resistant.

Ans: Aluminium protects itself against corrosion upon exposure to air by forming a layer of aluminium oxide. If this layer is made more uniform, it protects the aluminium underneath more effectively. Thus, this is done by a process called anodizing to make it corrosion resistant.

5. List three important uses of hydrogen. Ans: Three important uses of hydrogen are:

(i) to manufacture ammonia gas, which is used to manufacture fertilizers such as urea and ammonium sulphate.

(ii) to extract metals such as copper, lead and tin.

(iii) in oxy-hydrogen flame for cutting and welding metals.

6. List three uses of silicon.

Ans: The uses of silicon are:

(i) in the electronic and computer industries to make devices like transistors, microchips and solar cells.

(ii) to manufacture silicones, which are used for making waterproof clothes, greases and polishes.

(iii) to make insulating material for electrical appliances.

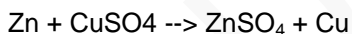
E. LONG-ANSWER QUESTIONS: Answer in about 60 words.

1. State whether a displacement reaction will occur if the following are mixed. Give reasons. Give the reaction.

a. copper sulphate and zinc b. copper sulphate and iron c. zinc sulphate and copper

d. zinc sulphate and iron f. iron sulphate and copper e. iron sulphate and zinc

Ans: (a) Copper sulphate and Zinc: A displacement reaction will occur between copper sulphate and zinc because zinc is placed above copper in the reactivity series. Thus, it will replace copper.



(b) Copper sulphate and Iron: A displacement reaction will occur because iron is placed above copper. Thus, it will replace copper. $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$

(c) Zinc sulphate and copper: A displacement reaction will not occur here because copper is placed below zinc. Thus, it will not replace zinc.

(d) Zinc sulphate and iron: A displacement reaction will not occur here because iron is placed below zinc. Thus, it will not replace zinc.

(e) Iron sulphate and zinc: A displacement reaction will occur because zinc is placed above iron. Thus, it will replace iron. $\text{Zn} + \text{FeSO}_4 \rightarrow \text{ZnSO}_4 + \text{Fe}$

(f) Iron sulphate and copper: A displacement reaction will not occur here because copper is placed below iron. Thus, it will not replace iron from iron sulphate.

2. Describe an experiment to show the conditions necessary for rusting of iron.

Ans: To investigate the conditions under which iron rusts, let us perform the following activity:

Take three test tubes labelled A, B and C and clean iron nails.

In test tube A, put a few lumps of anhydrous calcium chloride (a good drying agent which absorbs water vapour from the atmosphere). Put a layer of cotton over salt and then put the nail. Close the test tube with a cork.

In test tube B, take some pure (distilled) water. Boil it for one minute to remove any dissolved air. Then drop in the nail. To keep the air out, seal the water surface in the test tube by pouring molten wax on it (wax will solidify on the cool water surface). Close the test tube with a cork.

Half-fill test tube C with tap water and drop the nail in it. Close this test tube also with a cork.

Leave the tubes for several days and then examine them.

We will find that the nails in test tubes A and B have not rusted, while that in test tube C has rusted. The activity shows that for rusting to take place, both air (oxygen) and water are essential.

3. Discuss briefly the different methods used for preventing corrosion of metals.

Ans: Different methods are used for preventing corrosion of metals. They are:

(a) Painting or applying oil: Painting the surface of the metal after cleaning it thoroughly is the most common method which keeps air away. Applying grease or oil on the surface has a similar effect.

(b) Covering with another metal: Depositing a layer of another metal which is more resistant to corrosion is another commonly used method. The metals mostly used are tin and zinc.

This method can be done by the following ways:

(i) Galvanizing: Clean iron sheets are dipped in molten zinc to deposit a layer of zinc on it. This process is called galvanization.

(ii) Electroplating: Tin is electroplated on iron to make food containers commonly called tin cans.

(iii) Anodizing of aluminium: Anodizing process consists of passing an electric current through sulphuric acid using aluminium as anode. Oxygen is evolved at the anode which reacts with aluminium to form a uniform protective layer of aluminium oxide.

(iv) Alloying: An alloy is a mixture of two or more metals. It is used to alter the properties of metals to suit certain applications. Example: stainless steel is an alloy of iron, chromium and nickel, does not rust easily.

4. Give the names and composition of alloys that are used for the following.

- | | |
|--|---|
| a. making statues | b. joining wires in electronic equipments |
| c. making surgical instruments | d. making bodies of aircrafts |
| e. making accurate laboratory balances | f. making bodies of ships |

Ans. Used for	Names	Composition
(a) Making	statues	bronze copper, tin
(b) Joining wires in electronic equipment	solder	lead, tin
(c) Making surgical instrument	stainless steel	Iron, chromium, nickel
(d) Making bodies of aircraft	duralumin	aluminium, copper, magnesium, manganese
(e) Making accurate laboratory balances	magnalium	aluminium, magnesium

(f) Making bodies of ships

steel

iron, carbon

F. Hots Questions:

1. Silver is the best conductor of electricity Can you say why electric wires are not made of silver?

Ans: This is because it is very expensive

2. Why are bells made of metals and not from wood?

Ans: Bells are made of metals and not from wood because metals are sonorous but wood is not.

3. Suppose copper was high up in the reactivity series? Give reasons. Would it still have been such a useful metal .Give reason?

Ans: If copper had been higher up in the reactivity series it would have been very reactive, and would not have been useful as it would have got easily corroded.

4. It has been noticed that silverware becomes black faster today than it did fifty years ago. What can be the reason for this?

Ans: Silverware becomes black faster today than it did fifty years ago because of air pollution. Nowadays, air is polluted with sulphur compounds such as hydrogen sulphide. Silver reacts with it to form a black coating of silver sulphide.

5. Aluminium is above iron in the reactivity series. However, its reactions with oxygen and water seem to indicate that it is less reactive than iron. Explain.

Ans: When aluminium reacts with oxygen or water, it forms aluminium oxide which gets deposited as a thin layer on aluminium and prevents further oxidation. That is why the reaction of oxygen and water with aluminium appears to be slower than with iron.

6. If you are an engineer constructing a multi storey building, which alloy would you be extensively using and why?

Ans: Steel.

7. A doctor diagnosed a patient with iron deficiency, and gave him tablets containing iron. But the tablets were not hard and did not look like iron at all. What do you think the tablets contained?

Ans: The tablets contain iron in its compound form.

Extra score:

Name the metals and Non metal used for:

1. Filling electric bulb – Argon

2. Constructing bridge: - Iron

3. Making electric wire: - copper and aluminium

4. Making foil for wrapping food: - Aluminium

5. Making pencil leads: - Graphite

6. Making x-ray shield and bullets: - lead

7. Water purification: Chlorine

8. Filled in electric tube and glow sign: - Neon

9. Filled in gas balloon: - Helium

10. Preserve blood and other donated organ: - Nitrogen

Answer these questions:

1. Why are musical instrument and bell made up of metal?

Ans: Musical instrument and bell are made up of metal because metal produce ringing sound when struck by something.

2. Why are electric wire made up of copper?

Ans: Electric wire is made up of copper because copper is good conductors of electricity.

3. Why sodium and potassium stored in kerosene?

Ans: Sodium and potassium react quickly with oxygen at room temperature so they are stored in kerosene oil

4. Why is phosphorous stored under water?

Ans: phosphorous rapidly burn in air at room temperature so it is stored under water for safety.

5. Why silver and gold do not react with hydrochloric acid?

Ans: This is because silver and gold are less reactive than hydrogen.

6. Why is graphite not used for making electric cable?

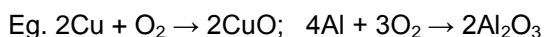
Ans: Graphite is a non metal that is brittle and cannot draw into wire. This is why graphite is not used for making electric cable

7. Could you store 500 ml Zinc sulphate solution in an aluminum vessel overnight? Give reason for your answer.

Ans: Aluminium is more reactive than zinc therefore displace zinc from Zinc sulphate solution and form salt with evolution of hydrogen gas. This is why we do not store Zinc sulphate solution in an aluminum vessel overnight.

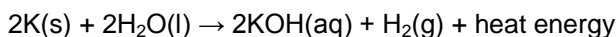
8. Describe any three properties of metal with suitable example?

Ans: (i) Metals combine with oxygen to form metal oxides.



(ii) In general metals react with water to form a metal oxide or hydroxide and hydrogen gas. But all metals do not react in the same way with water.

Metals like K and Na react vigorously with cold water to form hydrogen gas.

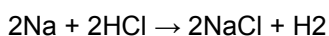


The reaction of calcium with water is less violent. The heat evolved is not sufficient for the hydrogen to catch fire.



Calcium starts floating because the bubbles of hydrogen gas formed stick to the surface of the metal.

(iii) Metals react with dilute acid, like dilute HCl to give a metal salt and H₂ gas.



Hydrogen gas is not evolved when a metal reacts with nitric acid (HNO₃). As HNO₃ is a strong oxidizing agent, it oxidizes the H₂ to water and itself gets reduced to oxide of nitrogen (N₂O, NO, NO₂).

Magnesium and Manganese react with very dil. HNO₃ to give H₂ gas.



9. What is aqua regia?

Ans: Aqua regia, (Latin for 'royal water') is a mixture of concentrated hydrochloric acid and concentrated nitric acid in the ratio of 3:1. It can dissolve gold, even though neither of these acids can do so alone.

Aqua regia is a highly corrosive, fuming liquid. It is one of the few reagents that is able to dissolve gold and platinum.

10. Name a non metal which When red hot reacts with steam. What happen as a result of the reaction

Answer: Carbon is a non metal. When it is red hot, it reacts with steam. This reaction forms a gaseous mixture of carbon monoxide and hydrogen, called water gas. The following reaction occurs:

