

NCERT Solutions for Class 10 Science

Chapter 3 – Metals and Non-metals

Intext Questions with Solutions of Class 10 Science Chapter 3 – Metals and Non-metals

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 and potassium

(iii) Silver

(iv) Mercury and lead

2.

Explain the meanings of malleable and ductile.

Ans:

Malleable: The capacity of a metal to be pounded into thin sheets is referred to as malleability, and the metal itself is so called.

Ductile: A metal is said to be ductile if there is a property that allows it to be pounded into thin wire or pipes.

3.

Why is sodium kept immersed in kerosene oil?

Ans: One metal that is reactive is sodium. It will react with oxygen to explode and burn if left exposed. So that it doesn't mix with oxygen, water, and carbon dioxide in the air, sodium metal is kept submerged in kerosene.

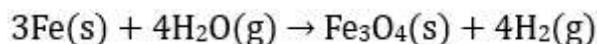
4.

Write equations for the reactions of

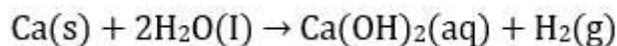
(i) iron with steam

(ii) calcium and potassium with water

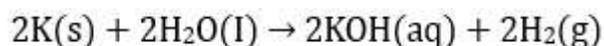
Ans: (i) When iron and steam combine, H₂ is released and a magnetic oxide of iron is created.



(ii) Calcium hydroxide and hydrogen are produced when calcium and water react.



Potassium and cold water react aggressively right away, producing H₂ that ignites.



5.

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 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

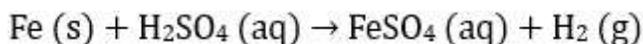
Ans:

- Displacement reaction with iron (II) sulfate makes metal B the most reactive.
- When metal B is put to copper (II) sulfate solution, a displacement reaction will occur, fading the blue color and forming a red-brown copper deposit on metal B.
- The most reactive metal is B, which displaces iron from its salt solution. Metal A displaces copper from its salt solution, making it less reactive. Metal C is less reactive since it can only displace silver from its salt solution, and metal D is the least reactive because it cannot displace any metal. In decreasing sequence of reactivity, metals are B > A > C > D.

6.

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

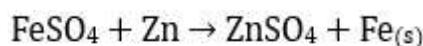
Ans: When a reactive metal is exposed to diluted hydrochloric acid, hydrogen gas is produced. Iron (II) sulfate is created when iron and diluted H₂SO₄ react, resulting in the production of hydrogen gas.



7.

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

Ans: Compared to iron, zinc is more reactive. Due to the creation of a colorless zinc sulphate solution and the deposition of iron metal on zinc, the greenish color of an iron (II) sulfate solution progressively disappears when zinc is added.

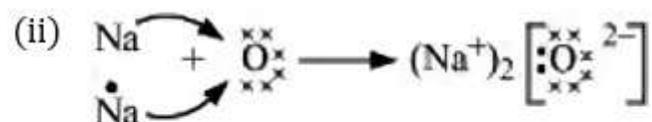


8.

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

Ans:

- (i) (a) Sodium (2, 8, 1) = $\overset{\cdot}{\text{Na}}$
(b) Oxygen (2, 6) = $\text{:}\overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{O}}}\text{:}$
(c) Magnesium (2, 8, 2) = $\overset{\cdot\cdot}{\text{Mg}}$



- (iii) The ions present in Na₂O are Na⁺ and O²⁻ ions and in MgO are Mg²⁺ and O²⁻ ions.

9.

Why do ionic compounds have high melting points?

Ans: Ionic compounds are stiff and densely packed because of the strong electrostatic force between their molecules. Ionic compounds have high melting points as a result of this close

packing.

10.

Define the following terms.

(i) Mineral (ii) Ore (iii) Gangue

Ans:

- i. Minerals are naturally occurring substances, usually referred to as elements, found in the Earth's crust. For example, alum and potassium sulfate (K_2SO_4). $Al_2(SO_4)_3 \cdot 24H_2O$, etc.
- ii. Ores are minerals from which metals can be mined. Example: Bauxite $Al_2O_3 \cdot 2H_2O$ is the ore of aluminum, while copper pyrite is represented as $CuFeS_2$. Not all minerals qualify as ores, yet all ores are classified as minerals.
- iii. Ores extracted from the soil are inherently polluted with sand and rocky elements. The ore contains impurities referred to as gangue.

11.

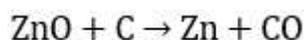
Name two metals which are found in nature in the free state.

Ans: Gold and platinum

12.

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

Ans: The electrolysis procedure reduces more reactive metals. Carbon or carbon monoxide can both degrade moderately reactive metals. Either highly reactive metals can displace the metals from their oxides or appropriate reducing agents, like carbon, can be used to decrease metal oxides. For instance, heating zinc oxide with carbon reduces it to metallic zinc.



13.

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 reaction	Displacement	No reaction
Magnesium oxide	No reaction	No reaction	No reaction
Copper oxide	Displacement	Displacement	No reaction

14.

Which metals do not corrode easily?

Ans: Silver, Gold and Platinum

15.

What are alloys?

Ans: A homogenous combination of two metals or metals and non-metals is called an alloy. Melting, combining, and finally solidifying the metals into an alloy is how they are created.

Eg: Bronze is an alloy of copper and tin.

Exercise Questions with Solutions of Class 10 Science Chapter 3 – Metals and Non-metals

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

Ans:

- a. Because metals are pliable, they can be readily smashed into sheets by hammering. However, non-metals break down when beaten and cannot be made into sheets because they are not malleable. When you connect metal to a battery, wire, and lightbulb, it creates a bulb because metals are good electrical conductors. In a similar vein, non-metals that are poor electrical conductors will not ignite the bulb when connected to a wire and battery.

b. These tests can be useful in illustrating the metals' and non-metals' malleability and electrical conductivity.

6.

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

Ans: Oxides that exhibit both acidic and basic properties are referred to as amphoteric oxides. Examples include aluminium oxide (Al_2O_3) and zinc oxide (ZnO).

7.

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

Ans: Since iron and aluminium are more reactive than hydrogen, they will displace hydrogen from diluted acids. Since copper and mercury are less reactive than hydrogen, they cannot remove hydrogen from diluted acids.

8.

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

Ans:

Cathode	-	Pure metal
Anode	-	Impure metal
Electrolyte	-	Metal salt solution

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?

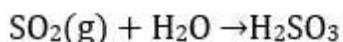
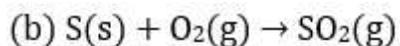
(ii) moist litmus paper?

(b) Write a balanced chemical equation for the reaction taking place.

Ans:

- a. Sulfur dioxide is made when sulfur powder is burned in air.
 - i. Sulfur dioxide doesn't change the way dry litmus paper works.

ii. Sulfur dioxide This will change the wet litmus paper from blue to red when SO_2 comes in contact with water.



10.

State two ways to prevent the rusting of iron.

Ans:

1. Applying rust-proof paint to the iron's surface will stop it from rusting.
2. Applying oil or grease to iron objects' surfaces will keep them from coming into touch with moisture-containing air.

11.

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

Ans: When non-metals react with oxygen, they create acidic oxides, which then react with water to form an acidic solution.

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.

Ans:

- a. Due to their malleability and ductility, platinum, gold, and silver are utilized to create jewellery. These have a high level of corrosion resistance.
- b. When exposed to oxygen, sodium, potassium, and lithium ignite due to their high reactivity. Their high reactivity and low ignition temperature are the causes of this.
- c. The surface of aluminium develops a non-reactive coating of aluminium oxide. This layer stops aluminium from reacting with other materials. For this reason, cooking utensils are made of aluminium.

d. Reducing a metal oxide to a free metal is simpler. The carbonate and sulphide ores are first transformed into oxides in order to recover the metals since it is simpler to acquire metals from their oxides than from their carbonates or sulphides directly.

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 reacts with moist carbon dioxide in the air to produce copper carbonate. Consequently, the lustrous brown surface of the copper vessel is replaced by a green layer of copper carbonate. The layer is dissolved by the citric acid in the lemon or tamarind, which neutralizes the basis copper carbonate. Consequently, in order to restore the copper vessel's distinctive luster, it is washed with lemon or tamarind juice.

14.

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

Ans:

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 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; graphite is the exception
Reducing agents.	Good oxidising 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.

15.

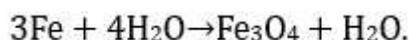
A man went door to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset 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?

Ans: Aqua regia was the solution he employed. 'Royal Water' is the meaning of the Latin term aqua regia. It is a 3:1 mixture of concentrated nitric acid and concentrated hydrochloric acid. It is capable of disintegrating metals such as gold and platinum. The weight of the gold bracelets was significantly reduced as a result of the dissolution of the outer layer in aqua regia.

16.

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

Ans: Copper does not react with cold water, boiling water, or steam. However, iron reacts to steam. If the hot water tanks are composed of steel (an iron alloy), iron will react violently with the steam produced by hot water.



This is why hot water tanks are made of copper rather than steel.