

# Metals and Non-metals

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## 1 Mark Questions

**1. A mineral is known as ore if metal**

- (a) Cannot be produced from it**
- (b) Can be produced from it**
- (c) Can be extracted from it profitably**
- (d) Is very costly**

**Ans. (c) Can be extracted from it profitably**

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**2. The earthy impurities associated with mineral used in metallurgy are called**

- (a) Slag**
- (b) Flux**
- (c) Gangue**
- (d) Ore**

**Ans. (c) Gangue**

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**3. A basic lining is given to a furnace by using**

- (a) Calcined dolomite**
- (b) Copper sulphate**
- (c) Haematite**
- (d) Silica**

**Ans. (a) Calcined dolomite**

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**4. Malachite is an ore of:**

- (a) Iron
- (b) Copper
- (c) Mercury
- (d) Zinc

**Ans. (b) Copper**

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**5. Metal always found in free state is:**

- (a) Gold
- (b) Silver
- (c) Copper
- (d) Sodium

**Ans. (a) Gold**

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**6. A process employed for the concentration of sulphide ore is**

- (a) Froth floatation
- (b) Roasting
- (c) electrolysis
- (d) bessemerisation

**Ans. (a) Froth floatation**

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**7. The slag obtained during the extraction of copper pyrites is composed mainly of**

- (a)  $Cu_2S$
- (b)  $FeSiO_3$

(c)  $CuSiO_3$

(d)  $SiO_2$

Ans. (b)  $FeSiO_3$

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**8. The common method for extraction of metals from the oxide ore is**

(a) Reduction with carbon

(b) reduction with hydrogen

(c) reduction with aluminium

(d) electrolytic method

Ans. (a) Reduction with carbon

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**9. An iron nail was suspended in  $CuSO_4$  solution and kept for a while the solution is**

(a) Remained blue and coating was found on the nail.

(b) turned green and a coating was formed on the nail

(c) remained blue and no coating was formed on the nail

(d) turned green and no coating was formed on the nail

Ans. (b) turned green and a coating was formed on the nail

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**10. The sulphide ore among the following is**

(a) haematite

(b) bauxite

(c) argentite

(d) zinc blende

Ans. (d) zinc blende

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**11. Chemically rust is**

- (a) Hydrated ferrous oxide**
- (b) Hydrated ferric oxide**
- (c) only ferric oxide**
- (d) none of these**

**Ans. (b) Hydrated ferric oxide**

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**12. Heating pyrites to remove sulphur is called**

- (a) Smelting**
- (b) Calcination**
- (c) Liquation**
- (d) Roasting**

**Ans.(d) Roasting**

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**13. Setting of Plaster of Paris takes place due to**

- (a) Solder**
- (b) Bronze**
- (c) Brass**
- (d) Bell metal**

**Ans. (a) Solder**

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**14. Some crystals of  $\text{CuSO}_4$  were dissolved in water. The color of the solution obtained would be**

- (a) Green**

**(b) Red**

**(c) Blue**

**(d) Brown**

**Ans. (c) Blue**

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**15. Most abundant metal on the surface of the earth**

**(a) Iron**

**(b) Aluminium**

**(c) Calcium**

**(d) Sodium**

**Ans. (b) Aluminium**

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**16. Zone refining is used for the**

**(a) concentration of an ore**

**(b) Reduction of metal oxide**

**(c) Purification of metal**

**(d) Purification of an ore**

**Ans. (c) Purification of metal**

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**17. Which of the following processes is used for the concentration of Bauxite**

**(a) Froth floatation**

**(b) Leaching**

**(c) Liqutation**

**(d) Magnetic separation**

**Ans. (b)** Leaching

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**18. During smelting, an additional substance is added which combines with impurities to form a fusible product. It is known as**

- (a) Slag**
- (b) Mud**
- (c) Gangue**
- (d) Flux**

**Ans. (d)** Flux

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**19. The lustre of a metal is due to**

- (a) its high density**
- (b) its high polishing**
- (c) its chemical inertness**
- (d) Presence of free electrons.**

**Ans. (d)** Presence of free electrons.

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**20. In the thermite process, the reducing agent is**

- (a) Nickel**
- (b) Zinc**
- (c) Sodium**
- (d) Aluminium**

**Ans. (d)** Aluminium

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**21. In addition to iron, stainless steel contains:**

- (a) nickel and chromium
- (b) Copper and tin
- (c) aluminium and magnesium
- (d) Carbon and magnesium

**Ans. (a) nickel and chromium**

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**22. The correct decreasing order of the metals in the activity series is:**

- (a) Ca, Mg, Ni, Fe
- (b) Ni, Ca, Mg, Fe
- (c) Ca, Mg, Fe, Ni
- (d) Mg, Ca, Fe, Ni

**Ans. (c) Ca, Mg, Fe, Ni**

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**23. Which of the following oxides is amphoteric in nature?**

- (a)  $\text{Na}_2\text{O}$
- (b)  $\text{MgO}$
- (c)  $\text{CaO}$
- (d)  $\text{Al}_2\text{O}_3$

**Ans. (d)**

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**24. A student adds one big iron nail each in four test tubes containing solution of zinc sulphate, aluminium sulphate, copper sulphate and iron sulphate. A reddish brown coating was observed only on the surface of iron nail which was added in the solution of:**

- (a) Zinc sulphate
- (b) Iron sulphate
- (c) copper sulphate
- (d) Aluminium sulphate

**Ans.** (c) copper sulphate

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**25. Iron nail clipped in a solution kept in a test tube. After half an hour it was observed that the colour of the solution was changed. The solution in test tube was that of:**

- (a) Zinc sulphate
- (b) Copper sulphate
- (c) Iron sulphate
- (d) Aluminium sulphate

**Ans.** (b) Copper sulphate

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

**Ans.** Gold and Platinum

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

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

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**28. Which of the following pairs will give displacement reactions?**

- (a) NaCl solution and copper metal
- (b)  $\text{MgCl}_2$  solution and aluminum



(c)  $\text{FeSO}_4$  solution and silver metal

(d)  $\text{AgNO}_3$  solution and copper

Ans. (d)  $\text{AgNO}_3$  solution and copper

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**29. 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

Ans. (c) Applying coating of zinc

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**30. 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

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**31. Food cans are coated with tin and not zinc because**

(a) Zinc is costlier than tin

(b) Zinc has higher melting point

(c) Zinc is more reactive than tin

(d) Zinc is less reactive than tin

**Ans.** (c) Zinc is more reactive than tin

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**32. What types of oxides are formed when non-metals combine with oxygen?**

**Ans.** Acidic oxides are formed when non-metals combine with oxygen.

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**33. Royal water is prepared by mixing two acids 'A' and 'B'. It can dissolve gold and platinum. It is highly corrosive and fuming liquid. Identify 'A' and 'B'. What is the ratio in which 'A' and 'B' are mixed.**

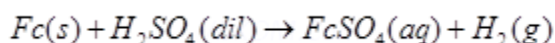
**Ans.**  $3\text{HCl} + \text{HNO}_3$

### 2 Mark Questions

**1. Which Gas is produced when a metal reacts with dilute hydrochloric acid?**

**Write the chemical reaction when iron reacts with dilute  $\text{H}_2\text{SO}_4$ .**

**Ans.** Hydrogen gas  $(\text{H})_2$  is produced when a metal reacts with dilute hydrochloric acid. Iron and dilute  $\text{H}_2\text{SO}_4$  react as follows:

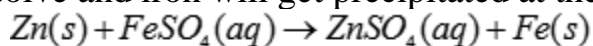


Hydrogen gas is evolved in this reaction also.

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**2. What would you observe when Zinc is added to a solution of Iron (II) sulphate? Write chemical reaction that taken place.**

**Ans.** The green colour of solution will slowly disappear. Zinc will gradually dissolve and iron will get precipitated at the bottom of the beaker.



(Dissolves)

(Precipitated)

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### 3. Why do ionic compounds have high melting points?

**Ans.** In the formations of ionic compounds, positive ions (cations) and negative ions (anions) participate. These are closely packed and the ionic compounds exist as crystalline solids. They have strong inter-ionic process of attraction and have high melting and forces of attraction and have high melting and boiling points.

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### 4. Why sodium is kept immersed in kerosene oil?

**Ans.** Sodium reacts both with air and water. It is therefore kept in kerosene oil in order to avoid contact with both air and water.

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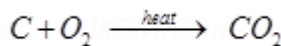
### 5. State two ways to prevent the rusting of iron.

**Ans. (i)** By applying a coating of grease or paint  
**(ii)** By depositing a layer of Zinc on the surface of iron.

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### 6. What type of oxide ore is formed when nonmetals combine with oxygen?

**Ans.** The oxides so formed are acidic in nature which when dissolved in water, their solutions change blue litmus red for ex-



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### 7. What are amphoteric oxides? Give examples?

**Ans.** Amphoteric oxides are the oxides which can act both as acids and bases for eg  $\rightarrow$  Aluminium oxide  $(Al_2O_3)$  and Zinc oxide  $(ZnO)$

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**8. Name two metals which can displace hydrogen from dilute acids and two metals which cannot do so?**

**Ans.** Sodium calcium can displace hydrogen from dilute acids.

Copper and silver cannot displace hydrogen from dilute acid.

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**9. Give reason why platinum, gold and silver are used to make jewellery.**

**Ans.** Platinum, Gold and silver are placed at the bottom of the activity series and are very little reactive in nature and are known as noble metals. They are not even affected by air, water and even by chemicals. Since they have bright lusture, we can use them for making jewellery.

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**10. Why copper is used to make hot water tanks and not steel?**

**Ans.** Since copper is used to make hot water tanks because it is good conductor of heat than steel.

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**11. Can all minerals of a metal act as ores? Justify.**

**Ans.** No, all minerals of a metal cannot act as ores but only those minerals can act as ores from which a metal can be conveniently and profitably extracted.

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**12. How does Galvanisation check rusting of iron?**

**Ans.** Galvanisation means coating the surface of iron metal with zinc. Since in activity series zinc lies above iron so it sacrifices itself for the sake of iron and prevents iron from rusting.

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**13. Metals are arranged in the reactivity series. Why hydrogen is kept in the series though it is not a metal?**

**Ans.** Hydrogen is a nonmetal but still it is placed in the reactivity series because it behaves as an electropositive element like metals i.e can lose electrons to form positive ions.

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**14. Why are metals generally lustrous?**

**Ans.** Metals are generally lustrous because they have a shining surface and when light falls on the surface of metal electrons absorb photons of light and release energy as light.

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**15. Corrosion of metals is not always harmful. Illustrate.**

**Ans.** Corrosion is a very harmful process resulting in slow eating up of a metal but corrosion of aluminium is useful as a layer of aluminium oxide ( $Al_2O_3$ ) formed as a result of chemical reaction and gets deposited on the surface of metal. It forms a protective coating on the surface and prevents the attacks of water, air, acids or alkalis.

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**17. Why does copper not liberate hydrogen on reacting with dilute sulphuric acid?**

**Ans.** Copper is placed below hydrogen in the activity series. It cannot lose electrons to  $H^+$  ions of the acid. Therefore, hydrogen gas is not evolved when copper reacts with dilute sulphuric acid.

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**18. Why are non-metals gaseous at room temperature?**

**Ans.** In the molecular form, non-metals exist as single molecules e.g. hydrogen, Oxygen, nitrogen, Carbon dioxide and ammonia etc. the attractive forces in these molecules are quite weak. Therefore, they exist as gases at room temperature.

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**19. Both calcium and magnesium are heavier than water but still float over it.**

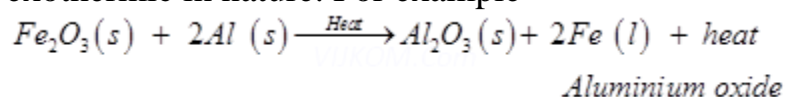
**Explain.**

**Ans.** The densities of metal Calcium and Magnesium are 1.74g/cc and 1.55g/cc respectively while that of water is 1.0g/cc at room temperature. However, both of them float over water surface. Actually hydrogen gas is evolved when these metals react with water. It is in the form of bubbles which stick on metal surface. Therefore, they float over water.

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**20. What is thermit reaction?**

**Ans.** Thermit reaction is the reduction of certain metal oxides such as  $MnO_2$ ,  $Cr_2O_3$  and  $Fe_2O_3$  etc. by aluminium metal upon strong heating. It is highly exothermic in nature. For example



**21. Why is sodium kept immersed in kerosene oil?**

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

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**22. Write equation for the reaction of**

**(i) Iron with steam**

**(ii) Calcium and potassium with water**

**Ans. (i)**  $3Fe + 4H_2O \rightarrow Fe_3O_4 + H_2$

**(ii)**  $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

$2K + 2H_2O \rightarrow 2KOH + H_2$

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

**Ans.** Hydrogen gas is produced when dilute hydrochloric acid is added to a reactive metal.

$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$

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

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

$Zn + FeSO_4 \rightarrow ZnSO_4 + Fe$

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**25. Why do ionic compounds have high melting points?**

**Ans.** 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.

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**26. Which metals do not corrode easily?**

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

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**27. What are alloys?**

**Ans.** 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.

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

**Ans.** 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

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

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

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

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

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**31. State two ways to prevent the rusting of iron.**

**Ans.** Rusting of iron can be prevented by

(i) By applying grease or paint.

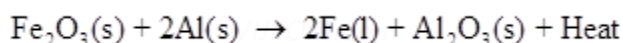
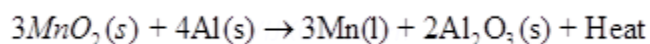
(ii) By galvanizing



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**32. A metal acts as a good reducing agent. It reduces Fe and MnO The reaction with Fe is used for welding broken railway tracks. Identify & the metal and write all the chemical reactions.**

**Ans.** Aluminum



**33. A yellow colored powder 'X' is soluble in carbon disulfide. It burns with a blue flame fanning suffocating smelling gas which turns moist blue litmus red. Identify 'X' and gives chemical reaction. Identify & it i metal or nonmetal.**

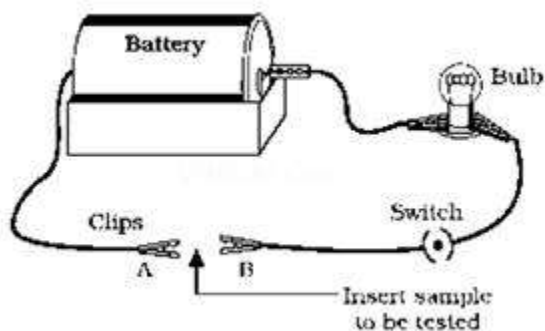
**Ans.** 'X' is sulphur

$\text{S} + \text{O}_2 \rightarrow \text{SO}_2$

It is non metal.

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**34. A student set up an electric circuit as shown in Fig. He placed the metal to be tested in the circuit between terminals A and B as shown.**



**(i) Does the bulb glow? What does this indicate?**

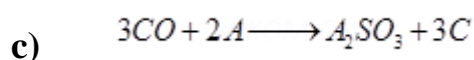
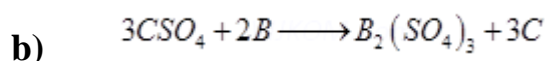
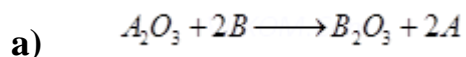
**(ii) Why are electric wires coated with rubber like materials?**

**Ans. (i)** Yes the bulb glows, this indicates that metal is a good conductor of electricity

**(ii)** Rubber like substance is a bad conductor of electricity

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**35. A, B and C are 3 elements which undergo chemical reactions according to following equations:**



**Answer of the following:**

**i) Which element is most reactive?**

**ii) Which element is least reactive?**

**Ans. (i)** Most reactive element is B as it has replaced both A and C from their compounds.

**(ii)** Element C is least reactive as it has been replaced both by A and B.

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**36. An element X on reacting with O<sub>2</sub> forms X Oxide dissolves in water and turns blue litmus paper red. Predict the nature of element whether it is a metal or a non metal.**

**Ans.** The oxide is acidic in nature as it has turned blue litmus to red. Hence X is a non metal.

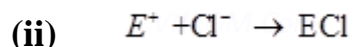
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**37. An element E combines with O<sub>2</sub> to form an oxide E which is a good conductor of electricity. Answer the following:**

**(i) How many electrons will be present in the outer most shell of E?**

**(ii) Write the formula of the compound formed when it combines with Chlorine.**

**Ans. (i)** Valency of the element B is 1. This means that it has only one electron in the valence shell.



Valency of Cl is 1 and Valency of B is also 1. Therefore, the formula will be E

### 3 Mark Questions

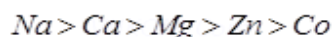
**1. Arrange the following metals in decreasing order of their reactivity:**

**(1)** *Cu, Ca, Mg, Na, Zn*

**(2) You are provided with three metals: sodium, magnesium and copper, Using only water as the reactant, how will you identify each of them**

**(3) Which metal listed in (1) is most likely to occur in the native state?**

**Ans. (1)** Based on the activity series, the decreasing order of reactivity of metals is:



**(2) (a)** The metal which reacts violently with cold water and catches fire is sodium

**(b)** The metal which evolves hydrogen gas upon heating with water is magnesium

**(c)** The metal which does not react with water even on strong heating is copper

**(3)** Copper is most likely to occur in the native (or free) state to a very small extent

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**2. Which method of concentration of an ore is preferred in the following cases and why?**

**(1) The ore has higher density particles mixed with a large bulk of low density impurities**

**(2) The ore consists of copper sulphide intermixed with clay particles Give an example of amalgam**

**Ans. (1)** The concentration of ore can be done by gravity separation method

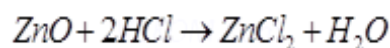
**(2)** The concentration of ore is done by froth floatation process An amalgam of mercury with silver or gold called dental alloy is used to fill cavities in the teeth

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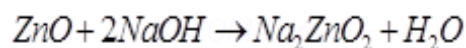
**3. (a) Why is  $ZnO$  called a amphoteric oxide? Name another amphoteric oxide**

**(b) What are alkali's? Give one example of alkali**

**Ans. (a)** Zinc oxide ( $ZnO$ ) is called amphoteric oxide as it behaves bath as acidic oxide and basic oxide



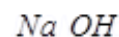
(Basic oxide) (Acid) Zinc chloride



(Acidic oxide) (Base) (Sodium *zincate*)

Aluminum oxide ( $Al_2O_3$ ) is another amphoteric oxide

**(b)** Water soluble hydroxides of metals are known as alkalies. For example



**4. 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) Assess the usefulness of these tests to distinguish between metals and non-metals**

**Ans. (a)** With the help of the things provided try to convert metals and non metals in the form of thin rods Metals will readily form into thin rods being malleable and non metals being brittle will break Now if we construct a cell using these rods or

plates the circuit which consists of metallic rod conducts whereas non metallic rod will not conduct

**(b)** From these tests we can say

**(i)** Metals are malleable whereas nonmetals are not

**(ii)** Metals are good conductors of electricity while non metals are not

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**5. Name an alloy of**

**(i)** Aluminium used in construction of aircrafts

**(ii)** lead in joining metals for electric work

**(iii)** copper used in house hold vessels

**Ans. (i)** Alloy is duralumin

**(ii)** Solder

**(iii)** Brass

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**6. Write three important properties of aluminium which are responsible for its great demand in industry?**

**Ans. (i)** It is a good conductor of electricity

**(ii)** It is not attacked by water

**(iii)** It is a powerful reducing agent

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**7. Which of the following metals would give hydrogen when added to dilute HCl**

**(1)** iron

**(2)** copper and

**(3)** magnesium

**Ans.** Both iron (Fe) and magnesium (Mg) will evolve hydrogen on reacting with dil HCl. These are active metals and are placed above hydrogen in the activity series. As copper is placed below hydrogen in the series, it will not evolve hydrogen.

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**8. Define an alloy and an amalgam. State the main constituents of the following alloys**

**Stainless steel, Bronze** In which property, each of them is different from its main constituent

**Ans.** An alloy is a homogeneous mixture of two or more metals or non-metals. An alloy in which mercury is one of the constituents is called amalgam.

**Stainless steel-** An alloy of iron, chromium, carbon and nickel. It does not get rusted, whereas iron is easily rusted.

**Bronze-** An alloy of copper and tin. It is less malleable than copper and is used for making coins, statues etc.

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**9. A group of students looked at different metals and metal sulphate solutions given in a tabular form. From the data, answer the following:**

Metal	Metal sulphate solution	Colour
1) Chromium	Chromium sulphate	Green
2) Cobalt	Cobalt sulphate	Pink
3) Copper	Copper sulphate	Blue
4) Magnesium	Magnesium sulphate	Colourless

**(a) Which metal reacted with all other sulphate solutions?**

**(b) Which metal did not react with any other metal sulphate solution?**

**(c) Arrange the metals in decreasing order of reactivity**

**Ans. (a)** Magnesium (Mg)

**(b)** Copper (Cu)

**(c)** Decreasing order of reactivity  $Mg > Cr > Co > Cu$

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**10. (1) A metal that gets covered with a protective film of its oxide (Al, Cu, Ag)**

**(2) A metal which burns in air with golden flame (Zn, K, Na)**

**(3) A metal which can displace hydrogen from boiling water as well as steam (K, Zn, Fe)**

**Ans. (1)** Aluminium (Al)

**(2)** Sodium (Na)

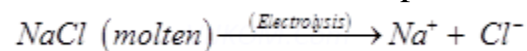
**(3)** Zinc (Zn)

**(4)** Magnesium (Mg)

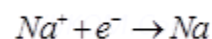
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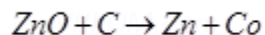
**11. Write one point of difference between electrolytic reduction and reduction with carbon Give one example of each**

**Ans.** The electrolytic reduction takes place at the cathode by the gain of electrons in electrolysis. At the same time carbon reduction is carried by heating a metal oxide with coke. For example



(Reduction by gain of electrons)





(Coke)(Heat) (Reduction by carbon)

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**12. (a) Arrange the following metals in decreasing order of their reactivity Cu, Ca, Mg, Na, Zn.**

**(b) You are provided with three metals: sodium, magnesium and copper**

**Using only water as the reactant how will you identify each of them?**

**(c) Which metal listed in (i) is most likely to occur in the native state**

**Ans.** (a)  $\text{Na} > \text{Ca} > \text{Mg} > \text{Zn} > \text{Cu}$

(b) (1) Metal reacts violently with cold water and catch fire is sodium

(2) Metal which evolves  $\text{H}_2$  gas upon heating with water is magnesium

(3) Metal which does not react with water on strong heating is copper

(c) Copper is found in native state

---

**13. Write the equation for the reaction of**

**(a) Iron with steam**

**(b) Calcium with water**

**(c) Potassium with water**

**Ans.** (a)  $3\text{Fe}(s) + 4\text{H}_2\text{O}(steam) \rightarrow \text{Fe}_3\text{O}_4(s) + 4\text{H}_2(g)$

(b)  $\text{Ca}(s) + 2\text{H}_2\text{O}(l) \rightarrow \text{Ca}(\text{OH})_2(s) + \text{H}_2(g)$

(c)  $2\text{K}(s) + 2\text{H}_2\text{O}(l) \rightarrow 2\text{KOH}(aq) + \text{H}_2(g)$

---

**14. Define the following terms:**

**(a) Minerals**

**(b) Ores**



**(c) Gangue**

**Ans. Minerals-** These are combined state of metals generally with non-metals

**Ores-** The minerals from which metals can be conveniently extracted are called an ore

**Gangue-** It represents the earthy impurities such as mud, sand and clay.

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**15. Pratyush took sulphur powder on a spatula and heated it He collected the gas evolved by inverting a test tube over it**

**What will be the action of gas in**

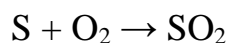
**(1) Dry litmus paper?**

**(2) Moist litmus paper?**

**Write a balanced chemical equation for the reaction taking place?**

**Ans. (1)** The gas is sulphur dioxide It will not react with litmus paper

**(2)** The gas will bleach moist litmus paper The balanced of chemical equation is



**16. Write any three differences between metals and non-metals on the basis of chemical properties?**

**Ans. Difference between metals and non-metals are-**

	Metals	Non- Metals
(1)	Oxides of metals are generally basic in nature	Oxides of non-metals are mostly acidic in nature
(2)	The compounds of metals are mostly ionic in nature	Compounds of non-metals are mostly covalent although there are many exceptions

(3)	<b>Metals act as reducing agents as their atoms loose electrons</b> <b>For e g:- <math>\text{Na} \rightarrow \text{Na}^+ + \text{e}^-</math></b>	<b>Non-metals are oxidizing agents as their atoms accept electrons</b> <b>For e g:- <math>\text{Cl} + \text{e}^- \rightarrow \text{Cl}^-</math></b>
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**17. Why is titanium metal called as strategic metal? Mention two of its properties which makes it so special**

**Ans.** Tritanium is called strategic metal because it is used for making certain war equipments

(1) It is light in weight but stronger

(2) It is not affected by corrosion even if kept open for a very long time

**18. (a) What is corrosion?**

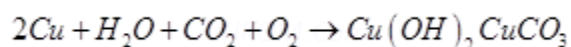
**(b) How is corrosion caused**

**(c) Complete the reaction**  $2\text{Fe} + \frac{3}{2}\text{O}_2 + x\text{H}_2\text{O} \rightarrow$

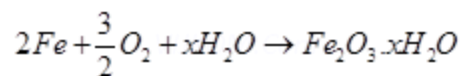
**Ans.** (a) The eating up of the surface of metal if kept open for a long time is called corrosion

(b) It is caused due to the eating of metals by the gasses and water vapours present in air due to the formation of certain chemical compound

For example: surface of copper acquires a green coating due to the formation of basic copper carbonate  $\text{Cu}(\text{OH})_2\text{CuCO}_3$



Component of air



Hydrated ferric oxide (rust)

---

**19. (1) Choose metal from the reactivity series which will not react with steam**

**(2) Choose one metal which will safely react with dilute sulphuric acid**

**(3) Name the salt formed when metal chosen in (2) reacts with sulphuric acid**

**Ans.** (1) Gold (Au)

(2) Zinc (Zn)

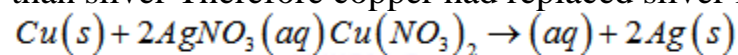
(3) The salt formed is  $ZnSO_4$  and is colourless

---

**20. A copper plate was dipped into a solution of      After sometime a black layer was deposited on the copper plate State the reason for it Write the chemical equation for the reaction involved**

**Ans.** Copper lies above silver in the activity series This means that copper is more reactive

than silver Therefore copper had replaced silver from  $AgNO_3$  solution



(Black)

Silver got deposited on the copper plate and changed to black after sometime because silver and also some salts of silver are sensitive to light They readily become blackish on standing or on exposure to air

---

**21. 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**

**Ans.** (i) Mercury

(ii) Sodium

(iii) Silver

(iv) Lead

---

## **22. Explain the meaning of malleable and ductile**

**Ans.** 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

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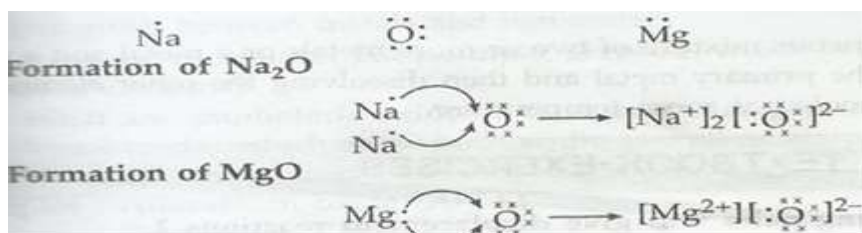
**23. (i) Write the electro-dot structures for sodium, oxygen, and magnesium**

**(ii) Show the formation of Na<sub>2</sub>O and MgO by the transfer of electrons**

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

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

(ii)



(iii) Ions present in  $\text{Na}_2\text{O}$  are  $\text{Na}^+$  and  $\text{O}^{2-}$

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

---

**24. Define the following terms:**

**(i) Minerals**

**(ii) Ores and**

**(iii) Gangue**

**Ans.** (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

---

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

Metal	Zinc	Magnesium	Copper
Zinc oxide			
Magnesium oxide			

**In which case will you find displacement reactions taking place?**

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

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

---

**26. 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, 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.

---

**27. 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?**

**Ans.** 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 bring out the shining bangles.

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

---

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

**Ans.** 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.

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

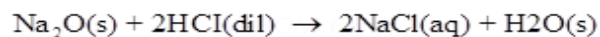
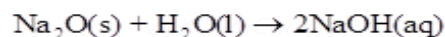
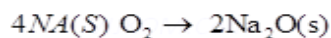
**Ans.** Metals and non-metals can be differentiated on the basis of following chemical properties

Metals	Non-metals
1. Metals displace hydrogen from water	1. Non-metal do not displace hydrogen from water
2. Metals are basic oxide	2. Non-metals are acidic oxides
3. Metals displace hydrogen from dilute acids	3. Non-metals displace hydrogen from dilute acids
4. Metals form ionic chlorides with chlorine	4. Non-metals form covalent chlorides with chlorine

---

**30. An element reacts with oxygen to form an oxide which dissolves in dilute hydrochloric acid. The oxide fanned also turns a solution of red litmus blue. Is the element a metal or non-metal? Explain with the help of a suitable example.**

**Ans.** It is metal



**31. Nikita took Zn, Al, Cu, Fe, Mg & Na metals & put each metal in cold water and then hot water. She reacted the metal with steam.**

**(i) Name the metal which reacts with cold water.**

**(ii) Which of the above metals react with steam?**

**(iii) Name the metal which reacts with hot water.**

**(iv) Arrange these metals in order of increasing reactivity.**

**Ans.** (i) Na

(ii) Al, Zn, Fe

(iii) Mg

(iv) Na > Mg > Al > Zn > Fe > Cu

---



**32. A student was given Mg, Zn, Fe, and Cu metals. He put each of them in dil HCl contained in different test tubes. Identify which of them**

**(i) will not displace H<sub>2</sub> from dil HCl**

**(ii) forms a pale green substance**

**(iii) will give H<sub>2</sub> with 5% NaNO**

**(iv) will be displaced from its salt solution by all other metals**

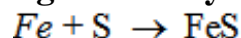
**Ans. (i) Cu**

**(ii) Fe**

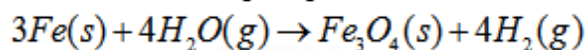
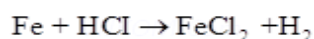
**(iii) Cu**

**(iv) Cu**

**33. A metal 'X' is found in the form of filings which burns vigorously when sprinkled on flame. When these filings are treated with sulphur, a black colored compound 'Y' is formed which is not attracted by magnet. 'X' reacts with dil HCl to liberate hydrogen gas. 'X' reacts with steam to form 'Z' along with hydrogen gas. Identify 'X', 'Y', and 'Z'. Write the reaction involved.**



**Ans. 'X' 'Y'**



**'Z'**

## 5 Mark Questions

1. (a) Name a metal which does not stick to glass?
- (b) Name a non-metal which is good conductor of electricity?
- (c) Name the metal which is commonly used in thermit welding?
- (d) What gets deposited at the cathode, a pure or impure metal?
- (e) What is the nature of Zinc oxide?

**Ans.**(i) Mercury

(ii) Graphite

(iii) Aluminum

(iv) A pure metal is always deposited at the cathode

(v) Zinc oxide (ZnO) is an amphoteric oxide.

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**2. Name three common forms in which metals occur in nature. Explain the interaction between metals and dilute acid?**

**Ans.** The three common forms in which metals occur in nature are

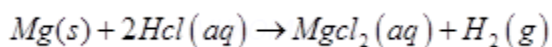
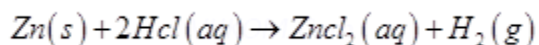
Sulphide form – copper pyrite  $(CuFeS_2)$

Oxide form – Bauxite  $(Al_2O_3 \cdot 2H_2O)$

Carbonate form – Calamine  $(ZnCO_3)$

Active metals generally interact with dil HCl or dil  $H_2SO_4$  to evolve hydrogen gas.

For eg-



The metals which lie below hydrogen in the activity series do not interact with dilute acid.

---

**3. Sample pieces of five metals A, B, C, D and E were added to the tabulated solutions separately. The results observed are shown in the table:**

Metal	$FeSO_4$	$CuSO_4$	$ZnSO_4$	$AgNO_3$	$Al(SO_4)$
A	No Change	No Change	No Change	Coating on metal	No Change
B	Grey Deposit on metal	Brown Coating on metal	No Change	Coating on metal	No Change
C	No Change	No Change	No Change	No Change	No Change
D	No Change	————	No Change	Coating on metal	No Change
E	————	Brown coating	New coating	New coating	No Change

**Based on the observations recorded in the table, answer the following:**

- (1) Which is the most reactive metal?**
- (2) Which is the least reactive metal?**
- (3) What would be observed if metal D were added to a solution of copper (II) sulphate?**
- (4) What would be observed if metal E were added to a solution of iron (II) sulphate?**
- (5) Arrange the metals A, B, C, D and E in decreasing order to their reactivity?**

**Ans.** (a)  $\text{Na} > \text{Ca} > \text{Mg} > \text{Zn} > \text{Cu}$

(b) (1) Metal reacts violently with cold water and catch fire is sodium.

(2) Metal which evolves  $\text{H}_2$  gas upon heating with water is magnesium.

(3) Metal which does not react with water on strong heating is copper.

(c) Copper is found in native state.

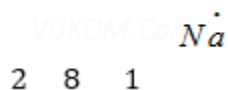
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**4. (1) Write electron dot structure for sodium, magnesium and oxygen?**

**(2) Show formation of        by the transfer of electrons?**

**Ans.** (1) Atomic No. of Na  $Z=11$

K   L   M



electron dot structure

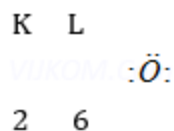
(2) Mg  $Z=12$

K   L   M



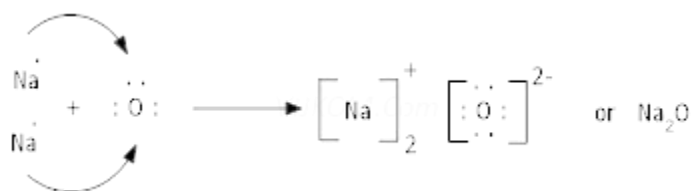
electron dot structure

(3) O  $Z=8$

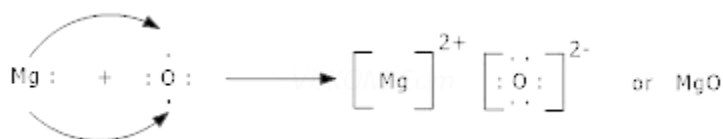


electron dot structure

(4) Formation of sodium oxide



Formation of magnesium oxide (MgO)

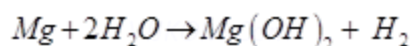


**5. Hydrogen gas is evolved by reacting a piece of magnesium ribbon with water:**

- (1) Describe how it could be shown that the gas collected is hydrogen.**
- (2) Write a chemical equation for the reaction taking place between magnesium and water using symbols.**
- (3) Suggest how the appearance of magnesium would change after a week.**
- (4) A few drops of universal indicator solution were added to water in the beaker. What colour would expect to see and what pH would this colour indicate?**

**Ans.** (1) If we bring a lighted splint near the gas, it will burn very brightly, accompanied by explosion along with a ‘pop sound’ this show that the gas evolved is hydrogen.

(2) The symbol equation for the reaction is:



(3) After a week’s time, magnesium will lose all its shine and a deposit of magnesium hydroxide will be formed on the surface of the metal.

(4) The indicator will acquire blue colour indicating that the solution is basic. The pH of the solution is expected to be more than seven.

---

**6. 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:**

<b>Metal</b>	<b>Iron(ii)suphate</b>	<b>Copper(ii)sulphate</b>	<b>Zinc sulphate</b>	<b>Silver nitrate</b>
<b>A</b>	<b>No reaction</b>	<b>Displacement</b>	_____	_____
<b>B</b>	<b>Displacement</b>	_____	<b>No reaction</b>	_____
<b>C</b>	<b>No reaction</b>	<b>No reaction</b>	<b>No reaction</b>	<b>Displacement</b>
<b>D</b>	<b>No reaction</b>	<b>No reaction</b>	<b>No reaction</b>	<b>No reaction</b>

**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.**

**Ans.**

(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:

$B > A > C > D$

---

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

**Ans.** (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.

---

**8. 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.**

**Ans.** (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.

---

**9. Four metals A, B, C and D are, in turn, added to the following solutions one by one. The observations made are tabulated below:**



<b>Metal</b>	<b>Iron (II) Sulphate</b>	<b>Copper (II) Sulphate</b>	<b>Zinc Sulphate</b>	<b>Silver Nitrate</b>
<b>A</b>	No reaction	Displacement	—	—
<b>B</b>	Displacement	—	No reaction	—
<b>C</b>	No reaction	No reaction	No reaction	Displacement
<b>D</b>	No reaction	No reaction	No reaction	No reaction

**Answer the following questions based on above information.**

- (i) Which is the most active metal and why?**
- (ii) What would be observed if B is added to a solution of copper (II) sulphate and Why?**
- (iii) Arrange the metals A, B, C and D in order of increasing reactivity.**
- (iv) Container of which metal can be used to store both zinc sulphate solution and silver nitrate solution.**
- (v) Which of the above solutions can be easily stored in a container made up of any of these metals?**

**Ans. (i) B**

**(ii) Displacement reaction. Because B is more reactive than Cu.**

**(iii) B.>A>CD**

**(iv) DI**

**(v) Zn**