

5

METALS AND NON-METALS

I. Multiple choice questions (Tick the correct option).

- The property due to which a metal can be beaten into sheets is called
(a) ductility (b) tenacity
(c) malleability (d) density
- A non-metal which is a good conductor of heat and electricity, is
(a) phosphorus (b) silicon
(c) graphite (d) sulphur
- The oxide of sodium is of
(a) acidic nature (b) neutral nature
(c) amphoteric nature (d) basic nature
- Sulphur dioxide gas formed by burning sulphur in oxygen is a/an
(a) amphoteric oxide (b) acidic oxide
(c) basic oxide (d) neutral oxide
- The most common ore of iron is
(a) bauxite (b) galena
(c) cryolite (d) haematite
- In the process of smelting, a metal oxide is reduced to metal. The reducing agent used is
(a) carbon in the form of coke (b) sodium metal
(c) hydrogen (d) none of the above
- A homogeneous mixture of a metal with other metals or non-metals is called
(a) a metalloid (b) a compound
(c) an alloy (d) none of the above
- Which one of these is an alloy of copper and zinc?
(a) Brass (b) Bronze
(c) German silver (d) Gun metal
- All metals are solids at room temperature except
(a) mercury (b) sodium
(c) potassium (d) none of these
- Which of these metals cannot displace hydrogen from a dilute acid?
(a) Iron (b) Zinc (c) Silver (d) Calcium

11. Metals more active than hydrogen, react with dilute mineral acid and displace
(a) hydrogen gas (b) nitrogen gas
(c) carbon monoxide gas (d) oxygen gas
12. An ore of iron is
(a) bauxite (b) malachite
(c) cuprite (d) haematite
13. The electrolyte used in the electrorefining of copper is
(a) copper nitrate (b) copper chloride
(c) copper sulphate (d) copper acetate
14. The ores which are generally subjected to roasting are
(a) carbonate ores (b) oxide ores
(c) sulphide ores (d) chloride ores
15. Which one of these is the process of removal of impurities from the ore?
(a) Concentration (b) Roasting
(c) Calcination (d) Smelting
16. The process of heating an ore in the absence of air is called
(a) concentration (b) roasting
(c) calcination (d) smelting
17. The impurity that settles down in the froth flotation process for concentration of an ore is called
(a) slag (b) galena (c) gangue (d) alloy
18. The name of the furnace used in the process of iron extraction is
(a) blast furnace (b) Bessemer converter
(c) oxygen furnace (d) none of these
19. Aluminium is extracted from its ore called
(a) bauxite (b) cryolite (c) haematite (d) none of these
20. Magnetite is an ore of
(a) copper (b) zinc (c) iron (d) aluminium
21. Sulphur ores are concentrated by
(a) roasting (b) froth flotation
(c) calcination (d) smelting
22. The method used to convert the carbonate ore of copper into its oxide in the absence of air is
(a) roasting (b) calcination
(c) concentration (d) reduction

23. During electrorefining, the impure metal acts as
 (a) cathode (b) anode
 (c) electrolyte (d) none of the above
24. The alloy used in the manufacture of aircraft bodies is
 (a) duralumin (b) gun metal
 (c) brass (d) German silver

Ans. 1. (c) 2. (c) 3. (d) 4. (b) 5. (d) 6. (a) 7. (c) 8. (a) 9. (a) 10. (c)
 11. (a) 12. (d) 13. (c) 14. (c) 15. (a) 16. (c) 17. (c) 18. (a) 19. (a)
 20. (c) 21. (b) 22. (b) 23. (b) 24. (a).

II. A. Fill in the blanks with appropriate words.

1. is an ore of barium.
2. The molecular formula of sand is
3. The metal present in the ore cinnabar is
4. Carbogen is used for
5. is the chemical formula of cryolite.
6. used to make tips of bullets.
7. reduces iron oxide to iron in the blast furnace.
8. is used in making surgical instruments.
9. is used in making the bodies of aeroplanes.
10. Silver, gold and platinum are called metals.
11. Mercury is a liquid
12. The oxides of non-metals are or in nature.
13. Two alloys of copper are and
14. Galvanised iron will have a coating of on its surface.
15. Bauxite is chemically
16. Aluminium alloys are used in the aircraft industry because they are and
17. Ores are obtained from
18. A liquid metal is
19. The best electrical conductor is
20. Sodium is always preserved under
21. Gold and silver are found in state.
22. The formula of haematite is
23. The more reactive metals are extracted by
24. is a homogeneous mixture of metals.

25. Bronze is an alloy of and
26. Metals are generally and ductile.
27. Metals form ions by losing electrons from their valence shells.
28. Non-metals have electrons in their valence shells.

Ans. 1. Barytes 2. SiO_2 3. mercury 4. artificial respiration 5. Na_3AlF_6 6. Lead
7. Carbon monoxide 8. Stainless steel 9. Magnalium 10. noble 11. metal
12. acidic, neutral 13. brass, bronze 14. zinc 15. hydrated aluminium oxide
16. light, strong 17. minerals 18. mercury 19. silver 20. kerosene
21. free 22. Fe_2O_3 23. electrolysis 24. Alloy 25. copper, tin 26. malleable
27. cations 28. 4, 5, 6 or 7

B. Fill in the blanks with appropriate words from the given list.

[List: acidic, mineral, zinc sulphide, non-metal, losing, copper, flourine, mercury.]

1. Amalgam is an alloy in which one of the component metals is
2. Graphite is a, yet it conducts electricity.
3. Metals form cations by electrons from their valence shells.
4. Non-metals do not react with dilute acids.
5. The oxides of non-metals are or neutral in nature.
6. Teflon is prepared from the non-metal
7. Zinc blende is chemically
8. Brass is an alloy of and zinc.

Ans. 1. mercury 2. non-metal 3. losing 4. mineral 5. acidic 6. fluorine
7. zinc sulphide 8. copper

C. Choose the correct words from the brackets.

1. (*Malleability/ductility*) is the ability of a metal to be drawn into wires and (*zinc/silver*) does not show this ability under normal conditions.
2. Metals have (*1, 2 or 3/4, 5, 6 or 7*) electrons in the outer or valence shell and (*lose/gain*) valence electrons and form (*anions/cations*).
3. Non-metals are good (*reducing/oxidising*) agents since they (*gain/lose*) electrons during chemical reactions.

4. Magnesium is (*above/below*) aluminium in the activity series of metals and (*zinc/silver*) can displace copper from copper sulphate solution.
5. Phosphorus pentoxide is an (*acidic/basic*) oxide which dissolves in water to give an (*acid/alkali*).

Ans. 1. Ductility, zinc 2. 1, 2 or 3, lose, cations 3. reducing, gain 4. above, zinc 5. acidic, acid

III. A. State whether the following statements are true or false. If false, write the correct statements:

1. Hydrogen has one electron in its valence shell and hence, it is a metal.

Ans. False: Hydrogen has one electron in its valence shell but it is neither a metal nor a non-metal.

2. Al^{3+} is the symbol of aluminium ion, as it loses three electrons from its valence shell.

Ans. True

3. S^{2-} is the symbol of sulphide ion, as it loses two electrons from its valence shell.

Ans. False: S^{2-} is the symbol of sulphide ion, as it gains two electrons in its valence shell.

4. Magnesium is alloyed with iron to form stainless steel.

Ans. False: Magnesium is alloyed with aluminium to form magnalium.

5. Tin is used in making bronze.

Ans. True

6. Bromine is a liquid metal at room temperature.

Ans. False: Bromine is a liquid non-metal at room temperature.

7. Silver iodide is used to create artificial rain.

Ans. True

8. Non-metals form acidic or neutral oxides.

Ans. True

9. Zinc is used to coat iron sheets so as to prevent them from rusting.

Ans. True

10. Stainless steel is an alloy of iron, chromium and carbon.

Ans. True

11. Aluminium is extracted from bauxite by electrolysis.

Ans. True

12. Al_2O_3 is an amphoteric oxide.

Ans. True

13. Magnesium is a silvery white metal used in nuclear reactors for absorption of neutrons.

Ans. True

14. Smelting is a reduction process in which the metal oxide is finally changed to a metal.

Ans. True

15. Sand is mostly silicon trioxide (SiO_3).

Ans. False: Sand is mostly silicon dioxide (SiO_2).

16. Aluminium does not react with water.

Ans. True

17. Metals form positive ions by losing electrons.

Ans. True

18. Non-metals react with water.

Ans. False: Non-metals generally do not react with water.

19. Metallurgy is a science of metals and their lustre.

Ans. False: Metallurgy involves the scientific principles and the physical and chemical processes that are applied to obtain pure metals from their ores.

20. The processes of roasting and calcination make the ore porous.

Ans. True

21. Magnetic ores can be easily separated by gravity separation.

Ans. False: Magnetic ores can be easily separated by magnetic separation.

22. Sulphur is a very good blood purifier.

Ans. True

III. B. The statements given below are incorrect. Write the correct statements.

1. Aluminium foils are used for decorating sweets.

Ans. Aluminium foils are used for packaging of foodstuffs.

2. Cast iron is used for making trunks.

Ans. Cast iron is used for making drain pipes.

3. The metal lead is extensively used for making dry cells.

Ans. Lead is used for making pipes.

4. Silicon is used for making electric wires.
Ans. Silicon is used for making microchips.
5. Copper metal is used for making an alloy magnalium.
Ans. Copper metal is used for making the alloys, brass and bronze.
6. Oxygen gas is used for hydrogenation of vegetable oils.
Ans. Oxygen gas is used for artificial respiration for patients suffering from breathing problems.
7. Sulphur is used in the manufacture of hydrochloric acid.
Ans. Sulphur is used in the manufacture of sulphuric acid.
8. Silver salts are used in the paint industry.
Ans. Silver salts are used in photography.
9. Water is an acidic oxide.
Ans. Water is a neutral oxide.
10. Alkalis are insoluble bases.
Ans. Alkalis are soluble bases.
11. Cast iron is the purest form of iron.
Ans. Wrought iron is the purest form of iron.
12. Arsenic, antimony and silicon are non-metals.
Ans. Arsenic, antimony and silicon are metalloids.

IV. Match the following.

<i>Column A</i>	<i>Column B</i>
1. Haematite	(a) lead ore
2. Roasting	(b) negative terminal of an electrolytic cell
3. Galena	(c) excellent conductor of electricity
4. Cathode	(d) German silver
5. Silver	(e) changing sulphide ores to oxides
6. Alloy	(f) iron ore

Ans. 1. (f) 2. (e) 3. (a) 4. (b) 5. (c) 6. (d)

V. Name the following.

- Impure form of iron used for making manhole covers.
- A pale yellow powder used for spraying on fruit trees.
- A combustible non-metal used for cutting and welding.
- A non-metal used for making microchips.

5. An alloy of zinc and copper.
6. A process of converting sulphide ore into an oxide ore.
7. A charged particle formed when non-metals gain electrons.
8. The process by which iron ore is concentrated.
9. An alloy of iron used for making surgical instruments.
10. Two alloys of copper used for making statues.
11. A liquid metal and a non-metal.
12. Two neutral oxides.
13. Two reducing agents.
14. The gas evolved when a reactive metal combines chemically with dilute sulphuric acid.
15. The products formed when an acidic oxide reacts with a base.
16. Two most reactive metals in the metal reactivity series.
17. The common name of the ore of zinc whose chemical name is zinc carbonate.
18. Two non-metals which are lustrous.
19. A metal which has a low melting point.
20. A non-metallic oxide which dissolves in water to give a weak acid.
21. A metal used for making bullets.
22. A metal which reacts with boiling water to liberate hydrogen gas.
23. A metal in red hot condition reacts with steam to liberate hydrogen gas.
24. A metal which reacts with dilute hydrochloric acid to liberate hydrogen gas.
25. A metal which reacts with dilute nitric acid to liberate hydrogen gas.
26. The process of converting a carbonate ore into an oxide ore.
27. The process of refining metals with an electric current.

Ans. 1. Cast iron/pig iron 2. Sulphur 3. Hydrogen 4. Silicon 5. Brass 6. Roasting 7. Anion 8. Magnetic separation 9. Stainless steel 10. Bronze and brass 11. Mercury and bromine 12. Water and nitric oxide 13. Hydrogen and sulphur dioxide 14. Hydrogen 15. Salt and water 16. Potassium and sodium 17. Calamine 18. Iodine and graphite 19. Sodium 20. Carbon dioxide 21. Lead 22. Magnesium 23. Iron 24. Zinc 25. Manganese 26. Calcination 27. Electrorefining.

28. Name two metals which are:
- Lighter than water.
 - Found in nature in free state.
 - Below hydrogen in the metal activity series.
 - Readily oxidised in air.
 - Commonly used as electrical conductors.

- Ans.
- Sodium and potassium
 - Gold and platinum
 - Copper and silver
 - Sodium and potassium
 - Copper and aluminium

VI. Answer the questions given below according to the instruction provided.

1. State one use of the alloys whose compositions are given below.
- Copper and zinc
 - Copper and tin
 - Aluminium, magnesium, manganese and copper
 - Iron, nickel, chromium and carbon
 - Lead and tin

- Ans.
- Used for making statues
 - Used for making coins
 - Used for making aircraft frames
 - Used for making surgical instruments
 - For soldering of joints

2. Select the correct formula for each of the following ores.
- Bauxite — $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ / Na_3AlF_6 / Al_2O_3
 - Galena — AgCl / PbS / CaF_2
 - Gypsum — $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ / FeCuS_2 / $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
 - Horn silver — AgCl / NaCl / AgNO_3
 - Siderite — Fe_3O_4 / FeS_2 / FeCO_3

- Ans.
- Bauxite — $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$
 - Galena — PbS
 - Gypsum — $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
 - Horn silver — AgCl
 - Siderite — FeCO_3

3. Name the product/s formed in each of the following reactions:

- (a) Calcium and water (b) Calcium oxide and water
(c) Iron and steam (d) Sodium and water
(e) Zinc sulphide and oxygen

- Ans.** (a) Calcium hydroxide and hydrogen
(b) Calcium hydroxide
(c) Triferric tetroxide and water
(d) Sodium hydroxide and hydrogen
(e) Zinc oxide and sulphur dioxide

4. Give the chemical names and the chemical formulae of the following metallic ores.

- (a) Bauxite (b) Malachite
(c) Galena (d) Common salt
(e) Epsom salt (f) Copper pyrites
(g) Haematite (h) Cinnabar
(i) Marble

- Ans.** (a) Hydrated aluminium oxide, $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$
(b) Basic copper carbonate, $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
(c) Lead (II) sulphide, PbS
(d) Sodium chloride, NaCl
(e) Hydrated magnesium sulphate, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
(f) Copper sulphide, CuS
(g) Iron (III) oxide, Fe_2O_3
(h) Mercury (II) sulphide, HgS
(i) Calcium carbonate, CaCO_3

5. State two most important uses of the following metals:

- (a) Magnesium (b) Aluminium
(c) Lead (d) Zinc
(e) Cast iron (f) Copper
(g) Gold (h) Silicon

- Ans.** (a) Magnesium:
(i) Fuse in ignition mixture
(ii) In nuclear reactors for absorption of excess neutrons.
(b) Aluminium:
(i) Foil for packaging foodstuffs
(ii) Electrical transmission wires

- (c) Lead:
 - (i) Sink pipes
 - (ii) Automobile batteries
 - (d) Zinc:
 - (i) Containers of dry cells
 - (ii) Galvanising iron sheets
 - (e) Cast iron:
 - (i) Drain pipes
 - (ii) Manhole lids
 - (f) Copper:
 - (i) Electrical wires
 - (ii) Coins
 - (g) Gold:
 - (i) Ornaments
 - (ii) Electronic devices like computers
 - (h) Silicon:
 - (i) Microchips
 - (ii) Water proof material
6. State two most important uses of the following non-metals:
- (a) Hydrogen
 - (b) Carbon
 - (c) Nitrogen
 - (d) Oxygen
 - (e) Silicon
 - (f) Phosphorus
 - (g) Sulphur

- Ans.**
- (a) Hydrogen:
 - (i) Hydrogenation of vegetable oils
 - (ii) Oxy-hydrogen flame
 - (b) Carbon:
 - (i) As electrodes (graphite)
 - (ii) Reducing agent (coke)
 - (c) Nitrogen:
 - (i) Preserving packaged foods
 - (ii) Dilutes the activity of oxygen
 - (d) Oxygen:
 - (i) Respiration by living beings
 - (ii) As a rocket fuel (in the liquid form)
 - (e) Silicon: (i) Solar cells (ii) Polymers called silicones
 - (f) Phosphorus: (i) Match industry (ii) Fireworks
 - (g) Sulphur:
 - (i) Medicine for purification of blood
 - (ii) Vulcanising rubber
7. Name the different metals used for the following purpose:
- (a) In accumulators or in car batteries
 - (b) For galvanising
 - (c) As silver paper

- (d) In torch cell (e) In electric bulb as a filament
(f) To protect radioactive radiation
(g) In flash light photography
(h) In ornaments (i) In the treatment of cancer
(j) In electrical transmission wires

- Ans.** (a) Lead (b) Zinc (c) Silver
(d) Zinc (e) Tungsten (f) Lead
(g) Aluminium (h) Gold, silver (i) Cobalt
(j) Copper, aluminium

8. Name:

- (a) The processes involved in concentration of ores.
(b) An oxide of a metal reduced by coke only.
(c) Two important ores of iron. Also give their composition.
(d) A compound containing zinc in the anion.

- Ans.** (a) Processes involved in concentration of ore:
(i) Hydraulic washing (ii) Froth flotation
(iii) Magnetic separation
(b) ZnO (c) (i) Haematite, Fe_2O_3 (ii) Magnetite, Fe_3O_4
(d) Sodium zincate, Na_2ZnO_2

VII. Give reasons for the following:

1. Metallic zinc is used in dry cells and for galvanisation but the metal copper is not used for the above purpose.

Ans. Zinc forms Zn^{2+} ions more readily than copper forms Cu^{2+} ions. Therefore, it is used as a container (cathode) of dry cells and for galvanisation.

2. Utensils are generally made of aluminium which is also an important metal used in the packaging industry.

Ans. Aluminium is a good conductor of heat and it does not react with water or acids. Therefore, it is used for making utensils. Aluminium foil is used in packaging since it is light and has a bright appearance.

3. Drain pipes and gutter covers are made of pig iron while automobiles and ships are made of steel.

Ans. Pig iron easily forms cheap castings and therefore, it is used for making drain covers.

Automobiles and ships are made of steel since the alloy is malleable and has a high tensile strength.

4. Lead finds application in flexible pipes, but magnesium does not.

Ans. Lead is malleable and more resistant to corrosion than magnesium and therefore, it is used for making flexible pipes.

5. Zinc is added to copper in brass while magnesium is added to aluminium in magnalium.

Ans. Zinc imparts hardness to copper in the alloy brass while magnesium enhances strength to aluminium in magnalium.

6. Stainless steel finds application in cutlery and German silver in decorative articles.

Ans. Stainless steel is used in making utensils since it is lustrous, hard and resistant to corrosion by acids and alkalis.

German silver is white and bright like silver, malleable and ductile, and so it is used for making decorative articles.

7. Hydrogen is used in welding and cutting and in hydrogenation of oils.

Ans. Hydrogen-oxygen mixture on burning produces a high temperature of 2800°C which can be used to melt or cut metals.

Hydrogen converts vegetable oils to fats at 200°C in presence of nickel. This is hydrogenation of oils.

8. Food products and electrical bulbs are filled with nitrogen gas and not with oxygen gas.

Ans. Nitrogen is unreactive in nature and prevents oxidation of food. Therefore, food products and electric bulbs are filled with nitrogen instead of oxygen.

9. Diamond is used as a tip of drills used for boring but graphite, an allotrope of carbon, is not.

Ans. Diamond is the hardest substance known to man and, therefore, it is used as a tip of drills. Graphite is soft and slippery, and so it cannot be used for the above purpose.

10. Chlorine is added in traces to swimming pools while wood charcoal is added to sewers.

Ans. Chlorine sterilises by killing germs in water and hence, it is added to swimming pools.

Wood charcoal adsorbs foul and poisonous gases when added to sewers.

11. Potassium is preserved in kerosene.

Ans. The reaction of potassium with oxygen of the air is so explosive that it catches fire immediately when brought in contact with air. Therefore, the metal is stored under kerosene.

12. Lead sheets are commonly used but not lead wires.

Ans. Lead sheets are commonly used since lead is malleable and resistant to corrosion but not ductile. These sheets are used for making pipes.

13. Silver is the best conductor of electricity, but wires of copper and aluminium are used widely to conduct current from place to place.

Ans. Silver is fairly scarce and, therefore, it is costlier than copper or aluminium. So, even though it is the best conductor of electricity, wires of silver are not used to conduct current. Instead, copper or aluminium wires are used.

14. Copper and silver cannot displace hydrogen from dilute acids.

Ans. Copper and silver lie below hydrogen in the metal activity series and therefore, cannot displace hydrogen from dilute acids.

15. All metals are good conductors of electricity.

Ans. Metals contain electrons which are loosely held in their atoms and these electrons are responsible for carrying electricity in the metals.

16. Duralumin is used in the construction of aeroplanes.

Ans. Duralumin is light, strong and resistant to corrosion. Therefore, it is used in the construction of aircraft.

17. Concentrated HNO_3 is stored in aluminium containers.

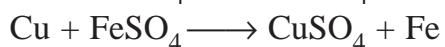
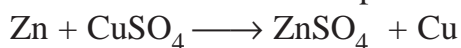
Ans. Aluminium is not attacked by water or acids due to a thin coating of oxide formed on its surface. This oxide layer prevents the reaction of aluminium with acids or any other reagents.

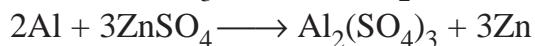
18. Statues are made of bronze and not of copper.

Ans. Tin, mixed with copper to make bronze, enhances the ability of copper to take up polish. Thus, bronze is used to make statues while copper is not used for the same.

VIII. Answer the following questions:

1. In the equations given below, state which reactions will proceed and which reactions will not proceed. Give a reason for your answer.





Ans. Zinc occurs above copper in the reactivity series and is more reactive than copper. So, it can displace copper from copper sulphate solution. Copper lies below iron in the metal activity series and therefore, it cannot displace iron from ferrous sulphate. So, the reaction does not occur.

Magnesium lies above aluminium and is more reactive than aluminium, so it displaces aluminium from aluminium chloride.

Aluminium lies above zinc in the metal activity series and can displace zinc from zinc sulphate solution.

2. Name two noble metals and give two uses of each metal named by you.

Ans. Platinum and gold are noble metals.

(a) (i) Platinum is used as a catalyst in the manufacture of nitric acid by Ostwald's process.

(ii) Platinum is used for making expensive ornaments and watches.

(b) (i) Gold is used in making expensive jewellery.

(ii) Gold is used for filling the teeth cavities in the form of an amalgam i.e., an alloy of gold, silver and mercury.

3. What do you understand by the following terms?

(i) Ore, (ii) Concentration of ore, (iii) Reduction of ore

Ans. (i) **Ore:** An ore is a mixture of minerals from which elements or compounds are profitably extracted.

(ii) **Concentration of ore:** The process of removal of gangue or earthy impurities from an ore is known as concentration of ore.

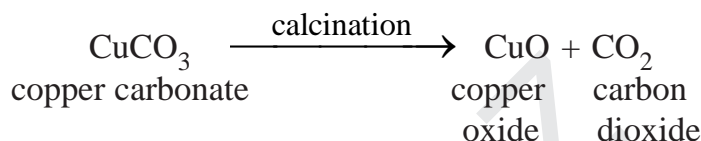
(iii) **Reduction of ore:** The process of removal of oxygen from a metallic oxide so as to convert it into a metal is known as reduction of ore.

4. Define: (i) Calcination, (ii) Roasting.

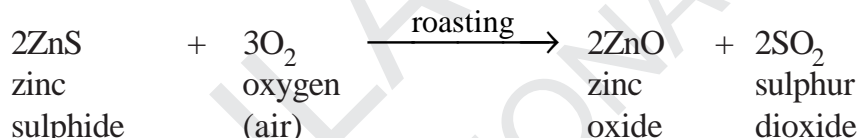
In each case, state what purpose is achieved by the above process, supporting your answer with at least one chemical equation.

Ans. (i) **Calcination:** The process of strongly heating a concentrated ore in the absence of air which is just insufficient to melt the ore is known as calcination.

- (ii) **Roasting:** The process of heating a concentrated ore to a high temperature in excess of air is known as roasting. Calcination removes moisture and other volatile impurities like CO_2 from the ores thus, making it porous. The process converts carbonate ores into metallic oxides.



Roasting removes water, volatile impurities like arsenic and phosphorus from the concentrated ores thus making the ore porous. It converts the ore into an oxide.



5. (i) What is an alloy? Why are alloys made?
(ii) Name the principal metal, the composition and two uses for the following alloys:
(a) Magnalium (b) Stainless steel
(c) German silver (d) Bronze (e) Brass

Ans. (i) An alloy is a homogeneous mixture of two or more metals or a metal and a non-metal in their molten states.

Alloys are made to:

- (a) prevent corrosion of metals
 - (b) give attractive colours to metals
 - (c) harden or lighten a metal
 - (d) produce desirable melting points for metals.
- (ii) (a) Magnalium — Aluminium and magnesium
(i) For making light tools
(ii) For making machine parts
(b) Stainless steel — Iron, chromium, nickel and carbon
(i) For making utensils
(ii) For making surgical instruments
(c) German silver — Copper, zinc and nickel
(i) For making decorative articles

- (ii) For making heaters
- (d) Bronze — Copper, tin and zinc
 - (i) For making statues
 - (ii) For making utensils
- (e) Brass — Copper and zinc
 - (i) For making statues
 - (ii) For making machine parts

6. Define the following terms:

- (i) Metallurgy
- (ii) Gangue
- (iii) Slag
- (iv) Flux
- (v) Electrolysis
- (vi) Smelting

- Ans.**
- (i) **Metallurgy:** It involves the scientific principles and the physical and chemical processes that are applied to obtain pure metals from their ores.
 - (ii) **Gangue:** Earthy impurities like sand, clay and mud present in an ore are called gangue.
 - (iii) **Slag:** The substance formed by the chemical combination of flux and ore based impurities is called slag.
 - (iv) **Flux:** The substance added to the ore to remove its impurities during the reduction of oxidised ore from original ore is called flux.
 - (v) **Electrolysis:** The process in which a compound in aqueous solution or in molten state is dissociated into positive and negative ions by the passage of electric current is known as electrolysis.
 - (vi) **Smelting:** The process of removal of oxygen from a metallic oxide so as to convert it into a metal is known as smelting.

7. Compare the physical properties of the metals and the non-metals with respect to:

- (i) Lustre
- (ii) Malleability
- (iii) Conductivity
- (iv) Ductility
- (v) Solubility

Ans.	Metals	Non-metals
(i) Lustre:	Metals are lustrous and can be polished.	Non-metals are dull in appearance and cannot be polished

	Metals	Non-metals
(ii) Malleability:	Metals can be hammered into sheets (i.e. they are malleable).	Non-metals are brittle and cannot be hammered into sheets.
(iii) Conductivity:	Metals are generally good conductors of heat and electricity.	Non-metals are generally bad conductors of heat and electricity.
(iv) Ductility:	Metals can be drawn into wires (i.e. they are ductile).	Non-metals are not ductile.
(v) Solubility:	Metals are insoluble in water or in organic solvents.	Non-metals may be soluble or insoluble in water or any other organic solvents.

8. What is meant by the metal reactivity series? What are its important features?

Ans. The arrangement of the metals in a series in the decreasing order of their chemical reactivity is called the metal reactivity series.

Important features of the metal reactivity series:

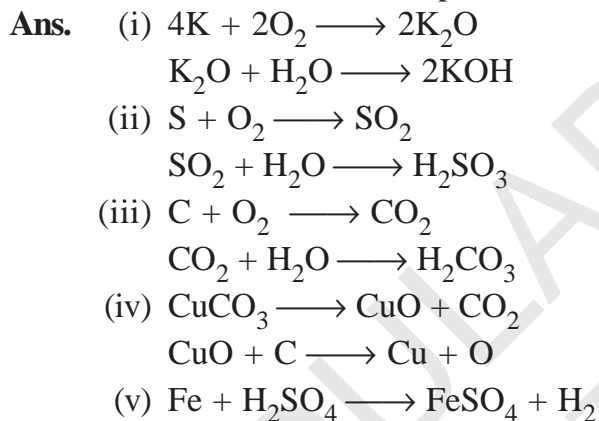
- (i) It helps in the comparative study of metals in terms of reactivity.
- (ii) The oxides, carbonates, nitrates and hydroxides of the metals can also be easily compared.
- (iii) The ease with which a metal loses electron and forms positive ion in solution decreases down the series.
- (iv) Hydrogen loses electrons like metals and becomes positive ions. So, it is also included in the reactivity series.

9. How is electrorefining done?

Ans. During electrorefining, an impure metal block is made the anode, a thin sheet of pure metal the cathode and a suitable salt of the metal, the electrolyte.

When electric current is passed through the electrolyte, the electrolyte dissociates into free metal ions, and thus the pure metal gets deposited at the cathode (negative electrode). The mass of impurities that settle down in the solution below the anode is known as anode mud.

10. Give balanced equation for the following conversions:
- Potassium → potassium oxide → potassium hydroxide.
 - Sulphur → sulphur dioxide → sulphurous acid.
 - Carbon → carbon dioxide → carbonic acid.
 - Copper carbonate → copper [II] oxide → copper.
 - Iron → iron [II] sulphate.



11. Define: indicators

Name some commonly used indicators.

Ans. Indicators are organic substances that indicate whether a solution is acidic or basic in nature by their colour change.
Litmus, methyl orange and phenolphthalein are some commonly used indicators.

12. You are given five metals (A to E). E can displace all others from salt solutions, but A can replace none. C can displace three others, but not E. D can displace A and B only from the salt solutions. Arrange these metals in the decreasing order of metal activity.

Ans. E is the most reactive metal while A is the least reactive among the five metals A, B, C, D and E.
C is more reactive than A, B, D but less reactive than E, i.e., $C > B, D, A$.
D is more reactive than A and B only i.e. $D > B, A$.
 $\therefore C$ is more reactive than D i.e., $C > D$.
Since A is the least reactive $D > B > A$
 $\therefore E > C > D > B > A$.
