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STUDY COURSE MATERIAL-5

CHEMISTRY

SESSION-2020-21

CLASS- X

TOPIC: METALS AND NON-METALS

DAY-1

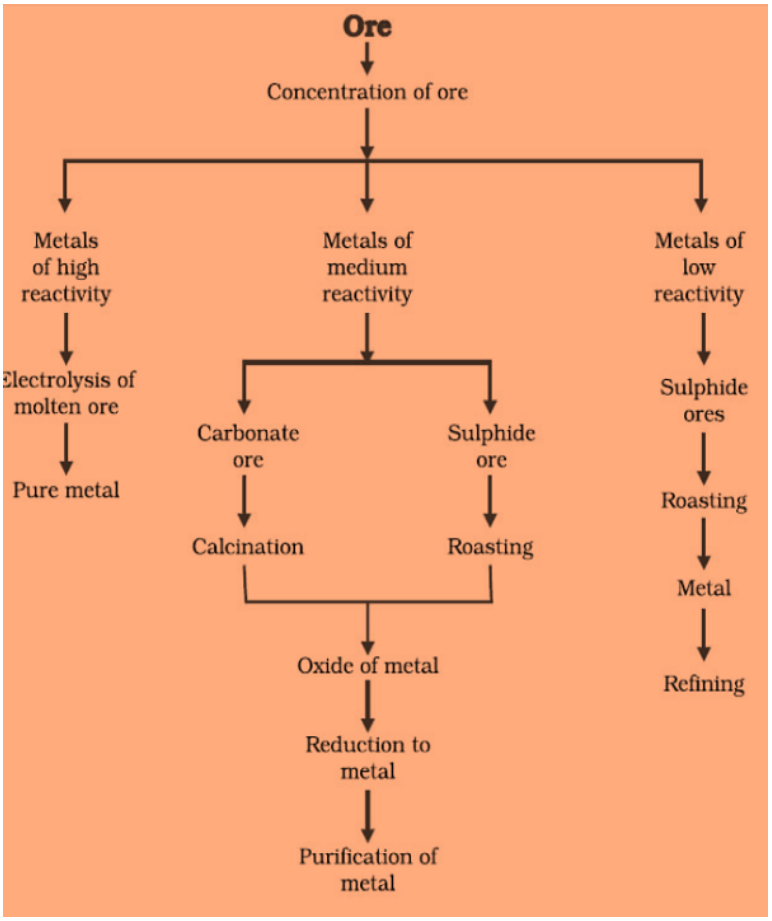
❖ **NCERT LINK:**

http://ncert.nic.in/textbook/textbook.htm?jesc1=3-16

❖ **TEACHING MATERIAL**

Occurrence of Metals

Elements or compounds which occur naturally in earth crust are known as **Minerals**. Minerals from which pure metals can be extracted are known as **Mineral Ores**.



Extraction of pure metals from its ores/steps for extraction of metals from its ore

- The first step is enrichment of the ore.
- Second step includes extraction of metals
- Third steps involve refining of metal

❖ VIDEO-LINKS

LINK-1 : https://www.youtube.com/watch?v=IuyYDyWvpPE

❖ ASSIGNMENT

1) Every ore is a mineral but not every mineral is an ore . Explain

DAY-2

❖ TEACHING MATERIAL

Gangue - Ores contain different impurities in it such as sand, soil etc. These impurities are known as **Gangue**.

Extracting Metals which are low in activity series

Metals which are low in activity series are unreactive. The oxides of such metals can be reduced to metals by heating alone. **For Example**, Cinnabar (HgS)

$$2HgS(s) + 3O_2(g) \xrightarrow{Heat} 2HgO(s) + 2SO_2(g)$$

$$2HgO(s) \xrightarrow{Heat} 2Hg(l) + O_2(g)$$

Extracting Metals in the middle of the Activity Series

These metals are moderately reactive. They exists as sulphides or carbonates in nature. Before reduction, metal sulphides and carbonates must be converted into metal oxides. Sulphide ores are converted into oxides by heating strongly in presence of excess air, this is known as **Roasting**. Carbonate ores are converted into oxides by heating in limited air. This is known as **Calcination**.

Roasting

$$2ZnS(s) + 3O_2(g) \xrightarrow{Heat} 2ZnO(s) + 2SO_2(g)$$

Calcination

$$ZnCO_3(s) \xrightarrow{\text{Heat}} ZnO(s) + CO_2(g)$$

Reduction-metal oxides can be reduced to metals using reducing agent such as such as **Carbon**.

Reduction of Metal Oxide :
1.USING COKE: Coke as a reducing agent.

$ZnO + C \xrightarrow{heat} Zn + CO$

.2. USING DISPLACEMENT REACTION : highly reactive metal like Na, Ca and Al are used to displace metals of lower reactivity from their compounds.

$MnO2 + 4Al \xrightarrow{heat} 3Mn + 2Al2O3 + heat$

$Fe2O3 + 2Al \xrightarrow{heat} 2Fe + Al2O3 + heat$

– In the above reaction molten iron is formed and is used to join railway tracks. This is called thermit reaction.

Extracting metals towards the top of the activity series

The metals are highly reactive. They cannot be obtained by heating. **For Example**, Sodium, magnesium and calcium are obtained by the electrolysis of their molten chlorides.

At cathode $Na^+ + e^- \rightarrow Na$
At anode $2Cl^- \rightarrow Cl_2 + 2e^-$

❖ VIDEO-LINKS

LINK – 1 : https://www.youtube.com/watch?v=tDampkkeS8Q
LINK-2: https://www.youtube.com/watch?v=YnDIruChpHU

❖ ASSIGNMENTS

1) Distinguish between roasting and calcination .
2) Explain the thermit process .

DAY-3

❖ TEACHING MATERIAL

Refining of Metals

Refining of impure metal is done using electrolytic refining. Impure copper is used as anode and strip of pure copper is used as **Cathode**. Acidified copper sulphate is used as electrolyte. When electric current is passed through this, impure metal from

the anode gets deposited in the electrolyte solution, whereas pure metal from the electrolyte is deposited at cathode.

Deposition of insoluble residue formed from the dissolution of anode during commercial electrolysis.

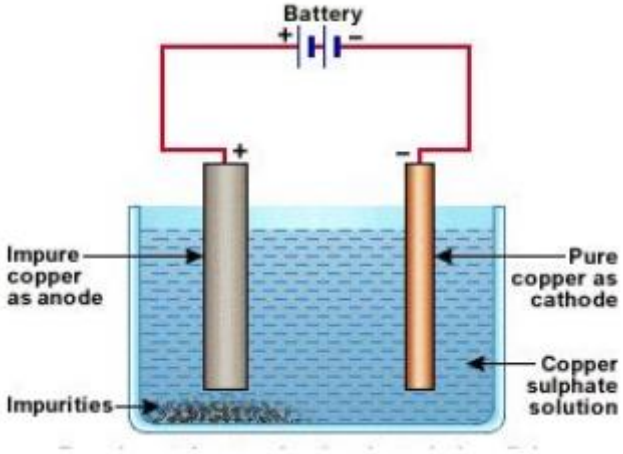


Fig.2. Electrolytic refining

Corrosion

Metals when exposed to moist air for a long period of time, they become corroded. This is known as **Corrosion**. **For Example**, Silver reacts with moist air and becomes black in colour due to silver sulphide coating.

Iron + oxygen → Iron (III) oxide

$$Fe + O_2 \rightarrow Fe_2O_3$$

Prevention of Corrosion

- Rusting of iron can be prevented by oiling, galvanizing, painting, greasing etc.
- To protect steel and iron from rusting, a thin layer of zinc are coated on them, this is known as **Galvanization**.

❖ VIDEO-LINKS

LINK – 1 : https://www.youtube.com/watch?v=i4VTEASnzMU

LINK-2: https://www.youtube.com/watch?v=zpUIeN48A9c

❖ ASSIGNMENT

1) What is galvanization ? why is it done?

DAY-4

❖ TEACHING MATERIAL

ALLOYS:-

Mixture of two or more metals or metal and non-metal is known as **Alloy**. **For Example**,

- Brass is an alloy of copper and zinc.
- Bronze in an alloy of copper and tin.
- In brass and bronze, melting point and electrical conductivity is lower than that of pure metal.
- Solder is an alloy of lead and tin. It has low melting point and is used for welding electrical wires .
- Adding small amount of carbon makes iron hard and strong .
- Stainless steel is obtained by mixing iron with nickel and chromium . It is hard and doesn't rust .
- Mercury is added to other metals to make amalgam.

❖ VIDEO-LINKS

LINK-1: https://www.youtube.com/watch?v=KgUmNQD6m5Q
LINK-2: https://www.youtube.com/watch?v=X7b8_9wAREE

❖ ASSIGNMENT

ANSWER THE FOLLOWING QUESTIONS :

1) Why food cans are coated with tin and not with zinc ?
2) Name any two alloys whose electrical conductivity is less than that of pure metals .
3) Name the non-metal with lustre .

DAY-5

❖ TEACHING MATERIAL

Question 1: Explain the meanings of malleable and ductile.

Answer: Malleable: Substances that can be beaten into thin sheets are called malleable. For example, most of the metals are malleable.
Ductile: Substances that can be drawn into thin wires are called ductile. For example, most of the metals are ductile.

Question 2: Why is sodium kept immersed in kerosene oil?
Answer: Sodium and potassium are very reactive metals and and combine explosively with air as well as water. Hence, they catch fire if kept in open. Therefore, to prevent accidental fires and accidents, sodium is stored immersed in kerosene oil.

Question 3: Why do ionic compounds have high melting points?
Answer: Ionic compounds have strong electrostatic forces of attraction between the ions. Therefore, it requires a lot of energy to overcome these forces. That is why ionic compounds have high melting points.

Question 4: Define the following terms. (i) Mineral (ii) Ore (iii) Gangue
Answer: (i) Mineral: Most of the elements occur in nature as in combined state as minerals. The chemical composition of minerals is fixed.
(ii) Ore: Minerals from which metals can be extracted profitably are known as ores.
(iii) Gangue: The impurities (sand, silt, soil, gravel, etc.) present in the ore are called gangue.

Question 5: Name two metals which are found in nature in the free state.
Answer : The metals at the bottom of the reactivity series are mostly found in free state. For example: gold, silver, and platinum.

Question 6: What chemical process is used for obtaining a metal from its oxide?
Answer: The chemical process used for obtaining a metal from its oxide is reduction. In this process, metal oxides are reduced by using suitable reducing agents such as carbon or by highly reactive metals to displace the metals from their oxides.

❖ VIDEO-LINKS

LINK -1 : https://www.youtube.com/watch?v=lkiebvwfris

❖ ASSIGNMENTS:

1) Name a metal which combines with hydrogen gas . Name the compound formed .