# 13. PRINCIPLES OF METALLURGY

# 1 Mark Questions

#### I. 1. What is metallurgy?

(As-1)

**Ans.** The process of extraction of metals from their ores is called metallurgy.

- 2. Do you agree with the statement "All ores are minerals but all minerals need not be ores?" Why.
- **Ans.** Yes I agree wish the statement because ore is a mineral from which the metals are extracted wish out economical loss.
  - 3. Which metals exist in the nature in free state?
- Ans. Gold (Au), Silver(Ag), Platinum (Pt).
  - 4. What is activity series?
- **Ans.** Arrangement of the metals in decreasing order of their activity is known as activity series.
  - 5. Write the stages involved in the extraction of metals from the ores?
- **Ans.** The extraction of a metal from its ore involves three stages. They are 1) concentration or Dressing (2) Extraction of crude metal 3) Refining (or) purification of the metal.
  - 6. Which method do you suggest for the dressing of a ore containing magnetic and non magnetic and substances?
- **Ans.** I suggest Magnetic separation. Because in magnetic separation method electro magnets are used to separate the magnetic and non-magnetic substances.
  - 7. Write the names of any two ores of Iron?

**Ans.** Haematite -  $Fe_2O_3$ Magnetite -  $Fe_3O_4$ 

- 8. Name two metals which corrode easily and two metals which donot corrode readily?
- **Ans.** Iron, and copper corrode easily.

  Gold and platinum do not corrode.
  - 9. What is Liquation?
- **Ans.** A low melting metal can be made to flow on a slopy surface to separate it from high metting impurity **Ex**: Tin.
- 10. Which purification method is used if the impurities have high boiling point?
- **Ans.** Distillation process is used if the impurities have high boiling point. In this method the extracted metal in the molten state is distilled to obtain the pure metal as distillate.

#### 11. What is gangue?

**Ans.** The unwanted material in the ore is called gange.

#### 12. What is flux? Which is used as flux in th extraction of Iron in blast furnace.

**Ans.** Flux is a substance added to the ore to remove the gangue from it by reacting with ore. Calcium carbonate is used as flux in the extraction of Iron in blast furnace.

### 13. What is slag?

**Ans.** The substance formed due to reaction of gangue and flux is called slag.

Ex: Casio<sub>3</sub>, Fesio<sub>3</sub>.

### 14. Which method is used to extract magnesium from its ore carnalite?

**Ans.** The formula of carnalite is Kcl. MgCl<sub>2</sub>.6H<sub>2</sub>O. Electrolytic reduction method is used to extract magnesium from its ore carnalite.

# 15. Does the reactivity of a metal and form of its ore has any relatioon with process of extraction?

**Ans.** Yes, they have relation. Metals like K, Na, Ca, Mg and Al are so reactive and exists in all forms. Moderate reactive metals like Zn, Fe, Pb exists as oxides, sulphires and carbonates. Least reactive metals Au, Ag found in free state

## 2 Mark Questions

### II. 1. What is the difference between roasting and calcination? Give one example for each?

	Roasting	Calcination		
1.	Ore is heated in the presence of air.	1. Ore is heated in the absence of air.		
2.	This method is used for sulphix ores.	2. This method is used for carbonates and oxide ores.		
3.	It dries the ore	3. It makes the ore porus.		
4.	$2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$	4. $CaCO_3 \Delta CaO + CO_2$ .		

# 2. Which metals are present at the top of the activity series (High reactive metals). how they are extracted.

**Ans.** 1) High reactive metals are – K, Na, Ca, Mg, Al.

- 2) Their fused components are subjected t electrocysis to get that metal.
- 3) Ex: Fused Nacl (Sodium chlaix) is electrolysed with steel cathode (–) and graphite anode (+). The metal will be deposited at cathode and chloride liberated at the anode.
- 4) At Cathode  $\rightarrow$  2Na<sup>+</sup> 2e<sup>-</sup>  $\rightarrow$  2Na. At Anose  $\rightarrow$  2C1<sup>-</sup>2e  $\rightarrow$  C1<sub>2</sub>.

### 3. What is thermite reaction. Where it is used?

**Ans.** The reaction of Iron (III) Oxide (Fe<sub>2</sub>O<sub>3</sub>) with aluminium is used to join vailings of railway tracks or cracked machine parts. This reaction is known as Thermite reaction. (Thermite process)

$$2A_1 + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe + Heat$$
  
 $2A_1 + Cr_2O_3 \rightarrow Al_2O_3 + 2Cr + Heat$ 

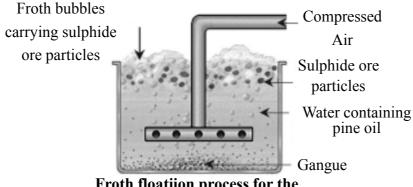
- 4. Which method is used to purify Blister (copper copper obtained from its sulphide ore) Explain.
- **Ans.** Blister copper is parified by poling. In this method the motten metal is stirred with logs (Pores) of green. The impurities are removed either as gases or they ge oxidized and form slag over the motten metal. The reducing gases evolved from the wood prevents the oxidation of copper.
  - 5. Give examples for the metals undago corrosion? Why do they corrode? how to prevent corrosion?
- **Ans.** 1) Iron, silver, copper. Generally undergo corrosion.
  - 2) In metallic corrosion a metal is oxidised by loss of electron's generally to oxygen and results in the farmation of oxides.
  - 3) **Prevantion**: Covering the surface with paint or some chemicals **e.g.**: Bisphenol.
  - B) Electroplating.
  - 6. What is the main difference in Blast furnace and Reverberatory furnace vegarding fire box and hearth?
- **Ans.** In Blast Furnace both fire box and hearth are combined in big chamber which accommodates both ore and fuel.

In Reverbaratory Furnace fire box and hearth are separated, but the vapours obtained due to the burning of the fuel touch the ore in the hearth and heat it.

# **4 Mark Questions**

### III.1. Which method is used for dressing sulphide ore. Explain with a neat diagram?

- Ans. 1) Froth Flotation method is used for dressing the sulphire ore.
  - 2) The ore with impurities is finely powderd and kept in water taken in a flotation cell.
  - 3) Air under pressure is blown to produce forath in water.
  - 4) Froth produced takes the ore particles to the surface.
  - 5) The impurities settle at the bottom.
  - 6) Froth is separated and washed to get ore particles.



Froth floatiion process for the concentration of sulphide ores

### 2. Ores are given below. Wrie their formula, metal extracted and their reactivity order.

	ORE	Formula	Metal	Reactivity
1.	Zincite			
2.	Magnetite			
3.	Galena			
4.	Copper Iron			
	pyrites			

#### Ans.

1.	Zincite	Zno	Zn	Moderate
2.	Magnetite	$\mathrm{Fe_3O_4}$	Fe	Moderate
3.	Galena	pbs	pb	Moderate
4.	Copper Iron pyrites	$CuFeS_2$	Cu	Moderate

# 3. What is a furnace? Which Furnace is used for smelting. Write the reactions that occur in the furnace?

Ans. 1) The furnace is one which is used to carry out pyrochemical process in Metallurgy.

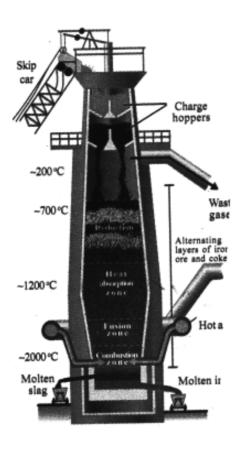
- 2) Blast Furnace is used for smetting. Smetting is a pyrochemical process in which the ore is mixed with flux and fuel and strongly heated.
- 3) All the reactions of Furnace take place in the body.

The reactions inside the furnace are

- 4. Describe an experiment to prove that the presence of air and water are essential for corrosion Explain the procedure. (As-3)
- **Ans.** 1) Take three test tubes and place clean Iron nails in each of them.
  - 2) Label these test tabes A, B and C.
  - 3) Pour some water in test tub A and cork it.
  - 4) Pour Boiled water in test tube B and add 1 ml of oil and cork it. The oil float on water and prevent the air from dissolving in the water.
  - 5) Put some anhydrous calcium chloride in test tube C and cork it. It absobs any moisture present in the test tube.
  - 6) Leave these test tubes for a few days and then observe.
  - 7) We notice that iron nails rust in test tube A only. Because the nails are exposed to air and water
  - 8) The nails in B are exposed only to water and Nails in test tube Care exposed to dry air.
  - 9) From this we can say that air and water are essential for corrosion.

## **5 Mark Questions**

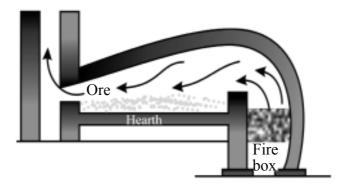
1. Write the process involved in Blast furnace in to extraction of metals with a diagram and lable the parts.



**Ans.** Smetting is carried out in a blast furnace.

# 2. What is the role of a furnace in metallurgy. Draw a neat diagram of Reverberatony furnace?

Ans. Furnace is one which is used to carry out pyrochemical process in meltallurgy.



# PART - B

I.	Multiple Choice quest	tions:				
1.	The reducing agent us	ed in thermite process i	S		(	)
	A) Al	B) Mg	C) Fe	D) Si		
2.	The purpose of smetting an ore is to it					
	A) 4Oxidse	B) Reduce	C) Neutralise	D) None		
3.	The dprocess used to		(	)		
	A) Roasting	B) Calcination	C) Smetting	D) None		
4.	The substance added t	to remove the impurity	is		(	)
	A) Gangue	B) Flux	C) Fuel	D) None		
5.	. The most abundent metal in he earth's crust is					)
	A) Silver	B) Zinc	C) Aluninium	D) Iron		
6.	group element		(	)		
	A) 16 <sup>th</sup>	B) 15 <sup>th</sup>	C) 14 <sup>th</sup>	D) 13 <sup>th</sup>		
7.	Low boiling metals are purified by method					
	A) Poling B) Distillation C) Liquation D) Electro re					
8.	The part of Furnace where we keep Fuel for burning is					)
	A) Hearth	B) Fire box	C) Chimney	D) None		
9.	During corrosion	process takes place			(	)
	A) Oxidation	B) Reduction	C) Both	D) None		
10.	is the place inside the furnace where the ore is kept for heating purpose					)
	A) Fire box	B) Hearth	C) Chimney	D) None		

II.	Matchi	ng.							
I.	$\mathbf{A}$						В		
1.	Horn sil	ver		(	)	A.	Nacl		
2.	Epsom s	salt		(	)	B.	Pbs		
3.	Rock sa	lt		(	)	C.	$MgSO4.7H_2O$		
4.	Cinnaba	r		(	)	D.	Agcl		
5.	Galena			(	)	E.	Hgs		
						F.	CaCO <sub>3</sub>		
						G.	$CuFeS_2$		
II.	A						В		
1.	Oxides			(	)	A.	Rocksalt		
2.	2. Sulphides			(	)	B.	Epsom salt		
3. Chlorides			(	)	C.	Zincite			
4. Carbonates			(	)	D.	Zinc Blend			
5. Sulphates			(	)	E.	Lime stone			
						F.	Gold		
						An	swer		
I.	1) A	2) B	3) A		4) B		5) C	6) A	7) B
	8) B	9) A	10) B						
I.	1) D	2) C	3) A		4) E		5) B		
II.	1) C	2) D	3) A		4) E		5) B		

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