

- Pitch blende is the source of Ra, U and Th.
- Nitrate is least likely to be found in mineral.
- Oxygen is the most abundant element (45.2%)
- ★ Aluminium is the most abundant metal (8.3%)
- the universe (27.2%)
- ✓ First five element comprise al most 92% by
- First ten elements make up over 99.5% of the earth crust.
- S Other very abundant element are nitrogen (78%) of the atmosphere) and hydrogen which occurs as water in the ocean.
- Diamond consist only carbon.
- Removal of unwanted earthy and silicious impurity from the ore is called ore dressing or concentration.
- & Refractory materials: These are the substances which can withstand very high temperature without melting or becoming soft.
- ✓ Noble metal like Au, Ag etc. are obtained by cyanide or amalgamation process.
- ★ Active metal like Li, Na, K (alkalimetal) Cs, Mq, Sr, Ba (alkaline earth metal) etc are obtained by the electrolysis of their chloride, oxides or hvdroxide.
- 🗷 Heavy metal like Cu, Zn, Fe, Pb, Sn etc are obtained by roasting and smelting process.
- separation is employed for the concentration of oxide ores.
- ✓ Slag is used in road making as well as in the manufacture of cement and fertilizers.



#### Occurrence

- The most abundant element on earth crust is [MP PMT 1972, 80, 84; DPMT 1986]
  - (a) Hydrogen
- (b) Oxygen
- (c) Silicon
- (d) Carbon

Naturally occurring substances from which a metal can be profitably (or economically) extracted are called

[CPMT 1982; MP PET 1996]

- (a) Minerals
- (b) Ores
- (c) Gangue
- (d) Salts
- Titanium containing mineral found in our country 3.

[NCERT 1984: RPET 1999]

- (a) Bauxite
- (b) Dolomite
- (c) Chalcopyrites
- (d) Elmanite
- Silicon is main constituent of
- [DPMT 1985]

[MP PMT 1987]

- (a) Allovs
- (b) Rocks
- (c) Animals
- (d) Vegetables
- Ore pitch blende is main source of 5.

[DPMT 1985; RPET 1999]

- (a) *Ra* (c) Th
- (b) Ce (d) Mg
- Which of ore is metalloid
- (a) As
- (b) Na
- (c) Au
- (d) Fe
- A mineral is called an ore if
- [MP PMT 1990]
- (a) Metal present in mineral is precious
- (b) Metal can be extracted from it
- (c) Metal can be extracted profitably from it
- (d) Metal cannot be extracted from it
- The highest quantity present in the atmosphere is

[NCERT 1971, 79; CPMT 1972]

- (a) Oxygen
- (b) Hydrogen
- (c) Nitrogen
- (d) Ozone
- Which of the following statement is correct 9.
  - (a) Bauxite is an ore of aluminium
  - (b) Magnetite is an ore of manganese
  - (c) Haematite is an ore of mercury
  - (d) Pyrites is an ore of phosphorus
- Carnellite is a mineral of 10.

[CBSE PMT 1988; DPMT 1983; AMU 1999]

- (a) *Ca*
- (b) *Na*
- (c) Mg
- (d) Zn
- 11. The salt which is least likely to be found in minerals is

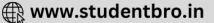
[DPMT 1984]

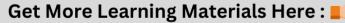
- (a) Chloride
- (b) Sulphate
- (c) Sulphide
- (d) Nitrate
- Metal which can be extracted from all the three dolomite, magnesite and carnallite is[MP PET 1985]
  - (a) Na
- (b) K
- (c) Mg
- (d) Ca
- 13. Cinnabar is an ore of

[DPMT 1982, 84; CBSE PMT 1991; MNR 1986; CPMT 1973, 76, 78, 79, 86, 89, 94; UPSEAT 1999]

- (a) *Hg*
- (b) Cu







#### 662 General Principles of Extraction of Metals (c) Pb (d) Zn (c) Cryolite (d) Magnetite Metallurgy is the process of 14. [MP PET 2001] 27. Corundum is [CPMT 1975, 76; DPMT 1983] (a) Concentrating the ore (a) $SrO_2$ (b) $Al_2O_3$ (b) Roasting the ore (c) CaCl<sub>2</sub> (d) $Cu_2Cl_2$ (c) Extracting the metal from the ore Which is not a mineral of aluminium 28. (d) Adding carbon to the ore in blast furnace [BHU 1974, 79; MNR 1984; DPMT 2002] What is believed to be the second most common 15. (b) Bauxite (a) Anhydrite element in the universe [MP PET 2000] (c) Corundum (d) Diaspore (a) Helium (b) Hydrogen Which of the following mineral does not contain 29. (c) Nitrogen (d) Silicon Which of the following substances consists of only [IIT (Screening) 1992] one element [MP PET 1999, 2000] (a) Cryolite (b) Mica (a) Marble (b) Sand (d) Fluorspar (c) Feldspar (c) Diamond (d) Glass 30. An important oxide ore of iron is Which of the following minerals is not an ore of 17. [MP PET/PMT 1998; MP PET 1990; MP PMT 1994, 96] aluminum (a) Bauxite (b) Gypsum (a) Haematite (b) Siderite (c) Cryolite (d) Corundum (c) Pyrites (d) Malachite An example of halide ore is [MP PMT 1993] Which ore is used for the manufacture of iron (a) Galena (b) Bauxite [CPMT 1973, 79; RPET 2000] (c) Cinnabar (d) Cryolite (a) Cryolite (b) Bauxite 19. Which of the following is not an ore [IIT 1982] (c) Haematite (d) Chalcopyrites (a) Bauxite (b) Malachite Formula of magnetite is 32. [CPMT 1991] (c) Zinc blende (d) Pig iron (a) $Fe_2O_3$ (b) $FeS_2$ "Chile saltpetre" is an ore of [CPMT 1982] (c) FeCO<sub>3</sub> (d) $Fe_3O_4$ (a) Iodine (b) Sodium Which of the following is ferrous alloy 33. (d) Magnesium (c) Bromine [DPMT 1982, 84; CPMT 1989] Which of the following metal is not found in free 21. (a) Invar (b) Solder state (c) Magnalium (d) Type metal (a) Na (b) Au 34. Which of the following ores does not represent (d) Pb (c) Ag the ore of iron [CPMT 1989; AIIMS 2002] Which of the following ore is used for industrial (a) Haematite (b) Magnetite extraction of aluminium in India [MP PET 1989] (c) Cassiterite (d) Limonite (a) Corundum (b) Keolin The formula of haematite is [MNR 1994] 35. (c) Cryolite (d) Bauxite (a) $Fe_3O_4$ (b) $Fe_2O_3$ Bauxite is an oxide ore of 23. (c) $FeCO_3$ (d) $FeS_2$ [BHU 1979; AFMC 1980; Kurukshetra CEE 1998; RPET 1999; CPMT 1976, 2001, 02] Which metal is not silvery white 36. (a) Barium (b) Boron (a) Ni (b) Cu (c) Bismuth (d) Aluminium (c) Na (d) Sn Cryolite is 24. [AMU 1983] Azurite is an ore of 37. (a) Magnesium silicate (a) Ag (b) Cu (b) Sodium borofluoride (c) Pt (d) Au (c) Sodium aluminium fluoride 38. Copper can be extracted from (d) Magnesium silicate [NCERT 1973; IIT 1978; J & K 2005] Composition of bauxite is 25. (a) Kupfernickel (b) Dolomite

[CPMT 2002, MP PMT 1999] (c)  $Cu_2O$  (d)  $CuCO_3$  (a) Bauxite (b) Corundum



(b)  $Al_2O_3.H_2O$ 

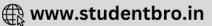
(d)  $Al_2O_3$ .  $3H_2O$ 

[CPMT 1989, 91, 2001; RPMT 1997; RPET 1999]



(c) Galena

(a)  $Cu_2S$ 



[CPMT 1989, 93]

(d) Malachite

(b)  $CuCO_3.Cu(OH)_2$ 

Which of the following ore is called malachite

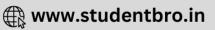
(a)  $Al_2O_3$ 

(c)  $Al_2O_3.2H_2O$ 

Main ore of aluminium is

		G	enerai	Principles of Extraction	n or Metals 003
40.	Argentite is a mineral o	f MT 1978; MP PMT/PET 1988]	53.	Which one of the follow	ving ores is a chloride [EAMCET 1997; CPMT 2001]
	(a) Copper	(b) Silver		(a) Horn silver	(b) Zincite
	(c) Platinum	(d) Gold		(c) Bauxite	(d) Felspar
41.	Which one of the follow		54.		indant in earth crust yet it
7-1		P PET 1989; CBSE PMT 1993]	34.	is obtained from bauxit	-
	(a) Argentite	(b) Stibnite		(a) Bauxite is available	
	(c) Haematite	(d) Bauxite		(b) Of easy extraction of	
42.	Calamine is	(4)		(c) Bauxite contains ma	
7		00; MNR 1995; UPSEAT 1999]		(d) Bauxite is less impu	
	(a) $ZnSO_4$	(b) <i>ZnO</i>	55.	An ore of potassium is	[JIPMER 2001]
	•	, ,	33.	(a) Bauxite	(b) Solomite
	$(c) Zn(NO_3)_2$	(d) $ZnCO_3$		(c) Carnallite	(d) Cryolite
43.	Important ore of zinc is		-6		-
	(a) Calamine	(b) Cryolite	56.	The molecular formula	
	(c) Gibsite	(d) Malachite		(a) E <sub>0</sub> ()	[AFMC 1999; MP PET 2002]
44.	Which of the following			(a) $Fe_3O_4$	(b) $Na_3AlF_6$
		[CPMT 1985]		(c) $Na_2Al_2O_3$	(d) All of these
	•	contains silver sulphide	57.	All ores are minerals,	while all minerals are not
	(b) Gold is found in nat			ores because	
	(c) Zinc blende mainly				[Orissa JEE 2002]
	(d) Copper pyrites also	contain $Fe_2S_3$			e extracted economically
45.	Commercially importan	t ore of lead from which it		from all the mineral	
		PMT 1982, 96; MP PMT 2000]		(b) Minerals are comple	_
	(a) Siderite	(b) Haematite		(c) The minerals are ob	
	(c) Galena	(d) None of these		(d) All of these are corr	
46.	Which of the following	is not an ore of lead[ <b>MP PM</b> ]	Г 19 <b>5</b> §}	Corundum is an ore of	[Kerala (Med.) 2002]
	(a) Galena	(b) Anglesite		(a) Copper	(b) Boron
	(c) Calamine	(d) Cerrusite		(c) Aluminium	(d) Sodium
47.	Galena is		59.		ving is correct[MP PET/PMT 200
	(a) <i>PbO</i>	(b) <i>PbCO</i> <sub>3</sub>		(a) A mineral cannot be	
	(c) PbS	(d) PbCl <sub>2</sub>		(b) An ore cannot be a r	
48.	An example of an oxide	ore is [MP PET 1996]		(c) All minerals are ore	
40.	(a) Bauxite	(b) Malachite	_	(d) All ores are mineral	
	(c) Zinc blende	(d) Felspar	60.	Which ore contains both	
49.	Cryolite is an ore of	(a) Totopul		( ) 0 "	[IIT-JEE (Screening) 2005]
75.	•	996; BHU 2002; DPMT 1996]		(a) Cuprite	(b) Chalcocite
	(a) Iron	(b) Silver	<b>C</b> -	(c) Chalcopyrite	(d) Malachite
	(c) Zinc	(d) Aluminium	61.	Formula of Felspar is	[MHCET 2004]
50.		[CBSE PMT 1999; DPMT 1996]		(a) $K_2O.Al_2O_3.6SiO_2$	
_	(a) <i>Mn</i>	(b) <i>Ni</i>		(b) $K_2O_3.Al_2O_3.6Si_2.O_2.2H$	$H_2O$
	(c) <i>Sb</i>	(d) <i>Sn</i>		(c) $Al_2O_3.2SiO_2.2H_2O$	
51.		wing is the most abundant		(d) $3MgO.4SiO_2.H_2O$	
J	element in the universe	•	62.	Chile saltpetre is	[MP PET 2004]
	(a) Nitrogen	(b) Hydrogen		(a) $NaNO_3$	(b) <i>KNO</i> <sub>3</sub>
	(c) Oxygen	(d) Silicon		(c) $Na_2SO_4$	(d) $Na_2S_2O_3$
52.		statements, the incorrect	<b>C</b> -	= '	
J-•	one is		63.		ving is not an ore of
		[IIT 1997]		magnesium	[CDMT 2004: DCE 2004]
	(a) Calamine and sideri			(a) Magnesite	[CPMT 2004; DCE 2004] (b) Dolomite
	(b) Argentite and currit	te are oxides		(c) Cyncum	(d) Carnalita
	<ul><li>(b) Argentite and cuprit</li><li>(c) Zinc blende and pyr</li></ul>		64.	(c) Gypsum Which of the following	(d) Carnalite is not a mineral of iron?





#### 664 General Principles of Extraction of Metals (a) Magnetite (b) Siderite (c) Chloride ores (d) Amalgams (c) Smithsonite (d) Limonite A process used for the concentration of ore is 3. (e) Haematite [MP PMT 1990; MP PET 2003] The ore carnalite is represented by structure: (a) Froth floatation (b) Roasting [EAMCET 1987; MP PET 1986, 04; AFMC 2000 (c) Electrolysis (d) Bessemerization Pb. PMT 2004] Magnetic separation is used for increasing (b) $Na_3AlF_6$ (a) $Na_2Al_2O_3$ concentration of the following [MP PET 1990] (c) $KCl.MgCl_26H_2O$ (d) $Fe_3O_4$ (a) Horn silver (b) Calcite (c) Haematite 66. Which of the following metal is sometimes found (d) Magnesite native in nature [CPMT 1973, 75; MP PET 1999] The substance added in water in the froth 5. (a) *Al* (b) Cu floatation process is [EAMCET 1980] (c) Fe (d) Mg (a) Soap powder (b) Pine oil The most abundant metal in the earth crust is (c) Coconut oil (d) None of the above [BHU 1979, 81; MP PMT 1997; CPMT 1988, 2001; CBSE PMT 2000] 6. For which ore of the metal, froth floatation (a) Na (b) Mg method is used for concentration [MP PMT 2001] (d) Fe (a) Horn silver (b) Bauxite (c) Al Indicate the mineral from which copper is (c) Cinnabar (d) Haematite manufactured Cyanide process is used in the extraction of [DCE 2002, 03] 7. [NCERT 1973] (b) Ag (a) Galena (b) Cuprite (c) both (a) and (b) (d) Cu (c) Sphalerite (d) Chalcopyrite Cassiterite is concentrated by [EAMCET 1998] The principal ores of silver are argentite, horn (a) Levigation silver and pyrargyrite. Their formula respectively (b) Electromagnetic separation (c) Floatation (a) $Ag_2S$ , AgCl and $AgSbS_2$ (d) Liquifaction (b) AgCl, AgSbS<sub>2</sub> and Ag<sub>2</sub>SFroth floatation process for the concentration of (c) $AgSbS_2$ , $Ag_2S$ and AgClores is an illustration of the practical application of [NCERT 1984] (d) AgCl, $Ag_2S$ and $AgSbS_2$ (a) Adsorption (b) Absorption **70.** The most important ore of tin is [AFMC 2005] (c) Coagulation (d) Sedimentation (a) Cassiterite (b) Cryolite Iron ore is concentrated by 10. [MP PMT 1991] (c) Cerussite (d) None of these (a) Froth floatation (b) Electrolysis Important ore of *Mg* is [BCECE 2005] (c) Roasting (d) Magnetic treatment (a) Gypsum (b) Carnalite 11. An ore of tin containing FeCrO<sub>4</sub> is concentrated (c) Magnatide (d) Carnolite 72. Which of the following is a carbonate ore[AIIMS 2005] by (a) Pyrolusite (b) Malachite (c) Diaspore (d) Cassiterite (a) Magnetic separation (b) Froth floatation (c) Electrostatic method (d) Gravity separation Concentration One of the following metals forms a volatile compound and this property is taken advantage for its extraction. This metal is Sulphide ores are generally concentrated by [NCERT 1984] [CPMT 1980, 82; EAMCET 1980; MNR 1981; (a) Iron (b) Nickel DPMT 1982; KCET 1993] (c) Cobalt (d) Tungsten (a) Froth floatation process (b) Magnetic separation Bauxite ore is concentrated by (c) Gravity separation (d) By hand picking 13.

Froth floatation process is used for concentration of [NCERT 1984; CPMT 1982, 87; MP PMT 1989; BHU 1997; EAMCET 1983; AMU 1984; DPMT 1989; AFMC 2000; MNR 1981; KCET 2000; MP PET 2001; Pb. PMT 2002] (a) Oxide ores (b) Sulphide ores

**CLICK HERE** 

14.

(a) Froth flotation

(c) Chemical separation

(d) Hydraulic separation

(b) Electromagnetic separation

In extraction of copper, we use



65.

68.

69.

71.

2.

[MP PET 1994; KCET 1999; UPSEAT 2001]

				· ·	
	(a) G G	[CPMT 1980; MP PMT 1986]		(c) They are chemically	
	(a) $Cu_2S$	(b) Pyrites	_	(d) They do not require	_
	(c) Silver argentocyanio	de (d) $CuFeS_2$	2.	Main function of roastin	•
15.		ficult to be extracted from		(a) To remove volatile s	ubstances
	its oxide			(b) Oxidation	
	(a) <i>Cs</i>	(b) Ag		(c) Reduction	
	(c) Zn	(d) Mg	_	(d) Slag formation	ma in access of the fellowing
16.	Copper pyrites are conc	entrated by	3.	Roasting is generally do	ne in case of the following [MP PMT 1985]
		9; AMU 1999; MP PMT 2003]		(a) Oxide ores	(b) Silicate ores
	(a) Electromagnetic me	thod (b) Gravity method		(c) Sulphide ores	(d) Carbonate ores
	(c) Froth floatation pro	cess (d)All the above metho	ods 🗚	<del>-</del>	r for oxidation of sulphur
17.		c, flux is not used because	4.	is called	i for oxidation of surpliur
,	(a) Zinc ore has no imp			[CPMT 1973, 75, 78	8, 79, 94; DPMT 1982, 84, 86;
	(b) Zinc is volatile hence				MP PMT 2000, 01, 02]
	(c) Zinc reacts with flux	· -		(a) Roasting	(b) Calcination
	(d) Flux is volatile	•		(c) Smelting	(d) Slagging
18.		tungstates in tin ores are	5.	Which is not basic flux	[CPMT 1986]
	concentrated by	tungotutes in tin ores are		(a) CaCO <sub>3</sub>	(b) Lime
	(a) Froth floatation	(b) Magnetic separation		(c) $SiO_2$	(d) <i>CaO</i>
	(c) Gravity separation	(d) Electrostatic	6.	A substance which rea	icts with gangue to form
sepa	ration			fusible material is called	
19.	Froth-floatation met			[MP PMT 1	990; Kurukshetra CEE 1998]
	separating impurities fr			(a) Flux	(b) Catalyst
		iter than water containing		(c) Ore	(d) Slag
	additives like pine of	luble in water containing	7.	When lime stone is he	ated strongly, it gives off
	additives like pine of	_		$CO_2$ . In metallurgy this	process is known as[MP PET/P
	<del>-</del>	soluble in water containing		(a) Calcination	(b) Roasting
	additives like pine o	_		(c) Smelting	(d) Ore dressing
		as easily wetted by water	8.	Electric furnaces are lin	ed with magnesia because
	as by pine oil, cresy			(a) It is not affected by	acids
20.	An ore like zinc blende	<u> </u>		(b) It gives oxygen on h	eating
		[MP PMT 1997]		(c) It melts at very high	temperature
		(b) Magnetic separation		(d) It has no effect of el	ectricity
	(c) Leaching	(d) Washing with water	9.	Purpose of smelting of a	n ore is
21.		rating the ore which makes	[M	P PMT 1990, 2001; Kuruksl	netra CEE 1998; RPMT 2000]
	impurities is called	n density between ore and		(a) To oxidise it	
	-r 10 041104	[Pune CET 1998]		(b) To reduce it	
	(a) Levigation	(b) Leaching		(c) To remove vaporisal	ble impurities
	(c) Magnetic separation	•		(d) To obtain an alloy	
22.		ore is best concentrated by	10.	Smelting is done in	[DPMT 1979]
	froth-flotation method	[AIEEE 2004]		(a) Blast furnace	(b) Muffle furnace
	(a) Galena	(b) Cassiterite		(c) Open-hearth furnac	
	(c) Magnetite	(d) Malachite	11.	_	al chemical change in the
					leating of ore below its
	Roasting & C	Calcination		melting point is known	
		,, , ,		(a) Reduction	(b) Smelting
ı.		are generally used in	40	(c) Calcination	(d) Roasting
	furnaces because	[MND 1090: MD DMT 1096]	12.	Matte contains mainly	[KCET 2000]
		[MNR 1980; MP PMT 1986]		(a) $Cu_2S$ and $FeS$	(b) CuS and $Fe_2S_3$



(c) *Fe* 



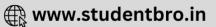
(d)  $Cu_2S$ 

(a) They possess great structural strength

(b) They can withstand high temperature

13.	The substance which is mixed with the ore for removal of impurities is termed as		(b) Smelting of sulphide	
	[MP PMT 1985, 87, 90; CPMT 1996; JIPMER 2002]		(c) Conversion of chlorid	-
	(a) Clag (b) Cangua		(d) Getting magnetic ma	
	(c) Flux (d) Catalyst	24.	in metallurgy, flux is a s	substance used to convert
1.4	The cheap and having high melting point		(a) In family 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	[EAMCET 1988]
14.	compound used in furnace is [CPMT 1975]		(a) Infusible impurities	
	(a) <i>PbO</i> (b) <i>CaO</i>		(b) Soluble impurities to	-
	(c) HgO (d) ZnO		(c) Fusible impurities to	infusible impurities
15.	Which of the following substance can be used for		(d) Mineral into silicate	: 1:
13.	drying gases [EAMCET 1978; MP PET 1999]	25.		iron lime stone added to lcium ion ends in the form
	(a) $CaCO_3$ (b) $Na_2CO_3$		of	
	(c) NaHCO <sub>3</sub> (d) CaO		[MP PMT 19	989; CPMT 1989; KCET 1993;
16.	Which one of the furnaces among the following			IIT 1982; MADT Bihar 1995]
10.	can produce the highest temperature		(a) Slag	(b) Gangue
	(a) Muffle furnace (b) Blast furnace		(c) Calcium metal	(d) CaCO <sub>3</sub>
		26.	Flux added in the extrac	
17.	The process of heating the ore strongly in excess		(a) Silica	(b) Felspar
	of air so that the volatile impurities are removed		(c) Limestone	(d) Flint
	and the ore is changed to oxide is known as [AMU 1985]	2NCE		
	(a) Calcination (b) Roasting		all the following process	=
	(c) Froth floatation (d) Leaching		(a) Oxidation	(b) Reduction
18.	The role of calcination in metallurgical operations		(c) Decomposition	(d) Sublimation
	is [AMU 1984]	28.		iron from haematite, the as[CPMT 1988; MP PET 1991,
	(a) To remove moisture		(a) A reducing agent	(b) Flux
	(b) To decompose carbonate		(c) Slag	(d) Gangue
	<ul><li>(c) To drive off organic matter</li><li>(d) To achieve all the above</li></ul>	29.		g the extraction of copper
10	Calcination is the process of heating the ore [CPMT 198	201	from copper pyrites is co	=
19.	(a) In a blast furnace (b) In absence of air	) <b>2</b> ]	[MNR 1993; MP I	PMT 1997; UPSEAT 2000, 01;
	(c) In presence of air (d) None of these		(a) C.:C:O	IIT-JEE Screening 2001]
20.	Smelting is termed to the process in which		(a) CaSiO <sub>3</sub>	(b) $FeSiO_3$
20.	[MP PMT 1987]		(c) $CuSiO_3$	(d) $SiO_2$
		30.	Complex is formed in the	e extraction of[MP PET 1989]
	(b) Ore is cold		(a) <i>Na</i>	(b) <i>Cu</i>
	(c) The ore is heated in the presence of air		(c) Ag	(d) Fe
		31.	Which of the followin	g metal is extracted by
21.	The metallurgical process in which a metal is	_	amalgamation process	, and the second
	obtained in a fused state is called[IIT 1978; MP PET 1997	7]	(a) Tin	(b) Silver
	(a) Smelting (b) Roasting		(c) Copper	(d) Zinc
		32.	The reaction $2ZnS + 3$	$O_2 \rightarrow 2ZnO + 2SO_2$ in the
22.	Which of the following processes involves			zinc is called[MP PET 1994]
	smelting		(a) Calcination	(b) Cupellation
	[NCERT 1983]		(c) Smelting	(d) Roasting
	(a) $ZnCO_3 \rightarrow ZnO + CO_2$	33.	Calcination is used in mo	•
	(b) $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$	55.		[AFMC 1995]
	(c) $2PbS + 3O_2 \rightarrow 2PbO + 2SO_2$		(a) Water and sulphide	(b) Water and $CO_2$
	(d) $Al_2O_3.2H_2O \rightarrow Al_2O_3 + 2H_2O$		(c) $CO_2$ and $H_2S$	(d) $H_2O$ and $H_2S$
23.		34.	Which of the following i	•
	metallurgical process mainly for [MP PMT 1994]  (a) Reduction of oxide ores		(a) CaO	(b) CaSO <sub>4</sub>





- (c) CaSiO<sub>3</sub>
- (d)  $SiO_2$
- The impurties associated with minerals used in 35. metallurgy are collectively called [MP PMT 1995; RPMT 1999]
- (b) Flux
- (c) Gangue
- (d) Ore
- **36.** When a metal is to be extracted from its ore, if the gangue associated with the ore is silica, then [MP PET 1996]
  - (a) An acidic flux is needed
  - (b) A basic flux is needed
  - (c) Both acidic and basic flux are needed
  - (d) Neither of them is needed
- 37. Which statement is correct
  - (a) Gangues are carefully chosen to combine with the slag present in the ore to produce easily fusible flux to carry away the impurities
  - (b) Slags are carefully chosen to combine with the flux present in the ore to produce easily fusible gangue to carry away the impurities
  - (c) Gangues are carefully chosen to combine with the flux present in the ore to produce easily fusible slag to carry away the impurities
  - (d) Fluxes are carefully chosen to combine with the gangue present in the ore to produce easily fusible slag to carry away impurities
- 38. Roasting of copper pyrites ores is for the following purposes
  - (a) To burn off sulphur, arsenic, antimony etc. as oxides and convert all the iron and copper to their oxides
  - (b) To burn off arsenic, antimony etc. as oxides and burn off sulphur so that enough of it remains to combine with all the copper
  - (c) To burn off sulphur partially to leave enough to combine with arsenic, antimony etc. and to convert all the iron and copper to oxides
  - (d) To melt arsenic and antimony sulphides etc. and remove them by liquation and to burn off sulphur partially to leave enough to combine with copper and iron
- In the modern blast furnaces, the charge consists of a mixture of
  - (a) Calcined iron oxides + lime + anthracite coal
  - (b) Calcined iron oxides + limestone + coke
  - (c) Hydrated iron oxides + dolomite + coke
  - (d) Iron pyrites + lime +bituminous coal
- 40. Roasting involves
  - (a) Only volatilisation of volatile impurities
  - (b) Only volatilisation of volatile impurities and decomposition of the ore
  - (c) Volatilisation of volatile impurities decomposition and oxidation of the ore
- (d) Oxidation and reduction of the ore and slag formation

- Which of the following ores is subjected to roasting during metallurgical operations for getting the metal oxide
  - (a) Horn silver
- (b) Zinc blende
- (c) Malachite
- (d) Limonite
- A metal obtained directly by roasting of its sulphide ore is

[Pune CET 1998]

- (a) Cu
- (b) Pb
- (c) Hg
- (d) Zn
- In blast furnace, the highest temperature is in

[KCET 1998]

- (a) Reduction zone
- (b) Slag zone
- (c) Fusion zone
- (d) Combustion zone
- The process of roasting of an ore is carried out in 44.

[BHU 1999]

[AIIMS 1999]

- (a) Absence of air
- (b) Presence of air
- (c) Limited supply of air (d) None of these
- Flux is used to remove 45.
- (b) Basic impurities
- (a) Acidic impurities
- (c) All impurities from ores (d) Both (a) and (b) During extraction of Fe; slag obtained is [CPMT 2000] 46.
  - (a) FeO (b) FeSiO<sub>3</sub>
  - (c)  $MgSiO_3$

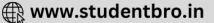
- (d) CaSiO<sub>3</sub>
- The final step for the extraction of copper from copper pyrite in Bessemere converter involves the reaction

[CPMT 2000]

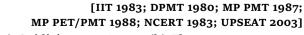
- (a)  $4Cu_2O + FeS \rightarrow 8Cu + FeSO_A$
- (b)  $Cu_2S + 2Cu_2O \rightarrow 6Cu + SO_2$
- (c)  $2Cu_2O + FeS \rightarrow 4Cu + Fe + SO_2$
- (d)  $Cu_2S + 2FeO \rightarrow 2Cu + 2FeCO + SO_2$
- Flux is used to remove[KCET (Med.) 2000; PCET 2004]
  - (a) Silica
  - (b) Metal oxide
  - (c) All impurities from ores
  - (d) Silica and undesirable metal oxide
- Roasting is done in
- [AFMC 2001]
- (a) Blast furnace
- (b) Open hearth furnace
- (c) Electric furnace
- (d) None of these
- Which of the following fluxes is used to remove acidic impurities in metallurgical process[KCET (Med.) 200
  - (a) Silica
- (b) Lime stone
- (c) Sodium chloride
- (d) Sodium carbonate
- Refractory metals are used in construction of 51. furnaces because [CPMT 2002]
  - (a) They can withstand high temperature
  - (b) They are chemically inert
  - (c) Their melting point is high
  - (d) None of these
- CN<sup>-</sup> solution used in extraction of which metal

[RPMT 2002]





#### 668 General Principles of Extraction of Metals (a) Ag (b) Ti (c) To make reduction easier (c) Zn (d) To precipitate slag (d) Sn Alumino-thermic process is used the In a line kiln, to get higher yield of $CO_2$ , the extraction of metals, whose oxides are measure that can be taken is [KCET 2003] (a) Fusible (a) To remove CaO (b) Not easily reduced by carbon (b) To add more CaCO<sub>3</sub> (c) Not easily reduced by hydrogen (c) To maintain high temperature (d) Strongly basic (d) To pump out $CO_2$ In blast furnace iron oxide is reduced by 5. [MP PMT 1989; KCET 2005] Which metal is used as a reducing agent in (a) Silica (b) CO smelting [MP PET 2003] (c) Carbon (d) Lime stone 6. (a) C (b) Al Furnaces are lined with calcium oxide because (c) Zn (d) None of these (a) It gives off oxygen on heating (b) It gives strong light on heating Inner layer of blast furnace is made of [MP PMT 1990] (c) It is refractory and basic (a) Graphite bricks (b) Silica bricks (d) It is not affected by acids (c) Fire-clay bricks (d) Basic bricks The substance used in the thermite process of Blast furnace is employed in the smelting of oxide 7. reducing metal ores is [MP PET 1993; CPMT 2000, 01] ore with coke and flux in the metallurgy of (a) Iron (b) Copper (a) Aluminium (b) Thorium (d) Carbon (c) Heated Pt gauge (c) Lead (d) All the above The electrolytic method of reduction is employed How is limestone used in Fe extraction[Orissa JEE 2004\$. for the preparation of metals that (a) Oxidation of Fe ore (b) Reduction of Fe ore [MP PMT 1991; NCERT 1984; CPMT 1988; KCET 2002] (c) Formation of slag (d) Purification of Fe (a) Are weakly electropositive formed (b) Are moderately electropositive **58.** Heating mixture of $Cu_2O$ and $Cu_2S$ will give (c) Are strongly electropositive [AIEEE 2005] (d) Form oxides (a) $Cu + SO_2$ (b) $Cu + SO_3$ 9. Which of the following metals cannot be extracted (c) CuO + CuS(d) $Cu_2SO_3$ by carbon reduction process [AMU 1982] Heating of ore in presence of air to remove (a) *Pb* (b) *Al* sulphur impurities is called [AFMC 2005] (c) Hg (d) Zn (a) Calcination (b) Roasting Carbon reduction process is used for the (c) Smelting (d) None of these extraction of 60. The important step in the extraction of metal (a) *Hg* (b) Zn from carbonate ore is (c) Cr (d) Fe (a) Calcination (b) Roasting Among the following groups of oxides, the group (d) Cupellation (c) Electro-reduction containing oxides that cannot be reduced by carbon to give the respective metals is[NCERT 1984] **Reduction to free Metal** (b) $Fe_2O_3$ , ZnO(a) $Cu_2O, K_2O$ (c) $CaO, K_2O$ (d) $PbO, Fe_3O_4$ Electrometallurgical process is used to extract Which one of the following metals is extracted by [MNR 1985, 89; UPSEAT 2000; MP PMT 2001] thermal reduction process? [EAMCET 1986] (b) *Pb* (a) *Fe* (a) Copper (b) Iron (c) Na (d) Ag (c) Aluminium (d) Magnesium General method for the extraction of metal from Chemical reduction is not suitable for converting oxide ore is [CPMT 1983; MP PET 2002] (a) Bauxite into aluminium (b)Cuprite into copper



(c) Haematite into iron (d) Zinc oxide into zinc

In alumino-thermite process, aluminium is used

(a) Oxidising agent

(b) Flux

by

14.

as

(a) Carbon reduction

(a) To make ore porous

(b) To remove gangue

(b) Reduction

(c) Reduction by hydrogen (d)Electrolytic reduction

Function of the flux added during smelting is

54.

55.

1.

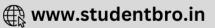
2.

3.

aluminium

		Ge	nerai	Principles of Extra	action of Metals	009
	(c) Reducing agent	(d) Solder		(a) Reduction by o		lysis
15.	Which metal is extract	ted by electrolytic reduction		(c) Self-reduction	n (d) Cyanid	e process
	method		25.	High purity copper	r metal is obtained	d by[ <b>MP PMT 19</b>
	(a) C:	[CPMT 1984; MP PET 1997]		(a) Carbon reduct	` , ,	en reduction
	(a) <i>Cu</i> (c) <i>Fe</i>	(b) <i>Al</i> (d) <i>Ag</i>		(c) Electrolytic re		rmite reduction
16.	Alumina	(u) Ag	26.	In the metallurgic		
10.	(a) Is a good conductor	r of electricity		the reducing agent		[MP PET 1994]
	(b) Is a bad conductor			(a) Carbon monox		
	(c) Melts at 200° C	or electricity		(c) Carbon dioxide	• •	
	(d) Is an electrovalent	compound	27.	In order to refine furnace and is st		
17.	Aluminium is prepared	-		The purpose is	inted with green	logs of wood.
-,.		[KCET 1991, 92]		1 1 1 1		[MP PET 1996]
	(a) Heating cryolite in	a limited quantity of air		(a) To expel the di	issolved gases in b	
	(b) Reducing aluminiu	m oxide with coke		(b) To bring the in	•	
	(c) Reducing aluminiu	m oxide with sodium	them		inpuriores to surru	00 4114 01114120
		ninium oxide dissolved in		(c) To increase the	e carbon content o	of copper
. 0	fused electrolyte			(d) To reduce the		
18.	Alumina is	(b) AICI			gases liberated fro	-
	(a) $Al(OH)_3$	(b) AlCl <sub>3</sub>	28.	Aluminium is pr	roduced on a la	rge scale by
	(c) AIN	(d) $Al_2O_3$		electrolysis of alu		
19.		following is used in the m by electrolytic process[ <b>CPM</b>	T 1978]		orspar. These two Spar are respective	
	(a) $Al_2O_3$	(b) $Al(OH)_3$		(a) $Na_3AlF_6$ and (	$CaF_2$	
	(c) AlCl <sub>3</sub>	(d) $Al_2(SO_4)_3$		(b) $AlF_3$ and $KF$		
20.	Which technique is u aluminium from bauxi	sed in the manufacture of te [NCERT 1983]		(c) $Al_2C_6$ and $KCl$		
	(a) Reduction with ma			(d) $KCl.MgCl_2.6H_2$	$O$ and $MgF_2$	
	(b) Reduction with col-	ge .	29.	Electrometallurgy	is used for	
	(c) Electrolytic reduct	ion		(a) Transition met	tals	
	(d) Reduction with iro	n		(b) Most reactive	metals	
21.	Which of the following	g processes does not involve		(c) Noble metals		
	a catalyst			(d) Soft metals		
	(a) II-banka mmaaaa	[KCET 1991]	30.	The metal extract	ted by electrolysi	s of its fused
	<ul><li>(a) Haber's process</li><li>(c) Ostwald process</li></ul>	(b) Thermite process		salt is		
22.	_	(d) Contact process ed to extract metals [KCET 198	n]		[MP	PET/PMT 1998]
		can't be reduced by carbon	נפי	(a) Iron	(b) Lead	
		ates do not yield oxides by		(c) Sodium	(d) Copper	
	thermal decomposi	-	31.	Alumino-thermic	process is used f	or metallurgy
	<del>-</del>	des can't be converted into		of		
	oxides by roasting					[CPMT 1996]
	(d) When their melting	g points are very high		(a) <i>Pb</i>	(b) Ag	
23.	Iron is obtained on a la	arge scale from $Fe_2O_3$ by		(c) Al	(d) None o	f these
	[CPMT	1973, 78, 79; Orissa JEE 2005]	32.	Which metal can't	t be obtained from	electrolysis
	(a) Reduction with $\it Al$				[CPMT 19	97; RPET 1999]
	(b) Reduction with CO	1		(a) <i>Cu</i>	(b) <i>Mg</i>	
	(c) Reduction with $H_2$			(c) <i>Cr</i>	(d) <i>Ni</i>	
	(d) Reduction with soc	lium	33.	To obtain chromit		oxide $(Cr_2O_2)$
24.	After partial roasting	, the sulphide of copper is	55.	the method used is		[JIPMER 2001]
	reduced by			(a) Alumino-thern		U11 WER 2001]
		[MP PMT 1993]		(b) Electrolytic re		
				(o) Electionytic re	auction	





- (c) Carbon reduction
- (d) Carbon monoxide reduction
- The substance used in the thermite process of 34. reducing metal ores is

#### [CPMT 2000; KCET 2001; UPSEAT 2001]

- (a) Aluminium
- (b) Thorium
- (c) Heated platinum gauze
- (d) Carbon
- Heating with carbon in absence of air is known as 35. [DCE 2002]
  - (a) Reduction
- (b) Carbon-reduction
- (c) Smelting
- (d) Roasting

# Refining of crude metal

In electrolytic refining of metals, electrolysis of 1. an aqueous solution of its complex salt is done with impure metal as anode and an strip of pure metal as cathode. This method cannot be used for the refining of the metal

[MP PMT 1989]

- (a) Silver
- (b) Copper
- (c) Aluminium
- (d) Zinc
- 2. Which method of purification is represented by the equation

$$Ti + 2I_2 \xrightarrow{500 K} TiI_4 \xrightarrow{1675 K} Ti + 2I_2$$
 [AIIMS 1983]

- (a) Cupellation
- (b) Poling
- (c) Van Arkel
- (d) Zone refining
- Cupellation process is used in the metallugry of 3.

## [CPMT 1983; MP PET 1994; MP PMT 2000, 02]

- (a) Copper
- (b) Silver
- (c) Aluminium
- (d) Iron
- Metals are 4.

- [MADT Bihar 1983]
- (a) Electropositive
- (b) Electronegative
- (c) Acceptor of electrons
- (d) None of these
- The cyanide process is used for obtaining 5.

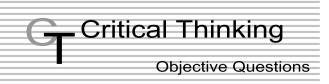
#### [DPMT 1982; CPMT 1976, 84, 90; MNR 1995; MP PET/PMT 1998; AIEEE 2002]

- (a) *Na*
- (b) Ag
- (c) Cu
- (d) Zn
- In electrolytic refining, the impure metal is made 6. is used to make [MP PET 2003]
  - (a) Cathode
- (b) Anode
- (c) Electrolytic bath
- (d) None of these
- Of the following, which cannot be obtained by 7. electrolysis of the aqueous solution of their salts[IIT 1990]
  - (a) Ag
- (b) Mg and Al
- (c) Cu
- (d) Cr

- Van Arkel method of purification of metals involves converting the metal to a [BHU 1990]
  - (a) Volatile stable compound
  - (b) Volatile unstable compound
  - (c) Non volatile stable compound
  - (d) None of the above
- Zone refining is a method to obtain g. [KCET 1993]
  - (a) Very high temperature (b)
    - Ultra pure Al
  - (c) Ultra pure metals
- (d) Ultra pure oxides
- Which one of the following is manufactured by the electrolysis of fused sodium chloride[CPMT 1979, 83, 9
  - (a) NaOH
- (b) NaClO
- (c) Na
- (d) NaClO<sub>3</sub>
- A metal which is refined by poling is [RPET 2000]
  - (a) Sodium
- (b) Blister copper
- (c) Zinc
- (d) Silver
- Silver from obtained argentiferrous lead containing lead impurity is purified by

#### [CPMT 1981; MP PMT 1990; EAMCET 1998]

- (a) Distillation
- (b) Froth floatation
- (c) Cupellation
- (d) Treatment of KCN
- If the impurity in a metal has a greater affinity 13. for oxygen and is more easily oxidised than the metal, then the purification of metal may be carried out by [MP PMT 1997]
  - (a) Poling
- (b) Zone refining
- (c) Electrolytic refining (d) Cupellation
- Electric refining is used for refining of[DPMT 1996]
  - (a) Lead
- (b) Copper
- (d) Sodium
- Zone refining is used for the purification of [Pune CET 1998
  - (a) *Cu*
- (b) Au (d) Ag
- (c) Ge
- Mond's process is used for preparing [MNR 1983]
  - (a) *Ni*
- (b)  $H_2SO_4$
- (c)  $NH_3$
- (d)  $HNO_3$
- (e) NaHCO<sub>3</sub>
- Gold is extracted by hydrometallurgical process based on its property [KCET 2005]
  - (a) Of being electropositive
  - (b) Of being less reactive
  - (c) To form complexes which are water soluble
  - (d) To form salts which are water soluble



Black Jack is an ore of

[PCET 2004]

(a) Cr

**CLICK HERE** 

(b) Sn



- (c) Zn
- (d) Ni
- 2. Froth floatation process is used for concentration

#### [MNR 1987; IIT 1989; UPSEAT 2000, 02]

- (a) Chalcopyrite
- (b) Bauxite
- (c) Haematite
- (d) Calamine
- The process of ore dressing is carried out to 3.

#### [MP PMT 1994]

- (a) Remove the siliceous materials
- (b) Add flux to the mineral
- (c) Convert the ore to oxide
- (d) Remove the poisonous impurities
- Wolframite ore is separated from tinstone ore by 4. the process of
  - (a) Roasting
- (b) Electromagnetic
- (c) Smelting
- (d) Calcination
- Which process of reduction of mineral to the 5. metal is suited for the extraction of copper from its ores with low copper content
  - (a) Metal displacement (b) Auto reduction
- (c) Chemical reduction (d) Electrolytic reduction
- Pb and Sn are extracted from their chief ore by

# [IIT-JEE Screening 2004]

- (a) Carbon reduction and self reduction.
- (b) Self reduction and carbon reduction.
- (c) Electrolysis and self reduction.
- (d) Self reduction and electrolysis.
- Zone refining is a technique used primarily for 7. which one of the following process
  - (a) Alloying
- (b) Tempering
- (c) Sintering
- (d) Purification
- Method used for obtaining highly pure silicon used as a semiconductor material is[CBSE PMT 1994]
  - (a) Oxidation
- (b) Electrochemical
- (c) Crystallization
- (d) Zone refining
- Which is correct 9.
- (a) Galena:  $Mg_2CO_3$
- [MADT Bihar 1995]
- (b) Cassiterite: CaCO<sub>3</sub> MgCO<sub>3</sub>
- (c) Dolomite: SnO<sub>2</sub>
- (d) Magnesite: MgCO<sub>3</sub>
- 'Lapis-Lazuli' is a blue coloured precious stone. 10. It is mineral of the class

#### [NCERT 1980; AIIMS 1980; BHU 1978, 80]

- (a) Sodium-alumino silicate (b)
- Zinc cobaltate
- (c) Basic copper carbonate (d)
- Prussian blue



Read the assertion and reason carefully to mark the correct option out of the options given below:

- If both assertion and reason are true and the reason is the correct explanation of the assertion.
- (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
- (c) If assertion is true but reason is false.
- (d) If the assertion and reason both are false.
- If assertion is false but reason is true. (e)

1. Assertion:  $Al(OH)_3$  is amphoteric in nature

> Al - O and O - H bonds can be Reason

broken with equal ease in  $Al(OH)_3$  [IIT 1998]

Iron is found in the free state in 2.. Assertion:

nature

[AIIMS 2001]

[BHU 2004] Reason Iron is highly reactive element

Zinc is used and copper is not used Assertion: 3. in the recovery of Ag from the

complex  $[Ag(CN)_2]^-$ .

Zinc is a powerful reducing agent Reason

than copper.

Assertion: Coke and flux are used in smelting. 4.

The phenomenon in which ore is Reason mixed with suitable flux and coke is heated to fusion is known as

smelting.

Assertion: Leaching is a process of reduction. 5.

Reason Leaching involves treatment of the ore with a suitable reagent so as to make it soluble while impurities

remains insoluble.

6. Assertion: Ethyl xanthate is used as a collector

in froth floatation process.

Reason Collectors depress the floatation property of one of the components of the ore and thus help in the separation of different minerals

present in the same ore.

Levigation is used for the separation 7. Assertion: of oxide ores from impurities.

Reason particles are removed washing in a current of water.

8. In Hall and Heroult's process, Al is Assertion: extracted by electrolysis of a fused mixture of alumina, cryolite and

fluorspar.

Addition of cryolite and fluorspar Reason lowers the fusion temperature and increases the conductivity of the

electrolyte.

9. Assertion:  $AgNO_3$  is called lunar caustic.

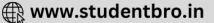
In contact with organic matter (skin, Reason

cloth paper, etc.) AgNO 3 is reduced

to metallic silver.







10. Assertion: Wolframite impurities are separated

from cassiterite by electromagnetic

separation.

Reason : Cassiterite being magnetic is attracted by the magnet and forms a

separate heap.

11. Assertion: Lead, tin and bismuth are purified

by liquation method.

Reason : Lead, tin and bismuth have low m.p.

as compared to impurities.

12. Assertion: Gold is recovered from its solution

containing aurocynaide complex by

adding zinc dust.

Reason : Zinc is more electropositive than

gold.



#### **Occurrence**

1	b	2	b	3	d	4	b	5	ac
6	а	7	С	8	С	9	а	10	С
11	d	12	С	13	а	14	С	15	d
16	С	17	b	18	d	19	d	20	b
21	а	22	d	23	d	24	С	25	С
26	а	27	b	28	а	29	d	30	a
31	С	32	d	33	а	34	С	35	b
36	b	37	b	38	d	39	b	40	b
41	а	42	d	43	а	44	С	45	С
46	С	47	С	48	а	49	d	50	d
51	b	52	b	53	а	54	а	55	С
56	b	57	а	58	С	59	d	60	С
61	а	62	а	63	С	64	С	65	С
66	b	67	С	68	d	69	а	70	а
71	b	72	b						

## Concentration

1	а	2	b	3	а	4	С	5	b
6	С	7	С	8	b	9	а	10	d
11	а	12	b	13	С	14	d	15	С
16	С	17	b	18	b	19	d	20	а
21	а	22	а						

# **Roasting & Calcination**

1	b	2	а	3	С	4	а	5	С

6	а	7	а	8	С	9	b	10	а
11	d	12	d	13	С	14	b	15	d
16	d	17	b	18	d	19	b	20	d
21	a	22	b	23	b	24	а	25	а
26	С	27	d	28	b	29	b	30	С
31	b	32	d	33	b	34	С	35	С
36	b	37	d	38	С	39	b	40	С
41	b	42	С	43	d	44	b	45	d
46	d	47	b	48	d	49	а	50	b
51	а	52	а	53	а	54	d	55	С
56	d	57	С	58	а	59	b	60	а

#### **Reduction to free Metal**

1	С	2	а	3	b	4	b	5	b
6	С	7	а	8	С	9	b	10	d
11	С	12	b	13	а	14	С	15	b
16	b	17	d	18	d	19	а	20	С
21	b	22	а	23	b	24	С	25	С
26	а	27	d	28	а	29	b	30	С
31	d	32	b	33	а	34	а	35	b

# **Refining of crude Metal**

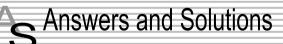
1	d	2	С	3	b	4	а	5	b
6			b				С		С
11	b	12	С	13	d	14	b	15	С
16	а	17	С						

# **Critical Thinking Questions**

1	С	2	а	3	а	4	b	5	b
6	b	7	d	8	d	9	d	10	а

#### **Assertion & Reason**

1	С	2	е	3	а	4	b	5	С
6	С	7	С	8	а	9	b	10	С
11	а	12	а						





#### **Occurrence**

- 1. (b) Element % abundance by weight

  O 46.6
  Si 27.7
  Al 8.3
  Fe 5.1
  Ca 3.6
- **6.** (a)  $As \rightarrow Metalloid Na, Au, Fe \rightarrow Metals$
- **8.** (c)  $N_2 = 78\%$ ;  $O_2 = 21\%$
- **9.** (a) Bauxite  $Al_2O_3.2H_2O$
- 10. (c) Carnellite KCl. MgCl<sub>2</sub>.6H<sub>2</sub>O
- 12. (c) Dolamite  $MgCO_3$ .  $CaCO_3$ Magnesite  $MgCO_3$ Carnallite KCl.  $MgCl_2$ .  $6H_2O$
- 16. (c) Diamond made up of carbon only.
- 17. (b) Bauxite  $(Al_2O_3)$ Cryolite  $(Na_3AlF_6)$ Corundum  $(Al_2O_3)$

 $Gypsum(CaSO_4.2H_2O)$ 

**18.** (d) Cryolite  $(Na_3AlF_6) \rightarrow$  Halide ore

Galena 
$$(PbS)$$
 Sulphide ore

Bauxite  $Al_2O_3.2H_2O \rightarrow O$ xide ore

19. (d) Pig iron  $\rightarrow$  It is the most impure form of iron and contains highest proportion of carbon (2.5-4%)

Malachite  $\rightarrow Cu(OH)_2.CuCO_3$ 

Zinc blende  $\rightarrow ZnS$ 

Bauxite  $\rightarrow Al_2O_3.2H_2O$ 

- **20.** (b) Chile salt petre  $\rightarrow NaNO_3$
- **21.** (a) *Na* is alkali metal highly reactive. Hence present in combined state.
- **24.** (c)  $Na_3AlF_6$  Sodium hexafluoro aluminate (III)
- **28.** (a) Bauxite  $(Al_2O_3.2H_2O)$

Corundum  $(Al_2O_3)$ 

 ${\tt Diaspore}\,(Al_2O_3.H_2O)$ 

- **29.** (d) Fluorspar  $(CaF_2)$ , Cryolite  $(Na_3AlF_6)$ , Feldspar  $(KAlSi_3O_8)$ , Mica  $(K_2O.3Al_2O_3.6SiO_2.2H_2O)$
- **30.** (a) Haematite  $Fe_2O_3$
- **33.** (a) Invar Fe = 64% and Ni = 36%
- **34.** (c) Cassiterite  $(SnO_2)$ , Magnetite  $(Fe_3O_4)$ ,

Haematite  $(Fe_2O_3)$ , Limonite  $(Fe_2O_3.3H_2O)$ .

- **36.** (b) Copper is a reddish brown metal
- 37. (b) Azurite  $Cu(OH)_2.2CuCO_3$
- **38.** (d) Malachite  $(Cu(OH)_2.CuCO_3)$
- **40.** (b) Argentite or silver glance  $(Ag_2S)$
- **44.** (c) Zinc blende is ZnS not  $ZnCl_2$
- **46.** (c) Galena (*PbS*), Anglesite (*PbSO*<sub>4</sub>),

  Calamine (*ZnCO*<sub>3</sub>), Cerrussite (*PbCO*<sub>3</sub>)
- **52.** (b) Cuprite  $(Cu_2O)$  and Argentite  $(Ag_2S)$
- **53.** (a) Horn silver (AgCl)
- **55.** (c) Carnallite is  $KCl.MgCl_2.6H_2O$
- **56.** (b) Cryolite is an ore of Al containing  $Na_3AlF_6$ .
- **58.** (c) Corundum  $(Al_2O_3)$  is an ore of Al.
- 59. (d) All minerals are not suitable for the extraction of metals commercially. Thus all ores are minerals, but all minerals are not ores.
- **60.** (c) Among cuprite  $[Cu_2O]$ , Chalcacite  $[Cu_2S]$ , Chalcopyrite  $[CuFeS_2]$  & Malachite  $[Cu(OH)_2.CuCO_3]$ , only Chalcopyrite is an ore which contains both Fe and Cu
- **61.** (a) Felspar is  $K_2O.Al_2O_3.6SiO_2$
- **62.** (a) Chile salt petre is  $NaNO_3$  While  $KNO_3$  is Indian salt petre.  $Na_2SO_4$  is Glouber salt and  $Na_2S_2O_3$  is known as Hypo.
- **63.** (c) Gypsum  $(CaSO_4.2H_2O)$  is an ore of calcium. Dolomite  $(CaCO_3.MgCO_3)$ , Magnesite  $(MgCO_3)$  and Carnalite  $(KCl.MgCl_2.6H_2O)$  are the ores of Magnesium.
- **64.** (c) Magnetite  $(Fe_3O_4)$ , Siderite  $(FeCO_3)$ , Limonite  $(Fe_2O_3.3H_2O)$  and Haematite  $(Fe_2O_3)$  are ores of Iron. Only Smithsonite is not an ore of Iron.





- **65.** (c) Carnalite is an important ore of magnesium. It is  $KCl.MgCl_2.6H_2O$
- **67.** (c) Al is most abundant metal in the earth crust
- **68.** (d) Chalcopyrite (CuFeS 2)
- **70.** (a) Cassiterite  $SnO_2$ Cryolite -  $Na_3AlF_6$ Cerussite -  $PbCO_3$
- **71.** (b) Carnalite is the ore of K and Mg its formula is  $KCl.MqCl_2.6H_2O$
- **72.** (b) Pyrolusite  $MnO_2$ Malachite  $CuCO_3.Cu(OH)_2$ Diaspore  $Al_2O_3.H_2O$ Cassiterite  $SnO_2$

# Concentration

- 1. (a) Froth floatation method is based on the fact that the surface of sulphide ores is preferentially wetted by oil while that of gangue is wetted by water.
- 4. (c) Haematite  $(Fe_2O_3)$ Iron ores are concentrated by this method
- 5. (b) Pine oil is foaming agent. Now another substance collector such as potassium ethyl xanthate or amyl xanthate are added.
- **6.** (c) Cinnabar (HgS) the ore of mercury is concentrated by froth floatation process.
- 7. (c) Cyanide process is used in the extraction of both Silver and Gold because these form complex salts with  $CN^-$  ion due to presence of lone pair of electron on nitrogen atom.
- **8.** (b) Cassiterite  $SnO_2$  or tinstone an ore of tin being non-magnetic can be separated from magnetic impurities like Fe and Mn from this method.
- 13. (c) Chemical separation or Leaching.
  In this powdered ore is treated with a suitable reagent which can dissolve the ore but not the impurities.
- 14. (d) Copper pyrite CuFeS 2 (Chalcopyrite)
- **16.** (c) Sulphides ores are always concentrated by froth floatation process
- **20.** (a) Froth floatation because it is sulphide ore (ZnS)
- **22.** (a) Here only Galena is *PbS* (a sulphide ore).

Cassiterite is  $SnO_2$  (oxide ore). Magnetite is  $Fe_3O_4$  (Oxide ore) and Malachite is  $Cu(OH)_2.CuCO_3$  (Carbonate ore). The froath floatation process is used to concentrate sulphide ores, based on preferential wetting properties with froating agent and water.

# **Roasting & Calcination**

- (b) These are the substances which can withstand very high temperature without melting or becoming soft.
- **2.** (a) To remove volatile substances.

$$S_8 + 8O_2 \rightarrow 8 SO_2 \uparrow$$
;  $P_4 + 5O_2 \rightarrow P_4O_{10} \uparrow$   
 $4 As + 3O_2 \rightarrow 2 As_2O_3 \uparrow$ 

- 3. (c) In this process sulphides ores are converted into oxide ores  $2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2 \uparrow$
- 5. (c)  $SiO_2$   $CaCO_3$ , lime, CaO Basic flux
- **6.** (a) (Impurity) Gangue + flux  $\rightarrow$  Slag Fusible Fusible
- 7. (a)  $CaCO_3 \rightarrow CaO + CO_2$

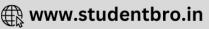
Heating the ore in absence of air is calcination.

**9.** (b) Smelting is a process of reducing metal oxide to metal by means of coke or *CO*.

$$Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$$
  
 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ 

- 13. (c) Flux is added during smelting it combines with infusible gangue present in the ore to form a fusible mass known as slag. Flux + Gangue  $\rightarrow$  Slag
- **15.** (d)  $CaO \rightarrow It$  is hygroscopic in nature
- **22.** (b) Reduction with carbon is called smelting  $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$
- **25.** (a)  $SiO_2 + CaO \rightarrow CaSiO_3$ Impurity Flux Slag
- **26.** (c) Impurities of  $SiO_2$  is present in the iron ore so basic flux  $CaCO_3$  is added.  $CaO + SiO_2 \rightarrow CaSiO_3$ Flux Impurity Slag
- **28.** (b)  $CaCO_3 \rightarrow CaO + CO_2$ ;  $CaO_3 + SiO_2 \rightarrow CaSiO_3$ Flux Impurity of haematite Slag
- **29.** (b)  $FeO + SiO_2 \rightarrow FeSiO_2$  Slag
- 30. (c) Hydrometallurgy  $Ag_2S + 4NaCN \rightarrow 2Na[Ag(CN)_2] + Na_2S$   $2Na[Ag(CN)_2] + Zn \rightarrow Na_2[Zn(CN)_4] + 2Ag$
- **31.** (b)  $Cu_2Cl_2 + Ag_2S \rightarrow Cu_2S + 2AgCl$





$$2AgCl + Hg \rightarrow Hg_2Cl_2 + 2Ag$$
  
 $AgCl + Hg \rightarrow Ag + HgCl$ 

- **32.** (d) Roasting (Sulphide ore is heated in excess of air)
- 33. (b)  $ZnCO_3 \rightarrow ZnO + CO_2$

In calcination ore is heated in absence of air in a reverberatory furnace to remove moisture and  ${\it CO}_2$ 

- **36.** (b)  $SiO_2 + CaO \rightarrow CaSiO_3$ Acidicimpurity Basic flux Slag
- **39.** (b)  $CaCO_3 + Coke + Calcined$
- 41. (b) Zinc blende (ZnS);  $2ZnS + 3O_2 \xrightarrow{\Delta} 2ZnO + 2SO_2$
- **42.** (c) When conc. HgS ore is roasted

$$HgS + O_2 \xrightarrow{773-873 \, K} Hg + SO_2$$

At this temperature, mercury vaporises and the vapours are condensed to the liquid metal. Mercury so obtained is about 99.7% pure.

**43.** (d) Combustion zone 1800 *K* 

Fusion zone 1600 K

Slage zone 1300 *K* 

Treduction zone 800 K

- **44.** (b) In roasting process, the ore (usually sulphide) alone or mixed with other materials is heated in excess of air.
- **45.** (d) Flux is used to fuse non-fusible impurities presents in ore.
- **46.** (d) During extraction of Fe calcium silicate  $(CaSiO_3)$  slag is obtained.
- **47.** (b) In Bessemer converter copper sulphide is partially oxidised to cuprous oxide which further reacts with remaining copper sulphide to form copper and sulphur dioxide.  $Cu_2S + 2Cu_2O \rightarrow 6Cu + SO_2$
- **48.** (d) Flux is used to remove silica and undesirable metal oxide.
- **49.** (a) Roasting is the process of heating the ore strongly in the presence of excess of air. It is generally carried in a reverberatory or blast furnace.
- **50.** (b) Lime stone which is a flux used to remove acidic impurities in metallurgical process.
- **52.** (a)  $CN^-$  solution used in extraction of Ag metal in the cyanide process.
- **57.** (c) Lime stone (*CaCO*<sub>3</sub>) is used for formation of slag in *Fe* extraction

$$CaCO_3 \longrightarrow CaO + CO_2 \uparrow$$
Lime stone

$$\begin{array}{c} \textit{CaO} + \textit{SiO}_2 & \longrightarrow \textit{CaSiO}_3 \\ \text{Gangue} & \text{slag} \\ \textit{or} & \text{impurity} \end{array}$$

**58.** (a)  $Cu_2S + 2Cu_2O \rightarrow 6Cu + SO_2$  (Auto-reduction).

This reaction occurs in reverberatory furnace to get metallic copper.

59. (b) Roasting involves heating of the ore either alone or with some other material usually in presence of air below its fusion temperature. In roasting, definite chemical changes like oxidation, chlorination etc., take place

$$S + O_2 \rightarrow SO_2$$

**60.** (a) Calcination  $ZnCO_3 \rightarrow ZnO + CO_2$ 

### Reduction to free metal

- (c) Because Na is very reactive and can not be extracted by means of the reduction by C, CO etc. So extracted by electrolysis.
- **2.** (a) Carbon reduction,  $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$
- 3. (b) Flux + Gangue  $\rightarrow$  Slag
- **4.** (b) Alumino thermite process involves reduction of oxides such as  $Fe_2O_3$ ,  $Mn_3O_4$ ,  $Cr_2O_3$  etc. to metals with aluminum.  $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr \Delta H = -ve$
- **5.** (b)  $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
- 7. (a) A mixture of Al powder and metallic oxide  $(Cr_2O_3, Mn_3O_4 \text{ etc})$  is called thermite.
- **9.** (b) *Al* is highly electropositive. It can be obtained by electrolytic reduction.
- **10.** (d)  $Fe_2O_3 + 3C \rightarrow 3CO + 2Fe$
- 13. (a) Bauxite into aluminium because Al is a strong reducing agent it has strong affinity with oxygen than carbon
- **20.** (c) Electrolytic reduction Hall and Heroult process.
- **23.** (b)  $Fe_2O_3 + 3CO \rightarrow 3CO_2 + 2Fe$
- **24.** (c) Self reduction :- Reduction of oxide ore of a metal by its own sulphide  $2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$
- **26.** (a)  $ZnO + CO \rightarrow CO_2 + Zn$
- **27.** (d)  $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

$$3Cu_2O + CH_4 \longrightarrow 6Cu + 2H_2O + CO$$
(From green logs of wood)





- **30.** (c) Sodium  $\rightarrow$  Highly reactive metal
- **33.** (a)  $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr$
- **34.** (a) In thermite process a mixture of aluminium powder and ferricoxide in the rate of 1: 3 is used.
- **35.** (b) Heating with carbon in absence of air is known as carbon reduction.

This is used in Iron metallurgy.

$$Fe_2O_3 + C \xrightarrow{\text{(in blast furnace)}} Fe$$

# Refining of crude metal

- **2.** (c) Van Arkel method *Ti* and *Zn* are refined by this method. It is used for obtaining ultra pure metals.
- **3.** (b) Cupellation method is used when the impure metals contain impurity of another metal which forms volatile oxide.
- **4.** (a) Metals are electropositive elements because they have tendency to loose  $e^-$  and forms + ve ions

$$Na \rightarrow Na^+ + e^-$$

- **6.** (b) Impure metal as anode and pure metal as cathode.
- 7. (b) Mg and Al can not be obtained by the electrolysis of aqueous solution of their salts because instead of metal  $H_2$  gas is liberated at cathode.
- 8. (a)  $Ti + 2I_2 \xrightarrow{500 K} TiI_4 \xrightarrow{1700 K} Ti + 2I_2$ Volatile
  Stable compound
- 9. (c) Zone refining is employed for preparing extremely pure metals.

It is based on the principle that when a molten solution of the impure metal is allowed to cool the pure metal crystallises out while the impurities remain in the melt. Ex: Semiconductors like *Si*, *Ge* and *Ga* are purified by this method.

**10.** (c)  $2NaCl \to 2Na^+ + 2Cl^-$ 

Anode:  $2Cl^- \rightarrow 2e^- + Cl_2$  (oxidation)

Cathode:  $2Na^+ + 2e^- \rightarrow 2Na$  - (reduction)

- (b) Poling is used for purification of metal which contain their own oxide as impuritye.g. Cu<sub>2</sub>O in Cu; SnO<sub>2</sub> in Sn
- **12.** (c) Cupellation: If metal possess the impurity of another metal which forms volatile oxide. Then cupellation method is used.
- **16.** (a) Mond's process

$$Ni + 4CO \xrightarrow{\text{heat}} [Ni(CO)_4] \xrightarrow{\text{Decompose}} Ni + 4CO$$
Impure

17. (c) Hydrometallurgy is the process of dissolving the metal or its ore by the action of a suitable chemical regent followed by recovery of the metal either by electrolysis or by the use of a suitable precipitating agent.

$$4Au + 8KCN + 2H_2O + O_2 \rightarrow 4K[Au(CN)_2] + 4KOH$$

$$2K[Au(CN)_2] + Zn \rightarrow 2Au + K_2[Zn(CN)_4]$$

# **Critical Thinking Questions**

- 1. (c) Black Jack (*ZnS*), also called zinc blend, is an ore of Zinc.
- **2.** (a) Chalcopyrities is contain sulphur that's why it is concentrated by froth floatation process.
- **3.** (a) Removal of silicious matter from ores is known as dressing or concentration of ore.
- 4. (b) Wolframite ore  $[FeWO_4]$  is present in tin stone as impurities and it has same mass per unit volume as that of tin stone. So it is separated by electromagnetic separator because wolframite is magnetic in nature hence it gets attracted by magnet while tin stone doesn't
- **5.** (b) Auto reduction is used for the extraction of copper from its ore with low copper content.
- **6.** (b) PbO &  $PbSO_4$  get reduced by PbS itself which is already present in mixture so because the reduction took place by mixture itself, hence is known as self reduction.

$$2PbO + PbS \xrightarrow{\Delta} 3Pb + SO_2 \uparrow$$

$$PbSO_4 + PbS \xrightarrow{\Delta} 2Pb + 2SO_2 \uparrow$$

- **7.** (d) Zone refining is a method of purification used for semiconductors like *Si*, *Ge* and *Ga*.
- **8.** (d) By the process of zone refining pure silicon is obtained which is used in semiconductor.
- **9.** (d)  $MgCO_3$  is the formula of magnesite.
- **10.** (a) Lapis lazuli is the aluminium silicate present in earth rocks as blue stone.

#### **Assertion and Reason**

- **2.** (e) Iron is highly reactive element, therefore, it is found in combined state. Here assertion is false but reason is true.
- **3.** (a) Both assertion and reason are true and reason is the correct explanation of assertion.
- 4. (b) Both assertion and reason are true but reason is not the correct explanation of assertion. Non fusible mass present in ore in mixing







with suitable flux are fused which are then reduced by coke to give free metal.

- **5.** (c) Assertion is false but reason is true. Leaching is a process of concentration.
- **6.** (c) Assertion is true but reason is false. Collectors absorbs themselves on polar groups to grains of ores and thus derive them on the surface to pass on into the froth.
- 7. (c) Assertion is true but reason is false.

  Oxide ores being heavier than the earthy or rocky gangue particles settle down while lighter impurities are washed away.
- **8.** (a) Both assertion and reason are true and reason is the correct explanation of assertion
- 9. (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
  Silver nitrate is called lunar caustic because when it comes in contact with organic substances (e.g. skin, clothes) and reduced to metallic silver which is white like the iron lunar.
- 10. (c) Assertion is true but reason is false.
  Wolframite being magnetic is attracted by the magnetic roller and forms a heap under it.
- (a) Both assertion and reason are true and reason is correct and reason is the correct explanation of assertion.
   Liquation process is based on the difference in fusibility of the metal and impurities. When the impurities are less fusible than the metal itself, the process is employed.
- 12. (a) Au is recovered from the solution by the addition of electropositive metal.

$$2NaAu(Cu)_2 + Zn \longrightarrow Na_2 Zn(CN)_4 2Au \downarrow$$
Soluble complex

