Exercise-1

& Marked Questions may have for Revision Questions.

Section (A) : ORES & method of concentration

ONLY ONE OPTION CORRECT TYPE

1.	Metallurgy is the proces (1) Concentration of ore (3) extraction of metal f	ss of : e rom ore	(2) roasting of ore (4) Both (1) and (3)	
2.	Gravity separation meth (1) preferential washing (2) difference in densitie (3) difference in chemic (4) none of these.	nod is based upon : g of ores and gangue par es of ore particles and im cal properties of ore partic	ticles. purities. cles and impurities.	
3.	The process of removin (1) levigation	ng lighter gangue particle (2) liquidation	s by washing in a curren (3) leaching	t of water is called : (4) cupellation.
4.	The metal that occurs in (1) silver	n the native state as well (2) magnesium	as in the combined form (3) aluminium	is : (4) manganese
5.	Which of the following i (1) Horn silver	s not the example of oxic (2) cassiterite	de ore ? (3) cuprite	(4) Haematite
6.24	The rocky and silicious (1) slag	matter associated with a (2) mineral	n ore is called : (3) matrix or gangue	(4) flux
7.	Cerrusite is an ore of : (1) Zn	(2) Mg	(3) Ca	(4) Pb
8.	Which of the following s (1) Zn, Cu, Mg	set of metals mostly foun (2) Zn, Cu, Pb	d as sulphide ores : (3) Fe, Al, Sn	(4) Cu, Ag, Au
9.	Which mineral has been (1) Bauxite : (3) Cryolite :	n named incorrectly ? Al ₂ O ₃ .2H ₂ O 3NaF .AIF ₃	(2) Corundum : (4) Felspar :	AI_2O_3 $Be_3AI_2Si_6O_{18}$
10.১	Chemical leaching is us (1) carnallite	seful in the concentration (2) bauxite	of : (3) calamine	(4) haematite
11.	Sulphide ores are gene (1) gravity separation p (3) froth floatation	rally concentrated by the rocess	e : (2) calcination process (4) electromagnetic sep	paration
12.	NaCN is sometimes ad are expected because $(1) Pb(CN)_2$ is precipitat (2) ZnS forms soluble of (3) PbS forms soluble of (4) NaCN is never adde	Ided in the froth flotation ted while no effect on Zn complex $Na_2[Zn(CN)_4]$ wh complex $Na_2[Pb(CN)_4]$ wh ed in froth floatation proce	process as a depressan S. ile PbS forms froth ile ZnS forms froth. ess.	t when ZnS and PbS minerals
13.	Which one of the follow (1) HgS + $O_2 \rightarrow$ Hg + S	ing reactions represents O_2	a calcination reaction? (2) $2CuFeS_2 + 4O_2 \rightarrow C$	Cu ₂ S + 2FeO + 3SO ₂

14.	(3) CuCO ₃ . Process of h (1) calcination	Cu(OH)₂→ eating ore on	CuO + C in air to (2) roa	$CO_2 + H_2O$ remove sulph sting	(4) Al ₂ iur is : (3) zo	₂ O ₃ .2H ₂ O ne refinin	+2NaC	$H \rightarrow 2N$ (4) liq	$laAlO_2 + 3H_2$. <mark>0</mark>
15.	In roasting : (1) moisture (3) ore beco	is remove nes porou	d. ıs.	0	(2) no (4) all	n–metals the abov	as the	ir volatile	e oxide are r	emoved.
16.১	Roasting is o (1) galena	carried out	in case ((2) zind	of : blende	(3) co	pper pyrit	tes	(4) all		
17.	Corundum is (1) ZnO	:	(2) Al ₂ 0	D ₃	(3) Fe	3O4		(4) Aç	J₂O	
18.	Important or (1) calamine	e of Zinc is	s : (2) ma	gnetite	(3) cry	/olite		(4) Ar	nglesite	
19.	Which of the (1) Bauxite	following	ores is c (2) Hae	oncentrated b ematite	y magneti (3) Arg	c separat gentite	tion me	thod ? (4) Do	olomite	
20.	When lime s (1) calcination	tone is he	ated, CO (2) roa	₂ gas is libera sting	ted. In me (3) ore	tallurgy, t e dressing	his pro g	cess is c (4) su	alled as : blimation	
21.为	Match Colun Column-I (M (a) Tin (b) Zinc (c) Copper (d) Lead Codes :	nn-I with C letals)	Column-II	and select th	e correct a Colun (p) Zir (q) Ca (r) Ce (s) Cu	answer us nn-II (Or ncite assiterite errusite iprite	sing the es)	codes (given below	:
	(a) (1) p (3) s	(b) q r	(c) r q	(d) s p	(2) (4)	(a) q q	(b) p p	(c) s r	(d) r s	
22.	In the froth fl (1) they are (3) their surf	oatation p ight. ace is pref	rocess fo	or the purificat	ion of mine (2) the I. (4) the	erals the ey are ins ey bear a	particle oluble. n electr	s float b ostatic c	ecause : charge.	
23.为	Match the n correct altern (a) Lead (b) Calc (c) Frot (d) Mag (a) (1) (s) (3) (p)	nethod of nate. umn I ching. ination. n floatation netic sepa (b) (q) (q)	concentr n. tration. (c) (p) (r)	(d) (r) (s)	ore in colu (p) (q) (r) (s) (2) (4)	umn I wi Coppe Magne Bauxite Chrom (a) (r) (q)	th the n II r pyrite. esite. e. (b) (q) (r)	ore in c (c) (p) (p)	olumn II ar (d) (s) (s)	id select the
Section	on (B) : The	ermodyr	namic p	orinciples o	of metall	lurgy ai	nd apj	olicatio	ons	
1.	Select correc (1) In the dec (2) Decompo (3) To make (4) All are co	ct stateme composition sition of a ΔG° nega prrect state	nt on of an c in oxide i tive, tem ements.	oxide into oxy s an endothei perature shou	gen and ga rmic chang Ild be high	aseous m ge. enough :	netal, er so that	ntropy in T ∆S° >	creases. ∆H°.	

2. Which of the following represents the thermite reaction?

(1) $3Mn_{3}O_{4} + 8AI \xrightarrow{\Delta} 9Mn + 4Al_{2}O_{3}$ (2) $2AI(OH)_{3} \xrightarrow{\Delta} Al_{2}O_{3} + 3H_{2}O_{3}$

3.	(3) $Cu_2S + 2Cu_2O$ $\xrightarrow{\Delta}$ Which of the following (1) Copper	\rightarrow 6Cu + SO ₂ metals is obtained by the	(4) ZnO + C $\xrightarrow{\Delta}$ Zr e self reduction process?	n + CO		
4.	 (1) Copper Blister copper is : (1) impure copper. (2) both (1) and (2) are 	(2) Th (2) obt	(3) Gold tained in self reduction pr	(4) Magnesium		
5.2	(3) both (1) and (2) are Main source of lead is	galena. It is converted to	Pb by :			
	(X): PbS -	$\xrightarrow{\text{air}} \xrightarrow{\text{PbO} + \text{SO}_2} \xrightarrow{\text{L}} \xrightarrow{\text{Pb} + \text{CO}_2}$	D_2			
	(Y): PbS -	$\xrightarrow{\text{air}} \xrightarrow{PbO + PbS} \xrightarrow{PbO + SC}$	02			
	(Z): PbS -	$\xrightarrow{\text{air}} \xrightarrow{\text{PbO} + \text{SO}_2} \xrightarrow{\text{L} \text{ co}} \text{Pb} + \text{Co}$:O ₂			
	Self - reduction process (1) X	s is : (2) Y	(3) Z	(4) none		
6.	Identify the metal M wh $MS + 2O_2 \rightarrow N$ $2MS + 3O_2 \rightarrow 3$ $MS + 2MO \rightarrow 3$ $MS + MSO_4 \rightarrow 3$	hose extraction is based ISO_4 $2MO + 2SO_2$ $3M + SO_2$ $2M + 2SO_2$	on the following reactions	5:		
	(1) zinc	(2) aluminium	(3) lead	(4) silver		
7.	The substance which is (1) silica	s used as flux in the extra (2) borax	action of iron from haema (3) lime stone	atite ore is : (4) salt cake		
8.	The composition of ma (1) Cu ₂ S and FeS	tte is : (2) CuS and Fe_2S_3	(3) Cu_2S and FeO	(4) Cu_2O and FeO		
9.	 In the extractive metallurgy of iron, the highest temperature in the blast furnance is found : (1) in the upper most part where reduction takes place. (2) in the lower part where fusion takes place. (3) in the middle part where slag formation takes place. (4) in the lower most part where combustion of carbon takes place. 					
10.	Ellingham diagram rep (1) change of ΔG with t (3) change of ΔG with p	resents : temperature. pressure.	(2) change of ΔH with t (4) change of ($\Delta G - T\Delta$	emperature. S) with temperature.		
11.	Carbon cannot be used (1) it is non-metal (2) the heat of formatio (3) pure carbon is not e (4) the heat of formatio	d in the reduction of Al_2O n of CO_2 is more than th easily available n of Al_2O_3 is too high	₃ because : at of Al ₂ O ₃			
12.	The hot mixture of PbS (1) Pb + SO_2	and PbO gives : (2) PbSO ₄	(3) PbSO ₄ + SO ₂	(4) Pb + SO ₃		
13.	The slag consists of me (1) metal carbonate	olten impurities, generall (2) metal silicate	y, in the form of : (3) metal oxide	(4) metal nitrate		

- 14. In which of the following pair of metals, both are commercially extracted from their respective ores by self reduction method ?
 (1) Zn, Cu
 (2) Pb, Cu
 (3) Sn, Zn
 (4) Al, Ag
- **15.** The iron obtained from the blast furnace is called : (1) pig iron (2) cast iron (3) wrought iron (4) steel
- **16.** In the extraction of Cu the reaction takes place in Bessemer converter is :
 - (1) $2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$. (2) $2CuFeS_2 + O_2 \rightarrow Cu_2S + FeS + SO_2$.
 - (3) $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$. (4) $2FeS + 3O_2 \rightarrow 2FeO + 2SO_2$.
- 17. Which of the following statement is incorrect about the extractive metallurgy of copper ?(1) Matte chiefly consists of iron sulphide and some ferrous oxide.
 - (2) The impurity of iron sulphide is removed as fusible slag, $FeSiO_3$ during roasting.
 - (3) The copper pyrite is concentrated by froth floatation process.
 - (4) Copper is obtained by self reduction in bessemer converter.
- **18.** The extraction of zinc from zinc blende involves :
 - (1) the electrolytic reduction.
 - (2) the roasting followed by reduction with carbon.
 - (3) the calcination followed by reduction with another metal.
 - (4) the roasting at molten temperature.

Section (C) : Electrochemical principles of metallurgy and applications

- 1.The metal which is obtained from both sea-water and ores from the earth's solid crust is :
(1) magnesium(2) copper(3) silver(4) calcium
- 2. Magnesium is extracted from ore carnallite by :
 - (1) the self-reduction process
 - (2) the carbon-reduction process
 - (3) the electrolytic process
 - (4) treating the ore with aqueous NaCN and then reducing the mixture
- **3.** NaCl and CaCl₂ are added to fused $MgCl_2$ in the electrolysis of $MgCl_2$ because :
 - (1) melting point is decreased and electrical conductivity is increased.
 - (2) melting point is increased and electrical conductivity is decreased.
 - (3) melting point and electrical conductivity both are decreased.
 - (4) melting point and electrical conductivity both are increased.
- Which metal is extracted using a hydrometallurgical process involving complexation?
 (1) Mg
 (2) Au
 (3) Sn
 (4) Zn
- **5.** In electrolysis of Al_2O_3 by Hall-Heroult process :
 - (1) cryolite $Na_3[AIF_6]$ lowers the melting point of AI_2O_3 and increases its electrical conductivity.
 - (2) Al is obtained at cathode and probably CO_2 at anode.
 - (3) oxygen liberated at anode reacts with carbon anode liberating CO and $CO_{_2}$.
 - (4) All of the above are correct.
- 6. Chemical reduction method is not used for :
 - (1) the extraction of Mg from anhydrous magnesium chloride.
 - (2) the extraction of Cu from cuprite.
 - (3) the extraction of Fe from haematite.
 - (4) the extraction of Zn from zincite.
- **7.** In the extraction of silver from argentite air is passed through aqueous solution because : (1) it converts Ag_2S to Ag_2O .

	 (2) it shifts the reaction sulphur. (3) it converts Ag₂S into (4) it helps in removing 	on equilibrium to forward o Ag and SO ₂ . the excess of CN ⁻ ions.	I direction by converting	Na_2S formed into Na_2SO_4 and
8.24	The process of bringin followed by extraction electropositive metal is	g the metal or its ore in of the metal either by e called : (2) bydrometallurgy	to solution by the action electrolysis or by a suitat	of a suitable chemical reagent ble precipitating agent i.e. more
	(T) electrometallurgy	(z) hydrometandrgy	(3) electro-renning	(4) 2011e remning.
9.2	In the electrolytic redcu (1) F_2	(2) OF ₂	AI_2O_3 and Na_3AIF_6 gas lib (3) O_2	erated at graphite anode is : (4) O ₃
Sectio	on (D) : Purificatior	n or refining of imp	ure metals	
1.	Aluminium metal is pur (1) Hoope electrolytic r (3) Serpeck's process	ified by : eduction process	(2) Dow's process (4) Baeyer's process	
2.	High purity copper met (1) carbon reduction (3) electrolytic reductio	al is obtained by : n	(2) hydrogen reduction (4) thermite reduction	
3.	The anode mud in the (1) Zn, Cu, Ag, Au	electrolytic refining of silv (2) Zn, Ag, Au	ver contains : (3) Cu, Ag, Au	(4) Au only
4.	Fractional crystallisatio (1) the concentration of (3) the purification of m	n method is used for : f ore netal	(2) the reduction of me (4) the purification of or	tal oxide e
5.	The method of zone re (1) Zn	fining of metals is used f (2) Al	or the purification of : (3) Cu	(4) None
6.	The process of zone re (1) silicon	fining is used for : (2) germanium	(3) gallium	(4) all the above.
7.a	Tin and zinc can be ref (1) cupellation	ined by : (2) liquation	(3) poling	(4) bessemerisation.
8.	To purify the 'blister co wood. The purpose of t (1) to remove the gases (2) to bring the impuritie (3) to increase the carb (4) to reduce the metal	pper' it is melted in a fur this is : s dissolved in blister cop es to the surface of the n oon percentage. lic oxide to metal by hyd	mace and then stirred win per. nolten liquid. rocarbons liberated by gr	th the poles of freshly cut green
9.	In the electro-refining, t (1) anode	the impure metal is made (2) cathode	e as : (3) electrolytic-tank	(4) none
10.১	Van Arkel method of pu	urification of metals invol	ves converting the metal	to :

- (1) volatile stable compound.
- (3) non-volatile stable compound.
- (2) volatile unstable compound.
- (4) none of these.

Exercise-2

Which of the following statements is incorrect? 1. (1) Silver glance mainly contains silver sulphide. (2) Copper pyrites mainly contains CuFeS₂. (3) Zinc blende mainly contains ZnSO₄. (4) Magnetite is the mixed oxide of FeO and Fe₂O₂ i.e. Fe₂O₄. 2. Among the following statements, the incorrect one is : (1) calamine and siderite are carbonates (2) argentite and bauxite are oxides (3) zinc blende and galena are sulphides (4) malachite and azurite are ores of copper Dolomite is mineral whose formula is : 3.2 (1) $CaMg(CO_3)_2$ (2) MgCO₃ (3) CaCO₃ (4) MgSO₄.7H₂O 4. Magnetic separation process is not used for the concentration of : (1) cassiterite (2) bauxite (3) haematite (4) chromite 5. Froth floatation process for the concentration of sulphide ores is an illustration of the practical application of: (1) adsorption (2) absorption (3) sedimentation (4) coagulation 6. Which one of the following is not a method of concentration of ore ? (1) electromagnetic separation (2) smelting (4) froth floatation process (3) gravity separation 7. Froth floatation process used for the concentration of sulphide ore : (1) is based on the difference in wetability of different minerals. (2) uses Xanthates and fatty acids as collector. (3) uses NaCN as depressant in the mixture of ZnS and PbS when ZnS forms soluble complex and PbS forms froth. (4) All are correct statements. 8. The reason, for floating of ore particles in concentration by froth floatation process is that : (1) they are light (4) they are hydrophobic (2) they are insoluble (3) they are charged In which of the following metallurgical processes leaching is not involved ? 9. (1) Al from Al₂O₂ (2) Ag from Ag₂S (3) Mg from MgCl₂ (anhydrous) (4) From low grade copper ore and scrapes 10.2 Which of the following statements is incorrect? (1) Beneficiation of ores involve the processes which are used for the removal of unwanted impurities. (2) In metallurgy, flux is a substance which is used to convert infusible impurities to fusible mass. (3) Aluminium is extracted by the electrolysis of alumina in aqueous medium . (4) In smelting processes the metal is obtained in fused state. 11. Which of the following processes are used for the extraction of Mg and Ag respectively? (1) Carbon reduction and cyanide process. (2) Cyanide process and electrolytic reduction. (3) Electrolytic reduction and cyanide process. (4) Carbon monoxide reduction and cyanide process.

12.১	Slag formed during smelting process in the extraction of Fe (from haematite) and Cu (from copper pyrites) are respectively :					
	(1) both CaSiO ₃	(2) both FeSiO ₃	(3) CaSiO $_{3}$ and FeSiO $_{3}$	(4) FeSiO_3 and CaSiO_3		
13.	When bauxite is heated (1) AI + CO	d with carbon in the atmosphere (2) AI + CO_2	osphere of nitrogen, prod (3) Al + CO + CO ₂	ucts formed are : (4) AIN + CO		
14.	Bauxite is leached with (1) KCI	: (2) NaCN	(3) NaOH	(4) Na ₂ SO ₄		
15.	Leaching the silver and (1) is oxidation reaction (3) is reduction reaction	gold metal with CN⁻ : n	(2) is complexation read (4) is both (1) and (2)	ction		
16.১	Which of the following r (1) 2AI + HCI \longrightarrow 2AIC (3) 2AI + N ₂ \longrightarrow 2AIN	reactions represents Gol Cl ₃ + 3H ₂	dschmidt aluminothermit (2) $Al_2O_3 + 2NaOH + 2l$ (4) $2Al + Cr_2O_3 \longrightarrow 2C$	hmidt aluminothermite process? $P(AI_2O_3 + 2NaOH + 2H_2O \longrightarrow 2NaAIO_2 + 3H_2O)$ $P(AI_2O_3 + Cr_2O_3 \longrightarrow 2Cr + AI_2O_3)$		
17.	The materials which ar of iron from haematite of (1) coke and silica (3) lime stone and silica	e added along with the opre are :	calcined iron ore into the (2) coke and lime stone (4) coke and borax	blast furnance in the extraction		
18.	In the extraction of aluminium Process X : employed for red bauxite to remove iron oxide (main impurity) Process Y : (Serpeck's process) : used for white bauxite to remove Z (main impurity) then, Select correct option for the process X and impurity Z. (1) X = Hall and Heroult's process and $Z = SiO_2$ (2) X = Bayer's process and $Z = SiO_2$ (3) X = Serpeck's process and Y = iron oxide (4) X = Bayer's process and Y = iron oxide					
19.	 Which of the following statements is correct regarding the slag obtained during the extraction of a metal like copper or iron ? (1) The slag is lighter and has lower melting point than the metal (2) The slag is heavier and has lower melting point than the metal (3) The slag is lighter and has higher melting point than the metal (4) The slag is heavier and has higher melting point than the metal 					
20.๖	Choose the correct opt (I) It is the process of h (II) It is an exothermic p (III) It is used for the co (IV) It removes easily o (1) I, II and III	ion using the code regar eating the ore in air in a process. ncentration of sulphide o xidisable volatile impurit (2) I, II and IV	ding roasting process. reverberatory furnace to ore. ies present in the concen (3) I, III and IV	obtain the oxide. trated ore. (4) I, II, III and IV		
21.	In the metallurgy of iror (1) CaSiO ₃	n, the upper layer obtain (2) spongy iron	ed in the bottom of blast $(3) \ Fe_2O_3$	furnace mainly contains : (4) FeSiO ₃		
22.	Which one of the follow (in iron metallurgy) ? (1) CaO + SiO ₂ \longrightarrow Ca (3) 3Fe ₂ O ₃ + CO \longrightarrow 2	ving reactions occurs du $aSiO_3$ (slag) 2Fe ₃ O ₄ + CO ₂	ring smelting in the reduction (2) $Fe_2O_3 + 3C \longrightarrow 2F$ (4) $CO_2 + C \longrightarrow 2CO$	ction zone at lower temperature e + CO		

23.ര	Extraction of silver from Ag_2S by the use of sodium cyanide is an example of :					
	(1) roasting	(2) hydrometal	lurgy	(3) electrometallurgy	(4) smelting	
24.	Which method is not o (1) Distillation : zinc a (3) Van Arkel : titatniu	correctly matched nd mercury m	for refin	ing of crude metals ? (2) Liquation : tin (4) Mond process : lea	ıd	
25.	Silver ore dissolves in (1) AgCN	dilute solution of (2) [Ag(CN) ₂] ⁻	NaCN ir	n the presence of air to f (3) AgCNO	orm : (4) [Ag(CN) ₃] ³⁻	
26.	Which of the following I. Gold ; II. Iron, III. S (1) I and II	ı metals may be p ilver ; IV Magnesi (2) II and IV	oresent ir ium	the anode mud during (3) I and III	electror-fining of copper? (4) III and IV	
27.	Match column I with c Column I I. Cyanide process.	column II and sele	ect the co Colum (1) Ultr	ct the correct answer using the codes given below the lists : Column II (1) Ultra pure Ge		
	 II. Froth floatation process. III. Electrolytic reduction. IV. Zone refining. (1) I–(3), II–(1), III–(4), IV-(2) (3) I–(3), II–(2), III–(4), IV-(1) 		 (2) Pine oil. (3) Extraction of Al. (4) Extraction of Au. (2) I-(4), II-(2), III-(3), IV-(1) (4) I-(4), II-(1), III-(3), IV-(2) 			
28.2	Which of the following (1) Highly pure ore (3) Ultra pure oxide	is obtained by zo	cone refining method? (2) Highly pure aluminium (4) Ultra pure metals used as semi-conductors			
	Exercise	-3 ====				

PART - I : NEET / AIPMT QUESTION (PREVIOUS YEARS)

1.	Cryolite is :				[AIPMT 2000]
	(1) Na_3AIF_6 and is used	t in the electrolysis of alu	mina for decreasing elec	trical conductivit	ty.
	(2) Na_3AIF_6 and is used	t in the electrolysis of alu	mina for lowering the me	Iting point of alu	imina.
	(3) Na_3AIF_6 and is used	t in the electrolytic purific	ation of alumina.		
	(4) Na_3AIF_6 and is used	d in the electrolysis of alu	mina.		
2.	The method of zone ref (1) greater noble charact (2) greater solubility of th (3) greater mobility of th (4) higher melting point		[AIPMT 2003]		
3.	Silver is obtained from	Na[Ag(CN) ₂] by reaction	with :		[AIPMT 2004]
	(1) Fe	(2) Na	(3) Zn	(4) Au	
4.	 (1) Fe (2) Na (3) Zn (4) Au The method of zone refining of metals is based on the principle of (1) greater mobility of the pure metal than that of the impurity (2) higher melting point of the impurity than that of the pure metal (3) greater noble character of the solid metal than that of the impurity (4) Au 				[AIPMT 2004]

5. Sulphide ores of metals are usually concentrated by Froth floatation process. Which one of the following sulphide ores offers an exception and is concentrated by chemical leaching ?

	(1) Sphalerite	(2) Argentite	(3) Galena	[AIPMT 2007] (4) Copper pyrite					
6.	Blister copper is : (1) impure Cu	(2) Cu alloy	(3) pure Cu	[AIPMT 2007] (4) copper having 1% impurity					
7.	Which of the following s not true ?	statements, about the ad	lvantage of roasting of s	ulphide ore before reduction is [AIPMT 2007]					
	(1) Carbon and hydroge (2) The $\Delta_f G^\circ$ of the sulpl	en are suitable reducing a hide is greater than those	agents for metal sulphide e for CS ₂ and H ₂ S	S					
	(3) The $\Delta_t G^\circ$ is negative for roasting of sulphide ore to oxide								
	(4) Roasting of the sulphide to the oxide is thermodynamically feasible								
8.	Sulphide ores of metals are usually concentrated by froth flotation process. Which on sulphide ores offers an exception and is concentrated by chemical leaching ?								
	(1) Argentite	(2) Galena	(3) Copper pyrite	(4) Sphalente					
9.	Which of the following e	lements is present as the	e impurity to the maximu	m extent in the pig iron ? [AIPMT 2011]					
	(1) Manganese	(2) Carbon	(3) Silicon	(4) Phosphorus					
10.	Which of the following p (1) Ga and In	airs of metals is purified (2) Zr and Ti	by van Arkel method ? (3) Ag and Au	[AIPMT 2011] (4) Ni and Fe					

- **11.** Aluminium is extracted from alumina (Al_2O_3) by electrolysis of a molten mixture of :[AIPMT 2012] $(1) Al_2O_3 + HF + NaAlF_4$ $(2) Al_2O_3 + CaF_2 + NaAlF_4$ [AIPMT 2012] $(3) Al_2O_3 + Na_3AlF_6 + CaF_2$ $(4) Al_2O_3 + KF + Na_3AlF_6$ [AIPMT 2012]
- 12. Which one of the following is a mineral of iron ? [AIPMT 2012] (1) Malachite (2) Cassiterite (3) Pyrolusite (4) Magnetite 13. In the extraction of copper from its sulphide ore, the metal is finally obtained by the reduction of cuprous [AIPMT 2012] oxide with : (1) Copper (I) sulphide (Cu₂S) (2) Sulphur dioxide (SO₂) (3) Iron sulphide (FeS) (4) Carbon monoxide (CO) 14. Identify the alloy containing a non-metal as a constituent in it. [AIPMT 2012] (1) Invar (2) Steel (3) Bell metal (4) Bronze
- 15. "Metals are usually not found as nitrates in their ores" [AIPMT 2015] Out of the following two (a and b) reasons which is /are true for the above observation ?

 (a) Metal nitrates are highly unstable.
 (b) Metal nitrates are highly soluble in water
 (1) a and b are false
 (2) a is false but b is true
 (3) a is true but b is false
 (4) a and b are true

 16. In the extraction of copper from its sulphide ore, the metal finally obtained by the reduction of cuprous oxide with :

 [AIPMT 2015]

(2) carbon monoxide

(4) sulphur dioxide (3) copper (I) sulphide 17. Match items of Column I with the items of Column II and assign the correct code : [NEET-1 2016] Column I Column II Ultrapure Ge Cyanide process (a) (i) Froth floatation process (ii) Dressing of ZnS (b) Electrolytic reduction (iii) Extraction of AI (c) (d) Zone refining (iv) Extraction of Au Purification of Ni (v) Code : (d) (d) (a) (b) (c) (a) (b) (c) (1)(iii) (iv) (v) (i) (2)(ii) (iii) (i) (iv) (3) (ii) (iii) (i) (v) (4) (ii) (iii) (iv) (i) 18. Extraction of gold and silver involves leaching with CN- ion. Silver is later recovered by : (1) liquation (2) distillation [NEET- 2017] (3) zone refining (4) displacement with Zn Considering Ellingham diagram, which of the following metals can be used to reduce alumina ? 19. (3) Mg (1) Fe (2) Cu (4) Zn [NEET- 2018] 20. Match the following : [NEET-1- 2019] (a) Pure nitrogen (i) Chlorine (b) Haber process (ii) Sulphuric acid (c) Contact process (iii) Ammonia (iv) Sodium azide or Barium azide (d) deacon's process Which of the following is the correct option ? (d) (a) (b) (c) (1)(iv) (iii) (ii) (i) (2) (i) (ii) (iii) (iv) (3) (ii) (iv) (i) (iii) (4)(iii) (ii) (iv) (i) 21. Which one is malachite from the following [NEET-1- 2019] (1) $CuCO_3.Cu(OH)_2$ (3) Cu(OH)₂ (4) Fe₃O₄ (2) CuFeS₂ 22. [NEET-2- 2019] Identify the incorrect statement (1) The scientific and technological process used for isolation of the metal from its ore is known as metallurgy (2) Minerals are naturally occurring chemical substances in the earth's crust (3) Ores are minerals that may contain a metal (4) Gangue is an ore contaminated with undesired materials **PART - II : AIIMS QUESTION (PREVIOUS YEARS)** 1. Thermite is a mixture of iron oxide and : [AIIMS 2002] (1) aluminium powder (2) zinc powder (3) potassium metal (4) sodium metal 2. In the extraction of copper from its sulphide ore, the metal is formed by reduction of Cu₂O with [AIIMS 2003]

(1) FeS (2) CO (3) Cu₂S (4) SO₂

3.	Asseration : Extraction of iron metal from iron oxide ore is carried out by heating with coke.				
	Reason : The reaction, $Fe_2O_3(s) \longrightarrow Fe(s)$	+ $\frac{3}{2}O_2(g)$			
	is a spontaneous process. (1) If both Asseration and Reason are true a (2) If both Asseration and Reason are true b (3) If Assertion is true but Reason is false. (4) If both Assertion and Reason are false.	nd Reason ut Reason	n is the correct explanation of is not the correct explanation	[AIIMS 2005] Asseration. of Asseration.	
4.	In zone refining method, the molten zone : (1) contains impurities (3) contains more impurity than the original	(2) cc (4) m	ontains purified metal only oves to either side	[AIIMS 2009]	
5.	Which of the following reaction is an example	e of calcin	ation process ?	[AIIMS 2010]	
	(1) 2Ag + 2HCl + [O] $\xrightarrow{\Lambda}$ 2AgCl + H ₂ O	(2) 22	$2n + O_2 \xrightarrow{\Delta} 2ZnO$		
	(3) $2ZnS + 3O_2 \xrightarrow{\Delta} 2ZnO + 2SO_2$	(4) M	$gCO_3 \xrightarrow{\Delta} MgO + CO_2$		
6.	The compound which does not exist as hydr (1) ferrous sulphate (3) magnesium sulphate	ate form : (2) cc (4) sc	opper sulphate odium chloride	[AIIMS 2011]	
7.	Which of the following statement is not correct (1) ΔG increases with an increases in tempe (2) It consists of plots of $\Delta_r G^\circ vs T$ for format (3) a coupling reaction can be well expressed (4) It express the kinetics of the reduction pro-	ect about E rature ion of oxic d by this d ocess	Ilingham diagram? es iagram	[AIIMS 2012]	
8.	Match list I with list II and select the correct a List I I. Cyanide Process II. Floatation process III. Electrolytic reduction IV. Zone refining Codes: (1) I–C, II–A,III–D,IV–B (3) I–C, II–B,III–D,IV–A	Answer us A. B. C. D. (2) I–I (4) I–I	ng the codes given below the List II Ultra pure Ge Pine oil Extraction of Al Extraction of Au D, II–B,III–C,IV–A D, II–A,III–C,IV–B	lists : [AIIMS 2013]	
9.	Assertion : Copper obtained after basseme Reason : Blisters are produced on the surfa (1) If both Asseration and Reason are true a (2) If both Asseration and Reason are true b (3) If Assertion is true but Reason is false. (4) If both Assertion and Reason are false.	rization is ace of the nd Reason ut Reason	known as blister copper. metal due to escaping of disso n is the correct explanation of is not the correct explanation	[AIIMS 2013] blved SO ₂ . Asseration. of Asseration.	

10. Carbon cannot be used to produce magnesium by chemical reduction of MgO because :
 (1) Carbon is not a powerful reducing agent
 (2) Magnesium reacts with carbon to form carbides

11.	(3) Carbon does not re ΔG^0 versus T plot in th	act with magnesium e Ellingham's diagram slo	(4) Carbon is a non-mopes downward for the	netal reaction	[AIIMS 2014] [AIIMS 2015]
	$(1) C + \frac{1}{2}O_2 \rightarrow CO$		(2) CO + $\frac{1}{2}O_2 \rightarrow CO$	2	
	$(3) 2Ag + \frac{1}{2}O_2 \rightarrow Ag_2$	0	(4) Mg + $\frac{1}{2}O_2 \rightarrow MgC$)	
12.	The zone refining proc (1) excess noble chara (2) lower melting point (3) greater solubility of (4) greater solubility of	ess of metals is based or acter of the liquid metal th of the impurity than that impure metal than that o the impurities in the molt	n the principle of an that of impurity. of pure metal f impurity ren state than in the soli	id.	[AIIMS 2016]
13.	In the equation, $4M + 8CN^{-} + 2H_2O + C$ Identify the metal (M). $4M + 8CN^{-} + 2H_2O + C$ (1) Au	(4) Cu	[AIIMS 2017]		
14.	Which process use in s (1) Self reduction of co (3) FeS convert into Fe	smelting during metallurg opper eO	y of coper (2) Cu₂S is converted (4) Reduction of Fe	into Cu ₂ O	[AIIMS 2018]

PART - III : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. Refining of impure copper with zinc impurity is to be done by electrolysis using electrodes as :

					[AIEEE - 2002]
	Cathode	Anode	Cathode	Anode	
	(1) pure copper	pure zinc	(2) pure zinc	pure copper	
	(3) pure copper impure	copper	(4) pure zinc	impure zinc	
2.	Aluminium is extracted	by the electrolysis of :			[AIEEE - 2002]
	(1) alumina		(2) bauxite		
	(3) molten cryolite		(4) alumina mixed with	molten cryolite	
3.	The metal extracted by	leaching with a cyanide	is :		[AIEEE - 2002]
	(1) Mg	(2) Ag	(3) Cu	(4) Na	
4.	Which one of the follow	ving ores is best concentr	ated by froth floatation m	nethod?	[AIEEE - 2004]
	(1) magnetite	(2) cassiterite	(3) galena	(4) malachite	
5.	Heating mixture of Cu ₂ 0	O and Cu_2S will give :			[AIEEE - 2005]
	(1) Cu_2SO_3	(2) CuO + CuS	(3) Cu + SO ₃	(4) Cu + SO ₂	
6.	During the process of e	electro-refining of copper	some metals present a	s impurity settl	e as anode mud.
	These are :				[AIEEE - 2005]
	(1) Sn and Ag	(2) Pb and Zn	(3) Ag and Au	(4) Fe and Ni	

 8. Which method of purification is represented by the following equation : [AIEEE - 2012, 4/4] Ti (s) + 2I₂(g) → ^{523K} → TiI₄(g) → ^{1700 K} → Ti (s) + 2I₂(g) (1) Zone refining (2) Cupellation (3) Polling (4) Van Arkel 9. In the context of the Hall - Heroult process for the extraction of AI, which of the following statement false? (1) CO and CO₂ are produced in this process [JEE-Main - 20] 	20] s is
Ti (s) + $2I_2(g) \xrightarrow{523K}$ TiI_4(g) $\xrightarrow{1700 \text{ K}}$ Ti (s) + $2I_2(g)$ (1) Zone refining(2) Cupellation(3) Polling(4) Van Arkel9.In the context of the Hall - Heroult process for the extraction of Al, which of the following statement false?(1) CO and CO ₂ are produced in this process[JEE-Main - 20]	s is
 (1) Zone refining (2) Cupellation (3) Polling (4) Van Arkel In the context of the Hall - Heroult process for the extraction of Al, which of the following statement false? (1) CO and CO₂ are produced in this process [JEE-Main - 20] 	s is
 9. In the context of the Hall - Heroult process for the extraction of Al, which of the following statement false? (1) CO and CO₂ are produced in this process [JEE-Main - 20] 	s is
(1) CO and CO_2 are produced in this process [JEE-Main - 20	
	15]
(2) AI_2O_3 is mixed with CaF_2 which lowers the melting point of the mixture and brings conductivity	
(3) Al ³⁺ is reduced at the cathode to form Al	
(4) $Na_{3}AIF_{6}$ serves as the electrolyte	
10. Which one of the following ores is best concentrated by froth floatation method? [JEE-Main - 20]	16]
(1) Siderite (2) Galena (3) Malachite (4) Magnetite	•
 When metal 'M' is treated with NaOH, a white gelatinous precipitate 'X' is obtained, which is solubl excess of NaOH. Compound 'X' when heated strongly gives an oxide which is used in chromatogra as an adsorbent. The metal 'M' is : 	ə in phy 18]
(1) AI (2) Fe (3) ZN (4) Ca	
12.The ore that contains both iron and copper is :[JEE-Main - 20]	19]
(1) azurite (2) copper pyrites (3) malachite (4) dolomite	
13. The correct statement regarding the given Ellingham diagram is :[JEE-Main - 20]	19]
(1) At 140000 Al cap be used for the extraction of Zn from ZnO	
(1) At 1400°C, At can be used for the extraction of Cu from Cu_2O	

(4) At 500°C, coke can be used for the extraction of Zn from ZnO

14. Hall-Heroult's process is given by :

[JEE-Main - 2019]

$(1) 2Al_2O_3 + 3C \rightarrow 4Al + 3CO_3$	2
---	---

(3) ZnO + C $\xrightarrow{\text{Coke, 1673 K}}$ Zn + CO

(2) $Cu^{+2}(aq) + H_2(g) \rightarrow Cu(s) + 2H^+(aq)$ (4) $Cr_2O_3 + 2AI \rightarrow Al_2O_3 + 2Cr$

15. Match the ores (column A) with the metals (column B) : [JEE-Main - 2019] (Column A) (Column B) Ores Metals (I) Siderite Zinc (a) (II) Kaolinite (b) Copper (III) Malachite Iron (c) (IV) Calamine (d) Aluminium (1) (I) \rightarrow (c); (II) \rightarrow (d); (III) \rightarrow (b); (IV) \rightarrow (a) (2) (I) \rightarrow (b); (II) \rightarrow (c); (III) \rightarrow (d); (IV) \rightarrow (a) (3) (I) \rightarrow (c); (II) \rightarrow (d); (III) \rightarrow (a); (IV) \rightarrow (b) (4) (I) \rightarrow (a); (II) \rightarrow (b); (III) \rightarrow (c); (IV) \rightarrow (d) 16. In the Hall-Heroult process, aluminium is formed at the cathode. The cathode is made out of : [JEE-Main - 2019] (1) Carbon (2) Copper (3) Pure aluminium (4) Platinum 17. The pair that does NOT require calcination is : [JEE-Main - 2019] (1) ZnO and MgO (2) ZnCO₃ and CaO (3) Fe₂O₃ and CaCO₃.MgCO₃ (4) ZnO and Fe₂O₃.xH₂O

Answers

	EXERCISE - 1												
SEC	TION (A)												
1.	(3)	2.	(2)	3.	(1)	4.	(1)	5.	(1)	6.	(3)	7.	(4)
8.	(2)	9.	(4)	10.	(2)	11.	(3)	12.	(2)	13.	(3)	14.	(2)
15.	(4)	16.	(4)	17.	(2)	18.	(1)	19.	(2)	20.	(1)	21.	(2)
22.	(3)	23.	(2)										
SEC	TION (B)												
1.	(4)	2.	(1)	3.	(1)	4.	(3)	5.	(2)	6.	(3)	7.	(3)
8.	(1)	9.	(4)	10.	(1)	11.	(4)	12.	(1)	13.	(2)	14.	(2)
15.	(1)	16.	(1)	17.	(1)	18.	(2)						
SEC	TION (C)												
1.	(1)	2.	(3)	3.	(1)	4.	(2)	5.	(4)	6.	(1)	7.	(2)
8.	(2)	9.	(3)										
SEC	TION (D)												
1.	(1)	2.	(3)	3.	(4)	4.	(3)	5.	(4)	6.	(4)	7.	(2)
8.	(4)	9.	(1)	10.	(2)								
						EXER	CISE	- 2					
1.	(3)	2.	(2)	3.	(1)	4.	(2)	5.	(1)	6.	(2)	7.	(4)
8.	(4)	9.	(3)	10.	(3)	11.	(3)	12.	(3)	13.	(4)	14.	(3)
15.	(4)	16.	(4)	17.	(2)	18.	(2)	19.	(1)	20.	(4)	21.	(1)
22.	(3)	23.	(2)	24.	(4)	25.	(2)	26.	(3)	27.	(2)	28.	(4)
						EXER	CISE	- 3					
						P	ART-I						
1.	(2)	2.	(2)	3.	(3)	4.	(4)	5.	(2)	6.	(4)	7.	(1)
8.	(1)	9.	(2)	10.	(2)	11.	(3)	12.	(4)	13.	(1)	14.	(2)
15.	(2)	16.	(3)	17.	(2)	18.	(4)	19.	(3)	20.	(1)	21.	(1)
22.	(4)					_							
1	(1)	2	(3)	3	(3)		(3)	5	(4)	6	(4)	7	(A)
י. פ	(1)	2. Q	(3)	3. 10	(3)	 11	(3)	J. 12	(+) (4)	0. 13	(1)	11	(4)
э.	(4)	Э.	(1)	10.	(2)	PA	ART-II	12.	(+)	13.	(1)	14.	(\mathbf{J})
1.	(3)	2.	(4)	3.	(2)	4.	(3)	5.	(4)	6.	(3)	7.	(3)
8.	(4)	9.	(4)	10.	(2)	11.	(1)	12.	(2)	13.	(1)	14.	(1)
15.	(1)	16.	(1)	17.	(1)								