General Principles and Processes of Isolation of Elements

(1) Gypsum is an ore of Calcium. It is composed of Calcium Sulfate dihydrate

Chemically it is $CaSO_4 \cdot 2H_2O$

(2) Bauxite is composed of $Al_2O_3 \cdot 2H_2O$

(4) Argentite = Ag_2S

horn Silver = AgCl

Pyrargyrite = $AgSbS_2$

(5) Flux is a process in which a substance is added to the molten metal to bond with impurities that can then be readily removed. Since Zinc is volatile it can be easily separated

(3) Azurite = $Cu_3(CO_3)_2(OH)_2$

(6) The electric furnace can go upto temperatures of 3000°C

(7) Iron ore normally contain gangue materials such as Silica (SiO_2), Alumina (Al_2O_3) along with Sulphur (S) and phosphorous. Limestone is composed to CaO and reacted with gangue material

(8) Iron is not Sublimated in the blast furnace. It is a process of converting solid to gas

(9) The process used for amalgamation of tin was Patio process.

(10) Answered in Q5

(11) Limestone acts as flux, coke acts as fuel Iron oxide for extraction of iron

(12) Roasting is volatilisation of volatile impurities and decomposition and addition of the ore

(13) Zinc blende ore is roasted in O_2 to get ZnO

$$2ZnS + 3O_2 \longrightarrow 2ZnO + 2SO_2$$

(14) Burning of lime is calcination (name derived)

(15) To remove gangue

(16) Furnace lining requires materials with high melting point

(17) metal oxide + carbon → metal + carbon dioxide

(18) Alumina is Al_2O_3

(19) Cryolite = Na_3AlF_6 fluorspar = CaF_2

(20) It is a process of refining or purifying metals using electricity used for most reactive metals

(21) No external reducing agent is used for autoreduction it is used mainly for the sulphide ores of Hg, Pb, Cu

(22) Silicon is used for semiconductors

(23) It is a purification process of crystalline solid.

(24) It is called Belts Electrorefining process (BEP). It contains H_2SiF_6 - $PbSiF_6$ with gelatin

(25) Oxide ore + Coke + flux (limestone) is used for extraction of all the metals listed

(26) Excess Carbon and Other impurities are burnt out of Pig iron to produce steel.

(27) It is trivial

(28) Bordeaux is $CuSO_4$ and Slaked Lime ($Ca(OH)_2$)

(29) Roasting is heating metal in Air for oxidation

(30) Ni metal ore is heated with CO to produce Nickel Carbonyl Vapour which is decomposed at high temp

(31) To heat metal below melting point to cause loss of moisture is called Calcination

(32) Alumino-thermic process is used for metals which are very reluctant towards reduction by Carbon

(33) a narrow region of a crystal is molten and this zone is moved along the crystal which melts impure solid leaving pure metal

(34) it is $Ca_3(PO_4)_2$

(35) Cu_2O can be reduced by H_2, C, and CO

Level-II

(1) $CuCl_2$ is reduced by all the listed metals

(2) It is $2PbCO_3 \cdot Pb(OH)_2$

(3) It is $PbCO_3$

(4) It is rigid and highly resistant alloy

(5) Fe_2O_3, TiO_2 and SiO_2 are the major impurities in $Al_2O_3 \cdot x H_2O$

(6) Al_2O_3 is a bad conductor of electricity

(7) It is a process of separating minerals from gangue by taking advantage of differences in hydrophobicity. It is done then wetting agents

(8) Wrought irons with carbon content of 0.01 to 0.08% is obtained

(9) all the solids absorb moisture

(10) AgBr is easy to photoreduce to get Ag and Br_2 gas

(11) Al is converted to Al^{+3}

(12) It is a method to purify copper which has cuprous oxide as impurity.

(13) It is a thermal proces in presence of air applied to ores and other solid materials to bring out a thermal decomposition product so CO_2 and H_2S are removed

(14) Silver and gold are extracted

(15) It contains Al, Mg, Cu and Mn

(16) All are reducing agents of 5th group

(17) It is $[Cu(NH_3)_4(H_2O)_2](OH)_2$

(18) Electric furnaces are lined with compounds of high melting temperature

(19) Main Equilibrium reaction is $Cu_2O + FeS \rightleftharpoons Cu_2S + FeO$

(20) $CuCO_3 \cdot Cu(OH)_2$ is Green

(21) Bromine is present only in two Oxidation States

(22) Zeolite is $Na_2Al_2Si_{14}O_{32} \cdot 3H_2O$

(23) It Contains Iron, chromium, Cadmium Nickel

(24) Lead is the main constituent of type metal

(25) $ZnO + C \xrightarrow[\text{coke}]{1673K} Zn + Co$ high temperature is involved

(26) It is explained by (a) Excitation of free protons (b) Diffusion of sodium ions (c) Oscillation of loose electrons (d) Existence of body centred cubic

(27) The middle layer Contains mixture of fluorides of Sodium aluminium and barium (Cryolite + BaF_2)

(28) Na is a highly reactive metal it even reacts with moisture in the air

(29) Copper

(30) AgI is Soluble in non polar solvents

(31) Silver is produced ~~from~~ during the electrolytic refining of copper and by application of parkes process

(32) Copper and Mercury are extracted by this process

(33) Chalcopyrate & copper pyrate ore is $CuFeS_2$

(34) Metals are Volatilised

(35) Bauxite is a major ore of aluminium

Assertion and Reason

(1) Al-O and O-H bonds have quite different bond strengths

(2) Iron is highly reactive hence it is not found freely

(3) Zinc is ~~below~~ above Cu in electrochemical series

(4) Coke is used as a reducing agent and flux is used ~~as~~ to remove gangue

(5) Leaching converts metals into soluble salts in aqueous media

(6) Froth floatation is a process for selectively separating hydrophobic materials from hydrophilic.

(7) It is a process of removal of heavy ore particles from lighter particles by washing with water.

(8) Both are correct

(9) How can that be a reason for the naming. It is called Lunar Caustic because it was called luna by ancient alchemists believed to be associated with moon

(10) Sn^{+4} is diamagnetic

(11) Since they have low m.p. they can be separated easily

(12) Since zinc is ~~most~~ more electropositive gold is reduced to Au

(13) answered in (Q6)

(14) Reason can't be an explanation for assertion

(15) answered in (Q3)

(16) answered in (Q9)

(17) Oxygen is changed from O_2^{2-} to O_2 so H_2O_2 is a reducing agent

(18) $H_2O_2 \longrightarrow H_2O + \frac{1}{2}O_2$

(19) Sulphide ores are separated based on hydrophobic difference

(20) Zinc is above gold in electrochemical series

(21) same as (20)

(22) $Fe_2O_3 + CO \longrightarrow 2FeO + CO_2$

(23) Majors ores for extraction of copper are Chalcolite, Chalcopyrites

(24) C, H_2 and CO are powerful reducing agents

(25) Tin stone is diamagnetic.

(26) same as (Q3)

(27) Mn and Cr exist mainly as oxides. Because of affinity of O_2 by Al these can be easily extracted

(28) same as (Q16)

(29) Tin (Sn^{+4}) is diamagnetic

(30) Coke is used for extracting metals from oxides

(31) Same as (26)

(32) Group 1 and 2 elements are Stronger reducing agents

(33) Transition elements are powerful reducing agents

(34) the Complex is $[Ag(CN)_2]Na$

(35) Blister Copper is an intermediate Copper form not the final metal

(36) leaching converts metals into soluble salts in aqueous media

Questions asked in 2010 to 2001

(1) Gypsum is $CaSO_4 \cdot 2H_2O$

(2) given in (Q I)

(3) After oxygen and silicon aluminium is the third most abundant

(4) Solder contains tin and lead

(5) Silica is used in large proportion

(6) Nangal fertilizer = $5Ca(NO_3)_2 \cdot NH_4NO_3 \cdot 10H_2O$

(7) It is a copper Alloy with Nickel and often Zinc

(8) 800 – 1000°C

(9) Mischmetal contains ≃ 5·1. of iron

(10) A-IV B-V, C-I D-II

(11) Zn_2SiO_4

(12) Cerussite is $PbCO_3$

(13) It contains 4:1 ratio of Copper and tin

(14) between 2·4 – 4 ·1.

(15) It is an alloy of Mg and Zn ~~xx~~ toadenamed by Magnesium elektron Limited

(16) Carnallite is $KMgCl_3 \cdot 6H_2O$

(17) Calamine is a mixture of ZnO with 0·5·1. Fe_2O_3

(18) Argentite is Ag_2S

(37) The process of removal of heavy ore particles from lighter ones by washing with water

(38) Blister Copper is an intermediate form of copper.

(39) SnO_2 is diamagnetic while $FeWO_4$ is ferromagnetic. It is used when one of it is magnetic in nature

(40) Galena is PbS Chalcolite is Cu_2S

Previous Years Questions

(1) Mixture is $Al_2O_3 + Na_3AlF_6 + CaF_2$

(2) Haematite is Fe_2O_3

(3) Because during roasting Cu_2S gets converted to Cu_2O and SO_2 Same with Hg

(4) Carnallite is $KMgCl_3 \cdot 6H_2O$

(5) Ag and Au are impurities in Copper

(6) PbS doesnot react with lead

(7) ZnS, FeS, Ag_2S, HgS exits but not with Cr

(8) Zr and Ti

(9) for any reaction to happen free energy should be negative so Carbon reduces Fe_2O_3 only to FeO

(16) Roasting doesnot remove moisture

(36) Hgs - Cinnabar is concentrated by froth floatation

(37) Argentite is leached with NaCN during extraction of Silver in Mc. Arthur forrest cyanide process.

(38) Limestone is used as flux in the metallurgy of iron

(39) It involves the use of chelating agents which can selectivly bind certain metals to form complexes.

(40) Silver oxide is reduced to silver by zinc in layer X
layer Y contains traces of silver and lead. They both are immiscible

(41) Annealing is a process in which the material is treated with heat which alters the physical and sometimes chemical properties to increase ductility and make it more workable

(42) It is used to combine the material with Mercury for separation later

(43) Both Copper and Silver react with conc. H_2SO_4. Also they can be separated from electrolytically

(44) Silica or SiO_2 can be a gangue or a flux

(45) Smelting is a process by which a metal is obtained either as an element or as a simple compound from its ore by heating beyond the melting point.

(46) Sphalerite $(Zn, Fe)S$ is an exception and is done by chemical leaching.

(47) In Hall's process alumina, Al_2O_3 is dissolved in Molten Cryolite, Na_3AlF_6 to lower its melting point for easier electrolysis.

(19) Ruby is aluminium oxide with chromium.

(20) Anglesite is an ore of $PbSO_4$

(21) $Cu_2CO_3 \cdot (OH)_2$

(22) Iron oxide is the major impurity

(23) It is Hgs

(24) It is a group of phosphate minerals with high concentrations of OH^-, F^- and Cl^-

(25) Malachite is $Cu_2CO_3(OH)_2$

(26) Zirconium and Tin are purified by this method

(27) Fe has high affinity towards Oxygen. On higher temperatures this can happen

(28) It is roasted not Calcined

(29) Au in +1 State in $[M(CN)_2]^-$

(30) Slag is usually a mixture of metal oxides that combines with impurities to form a fusible product

(31) $FeO + C \rightarrow Fe + CO$ Carbon has higher affinity for oxygen

(32) Gangue is mixed with a wanted ~~Chemical~~ mineral in an ore deposit to be extracted during processing

(33) Haematite

(34) Molten zone ~~Conv~~ is formed after metal ~~is~~ ~~Extracted~~ extraction is in proces so impurities are more

(35) In Calcination the ore is heated to remove moisture

(48) the reaction is $Fe_2O_3 + 2Al \longrightarrow 2Fe + Al_2O_3$ Al acts as reducing agent

(49) $Cu_2S + 2Cu_2O \longrightarrow 6Cu + SO_2$

(50) $CaCO_3$ is heated to decompose to $CO_2 + CaO$

(51) ΔG° for the overall reaction is negative. So ZnO can be reduced by graphite

(52) Copper pyrates are concentrated by selectively separating hydrophobic and hydrophilic

(53) Metallurgy is a process of extracting the metal from the Ore

(54) Diamond contains only Carbon bonded with 3 others in a tetrahedral Structure

(55) Bauxite is one of the major ores of Aluminium

(56) Anhydrite is an mineral of $CaSO_4$

(57) Haematite is the mineral form of Iron (III) oxide.

(58) Cassiterite is a tin oxide mineral, SnO_2

(59) Copper can be extracted from $Cu_2CO_3(OH)_2$ which is Malachite.

(60) Galena is called lead glance, is the natural mineral form of lead (II) Sulphide.

(61) Cryolite is an Ore of Aluminium which is Na_3AlF_6

(62) Horn Silver is Chlorargyrite which is AgCl

(63) Carnallite is $KMgCl_3 \cdot 6H_2O$ is an Ore of Potassium

(64) It is Na_3AlF_6

(65) Corundum is a crystalline form of Aluminium Oxide Al_2O_3

(66) All ores are minerals

(67) Felspar is $K_2O\ Al_2O_3 \cdot 6SiO_2$

(68) It is Sodium nitrate, a deliquescent crystalline Sodium Salt that is found in North Chile

(69) Gypsum is $CaSO_4 \cdot 2H_2O$

(70) Smithsonite is a mineral of Zn it is $ZnCO_3$

(71) Carnalite is $KCl \cdot MgCl - 6H_2O$

(72) Aluminium is the most abundant after Silica

(73) Cassiterite is SnO_2

(74) Carnalite is $KCl\ MgCl \cdot 6H_2O$

(75) Malachite is $Cu_2CO_3(OH)_2$

(76) Sulphide ores are separation by using the differences in hydro-philicity which is froth floatation

(77) In froth floatation the mineral is concentrated by taking into advantage of differences in hydrophilicity

(78) answered in (Q36)

(79) $4X + 8NaCN + O_2 + 2H_2O \rightarrow 4Na[X(CN)_2] + 4NaOH \quad X = Ag, Au$

(80) Aluminium ore, bauxite is concentrated by chemical separation

(81) answered in (Q52)

(82) It is separation in water. Since pure ore is insoluble in water it can be easily separated

(83) Roasting involves gas-solid reactions at elevated temperature with the goal of purifying metal component

(84) Smelting produces metal from ore by reduction.

(85) Matte is a term used in the field of pyrometallurgy given to the molten metal surface phases typically formed during smelting of copper, Nickel and other base metals

(86) flux is mixed with the ore for removal of impurities usually $CaCO_3$ is used as flux

(87) $2CuFeS_2 + O_2 \longrightarrow Cu_2S + 2FeS + SO_2$

$2FeS + 3O_2 \longrightarrow 2FeO + 2SO_2$

$FeO + SiO_2 \longrightarrow FeSiO_3$

(88) $CaCO_3 \longrightarrow CaO + CO_2$

$CaO + SiO_2 \longrightarrow CaSiO_3$

(89) It is $Cu_2S + 2Cu_2O \longrightarrow 6Cu + SO_2$

(90) flux is used to remove silica and other impurities

(91) Roasting involves heating at high temperature so is done in blast furnace

(92) Limestone or $CaCO_3$ $CaCO_3$ is used to remove acidic impurities

(93) Refractive metals can withstand high temperatures

(94) $[Ag(CN)_2]^-$ is formed from CN^- solution

(95) $CaCO_3 \rightleftharpoons CaO + CO_2$ if CaO is removed the reaction goes in forward direction

(96) Coke is used which is not a metal.

(97) Roasting is heating of ore in the presence of air to remove impurities

(98) Most common metals used in Electrometallurgical process is alkali and alkaline earth metals

(99) Mostly Oxides ~~are~~ ores are treated with Carbon to extract the metal

(100) $3Fe_2O_3 + CO \longrightarrow 2Fe_3O_4 + CO_2$

(101) The process is Aluminothermite process

(102) Strong electropositive metals can easily lose electrons and form M^{n+} which can be reduced to get metals

(103) answered in (Q48)

(104) $Cr_2O_3 + 2Al \longrightarrow 2Cr + Al_2O_3$

(105) answered in (Q101)

(106) Carbon is a powerful reducing agent

(107) Cupellation process is used to separate noble elements like gold and silver

(108) at anode metal is reduced.

(109) Poling is a method used to refine copper

(110) Gold forms cyanide complexes which are water soluble

(111) Black Jack is (Zn, Fe)S ore

(112) Chalcopyrates can be separated from impurities by pH change

(113) Since tinstone is diamagnetic it can be separated