ISOLATION OF ELEMENTS

1) Which one of the following is most abundant in earth crust?
(a) Mg (b) Na **(c) Al** (d) Fe

2) The metal always found in free state is
(a) Au (b) Ag (c) Cu (d) Na

3) Copper is extracted from
(a) cuprite (b) copper glance (c) malachite **(d) copper pyrites**

4) The salt which is least likely to be found in minerals
(a) chloride (b) sulphate (c) sulphide **(d) nitrate**

5) Ore dressing of iron ore is done by
(a) Froth floatation **(b) Magnetic separation** (c) Hand picking (d) All the above

6) For which of the following ores,froth floatation process is applicable?
(a) Oxide **(b) Sulphide** (c) Carbonate (d) Sulphate

7) Which of the following benefaction processes is used for the mineral,$Al_2O_3.2H_2O$?
(a) Froth floatation **(b) Leaching** (c) Liquation (d) Magnetic separation

8) Heating pyrites to remove sulphur is called
(a) smelting (b) calcination (c) liquation **(d) roasting**

9) Consider the following reaction at 1000^0C. A.$Zn(s)+\frac{1}{2}O_2(g)\longrightarrow ZnO(g);\Delta G^0$=-360 kJ mol^{-1}
B.$C(gr)+\frac{1}{2}O_2(g)\longrightarrow CO(g);\Delta G^0$=-460 kJ mol^{-1} Choose the correct statement at 1000_0C
(a) zinc can be oxidised by carbon monoxide **(b) zmc oxide can be reduced by graphite**
(c) both statements (a) and (b) are true (d) both statements (a) and (b) are false
(e) carbon monoxide can be reduced by zinc

10) Which of the following reaction taking place in the blast furnace during extraction of iron is endothermic?
(a) $CaCO_3\longrightarrow CaO+CO_2$ (b) $2C+O_2\longrightarrow 2CO$ (c) $C+O_2\longrightarrow CO_2$
(d) $Fe_2O_3+3CO\longrightarrow 2Fe+3CO_2$

11) Smelting involves reduction of metal oxide with
(a) carbon (b) carbon dioxide (c) magnesium (d) aluminium

12) During smelting,an additional substance is added which combines with impurities to form a fusible mass.The additional substance is called
(a) flux (b) slag (c) gangue (d) ore

13) Which step is not correct for refining of crude metals?
(a) $Cu_2S+2Cu_2O\longrightarrow 6Cu+SO_2$ (b) $CuSO_4+Fe\longrightarrow Cu+FeSO_4$
(c) $CuFeS_2+2H_2SO_4\longrightarrow CuSO_4+FeSO_4+2H_2S$ (d) $CuCO_3+H_2SO_4\longrightarrow CuSO_4+CO_2+H_2O$

14) Which method is not correct for refining of crude metals?
(a) Liquation:tin (b) Zone refining:silicon **(c) Mond process:aluminium**
(d) Electrolytic refining:blister copper

15) Mond's process of is used for refining of
(a) Ni (b) Ag (c) Sn (d) Al

16) In the process of extraction of gold,Roasted gold ore+CN^{-1}+$H_2O \xrightarrow{O_2}$[X]+OH^- [X]+Zn $\longrightarrow$[Y]+Au Identify the complexes[X] and [y]

(a) $X=[Au(CN)_2]^-$,$[Y]=[Zn(CN)_4]^2$ (b) $X=[Au(CN)_4]^-$,$[Y]=[Zn(CN)_4]^2$

(c) $X=[Au(CN)_2]^-$,$[Y]=[Zn(CN)_6]^{4-}$ (d) $X=[Au(CN)_4]^-$,$[Y]=[Zn(CN)_4]^{2-}$

17) In extraction of gold,zinc acts as

(a) flux (b) oxidising agent **(c) reducing agent** (d) none

18) The method of zone refining of metals is based on the principle of

(a) greater mobility of the pure metal than that of the impurity

(b) higher melting point of the impurity than that of the pure metal

(c) greater noble character of the solid metal than that of the impurity

(d) greater solubility of the impurity in the molten state than the solid

19) In the extraction of chlorine by electrolysis of brine.....

(a) oxidation of Cl^- ions to chlorine gas occurs

(b) reduction of Cl^- ions to chlorine gas occurs

(c) for overall reaction ΔG^0 has negative value (d) a displacement reaction takes place

20) When copper ore is mixed with silica,in a reverberatory furnace,copper matte is produced.The copper matte contains.....

(a) sulphides of copper (II) and iron (II) (b) sulphides of copper (II) and iron (III)

(c) sulphides of copper (I) and iron (II) (d) sulphides of copper (I) and iron (III)

21) Which of the following reactions is an exam[le of autoreduction?

(a) $Fe_3O_4+4CO \longrightarrow 3Fe+4CO_2$ (b) $Cu_2O+C \longrightarrow 2Cu+CO$

(c) $Cu^{2+}(aq)+Fe(s) \longrightarrow Cu(s)+Fe^{2+}(aq)$ **(d) $Cu_2O+\frac{1}{2}Cu_2S \longrightarrow 3Cu+\frac{1}{2}SO_2$**

22) A number of elements are available in earth,s crust but most abundant elements are

(a) Al and Fe (b) Al and Cu (c) Fe and Cu (d) Cu and Ag

23) Zone refining is based on the principle that.....

(a) impurities of low boiling metals can be separated by distillation

(b) impurities are more soluble in molten metal than in solid metal

(c) different components of a mixture are differently adsorbed on an adsorbent

(d) vapours of volatile compound can be decomposed in pure metal

24) In the extraction of copper from its sulphide ore,the metal is formed by the reduction of Cu_2O with

(a) Fes (b) CO **(c) Cu_2S** (d) SO_2

25) Brine is electrolysed by using inert electrodes.The reaction at anode is....

(a) $Cl^-(aq) \longrightarrow \frac{1}{2}Cl_2(g)+e^-;E^0_{cell}=1.36V$ **(b) $2H_2O(l) \longrightarrow O_2(g)+4H^++4e^-;E^0_{cell}=1.23V$**

(c) $Na^+(aq)+e^- \longrightarrow Na(s);E^0_{cell}=2.71V$ (d) $H^+(aq)+e^- \longrightarrow \frac{1}{2}H_2O(g);E^0_{cell}=0.0V$

26) In the metallurgy of aluminium....

(a) Al^{3+} is oxidised to Al(s)

(b) graphide anode is oxide to carbon monoxide and carbon dioxide

(c) Oxidation state of oxygen changes in the reaction at anode

(d) oxidation state of oxygen changes in the overall reaction involved in the process

27) Electrolytic refining is used to purify which of the following metals?

(a) Cu and Zn (b) Ge and Si (c) Zr and Ti (d) Zn and Hg

28) Extraction of gold and silver involves leaching the metal with CN^- ion.The metal is recovered by....

(a) displacement of metal by some other metal from the complex ion

(b) roasting of metal complex (c) calcination followed by roasting

(d) thermal decomposition of metal complex

29) Which of the following option are correct?

(a) Cast iron is obtained by remelting pig iron with scrap iron and coke using hot air blast

(b) In extraction of silver,silver is extracted as cationic complex

(c) Nickel is purified by zone refining (d) Zr and Ti are purified by van Arkel method

30) In the extraction of aluminium by Hall-Heroult process,purified Al_2O_3 is mixed with CaF_2 to

(a) lower the melting point of Al_2O_3 (b) increase the conductivity of molten mixture

(c) reduce Al^{3+} into Al(s) (d) (d) acts as catalyst

31) Which one of the following statements is correct about the role of substance added in the froth floatation process?

(a) Collectors enhance the non-wettability of the mineral particles

(b) Collectors enhance the wettability of gangue particles

(c) By using depressant in the process two sulphide ores can be separated

(d) Froth stabilisers decrease wettability of gangue

32) In the froth Floatation process,zinc sulphide and lead sulphide can be separated by.....

(a) using collectors **(b) adjusting the proportion of oil to water** (c) using depressant

(d) using froth stabilisers

33) Common impurities present in bauxite are....

(a) CuO (b) ZnO **(c) Fe_2O_3** (d) SiO_2

34) Which of the following ores are concentrated by froth floatation?

(a) Haematite **(b) Galena** (c) Copper pyrites (d) Magnetite

35) Which of the following reactions occur during calcination?

(a) $CaCO_3 \longrightarrow CaO+CO_2$ (b) $2FeS_2+\frac{1}{2}O_2 \longrightarrow Fe_2O_3+4SO_2$ (c) $Al_2O_3.xH_2O \longrightarrow Al_2O_3+xH_2O$

(d) $ZnS+\frac{3}{2}O_2 \longrightarrow ZnO+SO_2$

36) For the metallurgical process of which of the ores calcination ore can be reduced by carbon?

(a) haematite (b) calamine (c) iron pyrites (d) sphalerite

37) The main reactions occurring in blast furnace during extraction of iron from haematite are.....

(a) $Fe_2O_3+3CO \longrightarrow 2Fe+3CO_2$ (b) $FeO+SiO_2 \longrightarrow FeSiO_3$ (c) $Fe_2O_3+3C \longrightarrow 2Fe+3CO$

(d) $CaO+SiO_2 \longrightarrow CaSiO_3$

38) In which of the following method of purification,metal is converted to its volatile compound which is decomposed to give pure metal?

(a) heating with stream of carbon monoxide (b) heating with iodine (c) liquation

(d) distillation

39) Which of the following statements are correct?

(a) A depressant prevents certain type of particle to come to the froth

(b) Copper matte contains Cu_2S and ZnS

(c) The solidified copper obtained from reverberatory furnace has blistered appearance due to evolution of SO_2during the extraction

(d) Zinc can be extracted by self-reduction

40) In the extraction of chlorine from brine.....

(a) ΔG^0 for the overall reaction is negative (b) $\Delta G^0$for the overall reaction is positive

(c) E^0 for the overall reaction has negative value

(d) E^0 for the overall reaction has positive value

41) Which one of the following is a mineral of iron?

(a) Malachi (b) Cassiterite (c) Pyrolusite **(d) Magnetite**

42) The ore having two different metal atoms is

(a) haematite (b) galena (c) magnetite **(d) copper pyrites**

43) Oxidation states of the metal in the minerals haematite and magnetite,respectively,are
(a) II,III in the haematite and III in magnetite (b) II,III in the haematite and II in magnetite
(c) II in haematite and II and III in magnetite
(d) III in haematite and II and III in magnetite

44) In which of the following minerals,aluminium is not present?
(a) Cryolite (b) Mica (c) Fledspar **(d) Fluorspar**

45) sulphide ores are common for metals
(a) Ag,Cu and Pb (b) Ag,Cu and Sn (c) Ag,Mg and Pb (d) Al,Cu and Pb

46) "Metals are usually not found as nitrates in their ores" out of the following two (I and II) reasons which is/are true for the above observation? I.Metal nitrates are highly unstable.
II.Metal nitrates are highly soluble in water.
(a) I is false but II true (b) I is true but II is false (c) I and II are true
(d) I and II are false

47) In the froth floatation process for benefaction of the ores,the ore particles float because
(a) they are light **(b) their surface is not easily wetted by water**
(c) they bear electrostatic charge (d) they are insoluble

48) The function of potassium ethyl xanthate in froth floatation process is to make the ore
(a) attracted towards water **(b) water repellant** (c) porous (d) heavier

49) Sodium cyanide is sometimes added in the froth floatation process as a depressant when the ore contains a mixture of ZnS + PbS because
(a) $Pb(CN)_2$ gets precipitated without any effect on ZnS
(b) Zns forms soluble complex,$Na_2[Zn(CN)_4]$ while PbS forms the froth
(c) PbS forms soluble complex,$Na_2[Pb(CN)_4]$ while ZnS forms froth
(d) $Zn(CN)_2$ gets precipitated without any effect on PbS

50) In the leaching of Ag_2S with NaCN,a stream of air is also passed.It is because
(a) Thr reaction between Ag_2S and NaCN is reversible
(b) to oxidise Na_2S formed in the reaction Na_2SO_4 (c) to oxide Ag_2S to Ag_2O
(d) Both (a) and (b)

51) Name the method used for removing gangue from sulphide ore.
Answer : Froth floatation process.

52) How is copper extracted from a low grade ore of it?
Answer : Extraction of Copper from low grade ores and scraps: It is extracted by hydrometallurgy. It is carried out in two steps: - Leaching: Low grade copper ores and scraps are leached by using acid or bacteria. - Reduction: The solution containing copper ions is treated with H_2. $Cu^{2+}(aq) + H_2(g) \rightarrow Cu(s) + 2H^+(aq)$

53) What is the role of collectors in Froth Floatation process?
Answer : Collectors like pine oil, fatty acids, xanthates enhance non-wettability of mineral particles.

54) Differentiate between a mineral and an ore.
Answer : Mineral is a naturally occuring substance from which metal may or may not be extracted profitably. Ore is a naturally occuring rocky material which contains sufficient quantity of mineral from which metal can be extracted profitably and conveniently.

55) What type of ores can be concentrated by magnetic separation method?
Answer : Those ores which are magnetic in nature, i.e. attracted by magnet, whereas impurities are non-magnetic in nature or vice-versa are concentrated by magnetic separation method.

56) Copper matte is charged into a silica lined converter in extraction of copper. What is the role of silica lining here?
Answer : Silica acts as a flux.

57) What is meant by the term 'pyrometallurgy'?
Answer : The process of reducing a metal oxide with coke or any other reducing agent at high temperature is called pyrometallurgy. In other words, it is a thermal process of extracting a metal from its ore.

58) Name two metals which occur in nature as oxides.
Answer : (i) Iron occurs as Fe_2O_3 (Haematite). (ii) Aluminium occurs as $Al_2O_3.2H_2O$ (Bauxite).

59) At a site, low grade copper ores are available and zinc and iron scraps are also available. Which of the two scraps would be more suitable for reducing the leached copper ore and why?
Answer : Zinc is more effective for reducing the leached copper ores because zinc is more reactive than iron and reduction will be faster in case zinc scraps are used. But zinc is more expensive than iron, therefore, iron scraps will be more economocal. Hence, iron scraps should be used.

60) Out of C and CO, which is a better reducing agent at 673 K?
Answer : CO (Carbon monoxide).

61) What is meant by the term "chromatography"?
Answer : Chromatography is the process of isolation, separation and purification of coloured substances mostly. These days, even colourless substances can also be separated by chromatography.

62) What criterion is followed for the selection of the stationary phase in chromatography?
Answer : The stationary phase should be immobile as well as immiscible with solvent used as eluent, e.g. Al_2O_3.

63) Out of C and CO, which is a better reducing agent for ZnO?
Answer : Carbon(C).

64) Which reducing agent is employed to get copper from leached low grade copper ore?
Answer : Iron is used as reducing agent.

65) Name the reducing agent used in aluminothermic (thermic) process.
Answer : Aluminium.

66) The naturally occurring chemical substance in form of which metals occur in the earth along with impurities are called.....
Answer : Minerals

67) Minerals from which metals are extracted conveniently and economically are called.....
Answer : Ores

68) The earthy and silicon impurities which generally occur with ores is called..... or .....
Answer : gangue,matrix

69) The complete process of extracting the metal from its ores is called.....
Answer : metallurgy

70) Highly reactive elements occur in nature in.....state
Answer : combined

71) The most abundant metal in the earth's crust is.....
Answer : aluminium

72) Calcination is the process of heating the ore strongly in the.....air
Answer : absence or limited supply

73) An ore of tin containing $FeCrO_4$ is concentrated by.....
Answer : electromagnetic separation

74) ..... ores are concentrated by froth floatation and roasted in excess of air to convert them into their respective.....
Answer : Sulphide,oxides

75) ..... involves treating the powdered ore with a suitable reagent which selectively dissolves the ore but not the impurities
Answer : Leaching

76) Sodium cyanide solution is used to extract..... or .....from its ores
Answer : silver,gold

77) Flux combines with infusible impurities to form.....
Answer : slag

78) .....act as an acidic flux while.....act as a basic flux
Answer : SiO_2,$CaCO_3$ or CaO

79) In the metallurgy of copper,the flux used to remove the basic impurity of FeO is.....
Answer : SiO_2

80) During extraction of iron from hematite,the flux used is.....
Answer : $CaCO_3$

81) At temperatures above 1073 K coke can be used to reduce FeO to Fe. How can you justify this reduction with Ellingham diagram?
Answer : According to Ellingham diagram, at temperatures greater than 1073 K $\Delta G(C,CO) < \Delta G(Fe,FeO)$. Hence coke can reduce FeO to Fe.

82) The purest form of iron is prepared by oxidising impurities from cast iron in a reverberatory furnace. Which iron ore is used to line the furnace? explain by giving reaction.
Answer : Haematite is used to line the furnace because carbon present in cast iron will get oxidised to carbon monoxide and we will get purest form of iron known as wrought iron. Haematite, Fe_2O_3 $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$

83) The mixure of compounds 'A and B' is passed through a column of Al_2O_3 by using alcohol as eluent. Compound 'A' is eluted in preference to compound 'B'. Which of the compounds 'A' or 'B' is more readily adsorbed on the column?
Answer : Since compound 'A' is moving faster, therefore, it is less adsorbed; whereas 'B' is more readily adsorbed.

84) Why is sulphide ore of copper heated in furnace after mixing with silica?
Answer : Iron(II) oxide is present as impurity in copper pyrites ($CuFeS_2$) after roasting. It is removed by silica which acts as flux to remove it as slag.
$\underset{Iron(II)\ oxide}{FeO} + \underset{silica}{SiO_2} \rightarrow \underset{[Iron\ (II)\ silica]}{FeSiO_3}$

85) Why are sulphide ores converted into oxide before reduction?
Answer : It is because oxides ores can be easily reduced, whereas sulphide ores cannot be reduced easily.

86) What is role of flux in metallurgical processes?
Answer : Flux is used for making the molten mass more conducting and it reacts with gangue to form slag which can be easily removed.

87) Define aluminothermy.
Answer : The process of reduction of a metal oxide to the metal with the help of aluminium powder is called aluminothermy.

88) Define calcination.
Answer : The process of heating the ore strongly either in a limited supply of oxygen or air or in the absence of air is called calcination.

89) What does copper matte contain?
Answer : Copper matte contains Cu_2S and FeS

90) Define roasting.
Answer : Roasting is a process of heating the ore strongly in the presence of excess of air at a temperature below the melting point of the metal.

91) Which is the cheapest and most abundant reducing agent which is used in the extraction of metals?
Answer : Carbon in the form of coke.

92) Why is the formation of sulphate in calcination sometimes advantageous?
Answer : Sulphates are usually water soluble and the gangue remains insoluble. Therefore, the desired metal is leached away as soluble sulphate from insoluble gangue.

93) Name the metal used as a reducing agent in aluminothermic process.

Answer : Aluminium.

94) What is cupellation?

Answer : Cupellation is a method used for refining of those metals which contain impurities of other metals which form volatile oxides. For example, removal of last traces of lead from silver.

95) What is Kroll process?

Answer : The production of titanium metal at 900K from $TiCl_4$ by reduction with Mg in argon atmosphere. $TiCl_4(g) + 2Mg \longrightarrow Ti(s) + 2MgCl_2(l)$

96) What is the actual reducing agent of haematite in blast furnace?

Answer : Carbon monoxide, CO.

97) What is meant by the term 'pyrometallurgy'?

Answer : Pyrometallurgy is the process of extracting metal by heating metal oxide with a suitable reducing agent.

98) Why is the froth flotation method selected for the concentration of sulphide ores?

Answer : This is because the sulphide ore particles are preferentially wetted by oil and the gangue particles by water.

99) What is the role of graphite in the electrometallurgy of aluminium?

Answer : The graphite rod is useful in the electrometallurgy of aluminium for reduction of alumina to aluminium. $2Al_2O_3 + 3C \longrightarrow 4Al + 3CO_2$

100) Name the method used for the refining of Nickel metal.

Answer : Mond's process.