



TOPIC: METALLURGY

- 1) The Metal extracted by leaching with cyanide is
    - 1) Mg
    - 2) Ag
    - 3) Cu
    - 4) Na
  - 2) For which of the following ores froath flotation method is used for concentration
    - 1) Haematite
    - 2) Zinc blende
    - 3) Magnetite
    - 4) Carnalite
  - 3) During the process of electrolytic refining of copper, some metals present at impurity settle as 'anode mud'. These are
    - 1) Pb & Zn
    - 2) Sn & Ag
    - 3) Fe & Ni
    - 4) Ag & Au
  - 4) Which of the following beneficiation process is used for mineral  $Al_2O_3 \cdot 2H_2O$ 
    - 1) Froath flotation
    - 2) leaching
    - 3) Liquation
    - 4) Magnetic seperation
  - 5) The metal that can't be obtained by electrolysis of an aqueous solution of its salt is
    - 1) Cu
    - 2) Cr
    - 3) Ag
    - 4) Ca
  - 6) Which of the oxide groups among following can't be reduced by carbon
    - 1)  $Fe_2O_3$ , ZnO
    - 2) PbO,  $Fe_2O_4$
    - 3)  $Cu_2O$ ,  $SnO_2$
    - 4) CaO,  $K_2O$
  - 7) Which of the following metal is not extracted by leaching
    - 1) Al
    - 2) Hg
    - 3) Ag
    - 4) Au
  - 8) Which of the following pairs of metals is purified by VanArkel method
    - 1) Ga & In
    - 2) Ag & Au
    - 3) Zr & Ti
    - 4) Ni & Fe
  - 9) With respect to are Ellingham diagram helps to predict the feasibility of it's
    - 1) Zone refining
    - 2) Thermal reduction
    - 3) Electrolysis
    - 4) Vapour phase refining
  - 10) Which of the following factor is of no significant for roasting sulphide ores to the oxides and not subject the Sulphide Ores to Carbon reduction directly?
    - 1)  $CO_2$  is more volatile than  $CS_2$
    - 2) Metal sulphides are thermodynamically more stable than  $CS_2$
    - 3)  $CO_2$  is thermodynamically more stable than  $CS_2$
    - 4) Metal sulphides are less stable than the corresponding oxides
  - 11) The Correct statement is
    - 1) Zone refining process is used for the refining of titanium
    - 2) Zincite is a Carbon Ore
    - 3) aniline is a froath stabilizer
    - 4) Sodium cyanide can't be used in the metallurgy of Ag
  - 12) Match the following
    - A) Sulphide ore
    - B) Mond's process
    - C) Cupellation
    - D) Calcination
    - E) Pyrometallurgy
    - 1) Silver
    - 2) Iron
    - 3) Carbonate Ore
    - 4) Froath flotation
    - 5) Nickel
- A, B, C, D, E      A, B, C, D, E      A, B, C, D, E      A, B, C, D, E
- 1) 4, 5, 1, 3, 2      2) 4, 5, 2, 3, 1      3) 1, 2, 3, 4, 5      4) 5, 4, 3, 2, 1

13) Match the following

- A) Mond's process
- B) VanArkel Method
- C) Cupellation
- D) Distillation

- 1) Purification of Cu
- 2) Purification of Zn
- 3) Purification of Ni
- 4) Purification of Titanium

A, B, C, D

A, B, C, D

A, B, C, D

A, B, C, D

1) 1, 2, 3, 4

2) 2, 3, 4, 1

3) 3, 4, 1, 2

4) 4, 1, 2, 3

14) From the following number of oxide ores is Carnallite, Bauxite, Magnetite, Pyrolusite, Haematite, Cuprite, Galena, Cassiterite-----

15) In the manufacture of iron from Haematite ore lime stone is added to acts as---

- 1) flux
- 2) slag
- 3) a reducing agent
- 4) an oxidising agent

16) Which of the following process involves smelting?

- 1)  $ZnCO_3 \rightarrow ZnO + CO_2$
- 2)  $PbS + 3O_2 \rightarrow PbO + 2SO_2$
- 3)  $Al_2O_3 \cdot 2H_2O \rightarrow Al_2O_3 + 2H_2O$
- 4)  $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$

17) Liquefaction, Poling, Calcination, Leaching, Cupellation, Zone refining, Levigation, Roasting.

How many of the following are refining methods.....

18) From the Ellingham graphs on Carbon which of the following statement is false

- 1)  $CO_2$  is more stable than CO at less than 983K
- 2) CO reduces  $Fe_2O_3$  to Fe at less than 983K
- 3) CO is less stable than  $CO_2$  at more than 983K
- 4) CO reduces  $Fe_2O_3$  to Fe in the reduction zone of blast furnace

19) When a metal 'M' is treated with NaOH a white gelatinous precipitate 'X' is obtained which is soluble in excess of NaOH compound 'X' when heated strongly gives an oxide. Which is used in chromatography as an adsorbent. The metal 'M' is

- 1) Ca
- 2) Al
- 3) Fe
- 4) Zn

20) The method of zone refining of metal is based upon the Principle is ....

- 1) greater solubility of the impurity in molten state than in solid
- 2) greater mobility of pure metal than impurity
- 3) higher melting point of impurity than of pure metal
- 4) greater noble character of solid metal than that of the impurity

21) Consider the following statements

Roasting is carried out to

- 1) Convert sulphide into oxide
  - 2) Melt the ore
  - 3) Remove moisture water of hydration and expel organic matter
  - 4) Remove sulphur and arsenic in the form of volatile oxide.
- 1) 1,3,4 are correct    2) 1,2,3 are correct    3) 2,3,4 are correct    4) 1,2,4 are correct

22) Poling process is Used

- 1) for removal of  $Cu_2O$  from Cu
- 2) For the removal of  $Al_2O_3$  from Al
- 3) For the removal of  $Fe_2O_3$
- 4) In all the above

23) Ore dressing for iron is done by

- 1) Froth flotation
- 2) Magnetic separation
- 3) Leaching
- 4) All of these

24) The incorrect statement is

- 1) Calamine and siderite are carbonates

- 2) Argentite and cuprite are carbonates  
 3) Zinc blende and Iron pyrites are sulphides  
 4) Malachite azurite are ores of copper  
 25) Cassiterite is an ore of

- 1) Mn                      2) Ni                      3) Sb                      4) Sn

26) Pyrolusite is an

- 1) oxide ore                      2) sulphide ore                      3) carbide ore                      4) not an ore

27) Which one of the following does not occur as sulphide ore?

- 1) Zn                      2) Cr                      3) Ag                      4) Fe

28) Assertions & reason type

A: All minerals are ore

R: Ores are minerals from which metal can be extracted conveniently and economically

1) A & R are correct R is explanation of A

2) A & R correct R not explanation of A

3) If A is correct & R is wrong

4) If A is incorrect R is correct

29) Iron is....th most abundant element in the earth crust

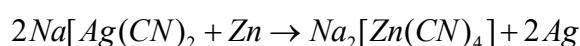
30) What is the oxidation state of Iron in Haematite are-----

### KEY:

1-10	2	2	4	2	4	4	2	3	2	1
11-20	3	1	3	6	1	4	4	3	2	1
21-30	1	1	2	2	4	1	2	4	4	3

### HINTS:

1) Silver is extracted by leaching with cyanide  $Ag_2S + 2NaCN \rightarrow Na[Ag(CN)_2]$



2) Froth flotation process is used to concentrate low grade sulphide ores zinc blende Zns

3) Se, Te, Ag, Au, Pt impurities settles as anode mud in refining of copper

4)  $Al_2O_3 \cdot 2H_2O \rightarrow Bauxite \rightarrow leaching$

5) Metals with less SRP (IA, IIA) an aqueous solution can't form (Ca with less SRP -2.87V)

6) Highly reactive metals like K & Ca can't be reduced by carbon. The oxides of less electro positive metals like Fe, Zn, Sn, Pb, Cu etc. are reduced by strongly heating them with coal or coke, in the blast furnace

7) Bauxite leached with NaOH, Ag & Au leached with NaCN but not Hg

8) VanArkel method is very useful for removing all the oxygen and nitrogen present in the form of impurities in metals like Zr and Ti

9) The E.D. indicates whether a reaction feasible or not. It does not say about the kinetics of the reduction process

10)  $2MO + C \rightarrow 2M + CO_2$   $\Delta G = -ve$



Hence metal sulphides are more stable than the metal oxides

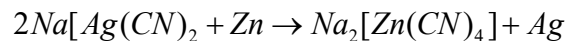
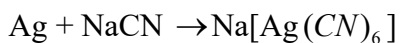
Eg:  $Cu_2S + 2O_2 \rightarrow 2Cu_2O + SO_2$



Due to more stable complete oxidation is not takes place and some amount of  $Cu_2S$  is left over ,which act as reducing agent (  $Cu_2S + 2Cu_2O \rightarrow 6Cu + SO_2$  )

↳ Reducing agent

11)  $Ti + I_2 \rightarrow TiI_4 \xrightarrow{\Delta} Ti$  (Van Arkel) Zincite is  $ZnO$ , NaCN used in extraction of Ag



12) Concept

13) Concept

14) 6,  $Al_2O_3 \cdot 2H_2O$ ,  $Fe_3O_4$ ,  $MnO_2$ ,  $Fe_2O_3$ ,  $CU_2O$ ,  $SnO_2$  (Carnalite –  $KCl \cdot MgCl_2 \cdot 6H_2O$ , Galena-PbS)

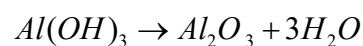
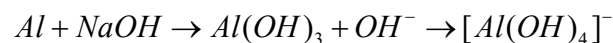
15) Concept

16) 1-Calicination, 2-Roasting, 3-Leaching

17) 4-liquation, Poling, Cupellation, Zone refining, (Calcination, Roasting –Extraction of crude metal, leaching, levigation are concentration methods)

18) Lime act as a flux and coke as fuel and reducing agent

19)  $Al_2O_3$  is used as an adsorbent in chromatography



20) This method based on principle that impurities are more soluble in the melt than in the solid state of the metal.

21) Concept 1,3,4 are correct

22) Poling is useful for refining of the metals having its metal oxides as impurity.

23) Hematite having the magnetic ore particles are separated from non-magnetic gangue by this method.

24) Argentite -  $Ag_2S$  , Calamine –  $ZnCO_3$  , Siderite –  $FeCO_3$  , Cuprite –  $Cu_2O$ , Zincblende  $ZnS$ , Iron pyrites –  $FeS_2$ , Malachite –  $CuCO_3 \cdot Cu(OH)_2$ , Azurite –  $2CuCO_3 \cdot Cu(OH)_2$

25)  $SnO_2$

26)  $MnO_2$

27) Cr-Chromite ( $FeO \cdot Cr_2O_3$ )

28) Concept

29) 4<sup>th</sup> most abundant element

30)  $Fe_2O_3$  -3

$$2x + 3(-2) = 0$$

$$2x = 6; x = 6/2 = 3$$