SECTION–I : (i) Only One option correct Type

This section contains **11 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. **3(–1)**

1. Given reactions take place during extraction of gold by hydrometallurgy.

$Au + CN^- + H_2O \xrightarrow{O_2} x$

$x + Zn \longrightarrow y + Au$

x and y are respectively.

(A) $\left[Au(CN)_2\right]^-$ and $\left[Zn(CN)_4\right]^{4-}$ (B) $\left[Au(CN)_2\right]^{2-}$ and $\left[Zn(CN)_4\right]^{2-}$

(C) $\left[Au(CN)_4\right]^{3-}$ and $\left[Zn(CN)_6\right]^{4-}$ (D) $\left[Au(CN)_2\right]^-$ and $\left[Zn(CN)_4\right]^{2-}$

2. Copper is in metallic form in

(A) Schweizer's salt (B) Bordeaux mixture (C) German silver (D) Chalcopyrites

3. Ore of a metal **M** $\xrightarrow[(X)]{\text{roasting}}$ Roasted ore $\xrightarrow[\text{absence of } O_2]{\Delta \text{ with (X)}}$ Metal **M**

Ore of same metal **M** $\xrightarrow[(Y)]{\text{calcination}}$ Calcinated ore $\xrightarrow[\text{absence of } O_2]{\Delta \text{ with (X)}}$ Metal **M**

Select **CORRECT** option :

(A) X = Chalcocite Y = Malachite (B) X = Galena Y = Cerrusite

(C) X = Zinc blende Y = Calamine (D) (A) and (B) both are correct

4. Which of the following method does not involve conversion of the anion in ore

(A) Roasting of zinc blende (B) Magnetic separation of tin stone

(C) Leaching of argentite (D) Calcination of malachite

5. Concentration of cassiterite ore is based on :-

(A) Adsorption phenomenon (B) Froth floatation

(C) Electromagnetic seperation (D) Liquification

6. In self reduction method for the extraction of metal from galena. Oxidising agent and reducing agent are respectively :

(A) SO_2 and S^{2-} (B) Dipositive cation of metal and S^{2-}

(C) Roasted ore and O^{2-} (D) ore and roasted ore

7. Calcination followed by carbon reduction is applicable for the extraction of metal from :

(A) Sphalerite (B) Dolomite (C) Calamine (D) Galena

8. Smithsonite is American name of ..... ore (European name). Metal is extracted from Smithsonite by calcination followed by carbon reduction. European name of Smithsonite is

(A) Calamine (B) Bauxite (C) Dolomite (D) Sphalerite

9. Which of the following metal oxide are not reduced commercially by carbon reduction method.
(A) Cr_2O_3 (B) Mn_3O_4 (C) ZnO (D) Both (1) and (2)

10. Zinc blende ore on roasting at above 850°C gives
(A) ZnS and $ZnSO_4$ (B) CO_2 and ZnO (C) SO_2 and ZnO (D) Zn and SO_2

11. Which of the following reaction is an example of reduction of calcined or roasted ore into metal

(A) Bauxite ore + $Na_2CO_3 \xrightarrow{\text{fused}} NaAlO_2$

(B) $Ag_2S + NaCN \rightleftharpoons Na[Ag(CN)_2] + Na_2S$

(C) $ZnO + C \longrightarrow Zn + CO$

(D) $CuSO_4$ (aq.) + $\underset{\text{dust}}{Zn} \longrightarrow ZnSO_4 + Cu$

(ii) One or more options correct Type

This section contains **06 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** are correct. **4(–1)**

12. Select ore in which oxidation number of metal is +2 and produce carbondioxide on calcination -
(A) Galena (B) Fools gold (C) Siderite (D) Malachite

13. Consider metallurgy of Ag from argentite and select correct answer.
(A) NaCN act as depressant (B) Zn act as reducing agent
(C) NaOH act as leaching agent (D) Zn produce $[Zn(CN)_4]^{2-}$ complex

14. Iron is **NOT** present in the form of sulphide in :
(A) Fool's gold (B) Siderite (C) Chalcopyrite (D) Limonite

15. Which of the following reactions are example of thermite reduction.
(A) A thermite reaction may start if a ship (having Al parts) is a hit by a missile

(B) $Al_2O_3 + 3Mg \xrightarrow{\Delta} 3MgO + 2Al$

(C) $Fe_2O_3 + 2Al \xrightarrow{\Delta} 2Fe + Al_2O_3$

(D) $Cr_2O_3 + Al \xrightarrow{\Delta} 2Cr + Al_2O_3$

16. Roasted silver ore + $CN^- + H_2O$
$\downarrow O_2$ (air)
'X' + OH^-
$\downarrow$ Zn
'Y' + Ag

Which of the following statement is **CORRECT** for the above process.
(A) Co-ordination number of X is two (B) 'X' and 'Y' both are diamagnetic
(C) Zn acts as a catalyst
(D) CN^- ion is a complex forming agent as well as acts as a reducing agent.

17. Select the correct matching :
(A) Pyro metallurgy : Extraction of Fe (B) Electro metallurgy : Extraction of Al
(C) Hydro metallurgy : Extraction of Au (D) none of these

Matching List Type

This Section contains **1 multiple choice question. Each question has matching lists.** The codes for the lists. have choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. **4(0)**

18. Match the folloiwng list :-

List - I **(Ore)**	**List - II** **(Reduction process involved in the extration)**
(P) SnO_2	(1) Self reduction
(Q) $CuFeS_2$	(2) Carbon reduction
(R) NaCl	(3) Electrolytic reduction
(S) MnO_2	(4) Alumino thermite process

Code :

	(P)	(Q)	(R)	(S)
(A)	1	2	4	3
(B)	2	1	3	4
(C)	2	1	4	3
(D)	1	3	2	4

SECTION–II : Matrix-Match Type

This Section contains **01 question**. Question has **four statements** (A, B, C and D) given in **Column I** and five statements (P, Q, R, S and T) in **Column II**. Any given statement in Column I can have correct matching with **ONE** or **MORE** statement(s) given in Column II. For example, if for a given question, statement B matches with the statements given in Q and R, then for the particular question, against statement B, darken the bubbles corresponding to Q and R in the ORS. **8(0)**

1. Match the folloiwng column :-

Column - I **(Metallurgical change)**	**Column - II** **(Properties)**
(A) $CaCO_3 \rightarrow CaO + CO_2$	(P) Non-redox change
(B) $ZnS + O_2 \rightarrow ZnO + SO_2$	(Q) Endothermic process
(C) $C + O_2 \rightarrow CO_2$	(R) Exothermic process
(D) $Fe_2O_3 \cdot xH_2O \xrightarrow{\Delta} Fe_2O_3$	(S) Redox change
	(T) Calcination

SECTION-IV : (Integer Value Correct Type)

This section contains **01 questions**. The answer to each question is **a single digit Integer**, ranging from **0 to 9** (both inclusive) **4(–1)**

1. How many of the following process of metallurgy is not associated with high temperature :
Froth floatation, Cupellation, Hydrometallurgical reduction, Self reduction