Chapter

# **General Principles and Processes** of Isolation of Elements

#### TYPE A : MULTIPLE CHOICE QUESTIONS

- 1. The process does not involve a catalyst is :
  - [1997] (a) Haber process (b) Contact process
  - (c) Thermite process (d) Ostwald process
- 2. Chief ore of Al is: [1997]
  - (a) cryolite (b) bauxite
  - (c) feldspar (d) kaolin
- Froth floatation is a process of: 3. [1998]
  - (a) Oxidation (b) Reduction
  - (c) Refining (d) Concentration
- 4. Flux is used to remove : [1999]
  - (a) basic impurities
  - (b) acidic impurities
  - (c) all types of impurities
  - acidic and basic both impurities (d)
- 5. Mac Arthur process is used for the extraction of: [2000] (a) Au
  - (b) Pt (c) Cu (d) Zn
- 6. In the extraction of copper from its sulphide ore, the metal is formed by reduction of Cu<sub>2</sub>O with : (a) FeS (b) CO [2003]
  - (c) Cu<sub>2</sub>S (d)  $SO_2$
- 7. Which of the following is a carbonate ore?
  - (a) Pyrolusite (b) Malachite [2005] (c) Diaspore (d) Cassiterite
- 8. Carbon and CO gas are used to reduce which of the following pairs of metal oxides for extraction of metals? [2007]
  - (b) SnO, ZnO (a) FeO, SnO
  - (c) BaO,  $Na_2O_2$ (d) FeO, ZnO
- 9. In metallurgical process of aluminium, cryolite is mixed with alumina in its molten state, because it [2011]
  - decreases the amount of alumina (a)
  - (b) oxidises the alumina
  - (c) increases the melting point of alumina
  - (d) decreases the melting point of alumina

- 10. Match list I with list II and select the correct answer using the codes given below the lists: List I List II I. A. Ultrapure Ge Cyanide process B. Pine oil П. Floatation process III. Electrolytic reduction C. Extraction of Al Zone refining D. Extraction of Au IV.
  - [2013]
  - Codes: (a) I-C, II-A, III-D, IV-B
  - I-D,II-B,III-C,IV-A (b)
  - (c) I-C,II-B,III-D, IV-A
  - (d) I-D.II-A.III-C.IV-B
- 11. Sulfide ores are common for the metals [2015] (a) Ag, Cu and Pb (c) Ag, Cu and Sn
  - (b) Ag, Mg and Pb (d) Al, Cu and Pb
- 12. Match List I with List II and select the correct answer using the codes given below the list 120151

			[2013]
	List I		List II
1.	Ti	А.	Bauxite
2.	Si	B.	Cerussite
3.	Al	C.	Van-Arkel method
4.	Pb	D.	Zone refining
(a)	1–B, 2–A, 3–C, 4–D		
(b)	1–B, 2–C, 3–A, 4–B		
(c)	1–C, 2–A, 3–B, 4-	–D	

- (d) 1-C, 2-D, 3-A, 4-B
- 13. The main reactions occurring in blast furnace during extraction of iron from haematite are

(i) 
$$\operatorname{Fe}_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$$

(ii) 
$$FeO + SiO_2 \longrightarrow FeSiO_2$$

- (iii)  $Fe_2O_3 + 3\vec{C} \longrightarrow 2Fe + \vec{3}CO$ (iv)  $CaO + SiO_2 \longrightarrow CaSiO_3$
- (a) (i) and (iii) (b) (ii) and (iv)
- (c) (i) and (iv) (d) (i), (ii) and (iii)

[2016]

- 14.  $2CuFeS_2 + O_2 \longrightarrow Cu_2S + 2FeS + SO_2$ Which process of metallurgy of copper is represented by above equation? [2017] (a) Concentration (b) Roasting
  - (c) Reduction (d) Purification

#### TYPE B : ASSERTION REASON QUESTIONS

**Directions for (Q. 15) :** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses.

- (a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (c) If the Assertion is correct but Reason is incorrect.
- (d) If both the Assertion and Reason are incorrect.
- (e) If the Assertion is incorrect but the Reason is correct.
- **15.** Assertion : Extraction of iron metal from iron oxide ore is carried out by heating with coke. **Reason :** The reaction,

 $\operatorname{Fe}_2O_3(s) \longrightarrow \operatorname{Fe}(s) + 3/2O_2(g)$ 

is a spontaneous process. [2005]

**Directions for (Qs.16-18) :** Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

- (a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- (b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
- (c) If Assertion is correct but Reason is incorrect.
- (d) If both the Assertion and Reason are incorrect.
- 16. Assertion : Copper obtained after bassemerization is known as blister copper.
  Reason : Blisters are produced on the surface of the metal due to escaping of dissolved SO<sub>2</sub>.

[2013]

17. Assertion : Coke and flux are used in smelting. [2017]

**Reason :** The phenomenon in which ore is mixed with suitable flux and coke is heated to fusion is known as smelting.

 Assertion : Galvanised iron does not rust. [2017] Reason : Zinc has a more negative electrode potential than iron. c-118

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## **HINTS & SOLUTIONS**

### Type A : Multiple Choice Questions

- 1. (c) In thermite process, no catalyst is required.  $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe + Heat$ This reaction evolves a lot of heat which provides energy to the reaction.
- 2. **(b)**
- 3. (**d**) Froth floatation is a process of concentration of sulphide ore.
- 4. **(d)** Flux is the material which is used in the metallurgy of metals to remove acidic and basic impurities. Acidic flux like silica is used to remove basic impurities present in ore like CaO.

 $CaO + SiO_2 \longrightarrow CaSiO_3$ . Basic flux like limestone is used to remove silica like acidic impurities. S

$$\operatorname{SiO}_2 + \operatorname{CaCO}_3 \longrightarrow \operatorname{CaSiO}_3 + \operatorname{CO}_2.$$

- 5. Mac Arthur process involves extraction of (a) gold from sulphide ore with the help of KCN.
- 6. (c)  $Cu_2S + 2Cu_2O \longrightarrow 6Cu + SO_2$
- 7. (b) Malachite is carbonate ore. Cu(OH)<sub>2</sub>CuCO<sub>3</sub>
- $ZnO + C \frac{3}{4} \frac{3}{8} Zn + CO$ 8. (**d**)  $FeO + C \frac{3}{4} \frac{3}{20} Fe + CO$ In the process of smelting the oxide ore is reduced by carbon and the metal may be obtained in the molten state or as vapours which are condensed. Metals like Zn, Fe, Pb or Sn are obtained by this process.
- 9. (**d**)
- 10. (b) Cyanide process is for gold (I-D); floatation process - pine oil (II-B); Electrolytic reduction - Al (III-C); Zone refining-Ge (IV-A).

- (a) Silver, copper and lead are commonly found 11. in earth's crust as Ag<sub>2</sub>S (silver glance), CuFeS<sub>2</sub> (copper pyrites) and PbS (galena).
- 12. (**d**) Ti-van-Arkel method Si-Zone refining method  $Al - Bauxite (Al_2O_3)$ Pb-Cerussite (PbCO<sub>2</sub>)
- 13. (c) 14.(b)

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- Type B : Assertion Reason Questions
- Iron is obtained from Fe<sub>2</sub>O<sub>3</sub> by heatig it 15. (c) with a mixture of coke and CaCO<sub>3</sub> in a blast furnace in which CO formed reduces Fe<sub>2</sub>O<sub>3</sub> to Fe.

 $Fe_2O_3 + CO \rightarrow Fe + CO_2$ 

However, the reason is false because the

eaction 
$$\operatorname{Fe}_2\operatorname{O}_3(s) \to \operatorname{Fe}(s) + \frac{3}{2}\operatorname{O}_2(g)$$

is not spontaneous as for this reaction both  $\Delta H$  and  $\Delta S$  are negative, so  $\Delta G$  will be positive

- 16. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- 17. Both assertion and reason are true but **(b)** reason is not the correct explanation of assertion. Non fusible mass present in ore in mixing with suitable flux are fused which are then reduced by coke to give free metal.
- 18. Zinc metal which has a more negative (a) electrode potential than iron will provide electrons in preference of the iron, and therefore corrodes first. Only when all the zinc has been oxidised, the iron start to rust.