Metallurgy

SUBTOPIC-II

2011

1. Which of the following pairs of metals is purified by van Arkel method? **[CBSE AIPMT]**

1. Ni and Fe 2. Ga and In 3. Zr and Ti 4. Ag and Au

2. Carbon cannot reduce Fe_2O_3 to Fe at a temperature below 983 K because **[KCET]**

1. Free energy change for the formation of CO is more negative than that of Fe_2O_3.

2. CO is thermodynamically more stable than Fe_2O_3.

3. Carbon has higher affinity towards oxygen than iron.

4. Iron has higher affinity towards oxygen than carbon

3. Which one of the following statements is False? **[KCET]**

1. During roasting, moisture is removed from the ore.

2. The ore is freed from almost all non-metallic impurities.

3. Calcination of ore is carried out in the absence of any blast of air.

4. The concentrated zinc blend is subjected to calcination during its extraction by pyrometallurgy.

2010

4. In the equation; $4M + 8CN^- + 2H_2O + O_2 \rightarrow 4\left[M\left(CN\right)_2\right]^- + 4OH^-$ **indentify the metal M.** **[AFMC]**

1. Copper 2. Iron 3. Gold 4. Zinc

5. During smelting an additional substance is added which combines with impurities to form a fusible product which is known as **[RPMT]**

1. Mud 2. Slag 3. Flux 4. Gangue

6. Carbon can reduce ferric oxide to iron at a temperature above 983 K because **[KCET]**

1. Carbon monoxide formed is thermodynamically less stable than ferric oxide.

2. Carbon has a higher affinity towards oxygen than iron.

3. Free energy change for the formation of carbon dioxide is less negative than that for ferric oxide.

4. Iron has a higher affinity towards oxygen than carbon.

7. Impurities present in the ore react to form a fusible substance known as **[OJEE]**

1. Flux 2. Gangue 3. Nugget 4. Mineral

2009

8. Gravity separation process is used for the concentration of **[AFMC]**

1. Calamine 2. Haematite 3. Chalcopyrite 4. Bauxite

9. In zone refining method, the molten zone [AIIMS]

1. Contains impurities
2. Contains purified metal only
3. Contains more impurity than the original metal
4. Moves to either side

10. The process of converting hydrated alumina into anhydrous alumina is called [CPMT]

1. Roasting
2. Smelting
3. Dressing
4. Calcinations

11. The ore that is concentrated by froth floatation process is [KCET]

1. Cinnabar
2. Bauxite
3. Malachite
4. Zincite

12. Which one of the following ores is concentrated by chemical leaching method? [Kerala CEE]

1. Galena
2. Copper pyrite
3. Cinnabar
4. Argentite
5. Copper glance

13. The incorrect statement among the following is [J&K CET]

1. Hydrogen is used reduce NiO.
2. Zirconium is refined by by van Arkel method.
3. The sulphide ore galena is concentrated by froth floatation.
4. In the metallurgy of iron, the flux used is SiO_2.

14. Hydro-metallurgical process of extraction of metals is based on [OJEE]

1. Complex Formation
2. Hydrolysis
3. Dehydration
4. Dehydrogenation

2008

15. **(Ag + Pb) alloy** $\xrightarrow[Zinc\,is\,added]{Melt\,and}$ **(Ag + Pb + Zn) melt** $\xrightarrow{Cool}$ $\xrightarrow[Layer\,Y]{Layer\,X}$

Select the correct statement based on above scheme. **[AIIMS]**

1. Layer X contains Zn and Ag.

2. Layer Y contains Pb and Ag but amount of silver in this layer is smaller than in layer X.

3. X and Y is immiscible layer.

4. All the above are correct statement.

16. **Steel is heated to below red that and then, cooled slowly**

[CPMT, MP PMT, RPMT]

1. Hardening 2. Annealing 3. Tempering 4. Nitriding

17. **The method not used in metallurgy to refine the impure metal is**

[Kerala CEE]

1. Mond's process 2. van Arkel process 3. Amalgamation process

4. Liquation 5. Zone-refining

18. **Impurities of Cu and Ag from gold are removed by** **[Manipal]**

1. Boiling impure gold with dil. H_2SO_4 2. Boiling impure gold with conc. H_2SO_4

3. Electrolytically 4. Both (b) and (c)

19. **Silica is a/an** **[Manipal]**

1. Acidic flux only
2. Gangue only
3. Basic flux only
4. Both gangue and acidic flux

20. The metallurgical process in which a metal is obtained in a fused state is called [J&K CET]

1. Smelting
2. Roasting
3. Calcinations
4. Froth flotation

2007

21. Sulphide ores of metals are usually concentrated by froth floatation process. Which one of the following sulphide ores offers an exception and is concentrated by chemical leaching? [CBSE AIPT]

1. Argentite
2. Galena
3. Copper pyrite
4. Sphalerite

22. In Hall's process, the main reagent is mixed with [AMU]

1. NaF
2. Na_3AlF_6
3. AlF_3
4. None of these

23. In alumino thermite process 'Al' acts as a/an [BHU]

1. Flux
2. Oxidising agent
3. Reducing agent
4. Solder

24. In the extraction of copper from its sulphide ore, the metal is formed by reduction of Cu_2O with [JCECE]

1. FeS
2. CO
3. Cu_2S
4. SO_2

PREVIOUS QUESTIONS METALLURGY

SUBTOPIC-II (KEY)

1) 3	2) 4	3) 4	4) 3	5) 2	6) 2	7) 2	8) 2	9) 3	10) 4
11) 1	12) 4	13) 4	14) 1	15) 4	16) 2	17) 3	18) 4	19) 4	20) 1
21) 4	22) 2	23) 2	24) 3						

PREVIOUS QUESTIONS METALLURGY

SUBTOPIC-II (SOLUTIONS)

1. Zr and Ti are purified by van Arkel method.

   This method is very useful for removing all the oxygen and nitrogen present in the form of impurity in certain metals like Zr and Ti.

   $$Zr + 2I_2 \xrightarrow{600^0 C} ZrI_4 \xrightarrow{1800^0 C} Zr + 2I_2$$

2. Iron has higher affinity towards oxygen than carbon. So, it cannot reduce Fe_2O_3 to Fe at a temperature below 983 K.

3. Zinc blend is heated in a regular supply of air in a furnace at a temperature below the melting point of the metal (roasting).

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

6. Above 983 K, free energy change for the formation of CO_2 is more negative than that for ferric oxide. Thus, above this temperature, carbon has a higher affinity towards oxygen than iron.

7. Flux + Gangue → Slag

8. Gravity separation method is used when there is a large difference between the densities of gangue and the ore particles. Hence, heavy oxide ores like hematite is concentrated by this process.

9. Zone refining process is based upon the fact that impurities are more soluble in melt than in the original metal. Hence, molten zone contains more impurities than the original metal.

10. Concentrated hydroxide ores (hydrated alumina) are converted into their oxide (anhydrous alumina) by a process, called calcination, in which the concentrated ore is heated in a limited supply of air.

13. CaO acts as a flux as it combines with silica present as an impurity (gangue) to form a fusible slag, $CaSiO_3$.

14. Hydrometallurgical process of extraction of metals is based on complex formation. For example, Ag_2S is converted into $Na\left[Ag(CN)_2\right]$. When Zn is added, Ag is displaced.

15. Zn and Pb in molten state are immiscible and form separate layer, zinc being lighter forms upper layer. Ag is soluble in both. Hence, all statements are correct.

16. The process of heating the steel to a temperature much below to redness and cooling it slowly is called annealing.

18. Impurities of Cu and Ag from gold are removed by boiling impure gold with conc. H_2SO_4 and also by electrolytic method.

19. When SiO_2 (silica) is present as earthly impurity in an ore, it is called gangue and when it is added to remove basic impurities like CaO, FeO etc, it is called an acidic flux.

20. The process in which metal is obtained in fused state is called smelting. During roasting and calcinations metal oxides are formed while froth floatation process is used to concentrate the ore.

21. Galena (PbS), copper pyrite ($CuFeS_2$) and argentite (Ag_2S) are concentrated by forth floatation process but sphalerite (ZnS) is concentrated by chemical leaching.

22. Pure alumina is a bad conductor of electricity and the fusion temperature of pure alumina is about 2000^0C. At this temperature when the electrolysis is carried of fused mass the metal formed vaporizes as the boiling point of Al is 1800^0C. To overcome this difficulty, Na_3AlF_6 and CaF_2 are mixed with alumina.

24. The copper metal is mainly extracted from its sulphide ore, copper pyrites $(CuFeS_2)$. The Cu_2O obtained can be reduced to copper by treating with Cu_2S.

$$2Cu_2S \xrightarrow{3O_2} 2Cu_2O + 2SO_2$$

$$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$$