JEE Main Chemistry Previous Year Questions With Solutions on Metallurgy

1. In Goldschmidt alumino thermic process, which of the following reducing agents is used?
(1) Calcium
(2) Coke
(3) Sodium
(4) Al-powder

Solution:
In Goldschmidt alumino thermic process Aluminium is used as the reducing agent.
Hence option (4) is the answer.

2. The metal that cannot be obtained by electrolysis of an aqueous solution of its salts is:
(1) Cu
(2) Cr
(3) Ag
(4) Ca

Solution:
The metal that cannot be obtained by electrolysis of an aqueous solution of its salts is Calcium. It can be obtained by the electrolysis of molten $CaCl_2$.
Hence option (4) is the answer.

3. The metal extracted by leaching with cyanide is
(1) Mg
(2) Ag
(3) Cu
(4) Na

Solution:
Silver is extracted by leaching with cyanide.
$Ag_2S + 2NaCN \rightarrow Na[Ag(CN)_2]$
$2Na[Ag(CN)_2] + Zn \rightarrow Na_2[Zn(CN)_4] + 2Ag$
Hence option (2) is the answer.

4. Aluminium is extracted by the electrolysis of
(1) bauxite
(2) alumina
(3) alumina mixed with molten cryolite
(4) molten cryolite

Solution:
Alumina is mixed with cryolite in the extraction of aluminium metal.
Hence option (3) is the answer.

5. Cyanide process is used for the extraction of
(1) barium
(2) aluminium
(3) boron
(4) silver

Solution:
Cyanide process is used for the extraction of silver. Cyanide forms a soluble complex with silver. Ag is precipitated using zinc.
Hence option (4) is the answer.

6. The smog is essentially caused by the presence of
(1) 0_2 and 0_3
(2) 0_3 and N_2
(3) Oxides of sulphur and nitrogen
(4) 0_2 and N_2

Solution:
Smog is smoke + fog. It is caused by a mixture of smoke and sulphur dioxide.
Hence option (3) is the answer.

7. When 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

Solution:
Al_2O_3 is used as an adsorbent in chromatography.
$Al + NaOH \rightarrow Al(OH)_3$
$Al(OH)_3 + OH^- \rightarrow [Al(OH)_4]^-$
$Al(OH)_3 \rightarrow Al_2O_3 + 3H_2O$
Hence option (2) is the answer.

8. Which of the oxide groups among the following cannot be reduced by carbon?
(1) Fe_2O_3, ZnO
(2) PbO, Fe_2O_4
(3) Cu_2O, SnO_2
(4) CaO, K_2O

Solution:
Highly reactive metals like K and Ca cannot be reduced by carbon. The oxides of less electropositive metals like Fe, Zn, Pb, Sn, Cu etc. are reduced by strongly heating them with coal or coke, in the blast furnace.
Hence option (4) is the answer.

9. The ore that contains both iron and copper is
(1) dolomite
(2) malachite
(3) copper pyrites
(4) azurite.

Solution:
Copper pyrite is $CuFeS_2$.
Hence option (3) is the answer.

10. The Mond process is used for the
(1) purification of Ni
(2) purification of Zr and Ti
(3) extraction of Zn
(4) extraction of Mo.

Solution:
The Mond process is used for the extraction and purification of Ni.
Hence option (1) is the answer.

11. The one that is not a carbonate ore is
(1) siderite
(2) calamine
(3) bauxite
(4) malachite.

Solution:
Bauxite is $Al_2O_3 .xH_2O$. It is not a carbonate ore.
Hence option (3) is the answer.

12. Calamine is an ore of
(1) aluminium
(2) copper
(3) iron
(4) zinc.

Solution:
Calamine ($ZnCO_3$) is an ore of zinc.

Hence option (4) is the answer.

13. Which one of the following ores is best concentrated by froth-flotation method?
(1) Magnetite
(2) Cassiterite
(3) Galena
(4) Malachite.

Solution:
Froth-floatation method is used for the concentration of sulphide ores.Here galena (PbS) is the only sulphide ore.

Hence option (3) is the answer.

14. With respect to ore, Ellingham diagram helps to predict the feasibility of its
(1) zone refining
(2) thermal reduction
(3) electrolysis
(4) vapour phase refining.

Solution:
Ellingham diagrams helps to predict the feasibility of thermal reduction of an ore.

Hence option (2) is the answer.

15. Which of the following factors is of no significance for roasting sulphide ores to the oxides and not subjecting 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.

Solution:
Oxidising roasting is a type of roasting in metallurgy. It is carried out to remove sulphur and arsenic in the form of their volatile oxides. CS_2 is more volatile than CO_2. Statement (1) is of no significance for roasting sulphide ores to their oxides.

Hence option (1) is the answer.

16. The correct statement is

(1) zone refining process is used for the refining of titanium
(2) zincite is a carbonate ore
(3) aniline is a froth stabilizer
(4) sodium cyanide cannot be used in the metallurgy of silver.

Solution:

Van Arkel method is used for refining titanium.
Zincite is ZnO.
Aniline is a froth stabilizer.
Sodium cyanide is used in the metallurgy of Ag.
Hence option (3) is the answer.