

CHEMISTRY

TARGET : JEE Advanced – 2021

CAPS – 18

Metallurgy

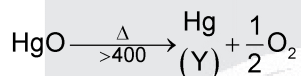
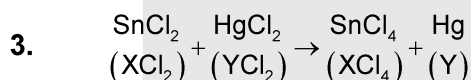
d -and f -Block Elements

Answer Key

- | | | | | |
|---|-----------|---------|----------|------------|
| 1. (B) | 2. (B) | 3. (B) | 4. (D) | 5. (D) |
| 6. (B) | 7. (B) | 8. (A) | 9. (ABD) | 10. (ABCD) |
| 11. (AC) | 12. (BCD) | 13. (B) | 14. (A) | 15. (A) |
| 16. (A) | 17. (B) | 18. (C) | 19. (A) | 20. (4) |
| 21. 4 (i) (ii) (iii) (iv) | 22. (D) | | | |
| 23. (A) - (q) ; (B) - (p) ; (C) - (r) ; (D) - (s) | | | | |

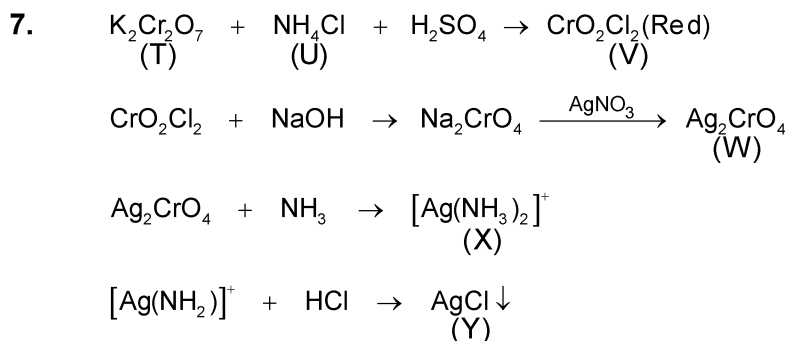
Solution

1. (B) 2. (B)



So, ore of Y is HgS, i.e., Cinnabar.

4. Roasting is the process in which concentrated ore is heated to high temp. in presence of excess of air, it is used for conversion of concentrated ore into its oxide. Generally roasts are exothermic.
5. (A) In Goldschmidt themite process aluminium acts as a reducing agent.
- $$\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe} + \text{heat}$$
- $$\text{Cr}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Cr} + \text{heat}$$
- This statement is true.
- (B) Mg is extracted by electrolysis of fused mixture of MgCl_2 and NaCl.
Thus statement is false.
- (C) Extraction of Pb is possible by carbon reduction method.
- $$\text{PbS} + \frac{3}{2} \text{O}_2 \rightarrow \text{PbO} + \text{SO}_2$$
- The oxide is reduced to Pb by carbon. This statement is true.
- (D) Red Bauxite (which contains iron oxide as the main impurity) is purified by Bayer's process.
White bauxite (which contains silica as chief impurity) is purified by serperck's process.
6. Iron obtained from blast furnace is pig iron.



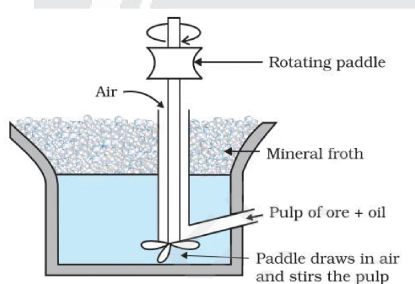
8. Elements belonging to 4d and 5d transition series have higher enthalpy of atomization than the elements belonging to 3rd series.

Hence, metal-metal bonding is more frequent in elements belonging to 4d and 5d transition series than in elements belonging to 3rd transition series.

9. • When the lead-silver alloy is rich in silver, lead is removed by the cupellation process. The impurities, including lead, copper, tin, and other unwanted metals, are oxidized and partly vaporized and partly absorbed into the pores of the cupel.
- When the lead silver alloy is rich in lead, lead is removed by Parke's or pattinson's process which includes desilverizing argentiferous lead by repeated meltings and skimmings, which concentrate the silver in the molten bath, the final skimmings being nearly pure lead.
- Zinc forms an alloy with silver, from which zinc is separated by distillation.

10. Froth flotation method has been in use for removing gangue from sulphide ores. In this process, a suspension of the powdered ore is made with water. To it, collectors and froth stabilisers are added. Collectors (e. g., pine oils, fatty acids, xanthates, etc.) enhance non-wettability of the mineral particles and froth stabilisers (e. g., cresols, aniline) stabilise the froth.

The mineral particles become wet by oils while the gangue particles by water. A rotating paddle agitates the mixture and draws air in it. As a result, froth is formed which carries the mineral particles. The froth is light and is skimmed off. It is then dried for recovery of the ore particles.



Sometimes, it is possible to separate two sulphide ores by adjusting proportion of oil to water or by using 'depressants'. For example, in case of an ore containing ZnS and PbS, the depressant used is NaCN. It selectively prevents ZnS from coming to the froth but allows PbS to come with the froth.

11. (AC)

12. Anhydrous $CuSO_4$ is gray, white coloured.

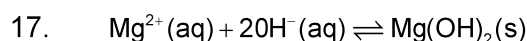
Molten silver absorbs oxygen which causes violent sputtering. This can be prevented by covering the molten metal with a layer of charcoal.

KI is converted into I_2 when KI is treated with standard sodium thiosulphate.

Lanthanum is the first element of the third transition series.

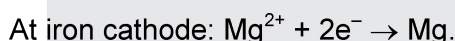
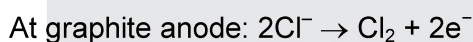
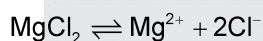
13. Refer the graph given in the question

14. Above the boiling point of the metal, entropy is increased. Hence the value of ΔG increases.
15. As ΔG is least negative for Hg among given metals above 400°C temp. So, Hg can be prepared by heating the oxide above 400°C .
16. ΔG of Al is more negative than Fe and less negative than Mg.

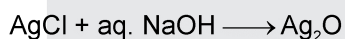
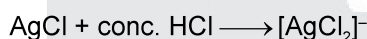
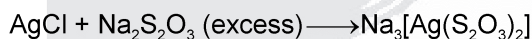
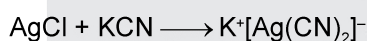
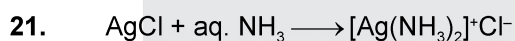


18. In the reaction of the process for obtaining magnesium from sea water $\text{Mg}(\text{OH})_2$ and HCl take participation and forms $\text{Mg}(\text{OH})_2 + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$.

19. Electrolysis of fused magnesium chloride is carried out.



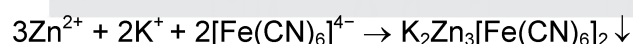
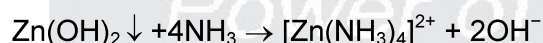
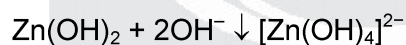
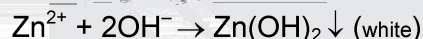
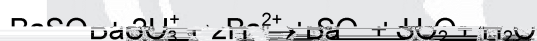
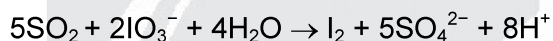
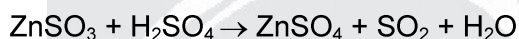
20. Sn, Fe, Pb, Zn can be extracted by carbon reduction method because they are moderately reactive.



22. Fact

23. (A) - (q) ; (B) - (p) ; (C) - (r) ; (D) - (s)

24. A: ZnSO_3 , B: SO_2 , C: ZnSO_4 , D: $\text{K}_2\text{Zn}_3[\text{Fe}(\text{CN})_6]_2$



25. In a particular series, the metallic strength increases upto the middle with increasing number of unpaired electrons i.e up to d^5 . After chromium, the number of unpaired electrons goes on decreasing. Accordingly, the melting points decrease after middle (Cr) because of increasing pairing of electrons. Magnitude of metallic bond is greater for $\text{Cr}(3d^5 4s^1)$ as compared to that of $\text{Zn}(3d^{10} 4s^0)$.