DPP-04

SOLUTIONS

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1. Correct option is D)

Two layers X and Y are immiscible. X is the upper layer. It contains zinc and a large amount of silver. Y is the lower layer. It contains lead and small amount of silver. Thus, the quantity of silver in upper X layer is more than the quantity in lower Y layer. Thus, all the statements are correct.

2. (i) Cu metal is extracted by self reduction

$CuFeS_2$:- In modern reverberatory furnace

Matter [90% Cu_2S, 2%FeS]

$FeS + O_2 \rightarrow FeO + SO_2$

$FeO + SiO_2 \longrightarrow FeSiO_3$ (slag)

$Cu_2S + O_2 \longrightarrow Cu_2O + SO_2$

$\underset{(R.A)}{Cu_2S} + Cu_2O \rightarrow \underset{(Copper)}{Cu} + SO_2$

(ii) Sno_2 (tin stone)is non magnetic while $FeWO_4$ is magnetic hence separated by magnetic separation.

(iii) $HgS \xrightarrow[T < 400^\circ C]{} HgO + SO_2$

$\downarrow T > 400^\circ C$

$Hg + \frac{1}{2}O_2$

$Cu_2S + O_2 \longrightarrow Cu_2O + SO_2$

$\underset{(R.A)}{Cu_2S} + Cu_2O \rightarrow \underset{(Copper)}{Cu} + SO_2$

(iv) Cassiterite ⇒ SnO_2

Rutile ⇒ TiO_2 True

3. Electrolytic reduction of alumina to aluminium by Hall-Heroult process is carried out in the presence of cryolite which forms a melt with lower melting temperature.
Note: Addition of cryolite and fluorspar makes alumina a good conductor of electricity and lowers fusion temperature to around 1140K.

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4. During electrolytic refining of copper. Impurities from the blister copper deposit as an anode mud which contains antimony, selenium, tellurium, silver, gold and platinum.

5. High-temperature reduction of a metal oxide by surplus carbon is a technique used to prepare certain metals for commercial use. In the cases of ZnO and Fe_2O_3, this approach can be effectively used.

Some metals are produced commercially by reducing metal oxide by excess carbon at high temperatures. It's known as smelting.
Less electropositive metals including Pb, Zn, Fe, Sn, and Cu are melted.
Therefore, ZnO and Fe_2O_3 may both be reduced using this approach.
Hence, option B is correct.

6. Electric furnaces are lined with magnesia because it melts only at very high temperatures.

Magnesia, which melts at very high temperatures and which can sustain high temperatures, is used to line electric furnaces.
Hence, option C is correct.

7. Heating a mixture of Cu_2O and Cu_2S will give $Cu + SO_2$.

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

This reaction takes place during bessemerization and is auto reduction process to give copper metal.

8. Correct options are A), B) and D)

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 parker'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.

9. Roasting → It is a process in metallurgy in which sulphide ore is heated in air and transform into oxides.
Smelting → It is a process of extracting a base metal from its corresponding metal oxides.
Electrolysis → It is used in the metallurgical processes, such as in extraction or purification of metals from ores or compounds.
Therefore correct sequence in this Questions in

$$\text{Metal sulphide} \xrightarrow{\text{(Roasting)}} \text{Metal oxide} \xrightarrow{\text{(smelting process)}} \text{Impure metal} \xrightarrow{\text{(electrolysis)}} \text{Pure metal}$$

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10. Ilmenite is a titanium-iron oxide mineral with the idealized formula $FeTiO_3$

Dolomite is a common rock-forming mineral. It is a calcium magnesium carbonate with a chemical composition of $CaMg(CO_3)_2$
Carnallite (also carnalite) is an evaporite mineral, a hydrated potassium magnesium chloride with formula $KCl.\ MgCl_2 \cdot 6(H_2O)$.
Chromite is a crystalline mineral composed primarily of iron(II) oxide and chromium(III) oxide compounds. It can be represented by the chemical formula of $FeCr_2O_4$