QB365 Question Bank Software Study Materials

Metallurgy Important 2 Marks Questions With Answers (Book Back and Creative)

12th Standard

Chemistry

Total Marks : 40

2 Marks

20 x 2 = 40

1) What are the differences between minerals and ores?

Answer :

S.NO	MINERALS	ORES
1.	A naturally occurring substance obtained by mining which contains the metal in free state or in the form of compounds are called minerals.	Minerals that contain a high percentage of metal, from which it can be extracted conveniently and economically are called ores.
2.	All the minerals are not the ores.	All the ores are Minerals.
3.	Bauxite and clay are the minerals of aluminium.	Bauxite is an ore of aluminium.

2) What are the various steps involved in the extraction of pure metals from their ores?

Answer : (i) Concentration of the ore
(ii) Extraction of crude metal
(iii) Refining of crude metal

3) What is the role of quick lime in the extraction of Iron from its oxide Fe_2O_3?

Answer : In this extraction, a basic flux, quick lime (CaO) is used, since the silica gangue present in the ore is acidic in nature. The quick lime combines with it to form calcium silicate (slag).

$CaO_{(s)} + Sio_{2(s)} \longrightarrow CaSio_{3(s)}$

Flux Gangue Slag

4) Which type of ores can be concentrated by froth floatation method? Give two examples for such ores.

Answer : This method is commonly used to concentrate sulphide ores such as galena (PbS), zinc blende (ZnS) etc.
In this method, the metallic ore particles which are preferentially wetted by oil can be separated from gangue.

5) Give the uses of zinc.

Answer : (i) Metallic zinc is used in galvanising metals such as iron and steel structures to protect them from rusting and corrosion.
(ii) Brass an alloy of zinc is used in water valves and communication equipment as it is highly resistant to corrosion.
(iii) Zinc is also used to produce die-castings in the automobile, electrical and hardware industries.

6) Explain the electrometallurgy of aluminium.

Answer : 1. This process is called as Hall-Heroult process.
Cathode: In this method, electrolysis is carried out in an iron tank lined with carbon which acts as the cathode.
Anode: The carbon blocks immersed in the electrolyte acts as a anode.
Eletrolyte: A 20% solution of alumina, obtained from the bauxite ore is mixed with molten Cryolite and is taken in the electrolysis chamber.
2. About 10% calcium chloride is also added to the solution.
3. Here Calcium chloride helps to lower the melting point of the mixture.
Temperature: The fused mixture is maintained at a temperature of above 1270 K.
4. The chemical reactions involved in this process as follows

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(a) Ionisaiton of alumina: $Al_2O_3 \longrightarrow 2Al^{3+} + 3O^{2-}$

(b) Reaction at cathode: $2Al^{3+}_{(melt)} + 6e^- \longrightarrow Al_{(l)}$

(c) Reaction at anode: $6O^{2-}_{(melt)} \longrightarrow 3O_2 + 12e^-$

5. Since carbon acts as anode the following reaction also takes place

(a) $C_{(s)} + O^{2-}_{(melt)} \longrightarrow CO + 2e^-$

(b) $C_{(s)} + 2O^{2-}_{(melt)} \longrightarrow CO_2 + 4e^-$

6. Due to the above two reactions, anodes are slowly consumed during the electrolysis.

7. The pure aluminium is formed at the cathode. The net electrolysis reaction can be written as

$4Al^{3+}_{(melt)} + 6O^{2-}_{(melt)} + 3C_{(s)} \longrightarrow 4Al_{(l)} + 3CO_{2(g)}$

7) Give the basic requirement for vapour phase refining.

Answer : In this method, the metal is treated with a suitable reagent which can form a volatile compound with the metal. Then the volatile compound is decomposed to give the pure metal.

8) Write the equation for the extraction of silver by leaching with sodium cyanide and show that the leaching process is a redox reaction.

Answer : $Ag_2S + 4NaCN \rightleftharpoons 2NalAg(CN)_2] + Na_2S$

Sodium Argento cyanide

$2Na[Ag(CN)_2] + Zn \rightarrow Na_2[Zn(CN)_{4]} + 2Ag\downarrow$

Silver is obtained by the reduction of sodium Argento cyanide with zinc. At the same time zinc gets oxidised into its complex. Hence leaching process is a redox reaction.

9) Magnesite (Magnesium carbonate) is calcined to obtain magnesia, which is used to make refractory bricks. Write the decomposition reaction.

Answer : $MgCO_3 \xrightarrow{\Delta} MgO + CO_2\uparrow$

The reaction is carried out in the absence of air.

10) Metallic sodium is extracted by the electrolysis of brine (aq. NaCl). After electrolysis the electrolytic solution becomes basic in nature. Write the possible electrode reactions.

Answer : $2NaCl_{(aq)} \rightarrow 2Na^+ + Cl^-$

At Cathode: $Na^+ + e^- \rightarrow Na$ (Reduction)

At Anode: $2Cl^- \rightarrow Cl_2 + 2e^-$ (Oxidation)

11) Why should we have a ecofriendly metallurgical process?

Answer : It is essential to design an eco friendly metallurgical process that would minimize waste, maximize energy efficiency. Such advances in metallurgy is vital for the economic and technical progress in the current era.

12) Name the two steps involved in the extraction of crude metal

Answer : (i) Conversion of ores into oxides.

(ii) Reduction of metal oxides.

13) Why is the froth flotation method selected for the concentration of sulphide ores?

Answer : (i) Lighter sulphide ore particles are wetted by pine oil and rise to the surface with the from while gangue particles are wetted by water.

(ii) Therefore, the froth flotation method is selected for the concentration of sulphide ores.

14) What are the various leaching processes?

Answer : The various leaching processe are cyanide leaching, ammonia leaching, alkali leaching and acid leaching.

15) Name and discuss the principle involved in obtaining silicon of high purity.

Answer : (i) Silicon of is refined by Zone refining method.

(ii) It is based on the principle that melting point of a substance is lowered by the presence of impurities

(iii) Consequently when an impure molten metal is cooled, crystals of the pure metal are solidified and the impurities remain behind the remaining metal.

16) Define metallurgy.

Answer : Metallurgy is the process of extraction of metal in the purest form from its ores.

17) Explain Mond's process.

Answer : (i) The impure nickel is heated in a stream of carbon monoxide at around 350 K. The nickel reacts with the CO to form a highly volatile nickel tetracarbonyl. The solid impurities are left behind.

$$\mathrm{Ni}_s + 4\mathrm{CO}_{(p)} \rightarrow \left[\mathrm{Ni}\left(\mathrm{CO}_4\right)\right]_{(\mathrm{g})}$$

(ii) When the Nickel Carbonyl Complex is heated at 460 K, it decomposes to give pure nickel.

$$\left[\mathrm{Ni(CO)_4}\right]_{(g)} \xrightarrow{460\ \mathrm{K}} \mathrm{Ni}_{(\mathrm{s})(\mathrm{pue})} + 4\mathrm{CO}_{(g)}$$

18) Write the uses of copper.

Answer : (i) Copper is used for making coins and ornaments along with gold and other metals.

(ii) Copper and its alloys are used for making wires, water pipes and other electrical parts.

19) Mention any two observations for the Ellingham diagram.

Answer : 1) The graph for the formation of CO is a straight line with negative slope. In this case ΔS is positive as 2 moles of CO gas is formed by the consumption of one mole of oxygen gas. It indicates that CO is more stable at higher temperature.

2) Oxygen gas is consumed during the formation of metal oxides which results in the decrease in randomness. Hence, ΔS becomes negative and it makes the term, ΔS (slope) positive in the straight line equation.

$\Delta G = \Delta H - \Delta TS$

20) What does Ellingham diagram represent?

Answer : (i) The graphical representation of variation of the standard Gibbs free energy of reaction for the formation of various metal oxides with temperature is called Ellingham diagram.

(ii) Ellingham diagram helps us to select a suitable reducing agent and appropriate temperature range for reduction.