

Metallurgy

Question1

The incorrect statement about Hall -Heroult process is

KCET 2024

Options:

- A. carbon anode is oxidised to CO and CO₂.
- B. Na₃AlF₆ helps to decrease the melting point of the electrolyte.
- C. CaF₂ helps to increase the conductivity of the electrolyte.
- D. oxidation state of oxygen changes in the overall cell reaction.

Answer: D

Solution:

The incorrect statement about Hall-Heroult process is given in option (d). It is because in this process oxidation state of oxygen remains same in the overall cell reaction.



Question2

Select the correct statement :

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Options:



- A. Roasting involves heating the ore in the absence of air.
- B. Calcination involves heating the ore above its melting point.
- C. Smelting involves heating the ore with suitable reducing agent and flux below its melting point.
- D. Calcination of calcium carbonate is endothermic.

Answer: D

Solution:

Among the given statements, correct statement is given in option (d). While statement given in options (a), (b) and (c) are incorrect. Their correct form are as follows

- Roasting involves heating the ore is the regular supply of air.
 - Calcination involves heating the ore below its melting point.
 - Smelting is the process by which a metal is obtained at temperature beyond the melting point from its ore.
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Question3

For the formation of which compound in Ellingham diagram ΔG° becomes more and more negative with increase in temperature?

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Options:

- A. CO
- B. FeO
- C. ZnO
- D. Cu₂O

Answer: A

Solution:



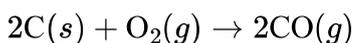
Understanding Ellingham Diagrams

- Ellingham diagrams depict the relationship between the standard Gibbs free energy change of formation (ΔG°) and temperature (T) for various metal oxides.
- A more negative ΔG° signifies a more thermodynamically favorable reaction, implying greater stability of the oxide.
- The slope of a line on an Ellingham diagram is related to the standard entropy change (ΔS°) of the reaction:
 - **Negative slope:** ΔS° is negative (less gas produced than consumed)
 - **Positive slope:** ΔS° is positive (more gas produced than consumed)

Finding the Answer

The formation of carbon monoxide (CO) exhibits a unique behavior on the Ellingham diagram:

- **Negative Slope:** The reaction has a negative slope, indicating a negative ΔS° :



- **Increasing Stability:** As temperature increases, the ΔG° for the formation of CO becomes increasingly negative. This means CO becomes more stable at higher temperatures.

Other Options:

The formation of FeO, ZnO, and Cu₂O have positive slopes on the Ellingham diagram, indicating that their stability decreases as temperature increases.

Correct Answer

- **Option A: CO**
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Question4

Copper is extracted from copper pyrites by

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Options:

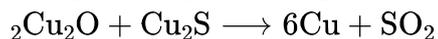
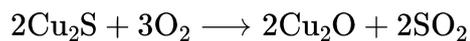
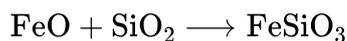
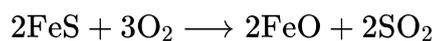


- A. thermal decomposition
- B. reduction by coke
- C. electrometallurgy
- D. auto reduction

Answer: D

Solution:

Copper is extracted from copper pyrites by auto reduction process in the following manner.



Question5

Function of potassium ethyl xanthate in froth floatation process is to make the ore

KCET 2020

Options:

- A. lighter
- B. hydrophobic
- C. hydrophilic
- D. heavier

Answer: B

Solution:

The role/function of potassium ethyl xanthate in the froth floatation process is to increase the non-wettability of mineral particles by making it hydrophobic. These are also given the name collectors.



Question6

Sulphide ore on roasting gives a gas X . X reacts with Cl_2 in the presence of activated charcoal to give Y . Y is

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Options:



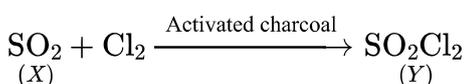
Answer: A

Solution:

When sulphide ore is roasted it means that sulphide ore is being heated in the presence of excess of air to form a gas SO_2 .

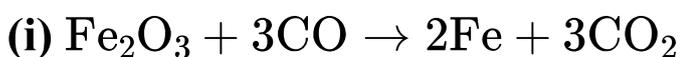


Thereafter, X reacts with Cl_2 in the presence of activated charcoal to give Y



Question7

Among the following, the main reactions occurring in blast furnace during extraction of iron from haematite are





KCET 2019

Options:

A. i and ii

B. iii and iv

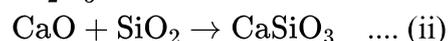
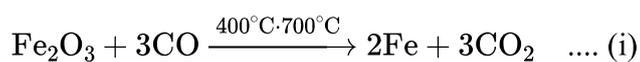
C. ii and iii

D. i and iv

Answer: D

Solution:

Among the given reactions, The main reactions occurring in blast furnace during extraction of iron from haematite ore are



Reaction (i) occurs in the uppermost part of furnace.

In this zone, CO coming upwards comes into contact with iron oxide and reduces it to iron.

Reaction (ii) occur in slag zone. CaO acts as a flux and combines with silica present as gangue in the ore to form a fusible slag, CaSiO₃.

Question8

Electrolytic refining is used to purify which of the following metals?

KCET 2018

Options:

A. Cu and Zn

B. Ge and Si

C. Z and Ti

D. Zn and Hg

Answer: A

Solution:

Electrolytic refining is a process in which an impure metal is made the anode in an electrolytic cell, and a pure metal is deposited on the cathode. This method is commonly used because the impurities either remain in the solution or form a sludge that can be removed, leaving behind a highly pure metal.

Among the options given:

- Copper (Cu) is the classic example of a metal refined by this method. In the electrolytic refining of copper, impure copper is used as the anode and a thin strip of pure copper serves as the cathode. When current is passed through the cell, copper ions dissolve from the anode and deposit on the cathode as pure copper.
- Zinc (Zn) can also be refined by an electrolytic process, although it is not as widely known as copper refining. Under controlled conditions, impure zinc can be purified using a similar principle.

The other options include metals like germanium (Ge), silicon (Si), titanium (Ti), and mercury (Hg), which are not typically purified by electrolytic refining.

Thus, the correct answer is:

Option A: Cu and Zn.

Question9

The common impurity present in bauxite is

KCET 2018

Options:

A. CuO

B. ZnO

C. Fe₂O₃

D. Cr₂O₃



Answer: C

Solution:

The correct answer is Option C: Fe_2O_3 .

Here's why:

Bauxite is the primary ore of aluminum and mainly consists of aluminum hydroxides such as gibbsite, boehmite, and diaspore.

During its natural formation, bauxite often contains various impurities. One of the most common impurities is iron oxide, represented by Fe_2O_3 .

The presence of Fe_2O_3 not only affects the color of bauxite (giving it a reddish tint) but is also a well-documented characteristic of this ore.

Thus, among the options provided, Fe_2O_3 is the correct choice.

Question10

The metal extracted by leaching with a cyanide is

KCET 2017

Options:

A. Al

B. Na

C. Cu

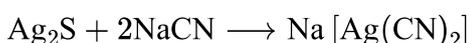
D. Ag

Answer: D

Solution:

Silver is extracted using a process involving leaching with cyanide. During this process, silver forms a soluble complex with sodium cyanide (NaCN). Here's how it works:

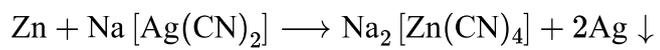
The reaction of silver sulfide (Ag_2S) with sodium cyanide (NaCN) produces a soluble complex:



This complex is known as sodium dicyanoargentate, which is soluble in water.

From this soluble complex, silver is then precipitated out using scrap zinc:





In this reaction, zinc replaces silver in the complex, resulting in the precipitation of silver metal.
