



CHEMISTRY

BOOKS - IIT-JEE PREVIOUS YEAR (CHEMISTRY)

EXTRACTION OF METALS

Jee Main And Advanced

1. Which one of the following ores is best concentrated by froth flotation method:

A. Siderite

B. Galena

C. Malachite

D. Magnetite

Answer: B



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2. From the following statements regarding H_2O_2 , choose the incorrect statements:

A. It can act only as an oxidising agent

B. It decomposed on exposure to light

C. It has to be stored in plastic or wax lined glass bottles in dark

D. It has to be kept away from dust

Answer: A



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3. In the correct of the Hall-Heroult process for the extraction of Al , which of the following statements is false ?

- A. CO and CO_2 are produced in this process
- B. Al_2O_3 is mixed with CaF_2 which lowers the melting point of the mixture and brings conductivity
- C. Al^{3+} is reduced at the cathode to form Al
- D. Na_3AlF_6 serves as the electrolyte

Answer: D



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4. The metal that cannot be obtained by electrolysis of an aqueous solution of its salts is :

A. Ag

B. Ca

C. Cu

D. Cr

Answer: B



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5. Sulfide ores are common for the metals.

A. Ag, Cu and Pb

B. Ag, Cu and Sn

C. Ag, Mg and Pb

D. Al, Cu and Pb

Answer: A



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6. In the cyanide extraction process of silver from argentite, the oxidizing and reduction agents used are _____.

A. O_2 and CO respectively

B. O_2 and Zn dust respectively

C. HNO_3 and Zn dust respectively

D. HNO_3 and CO respectively

Answer: B



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7. Oxidation states of the metal in the minerals haematite and magnetite, respectively, are

- A. II, III in haematite and III in magnetite
- B. II, III in haematite and II in magnetite
- C. II in haematite and II, III in magnetite
- D. III in haematite and II, III in magnetite

Answer: D



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8. Native silver metal forms a water soluble complex with a dilute aqueous solution of $NaCN$ in the presence of

- A. nitrogen
- B. oxygen
- C. carbon dioxide
- D. argon

Answer: B



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9. Extraction of iron from zinc blende is achieved by

- A. electrolytic reduction
- B. roasting followed by reduction with carbon

C. roasting followed by reduction with another metal

D. roasting followed by self-reduction

Answer: B

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10. Which ore contains both iron and copper?

A. Cuprite

B. Chalcocite

C. Chalcopyrite

D. Malachite

Answer: C

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11. The method chiefly used for the extraction of lead and tin from their ores are respectively .

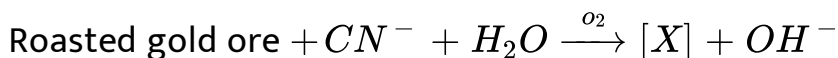
- A. self-reduction and carbon reduction
- B. self-reduction and electrolytic reduction
- C. carbon reduction and self-reduction
- D. cyanide process and carbon reduction

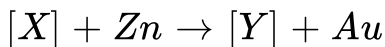
Answer: A



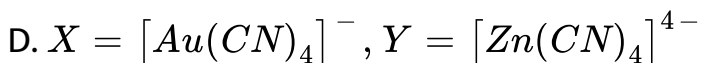
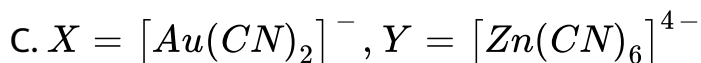
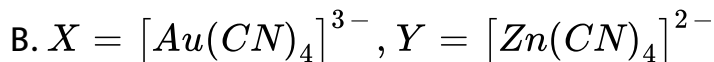
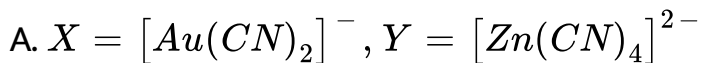
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12. In the process of extraction of gold,





Identify the complexes [X] and [Y]



Answer: A



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13. Anhydrous ferric chloride is prepared by

A. heating hydrated ferric chloride at a high temperature in
a stream of air

B. heating metallic iron in a stream of dry chlorine gas

C. reaction of ferric oxide with hydrochloric acid

D. reaction of metallic iron with hydrochloric acid

Answer: B



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14. Which of the following process is used in the extractive metallurgy of magnesium ?

A. Fused salt electrolysis

B. self-reduction

C. Aqueous solution electrolysis

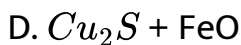
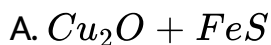
D. Thermite reduction

Answer: A



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15. The chemical composition of slag formed during the smelting process in the extraction of copper is



Answer: B



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16. Electrolytic reduction of alumina to aluminum by the Hall-Heroult process is carried out
- A. in the presence of NaCl
 - B. in the presence of fluorite
 - C. in the presence of cryolite which forms a melt with lower melting temperature
 - D. in the presence of cryolite which forms a melt with higher melting temperature

Answer: C



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17. The chemical process in the production of steel from haematite ore involves

- A. reduction
- B. oxidation
- C. reduction followed by oxidation
- D. oxidation followed by reduction

Answer: A



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18. In the commercial electrochemical process for aluminium extraction, the electrolyte used is

- A. $Al(OH)_3$ in NaOH solution
- B. an aqueous solution of $Al_2(SO_4)_3$
- C. a molten mixture of Al_2O_3 and Na_3AlF_6

D. a molten mixture of $AlO(OH)$ and $Al(OH)_3$

Answer: C

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19. The major role of flourspar, CaF_2 which is added in small amount in the electrolytic reduction of Al_2O_3 dissolved on fused cryolite in fused cryolite is

- A. as a catalyst
- B. to make the fused mixture very conducting
- C. to increase the temperature of the melt
- D. to decrease the rate of oxidation of carbon at the anode`

Answer: B

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20. Hydrogen gas will not reduce:

- A. heated cupric oxide
- B. heated ferric oxide
- C. heated stannic oxide
- D. heated aluminium oxide

Answer: D

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21. In the aluminothermite process, aluminium is

- A. an oxidising agent

B. a flux

C. a reducing agent

D. a solder

Answer: C



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22. Bonds presents in $CuSO_4 \cdot 5H_2O$ is

A. electrovalent and covalent

B. electrovalent and coordinate covalent

C. electrovalent, covalent and coordinate covalent

D. covalent and coordinate covalent

Answer: C



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23. In the metallurgy of iron, when limestone is added to the blast furnace, the calcium ions end up in

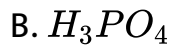
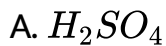
- A. slag
- B. gangue
- C. metallic calcium
- D. calcium carbonate

Answer: A



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24. Iron is rendered passive by treatment with concentrated



Answer: D



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25. Extraction of copper from copper pyrite ($CuFeS_2$) involves

A. crushing followed by concentration of the ore by froth-

floatation

B. removal of iron as slag

C. self reduction step to produce 'blister copper' following evolution of SO_2

D. refining of 'blister copper' by carbon reduction

Answer: A::B::C



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26. Copper is purified by electrolytic refining of blister copper

The current statement about this process is (are):

(i) impure Cu strip is used as cathode

(ii) acidified aqueous $CuSO_4$ is used as electrolyte

(iii) pure Cu deposits at cathode

(iv) impurities settle as anode mud

A. impure Cu strip is used as cathode

B. acidified aqueous $CuSO_4$ is used as electrolyte

C. pure Cu deposits at cathode

D. impurities settle as anode-mud

Answer: B::C::D



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27. Upon heating with Cu_2S the reagents that give copper metal are

(i) $CuFeS_2$ (ii) CuO

(iii) Cu_2O (iv) $CuSO_4$

A. $CuFeS_2$

B. CuO

C. Cu_2O

D. $CuSO_4$

Answer: B::C::D

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28. The carbon-based reduction method is NOT used for the extraction of

A. tin from SnO_2

B. iron from Fe_2O_3

C. aluminium from Al_2O_3

D. magnesium from $MgCO_3, CaCO_3$

Answer: C::D

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29. Extraction of metal from the ore cassiterite involves

- A. carbon reduction of an oxide ore
- B. self-reduction of a sulphide ore
- C. removal of copper impurity
- D. removal of iron impurity

Answer: A::D



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30. The addition of high proportions of manganese makes steel useful in making rails or railroads because manganese is useful in making rails or railroads because manganese

A. gives hardness to steel

B. helps the formation of oxides of iron

C. can remove oxygen and sulphur

D. can show highest oxidation state of +7

Answer: A::C



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31. Out of the following metals that cannot be obtained by electrolysis of the aqueous solution of their salts is

A. Ag

B. Mg

C. Cu

D. Al

Answer: B::D

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32. In the electrolysis of alumina, cryolite is added to

- A. lower the melting point of alumina
- B. increase the electrical conductivity
- C. minimise the anode effect
- D. remove impurities from alumina

Answer: A::B

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33. $Al(OH)_3$ is amphoteric in nature.

$Al - O$ and $O - H$ bonds can be broken with equal ease in $Al(OH)_3$.

- A. Statement I is correct, Statement II is correct, Statement II is the correct explanation of Statement I.
- B. Statement I is correct, Statement II is correct, Statement II is not the correct explanation of Statement I.
- C. Statement I is correct, Statement II is incorrect.
- D. Statement I is incorrect, Statement II is true.

Answer: B



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34. Copper is the most noble of first row transition metals and occurs in small deposits in several countries. Ores of copper include chalcantite ($CuSO_4 \cdot 5H_2O$), atacamite [$Cu_2Cl(OH)_3$], cuprite (Cu_2O), copper glance (Cu_2S), and malachite [$Cu_2(OH)_2CO_3$]. However, 80% of the world copper production comes from the ore chalcopyrite ($CuFeS_2$). The extraction of copper from chalcopyrite involves partial roasting, removal of iron and self-reduction.

Partial roasting of chalcopyrite produces

A. Cu_2S and FeO

B. Cu_2O and FeO

C. CuS and Fe_2O_3

D. Cu_2O and Fe_2O_3

Answer: B



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Iron is removed from chalcopyrite as.

A. FeO

B. FeS

C. Fe_2O_3

D. $FeSiO_3$

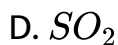
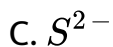
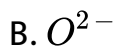
Answer: D



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36. Copper is the most noble of first row transition metals and occurs in small deposits in several countries. Ores of copper include chalcocite (Cu_2O), atacamite [$Cu_2Cl(OH)_3$], cuprite (Cu_2O), copper glance (Cu_2S), and malachite [$Cu_2(OH)_2CO_3$]. However, 80% of the world copper production comes from the ore chalcopyrite ($CuFeS_2$). The extraction of copper from chalcopyrite involves partial roasting, removal of iron and self-reduction. In self-reduction, the reducing species is.

A. S



Answer: C



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37. Match the anionic species given in Column I that are present in the ore (s) given in Column II.

Column I

Column II

A. Carbonate

p. Siderite

B. Sulphide

q. Malachite

C. Hydroxide

r. Bauxite

D. Oxide

s. Calamine

t. Argentite



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38. Match each of the reaction given in Column I with the corresponding product(s) given in Column II.

Column I	Column II
A. $\text{Cu} + \text{dil. HNO}_3$	<i>p.</i> NO
B. $\text{Cu} + \text{cons. HNO}_3$	<i>q.</i> NO_2
C. $\text{Zn} + \text{dil. HNO}_3$	<i>r.</i> N_2O
D. $\text{Zn} + \text{cons. HNO}_3$	<i>s.</i> $\text{Cu}(\text{NO}_3)_2$ <i>t.</i> $\text{Zn}(\text{NO}_3)_2$

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39. Match the conversions in Column I with the type(s) of reaction(s) given in Column II.

Column I	Column II
A. $\text{PbS} \rightarrow \text{PbO}$	<i>p.</i> Roasting
B. $\text{CaCO}_3 \rightarrow \text{CaO}$	<i>q.</i> Calcination
C. $\text{ZnS} \rightarrow \text{Zn}$	<i>r.</i> Carbon reduction
D. $\text{Cu}_2\text{S} \rightarrow \text{Cu}$	<i>s.</i> Self-reduction

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40. Match the extraction processes listed in Column I with metals listed in Column II.

Column I

A. Self reduction

B. Carbon reduction

C. Complex formation and displacement by metal

D. Decomposition of iodide

Column II

p. Lead

q. Silver

r. Copper

s. Boron

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41. Each entry in Column X is in some way related to the entries in Columns Y and Z. Match the appropriate entries.

Column X

Column Y

Column Z

A. Invar

p. Co,Ni

m. Cutlery

B. Nichrome

q. Fe,Ni

n. Heating element

C. Stainless steel

r. Fe,Cr,Ni

o. Watch spring

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42. Match the following choosing one item from Column X the appropriate item from Column Y.

Column X	Column Y
<i>a.</i> Al	<i>p.</i> Calamine
<i>B.</i> Cu	<i>q.</i> Cryolite
<i>C.</i> Mg	<i>r.</i> Malachite
<i>D.</i> Zn	<i>s.</i> Carnalite

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43. Match the following metals listed in Column I with extraction processes listed in Column II.

Column I	Column II
<i>A.</i> Silver	<i>p.</i> Fused salt electrolysis
<i>B.</i> Calcium	<i>q.</i> Carbon reduction
<i>C.</i> Zinc	<i>r.</i> Carbon monoxide reduction
<i>D.</i> Iron	<i>s.</i> Amalgamation
<i>E.</i> Copper	<i>t.</i> Self-reduction

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44. Silver jewellery items tarnish slowly in air due to their reaction with ____.

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45. In extractive metallurgy of zinc, partial fusion of ZnO with coke is called ____ and reduction of the ore to molten metal is called ____ (smelting, calcining, roasting, sintering).

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46. Silver chloride is sparingly soluble in water because its lattice energy is greater than _____

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47. Galvanisation of iron denotes coating with _____

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48. Cassiterite is an ore of

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49. In the thermite process, _____ is used as a reducing agent.

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50. In the basic Bessemer process for the manufacture of steel, the lining of the converter is made up of _____. The slag formed consists of _____.



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51. $AgCl$ dissolves in excess of KCN solution to give the ___ complex compound .



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52. Cu^+ disproportionate to Cu^{2+} and elemental copper in solution.



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53. Silver chloride is more soluble in very concentrated sodium chloride solution than in pure water.



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54. Dilute HCl oxidises melting Fe to Fe^{2+} .

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55. Silver fluoride is fairly soluble in water.

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56. The coordination number of Al in the crystalline state of $AlCl_3$ is _____.

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57. The number of water molecule(s) directly bonded to the metal centre in $CuSO_{4.5}H_2O$ is



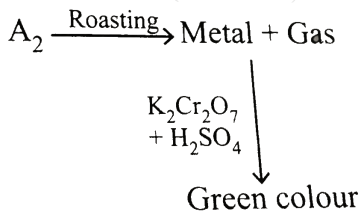
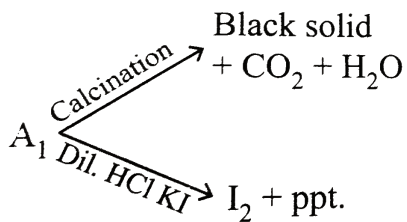
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58. Write the balanced chemical equations for developing a black and white photographic film. Also, give the reason as to why the solution of sodium thiosulphate on acidification turns milky white and give the balanced chemical equation of this reaction.



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59. A_1 and A_2 are two ores of metal M . A_1 on calcination gives a black precipitate, CO_2 and water. Identify A_1 and A_2 .



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60. Which one is more soluble in diethyl ether : anhydrous AlCl_3 or hydrated AlCl_3 ? Explain in terms of bonding.

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61. Write down the reactions involved in the extraction of Pb .
 What of the oxidation number of lead in litharge ?

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62. Write the balanced chemical equation for developing photographic films.

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63. Write the chemical reactions involved in the extraction of metallic silver from argentite.

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64. In moist air, copper corrodes to produce a green layer on the surface. Give reason.

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65. When the ore haematite is burnt in air with coke around $2000K$ along with lime, the process not only produces steel but also produces a silicate slag that is useful in making building materials such as cement. Discuss the same and show through balanced chemical equation.

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66. Give balance equation for the reaction of aluminium with aqueous sodium hydroxide.

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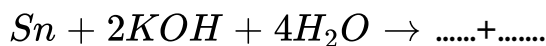
67. Write a balanced equation for the reaction of argentite with KCN and name the products in the solution .

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68. Give reasons for the following. "Although aluminium is above hydrogen in the electrochemical series, it is stable in air and water".

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69. Complete the following reaction:



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70. Give briefly the isolation of magnesium from sea water. Give equations for the steps involved.

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71. Calculate the number of moles of Cu and HNO_3 to give NO and NO_2 in the (2: 1) molar ratio.

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72. Write balanced equations for "the extraction of copper from pyrites by self-reduction".

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73. Give balanced equations for the following.

"Extraction of silver from silver glance by cyanide process".

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74. Answer the following questions briefly.

(i) What is the actual reducing agent of haematite in blast furnace ?

(ii) Give the equations for the recovery of lead from galena by air reduction.

(iii) Why is sodium chloride added during electrolysis of fused anhydrous magnesium chloride.

(iv) Zinc, not copper, is used for the recovery of metallic silver from the complex $[Ag(CN)_2]$. Explain.

(v) Why is chalcocite roasted and not calcinated during recovery of copper ?



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75. Write the balanced equations for the reaction occurring when gold is dissolved in aqua regia.



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76. Each of the following statements is true only under some specific conditions. Write the condition for each sub-equation in not more than two sentences.

(i) Metals can be recovered from their ores by chemical methods.

(ii) High purity metals can be obtained by zone refining method.



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77. Given reasons for the following in one or two sentences:
silver bromide is used in photography?



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78. State the conditions under which the preparation of alumina from aluminium is carried out. Give the necessary equations which need not be balanced.



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79. Write the chemical equations involved in the extraction of lead from galena by self-reduction process.



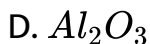
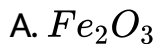
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80. Write balanced equation involved in the preparation of tin metal from cassiterite.



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81. In the thermite process, _____ is used as a reducing agent.



Answer: B



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82. Of the following substances the one which does not contain oxygen is

A. bauxite

B. epsom salt

C. cryolite

D. dolomite

Answer: C



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83. Match list I with list II and select the correct answer using the codes given below the lists.

List I (Ore)	List II (Metal)
(i) Dolomite	(ii) Copper
(ii) Chalcopyrite	(ii) Lead
(iii) Pyrolusite	(iii) Magnesium
(iv) Galena	(iv) Manganese

- A. (i) (ii) (iii) (iv)
III I IV II
- B. (i) (ii) (iii) (iv)
III II I IV
- C. (i) (ii) (iii) (iv)
I II III IV
- D. (i) (ii) (iii) (iv)
IV III II I

Answer: A



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84. Cupellation process is involved in the metallurgy of

A. Copper and dilute sulphuric acid

B. silver

C. gold

D. lead

Answer: B



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85. Carbon reduction method is commercially employed for commercial extraction of

A. hematite

B. cassiterite

C. iron pyrite

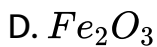
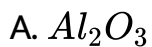
D. corundum

Answer: A::B



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86. Amphoteric oxides is/are



Answer: A::B::C



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87. Following two question have assertion followed by the reason. Answer them according to the following options.

Assertion In smelting process, the roasted ore is heated with powdered coke in presence of flux.

Reason Oxides are reduced to metal by carbon or CO and impurities are removed as slag.

- A. Both assertion and reason are correct and reason is the correct explanation of the assertion.
- B. Both assertion and reason are correct but reason is not the correct explanation of assertion.
- C. Assertion is correct but reason is incorrect.
- D. Assertion is incorrect but reason is correct.

Answer: A

88. Assertion (A): Magnesium can be obtained by the electrolysis of aqueous solution of $MgCl_2$.

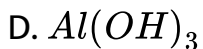
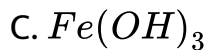
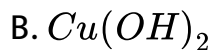
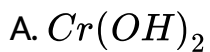
Reason (R): The electrode potential of Mg^{2+} is much higher than H^{\oplus} .

- A. Both assertion and reason are correct and reason is the correct explanation of the assertion.
- B. Both assertion and reason are correct but reason is not the correct explanation of assertion.
- C. Assertion is correct but reason is incorrect.
- D. Assertion is incorrect but reason is correct.

Answer: D

Others

1. Which of the following is soluble in ammonia?



Answer: B

2. Which one of the following pairs of substances could be used for the preparation of copper (II) sulphate in the laboratory?

- A. Copper and dilute sulphuric acid
- B. Copper (II) carbonate and sodium sulphate
- C. Copper (II) chloride and dilute sulphuric acid
- D. Copper (II) oxide and dilute sulphuric acid

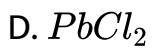
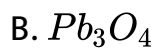
Answer: D



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3. Which is used in paint?

- A. PbO



Answer: A::B::C



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