



CHEMISTRY

BOOKS - V PUBLICATION

GENERAL PRINCIPLES AND PROCESSES OF ISOLATION OF ELEMENTS

Question Bank

1. Analyses the table given below:

Metal	Ore
Copper	Copper pyrites, copper glance, cuprite
Zinc	Zinc blende, calamine, zincite
Aluminium	Bauxite, diaspore
Iron	Haematite, magnetite, iron pyrites

Which of

the ores mentioned in the above table can be concentrated by magnetic separation method? Justify your answer.

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2. What is the significance of leaching in the extraction of aluminium?

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3. Metallurgical process can be explained in terms of thermodynamic principles. Reduction of Cr_2O_3 by Aluminium metal is accompanied by negative ΔG° value and is thermodynamically feasible. Why does this reaction fail at room temperature?

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4. Is it true under certain conditions Mg can reduce Al_2O_3 and Al can reduce MgO ? What are the conditions?

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5. Copper can be extracted by hydrometallurgy but not zinc. Explain.



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6. What is the role of depressant in froth floatation process?



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7. Why is the extraction of copper from pyrites more difficult than that from its oxide ore through

reduction?

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8. Explain: i) Zone refining ii) Column chromatography

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9. Out of C and CO, which is a better reducing agent at 673K?

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10. Name the common elements present in the anode mud in electrolytic refining of copper. Why are they so present?



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11. Write down the reactions taking place in different zones in the blast furnace during the extraction of iron.



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12. Write chemical reactions taking place in the extraction of zinc from zinc blende

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13. State the role of silica in the metallurgy of copper.

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14. What is meant by the term, 'Chromatography' ?

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15. What criterion is followed for the selection of the stationary phase in chromatography?

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16. Describe a method for refining nickel.

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17. How can you separate alumina from silica in a bauxite ore associated with silica? Give equations, if any.

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18. Giving examples, differentiate between 'roasting' and 'calcination'.

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19. How is 'cast iron ' different from 'pig iron'?

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20. All ores are minerals, but all minerals are not ores.
Why?

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21. Why copper matte is put in silica lined converter?

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22. Alumina is mixed with cryolite and subjected to electrolysis to extract aluminium.

Why cryolite is added to alumina?

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23. How is leaching carried out in case of low grade copper ores?



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24. Why is zinc not extracted from zinc oxide through reduction using CO?



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25. The value of $\Delta_r G$ for formation of Cr_2O_3 is $-540 kJ mol^{-1}$ and that of Al_2O_3 is $-827 kJ mol^{-1}$. Is the reduction of Cr_2O_3 possible with Al?



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26. Out of C and CO, which is a better reducing agent for ZnO?

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27. The choice of a reducing agent in a particular case depends on thermodynamic factor. How far do you agree with this statement? Support your opinion with two examples.

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28. Name the process from which chlorine is obtained as a by-product. What will happen if an aqueous solution of NaCl is subjected to electrolysis?



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29. What is the role of graphite rod in the electrometallurgy of aluminium?



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30. Outline the principles of refining of metals by the following methods. i, Zone refining ii. Electrolytic

refining iii. Vapour phase refining

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31. Predict conditions under which Al might be expected to reduce MgO

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32. All ores are minerals, but all minerals are not ores. Is this statement true or false? Give reason for your answer?

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33. Explain the term gangue, flux and slag.

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34. An oxide ore A has a magnetic oxide B and SiO_2 as the chief impurities. How will you concentrate the ore?

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35. Suggest methods for concentration of the following ores? 1. ZnS 2. Fe_2O_3 3. Cu_2S

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36. Given below are the names of a few ores. Classify them as oxide ores, sulphide ores, halide ores and carbonate ores. 1.Galena 2.Rutile 3.Cryolite 4.Bauxite
5.Siderite 6.Cinnabar

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37. Some metallic compounds /ores are given below [ZnS , $Al_2O_3 \cdot 2H_2O$, Cu_2S] Make a table containing ores, concentration method of the ore, name of the metal and one alloy of the metal.

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38. A. Describe the purification of Ti by Van Arkel method. B. Explain the process of purification of Nickel.



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39. A house wife gave some of her gold ornaments to a person for polishing . The person became happy, He conducted some chemical reactions and returned the polished ornaments. [Hint: - The person became happy because he got some gold in the 'dissolved form] a. Name the solvent used by the person to

dissolve gold. b. Explain the chemistry of the reaction:

c. How the person has recovered the dissolved gold from the solution?



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40. While adding the raw materials into the Blast furnace for the extraction of iron, it is forgotten to mix lime stone with the charge. a. Predict the result of this mistake b. Give reason for this result. c. Bessemer converter follows Blast furnace in a steel industry Justify.



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41. Given below is a symbolic parking zone. Select suitable term from those given in brackets to place in each circle. [Sulphide ores, Native metals, Blast furnace, Vapour phase refining, Bauxite, Semiconductors, Slagging, Zinc carbonate]

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42. In a classroom discussion Ramu said that ocean is a store house of elements. Is this argument true? Justify your answer.



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43. In a classroom discussion Raju said that silver ores and native gold have to be leached with metal cyanides. Is this statement true? Justify your answer?



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44. Froth floatation process is convenient for the concentration of sulphide ores. Describe?



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45. A.Name the metallurgical refining technique used for purification of Ni . B.Explain the purification of zirconium



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46. a. 'The ore mixed with coke and limestone is introduced into the blast furnace. What is the purpose of adding limestone?



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47. How does NaCN act as a depressant in preventing ZnS from forming the froth?



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48. Cinnabar (HgS) and galena (PbS) on roasting. often given their respective metals, but zinc blende (ZnS) does not. Explain.



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49. Although thermodynamically feasible, in practice, magnesium metal is not used for the reduction of

alumina in the metallurgy of aluminium. Why?

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50. In general which metals do you expect to occur in the native state in nature? Give examples

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51. Why is it advantageous to roast a sulphide ore before reduction?

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52. A, white powder (A) when heated gave off a colourless gas (B) which turns the lime water milky. The residue (C) was yellow when hot but turned white on cooling. Identify '(A),(B)' and '(C)' Write the equation for the action of heat on (B).



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53. Describe the principle of extraction of each of the following i) Sn from SnO_2



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54. Give one important ore of aluminium?



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55. Name the four, most abundant elements in the earth's crust? Arrange them in decreasing abundance.



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56. Copper and silver lie below in the electrochemical series and yet they are found in the combined state as sulphides in nature. Comment.



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57. Name, the method used for refining of (i) Nickel (ii) Zirconium



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58. A sample of galena (PbS) is contaminated with zinc blende (ZnS). Name one chemical which can be used to concentrate galena selectively by froth floatation method?



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59. Metal sulphides occur mainly in rocks and metal halides in lakes and seas. Explain.



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60. Predict the mode of occurrence of the following metals. (i) Highly reactive (eg, sodium) (ii) Moderately reactive (such as iron) (iii) Noble metal. (Au, Pt)



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61. Which of the following ores can be concentrated by magnetic separation. (i) Zinc blende, (ii) Bauxite (iii)

Haematite (iv) Magnetite

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62. Why is the reduction of a metal oxide easier if the metal formed is in liquid state at the temperature of reduction?

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63. What is Ellingham diagram?

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64. Name the constituents of the following-alloys? (i)

Bronze,ii)stainless steel



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65. Name the electrolytic process used for the extraction of aluminium? What is the electrolyte used in this process?



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66. Give the different steps involved in metallurgy



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67. Predict the mode of occurrence of the following metals. (i) Highly reactive (eg, sodium) (ii) Moderately reactive (such as iron) (iii) Noble metal. (Au, Pt)



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68. Giving appropriate examples (at least three) explain how the reactivity of a metal is related to its mode of occurrence in nature.



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69. Explain the terms-(1) Quenching (2) Annealing (3)

Tempering



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70. Name three metals which occur in nature mainly as oxide ores. Name one-oxide ore of each of them.



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71. What chemical principle is involved in choosing a reducing agent for getting the metal from its oxide

ore? Consider the metal oxides Al_2O_3 and Fe_2O_3 , and justify the choice of the reducing agent.

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72. Describe the principle of extraction of each of the following (b) Zn from ZnO

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73. Discuss some of the factors, which need consideration before deciding on the method of extraction of metal from its ore.

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74. Which of the following benefaction processes is used for the mineral $Al_2O_3 \cdot 2H_2O$?

- A. froth floatation
- B. leaching
- C. liquation
- D. magnetic separation

Answer: B



75. The impurities associated with the ore after mining are collectively called

A. flux

B. slag

C. minerals

D. gangue

Answer: D



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76. In which of the following minerals, aluminium is not present?

A. cryolite

B. mica

C. feldspar

D. fluorspar

Answer: D



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77. The process in which metal oxide is reduced to metal by Al is called

- A. smelting
- B. aluminothermy
- C. hydreothermy
- D. none of these

Answer: B



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78. During smelting, the additional substance added, which combines with impurities to form a fusible, mass, is called

A. flux

B. slag

C. gangue

D. ore

Answer: A



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79. An ore after levigation is found to have acidic impurities. Which of the following can be used as flux during smelting operation.

A. H_2SO_4

B. CaCO_3

C. SiO_2

D. Both CaCO_3 and SiO_2

Answer: B



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80. Which of the following metals is leached by cyanide process

A. Ag

B. Na

C. Al

D. Cu

Answer: C



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81. Which of the following metals can be extracted by smelting

A. Aluminium

B. Magnesium

C. iron

D. none of these

Answer: C



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82. Alkali metals do not exist in free state in nature because these are

A. very reactive

B. very volatile

C. metallic in nature

D. highly electronegative elements

Answer: A



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83. Smelting involves reduction of metal oxide with

A. carbon

B. carbon monoxide

C. magnesium

D. aluminium

Answer: A



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84. Heating pyrites to remove sulphur is called

A. smelting

B. calcination

C. liquation

D. roasting

Answer: D



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85. Extraction of silver from 'Ag₂S' by the use of sodium cyanide is an example of

A. roasting

B. hydrometallurgy

C. electrometallurgy

D. smelting

Answer: B



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86. In the aluminothermite process aluminium acts as

A. an oxidising agent

B. a flux

C. a reducing agent

D. a solder

Answer: C



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87. In the extraction of copper from its sulphide ore, the metal is formed by reduction of ' Cu_2O ' with

A. FeS

B. Co

C. Cu_2S

D. SO_2

Answer: C



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88. Silver is obtained from $\text{Na} [\text{Ag}(\text{CN})_2]$ by reaction with

A. Fe

B. Na

C. Zn

D. Au

Answer: C

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89. Van Arkel method of purification of metals involves converting the metal to a

- A. Volatile stable compound
- B. Volatile unstable compound
- C. Non volatile stable compound
- D. none of these

Answer: A



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90. Heating an ore in the absence of air. below its melting point is called

A. leaching

B. roasting

C. smelting

D. calcination

Answer: D



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91. In the froth floatation process for benefication of the ores, the ore particles float because

A. they are light

B. their surface is not easily wet by water

C. they bear electrostatic charge

D. they are insoluble

Answer: B



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92. Galena is an ore of

A. Pb

B. Hg

C. Sn

D. Zn

Answer: A



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93. For which ore of the metal, froth floatation method is used for concentration

A. Horn silver

B. Bauxite

C. Cinnabar

D. Haematite

Answer: C



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94. The froth floatation process is based upon

- A. The difference in the specific gravity of ore and gangue particles
- B. the magnetic properties of gangue and ore
- C. preferential wetting of ore particles by oil
- D. preferential wetting of gangue particles of oil

Answer: C





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95. Which one of the following ores is best concentrated by froth floatation method?

A. Magnetite

B. Malachite

C. Galena

D. Cassiterite

Answer: C



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96. Cassiterite is an ore of

A. Mn

B. Ni

C. Sb

D. Sn

Answer: D



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97. Cassiterite is concentrated by

A. levigation

B. electromagentic separation

C. floatation

D. liquefaction

Answer: B



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98. Which of the following metals is extracted by the electrometallurgical method?

A. Cu

B. Fe

C. Na

D. Ag

Answer: C



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99. The methods 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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100. In the extraction of Fe from ' Fe_2O_3 ' the reducing agent is

A. CO

B. Al

C. electrolytic reduction

D. Cu

Answer: A



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101. During the extraction of iron, slag produced is

A. CO

B. FeSO_3

C. MgSiO_3

D. CaSiO_3

Answer: D



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102. The magnetite ore is

- A. ferrous oxide
- B. ferric oxide
- C. ferric hydroxide
- D. ferrous ferric oxide

Answer: D



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103. The ore having two different metal atom is

A. haematite

B. galena

C. magnetite

D. copper pyrites

Answer: D



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104. The most electropositive metals are isolated from their ores by

A. high temperature reduction with carbon

B. self reduction

C. thermal decomposition

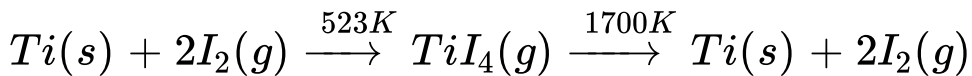
D. elctrolysis of fused ionic salts

Answer: D



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105. Which method of purification is represented by the _____ equations.



: Cupellation, Poling, van Arkel, Zone refining

A. Cupellation

B. Poling

C. van Arkel

D. Zone refining

Answer: C



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106. Vapour phase refining of nickel is carried out using

A. I₂

B. Cl₂

C. HCl

D. CO

Answer: D



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107. Mond's process is used for

A. Ni

B. Al

C. Fe

D. Cu

Answer: A



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108. Some metals occur in the native form because of their

- A. low density
- B. high density
- C. low reactivity
- D. high reactivity

Answer: C



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109. The metals occurring in the form of their compounds in the earth's crust are called

- A. maltee
- B. minerals
- C. alloys
- D. gangue

Answer: B

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110. In metallurgy, flux is a substance used to convert

- A. infusible impurities to fusible material
- B. soluble impurities to insoluble impurities
- C. fusible impurities to infusible impurities
- D. mineral into silicate

Answer: A



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111. Carbon is used as a reducing agent to obtain metals from their ores. It is used in the extraction of :

Cu, Ag, Cr, Pb, Zn, Fe

A. Cu

B. Ag

C. Cr

D. Pb,Zn,Fe

Answer: D



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112. Out of the following metals, the metal which cannot be obtained by electrölysis of the aqueous solution of their salts is

A. Ag

B. Cr

C. Cu

D. Mg

Answer: D



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113. Froth floatation process for the concentration: of ores' is an illustration of the practical application of

A. absorption

B. adsorption

C. coagulation

D. sedimentation

Answer: B



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114. Sulphide ores, of metals are usually concentrated by froth floatation process. Which one of the following sulphide ores offers an "exception and is concentrated by chemical leaching.

A. sphalerite

B. argentite

C. galena

D. copper pyrites

Answer: B



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115. Which of the following oxides cannot be reduced to metal by carbon?

A. ZnO

B. Al_2O_3

C. CuO

D. FeO

Answer: B



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116. The Oil used in the floatation method for the purification-of ores is

A. coconut oil

B. olive oil

C. pine oil

D. none of these

Answer: C



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117. Froth floatation process may be used to increase the concentration of the mineral in

A. Chalcopyrites

B. Bauxite

C. Haematite

D. Calamine

Answer: A



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118. Malachite is a mineral of

A. Mg

B. Cu

C. Al

D. Fe

Answer: B

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119. Electrolytic réduction method is used in the extraction of

- A. highly electronegative elements
- B. highly electropositive elements
- C. transition metals
- D. metalloids

Answer: B



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120. Extraction of zinc from zinc blende is achieved by

A. electrolytic reduction

B. roasting followed by reduction with carbon

C. roasting followed by reduction with other metal

D. roasting followed by self reduction

Answer: B



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121. Which metal has a greater tendency to form metal oxide

A. Al

B. Ca

C. Cu

D. Fe

Answer: B



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122. Silver containing lead as an impurity is purified by

A. poling

B. cupellation

C. levigation

D. distillation

Answer: B



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123. During electrolytic refining of copper, some metals present as impurity settle as 'anode mud'.

These are -

A. Sn and Ag

B. Pb and Zn

C. Ag and Au

D. Fe and Ni

Answer: C



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124. Blister copper is

A. impure Cu

B. Cu alloy

C. Pure Cu

D. copper having 1% impurity

Answer: D



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125. In blast furnace, iron oxide is reduced by

A. Silica

B. Co

C. C

D. lime stone

Answer: B



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126. One of the following metals forms a volatile compound and this property is taken advantage for its extraction. The metal is iron nickel cobalt tungsten

A. iron

B. nickel

C. cobalt

D. tungsten

Answer: B



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127. In electrolytic refining of metals, the impure metal is made, the anode and a strip of pure metal, the cathode during the, electrolysis of an aqueous solution of a complex metal salt. This method cannot be used for refining of : silver, copper, aluminium, zinc

A. silver

B. copper

C. aluminium

D. zinc

Answer: C





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128. Electrometallurgy is used for the reduction of Cu

Fe Na Ag

A. Cu

B. Fe

C. Na

D. Ag

Answer: C



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129. Which of the following statements, about the advantage of roasting of sulphide ore before reduction, is not true? roasting of the sulphide to the oxide is thermodynamically feasible, carbon and hydrogen are suitable reducing agents for metal sulphides, The $\Delta_f G^\circ$ of the sulphide is greater than those for CS_2 and H_2S , The $\Delta_f G^\circ$ is negative for roasting of sulphide ore to oxide.

A. roasting of the sulphide to the oxide is thermodynamically feasible

B. carbon and hydrogen are suitable reducing agents for metal sulphides

C. $\Delta_f G^\circ$ of the sulphide is greater than those for CS_2 and H_2S

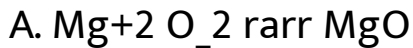
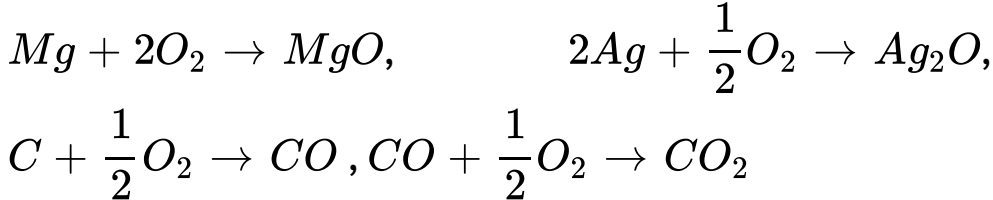
D. The ' $\Delta_f G^\circ$ ' is negative for roasting of 'sulphide ore to oxide.'

Answer: B



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130. ΔG° vs. T plot in the Ellingham's diagram slopes downward for the reaction :



Answer: C



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131. When compared to the ' ΔG° ' for the formation of ' Al_2O_3 ', the ' ΔG° ' for the

formation of 'Cr₂O₃' is Same unpredicted higher
lower

A. Same

B. unpredicted

C. higher

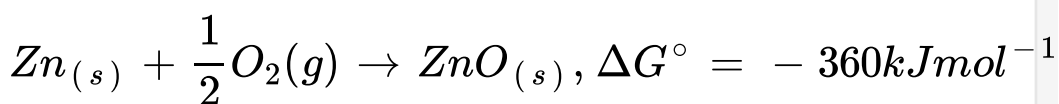
D. lower

Answer: C

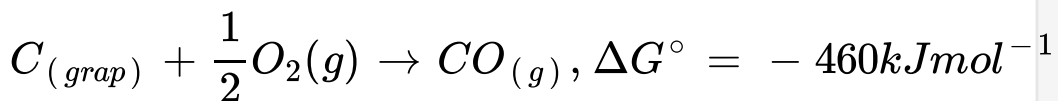


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132. Consider the following reaction at 1000° C (A).



(B).



choose the correct statement at $1000^\circ C$. : Zinc can be oxidised by carbon monoxide, zinc oxide can be reduced by graphite, both (a) and (b) are false, both (a) and (b) are true

A. Zinc can be oxidised by carbon monoxide

B. zinc oxide can be reduced by graphite

C. both (a) and (b) are false

D. both (a) and (b) are true

Answer: B



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133. Identify the reaction that does not take place in a blast furnace

$$2 \text{Fe}_2\text{O}_3 + 3 \text{C} \text{ gives } 4 \text{Fe} + 3 \text{CO}_2$$
$$\text{CO}_2 + \text{C} \text{ gives } 2 \text{CO}$$
$$\text{CaCO}_3 \text{ gives } \text{CaO} + \text{CO}_2$$
$$\text{FeO} + \text{SiO}_2 \text{ gives } \text{FeSiO}_2$$

A. $2 \text{Fe}_2\text{O}_3 + 3 \text{C} \text{ gives } 4 \text{Fe} + 3 \text{CO}_2$

B. $\text{CO}_2 + \text{C} \text{ gives } 2 \text{CO}$

C. $\text{CaCO}_3 \text{ gives } \text{CaO} + \text{CO}_2$

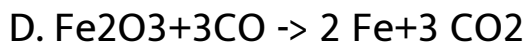
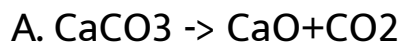
D. $\text{FeO} + \text{SiO}_2 \text{ gives } \text{FeSiO}_2$

Answer: D



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134. Which of the following reaction taking place in the blast furnace during extraction of iron is endothermic



Answer: A



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135. "Native silver metal forms a, water soluble complex with a dilute aqueous solution of NaCN in the presence of

A. nitrogen

B. oxygen

C. CO₂

D. argon

Answer: B



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136. Zone refining has been employed for preparing ultrapure samples of

A. Cu

B. Zn

C. Ge

D. Ag

Answer: C



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137. The method of zone refining of metals is based on the principle of

- A. greater mobility of the pure metal than that of the impurity
- B. higher melting point of the impurity than that of the pure metal
- C. greater noble character of the solid metal than that of the impurity
- D. greater solubility of the impurity in the molten state than in the solid

Answer: D



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138. Among the metals 'Cr', 'Fe, Mn, Ba' and 'Mg', the one that cannot be obtained by reduction of metal oxide by aluminium is



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139. Inner layer of blast furnace is made of

A. graphite bricks

B. silica bricks

C. fire clay bricks

D. basic bricks

Answer: C



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