METALLURGY

1. In the Hall-Heroult process, aluminium is formed at the cathode. The cathode is made out of :

(1) Platinum (2) Carbon

(3) Pure aluminium (4) Copper

2. The pair that does NOT require calcination is:

(1) ZnO and MgO

(2) Fe_2O_3 and $CaCO_3.MgCO_3$

(3) ZnO and $Fe_2O_3.xH_2O$

(4) $ZnCO_3$ and CaO

3. Match the ores(Column A) with the metals (column B) :

Column-A	***Column-B***
Ores	***Metals***
(I) Siderite	(a) Zinc
(II) Kaolinite	(b) Copper
(III) Malachite	(c) Iron
(IV) Calamine	(d) Aluminium

(1) I-b ; II-c ; III-d ; IV-a

(2) I-c ; II-d ; III-a ; IV-b

(3) I-c ; II-d ; III-b ; IV-a

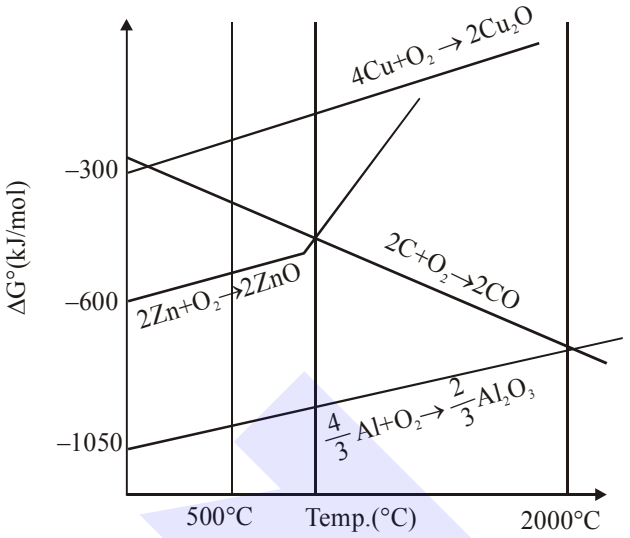
(4) I-a ; II-b ; III-c ; IV-d

4. The ore that contains both iron and copper is:

(1) malachite (2) dolomite

(3) azurite (4) copper pyrites

5. The correct statement regarding the given Ellingham diagram is:



(1) At 800°C, Cu can be used for the extraction of Zn from ZnO

(2) At 500 C, coke can be used for the extraction of Zn from ZnO

(3) Coke cannot be used for the extraction of Cu from Ca_2O.

(4) At 1400°C, Al can be used for the extraction of Zn from ZnO

6. The reaction that does NOT define calcination is :-

(1) $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2$

(2) $Fe_2O_3 \cdot XH_2O \xrightarrow{\Delta} Fe_2O_3 + XH_2O$

(3) $CaCO_3 \cdot MgCO_3 \xrightarrow{\Delta} CaO + MgO + 2\,CO_2$

(4) $2\,Cu_2S + 3\,O_2 \xrightarrow{\Delta} 2\,Cu_2O + 2\,SO_2$

7. Hall-Heroult's process is given by "

(1) $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr$

(2) $Cu^{2+}(aq.) + H_2(g) \rightarrow Cu(s) + 2H^+(aq)$

(3) $ZnO + C \xrightarrow{\text{Coke, 1673K}} Zn + CO$

(4) $2Al_2O_3 + 3C \rightarrow 4Al + 3CO_2$

8. The idea of froth floatation method came from a person X and this method is related to the process Y of ores. X and Y, respectively, are:
(1) fisher woman and concentration
(2) washer man and reduction
(3) washer woman and concentration
(4) fisher man and reduction

9. The correct statement is :
(1) leaching of bauxite using concentrated NaOH solution gives sodium aluminate and sodium silicate
(2) the blistered appearance of copper during the metallurgical process is due to the evolution of CO_2
(3) pig iron is obtained from cast iron
(4) the Hall-Heroult process is used for the production of aluminium and iron

10. The correct statement is :
(1) zincite is a carbonate ore
(2) aniline is a froth stabilizer
(3) zone refining process is used for the refining of titanium
(4) sodium cyanide cannot be used in the metallurgy of silver

11. With respect to an ore, Ellingham diagram helps to predict the feasibility of its -
(1) Vapour phase refining
(2) Zone refining
(3) Electrolysis
(4) Thermal reduction

12. The Mond process is used for the
(1) extraction of Mo
(2) Purification of Ni
(3) Purification of Zr and Ti
(4) Extraction of Zn

13. The ore that contains the metal in the form of fluoride is :
(1) magnetite (2) sphalerite
(3) malachite (4) cryolite

14. The one that is not a carbonate is :
(1) bauxite (2) siderite
(3) calamine (4) malachite

15. **Assertion:** For the extraction of iron, haematite ore is used.
Reason: Haematite is a carbonate ore of iron.
(1) Only the reason is correct.
(2) Both the assertion and reason are correct and the reason is the correct explanation for the assertion.
(3) Only the assertion is correct.
(4) Both the assertion and reason are correct, but the reason is not the correct explanation for the assertion.

16. Match the refining methods (Column I) with metals (Column II).

Column I (Refining methods)	Column II (Metals)
(I) Liquation	(a) Zr
(II) Zone Refining	(b) Ni
(III) Mond Process	(c) Sn
(IV) Van Arkel Method	(d) Ga

(1) (I) – (b); (II) – (c); (III) – (d); (IV) – (a)
(2) (I) – (b); (II) – (d); (III) – (a); (IV) – (c)
(3) (I) – (c); (II) – (a); (III) – (b); (IV) – (d)
(4) (I) – (c); (II) – (d); (III) – (b); (IV) – (a)

17. The alloy used in the construction of aircrafts is :-
(1) Mg – Sn (2) Mg – Mn
(3) Mg – Al (4) Mg – Zn

SOLUTION

1. Ans. (2) Carbon

In the Hall-Heroult process the cathode is made of carbon.

2. Ans. (1)

ZnO & MgO both are in oxide form therefore no change on calcination.

3. Ans. (3)

Siderite : $FeCO_3$

Kaolinite : $Al_2(OH)_4Si_2O_5$

Malachite : $Cu(OH)_2.CuCO_3$

Calamine : $ZnCO_3$

4. Ans. (4)

Copper pyrites : $CuFeS_2$

Malachite : $Cu(OH)_2 . CuCO_3$

Azurite $Cu(OH)_2 . 2CuCO_3$

Dolomite $CaCO_3 . MgCO_3$

5. Ans. (4)

According to the given diagram Al can reduce ZnO.

$3ZnO+2Al \rightarrow 3Zn+Al_2O_3$

6. Ans. (4)

Calcination in carried out for carbonates and oxide ores in absence of oxygen. Roasting is carried out mainly for sulphide ores in presence of excess of oxygen.

7. Ans. (4)

In Hall-Heroult's process is given by

$2Al_2O_3 + 3C \longrightarrow 4Al + 3CO_2$

$2Al_2O_3(\ell) \rightleftharpoons 4Al^{3+}(\ell) + 6O^{2\ominus}(\ell)$

At cathode :- $4Al^{3+}_{(\ell)} + 12e^{\ominus} \rightarrow 4Al(\ell)$

At Anode : $6O^{2\ominus}_{(\ell)} \rightarrow 3O_2(g) + 12e^{\ominus}$

$3C + 3O_2 \rightarrow 3CO_2 (\uparrow)$

8. Ans.(3)

The idea of froth floatation method came from washerwoman and this process is related to concentration of sulphide ores.

9. Ans.(1)

(1) During leaching when bauxite is treated with concentrated NaOH, then sodium aluminate and sodium silicate is formed in the soluble form, whereas Fe_2O_3 is precipitated

(2) The blistered appearance of copper during the metallurgical process is due to the evolution of SO_2.

(3) Cast iron is obtained from pig iron.

(4) Hall-Heroult process is used for production of only aluminium.

10. Ans.(2)

(1) Zincite is ZnO

(2) Aniline is the forth stablizer.

(3) Zone refining process is not used for refining of 'Ti'

(4) Sodium cyanide is used in the metallurgy of silver

11. Ans.(4)

Ellingham diagram helps in predicting the feasibiltiy of thermal reduction of ores.

Correct option : (4)

12. Ans.(2)

Mond's process is used for the purification of Nickel.

13. Ans.(4)

$Na_3AlF_6 \rightarrow$ Cryolite is the fluoride ore.

Magnetite Fe_3O_4

Sphalerite ZnS

Malachite $Cu(OH)_2.CuCO_3$

14. Ans.(1)

1. Bauxite–$AlO_x\ (OH)_{3-2x}$ where $0 < x < 1$
2. Siderite – $FeCO_3$
3. Calamine – $ZnCO_3$
4. Malachite – $CuCO_3.Cu(OH)_2$

15. Ans.(3)

Assertion is correct as Haemetite ore is used for extraction of Fe.

Haemetite is an oxide ore so reason is incorrect

16. Ans.(4)

Liquation is used for Sn.

Zone refining is used for Ga.

Mond's process is used for Ni.

Van arkel process is used for Zr.

17. Ans.(3)

Mg – Al alloy is used for construction of aircrafts.