

METALLURGY
Assignment Sheet

1. (a) X is an element in the form of a powder. X burns in oxygen and the product is soluble in water. The solution is tested with litmus. Write down only the word, which will correctly complete each of the following sentences :
- (i) If X is a metal, then the litmus will turn
 - (ii) If X is a non metal, then the litmus will turn
 - (iii) If X is a reactive metal, then will be evolved when X reacts with dilute sulphuric acid.
 - (iv) If X is a metal it will form oxide, which will form solution with water.
 - (v) If X is a non-metal it will not conduct electricity unless it is carbon in the form of
- (b) (i) The ore zinc blende, is an important source of the metal zinc. What is the name of the zinc compound in zinc blende?
(ii) What is the zinc compound obtained by roasting zinc blende?
(iii) What is the type of chemical reaction carried out after roasting in order to obtain zinc?
(iv) Are liquid zinc and liquid lead miscible or immiscible?
(v) What is the name of the alloy formed by zinc and copper? **[2000]**
2. (a) What is the zinc compound in zinc blende?
(b) Write the equation for the roasting of zinc blende.
3. From the metals copper, iron, magnesium, sodium and zinc, select a different metal in each case which :
- (i) does not react with dilute hydrochloric acid.
 - (ii) can form 2+ and 3+ ions.
 - (iii) has a hydroxide that reacts with both acids and alkalis.
 - (iv) does not react with cold water but reacts with steam when heated.
- (b) Arrange the given metals of [Q.3] in decreasing order of reactivity. **[2001]**
4. List 1 contains the metals/alloys 1, 2, 3, 4, 5 and list 2 contains their uses A, B, C, D, E.
- | | |
|---------------|------------------------|
| List 1 | List 2 |
| Metal / Alloy | Uses |
| 1. Aluminium | A. Steel making |
| 2. Lead | B. Aeroplane wings |
| 3. Brass | C. Galvanizing |
| 4. Iron | D. Radiation shield |
| 5. Zinc | E. Electrical fittings |
- Copy and complete the following table writing down the letter for the correct use of each metal. An answer may be used only once. **[2002]**

Metal	1	2	3	4	5
Use	B				

5. In order to obtain 1 tonne of aluminium, the following inputs are required: 4 tonnes of bauxite, 150kg of sodium hydroxide and 600kg of graphite. The aluminium compound in bauxite is aluminium oxide and the main impurity is iron(III) oxide. Aluminium is obtained by the electrolysis of aluminium oxide dissolved in cryolite.
- (a) When bauxite is treated with sodium hydroxide solution, what happens to :
- the aluminium oxide?
 - the iron (III) oxide?
- (b) (i) Name the process used for the purification of bauxite.
(ii) Write the equation for the action of heat on aluminium hydroxide.
- (c) (i) Write the formula of cryolite.
(ii) Write down the word which correctly complete the following sentence:
"By dissolving aluminium oxide in cryolite a (conducting/ non-conducting) solution is produced.
(iii) Why is large amount of graphite required for this electrolytic process?
(iv) Write the equation for the reaction which takes place at the cathode.
- (d) In construction work, why is the alloy of aluminium, i.e., duralumin is used rather than pure aluminium? **[2002]**
6. Compare the properties of a metal and a non-metal on the basis of the following.
- Electronic configuration
 - Nature of the oxides
 - Oxidizing or reducing action
 - Conductivity of heat and electricity **[2003]**
7. Aluminium is extracted from its chief ore, bauxite. The ore is first purified and then metal is extracted from it by electrolytic reduction.
- (a) Write three balanced equation for the purification of bauxite by Hall's process.
- (b) Name a chemical used for dissolving aluminium oxide. In which state of subdivision is the chemical used?
- (c) Write an equation for the reaction which takes place at the anode during the extraction of aluminium by the electrolytic process.
- (d) Mention one reason for the use of aluminium in thermite welding. **[2004]**
8. (a) (i) Name the ore of zinc containing its sulphide.
(ii) In the process of extracting zinc, the above named ore is roasted. Write the equation for the reaction which takes place when the sulphide ore is roasted.
(iii) Name the substance used to reduce the roasted ore. Write the equation for the reaction.
- (b) (i) To protect iron from rusting, it is coated with a thin layer of zinc. Name this process.
(ii) Name a non-metal that has a metallic lustre and sublimes on heating. **[2004]**
9. A to F below relate to the source and extraction of either zinc or aluminium.
- | | |
|------------------------------|---------------------|
| A. Bauxite | B. Coke |
| C. Cryolite | D. Froth floatation |
| E. Sodium hydroxide solution | F. Zinc blende |

K. 1, 2, or 3 valence electrons

L. 5, 6 or 7 valence electrons

[2007]

(Write the five letters corresponding to the correct characteristics)

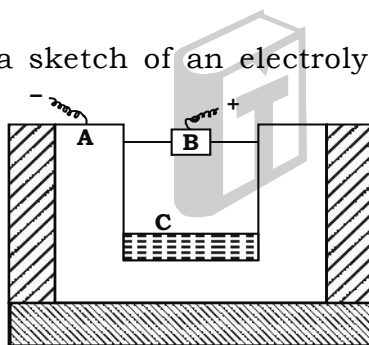
16. The following is an extract from 'Metals in the Service of Man, Alexander and street / Pelican 1976' :

'Alumina (aluminium oxide) has a very high melting point of over 2000°C so that it cannot readily be liquefied. However, conversion of alumina to aluminium and oxygen, by electrolytes, can occur when it is dissolved in some other substance'.

- Which solution is used to react with bauxite as a first step in obtaining pure aluminium oxide?
- The aluminium oxide for the electrolytic extraction of aluminium is obtained by heating aluminium hydroxide. Write the equation for this reaction.
- Name the element which serves both as the anode and the cathode in the extraction of aluminium.
- Write the equation for the reaction that occurs at the cathode during the extraction of aluminium by electrolysis.
- Give the equation for the reaction which occurs at the anode when aluminium is purified by electrolysis.

[2007]

17. The following is a sketch of an electrolytic cell used in the extraction of aluminium :



- What is the substance of which the electrodes A and B are made?
- At which electrode (A or B) is the aluminium formed?
- What are the two aluminium compounds in the electrolyte C?
- Why is it necessary for electrode B to be continuously replaced?

[2008]

18. Find the odd one out and explain your choice (note : valency is not a criterion).

(a) Sulphur, Phosphorus, Carbon, Iodine.

(b) Copper, Lead, Zinc, Mercury

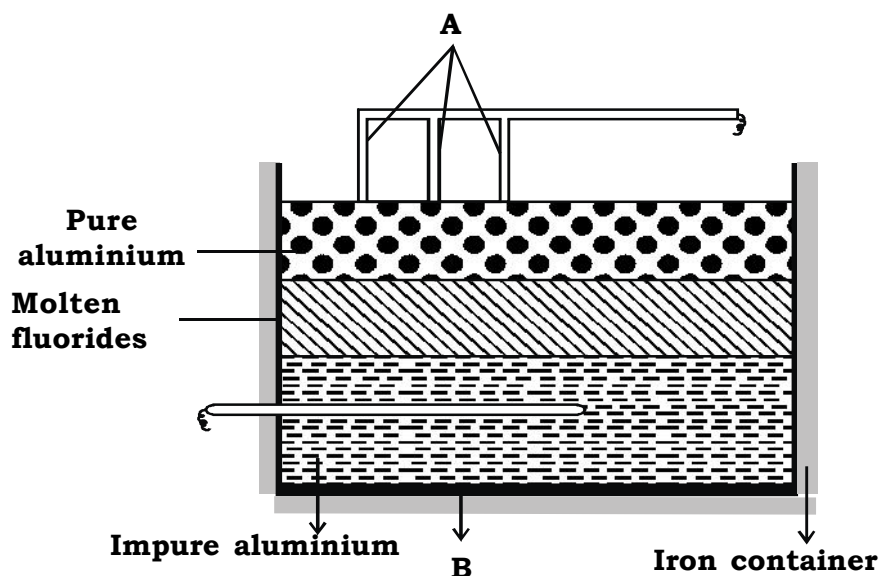
[2009]

19. State the property of the metal being utilized in the following.

[2009]

Use of metal	Property
Zinc in galvanization	
Aluminium in thermite welding	

20. The sketch below illustrates the refining of aluminium by Hoopes process.



- (a) Which of A and B is the cathode and which one is the anode?
 (b) What is the electrolyte in the tank?
 (c) What material is used for the cathode?

[2009]

21. Name the main constituent metal in the following alloys :

- (i) Duralumin.
 (ii) Brass
 (iii) Stainless steel.

[2010]

22. Answer the following questions :

- (i) Name a metal which is found abundantly in the earth's crust.
 (ii) What is the difference between calcination and roasting ?
 (iii) Name the process used for the enrichment of sulphide ore.
 (iv) Write the chemical formula of one main ore of iron and aluminium.
 (v) Write the constituents of electrolyte for the extraction of aluminium.

[2011]

23. Choose the most appropriate answer from the following options:

The metals zinc and tin are present in the alloy :

- (a) Solder (b) Brass
 (c) Bronze (d) Duralumin

[2013]

24. The following questions relate to the extraction of aluminium by electrolysis:

- (i) Name the other aluminium containing compound added to alumina and state its significance.
 (ii) Give the equation for the reaction that takes place at the cathode.
 (iii) Explain why is it necessary to renew the anode periodically.

[2013]

25.

	X	Y
Normal Electronic Configuration	2,8,7	2,8,2
Nature of oxide	Dissolves in water and turns blue litmus red	Very low solubility in water. Dissolves in hydrochloric acid
Tendency for oxidising and reducing reactions	Tends to oxidise elements and compounds	Tends to act as a reducing agent
Electrical and Thermal conductivity	Very poor electrical conductor Poor thermal conductivity	Good Electrical conductor Good Thermal conductor
Tendency to form alloys and amalgams	No tendency to form alloys	Forms alloys

Using the information above, complete the following:

[2013]

- (i) _____ is the metallic element.
- (ii) Metal atoms tend to have a maximum of _____ electrons in the outermost energy level.
- (iii) Non-metallic elements tend to form _____ oxides while metals tend to form _____ oxides.
- (iv) Non-metallic elements tend to be _____ conductors of heat and electricity.

26. Choose the correct answer from the options given below :

- (i) The main ore used for the extraction of iron is :
 - (A) Haematite
 - (B) Calamine
 - (C) Bauxite
 - (D) Cryolite
- (ii) Heating an ore in a limited supply of air or in the absence of air at a temperature just below its melting point is known as :
 - (A) Smelting
 - (B) Ore dressing
 - (C) Calcination
 - (D) Bessemerisation
- (iii) Aluminium powder is used in thermite welding because,
 - (A) it is a strong reducing agent
 - (B) it is a strong oxidising agent
 - (C) it is corrosion resistant
 - (D) it is a good conductor of heat. **2014]**

27. State the main components of the following alloys :

- (i) Brass. (ii) Duralumin. (iii) Bronze.

[2014]

28. Name the following :

- (i) The property possessed by metals by which they can be beaten into sheets.
- (ii) A compound added to lower the fusion temperature of electrolytic bath in the extraction of aluminum.
- (iii) The ore of zinc containing sulphide.

[2014]

29. Choose the most appropriate answer for each of the following:
This is not an alloy of copper:
(A) Brass (B) Bronze
(C) Solder (D) Duralumin. **[2015]**
30. For each of the substance listed below, describe the role played in the extraction of aluminium.
(1) Cryolite (2) Sodium hydroxide (3) Graphite **[2015]**
31. Fill in the blanks with the choices given in brackets.
Metals are good _____ (oxidizing agents / reducing agents)
because they are electron _____ (acceptors/donors). **[2016]**
32. Choose the correct answer from the options given below:
The two main metals in Bronze are :
A. Copper and zinc B. Copper and lead
C. Copper and nickel D. Copper and tin **[2016]**
33. Identify the term/substance in each of the following :
The method used to separate ore from gangue by preferential wetting. **[2016]**
34. Write the equation for the reaction where the aluminum oxide for the electrolytic extraction of aluminum is obtained by heating aluminum hydroxide. **[2016]**
35. From the list of terms given, choose the most appropriate term to match the given description. (calcination, roasting, pulverisation smelting)
1. Crushing of the ore into a fine powder.
2. Heating of the ore in the absence of air to a high temperature. **[2017]**
36. (A) Name the following :
(i) The process of coating of iron with zinc.
(ii) An alloy of lead and tin that is used in electrical circuits.
(iii) An ore of zinc containing its sulphide.
(iv) A metal oxide that can be reduced by hydrogen.
- (B) Answer the following questions with respect to the electrolytic process in the extraction of aluminum :
(i) Identify the components of the electrolyte other than pure alumina and the role played by each.
(ii) Explain why powdered coke is sprinkled over the electrolytic mixture.
- (C) Complete the following by selecting the correct option from the choices given.
(i) The metal which does not react with water or dilute H_2SO_4 but reacts with concentrated H_2SO_4 is _____. (Al/Cu/Zn/Fe)
(ii) The metal whose oxide, which is amphoteric, is reduced to metal by carbon reduction _____. (Fe/Mg/Pb/Al)
(iii) The divalent metal whose oxide is reduced to metal by electrolysis of its fused salt is _____. (Al/Na/Mg/K) **[2017]**

