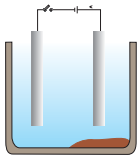
CHAPTER 3



Metals and Non-metals

Multiple Choice Questions

1. Which of the following property is generally not shown by metals?

(a) Electrical conduction
(b) Sonorous in nature
(c) Dullness
(d) Ductility

2. The ability of metals to be drawn into thin wire is known as

(a) ductility
(b) malleability
(c) sonorousity
(d) conductivity

3. Aluminium is used for making cooking utensils. Which of the following properties of aluminium are responsible for the same?

(i) Good thermal conductivity
(ii) Good electrical conductivity
(iii) Ductility
(iv) High melting point

(a) (i) and (ii) (b) (i) and (iii)
(c) (ii) and (iii) (d) (i) and (iv)

4. Which one of the following metals do not react with cold as well as hot water?

(a) Na
(b) Ca
(c) Mg
(d) Fe

5. Which of the following oxide(s) of iron would be obtained on prolonged reaction of iron with steam?

(a) FeO

(b) Fe_2O_3

(c) Fe_3O_4

(d) Fe_2O_3 and Fe_3O_4

6. What happens when calcium is treated with water?

(i) It does not react with water

(ii) It reacts violently with water

(iii) It reacts less violently with water

(iv) Bubbles of hydrogen gas formed stick to the surface of calcium

(a) (i) and (iv) (b) (ii) and (iii)

(c) (i) and (ii) (d) (iii) and (iv)

7. Generally metals react with acids to give salt and hydrogen gas. Which of the following acids does not give hydrogen gas on reacting with metals (except Mn and Mg)?

(a) H_2SO_4

(b) HCl

(c) HNO_3

(d) All of these

8. The composition of aqua-regia is

(a) Dil.HCl : Conc. HNO_3
3 : 1

(b) Conc.HCl : Dil. HNO_3
3 : 1

(c) Conc.HCl : Conc.HNO_3
3 : 1

(d) Dil.HCl : Dil.HNO_3
3 : 1

9. Which of the following are not ionic compounds?

(i) KCl

(ii) HCl

(iii) CCl_4

(iv) NaCl

(a) (i) and (ii) (b) (ii) and (iii)

(c) (iii) and (iv) (d) (i) and (iii)

10. Which one of the following properties is not generally exhibited by ionic compounds?

(a) Solubility in water
(b) Electrical conductivity in solid state
(c) High melting and boiling points
(d) Electrical conductivity in molten state

11. Which of the following metals exist in their native state in nature?

(i) Cu
(ii) Au
(iii) Zn
(iv) Ag

(a) (i) and (ii) (b) (ii) and (iii)
(c) (ii) and (iv) (d) (iii) and (iv)

12. Metals are refined by using different methods. Which of the following metals are refined by electrolytic refining?

(i) Au
(ii) Cu
(iii) Na
(iv) K

(a) (i) and (ii) (b) (i) and (iii)
(c) (ii) and (iii) (d) (iii) and (iv)

13. Silver articles become black on prolonged exposure to air. This is due to the formation of

(a) Ag_3N
(b) Ag_2O
(c) Ag_2S
(d) Ag_2S and Ag_3N

14. Galvanisation is a method of protecting iron from rusting by coating with a thin layer of

(a) Gallium
(b) Aluminium
(c) Zinc
(d) Silver

15. Stainless steel is very useful material for our life. In stainless steel, iron is mixed with

(a) Ni and Cr
(b) Cu and Cr
(c) Ni and Cu
(d) Cu and Au

16. If copper is kept open in air, it slowly loses its shining brown surface and gains a green coating. It is due to the formation of

(a) $CuSO_4$
(b) $CuCO_3$
(c) $Cu(NO_3)_2$
(d) CuO

17. Generally, metals are solid in nature. Which one of the following metals is found in liquid state at room temperature?

(a) Na
(b) Fe
(c) Cr
(d) Hg

18. Which of the following metals are obtained by electrolysis of their chlorides in molten state ?

(i) Na
(ii) Ca
(iii) Fe
(iv) Cu

(a) (i) and (iv) (b) (iii) and (iv)
(c) (i) and (iii) (d) (i) and (ii)

19. Generally, non-metals are not lustrous. Which of the following non-metal is lustrous?

(a) Sulphur
(b) Oxygen
(c) Nitrogen
(d) Iodine

20. Which one of the following four metals would be displaced from the solution of its salts by other three metals?

(a) Mg
(b) Ag
(c) Zn
(d) Cu

21. 2 mL each of concentrated HCl, HNO_3 and a mixture of concentrated HCl and concentrated HNO_3 in the ratio of 3 : 1 were taken in test tubes labelled as A, B and C. A small piece of metal was put in each test tube. No change occurred in test tubes A and B but the metal got dissolved in test tube C respectively. The metal could be

(a) Al
(b) Au
(c) Cu
(d) Pt

22. An alloy is

(a) an element
(b) a compound
(c) a homogeneous mixture
(d) a heterogeneous mixture

23. An electrolytic cell consists of

(i) positively charged cathode
(ii) negatively charged anode
(iii) positively charged anode
(iv) negatively charged cathode

(a) (i) and (ii) (b) (iii) and (iv)
(c) (i) and (iii) (d) (ii) ad (iv)

24. During electrolytic refining of zinc, it gets

(a) deposited on cathode
(b) deposited on anode
(c) deposited on cathode as well as anode
(d) remains in the solution

25. An element A is soft and can be cut with a knife. This is very reactive to air and cannot be kept open in air. It reacts vigorously with water. Identify the element from the following

(a) Mg
(b) Na
(c) P
(d) Ca

26. Alloys are homogeneous mixtures of a metal with a metal or non-metal. Which among the following alloys contain non-metal as one of its constituents?

(a) Brass
(b) Bronze
(c) Amalgam
(d) Steel

27. Which among the following statements is incorrect for magnesium metal?

(a) It burns in oxygen with a dazzling white flame
(b) It reacts with cold water to form magnesium oxide and evolves hydrogen gas
(c) It reacts with hot water to form magnesium hydroxide and evolves hydrogen gas
(d) It reacts with steam to form magnesium hydroxide and evolves hydrogen gas

28. Which among the following alloys contain mercury as one of its constituents?

(a) Stainless steel
(b) Alnico
(c) Solder
(d) Zinc amalgam

29. Reaction between X and Y, forms compound Z. X loses electron and Y gains electron. Which of the following properties is not shown by Z?

(a) Has high melting point
(b) Has low melting point
(c) Conducts electricity in molten state
(d) Occurs as solid

30. The electronic configurations of three elements X, Y and Z are

X — 2, 8; Y — 2, 8, 7 and Z — 2, 8, 2. Which of the following is correct?

(a) X is a metal
(b) Y is a metal
(c) Z is a non-metal
(d) Y is a non-metal and Z is a metal

31. Although metals form basic oxides, which of the following metals form an amphoteric oxide?

(a) Na
(b) Ca
(c) Al
(d) Cu

32. Generally, non-metals are not conductors of electricity. Which of the following is a good conductor of electricity?

(a) Diamond
(b) Graphite
(c) Sulphur
(d) Fullerene

33. Electrical wires have a coating of an insulting material. The material, generally used is

(a) Sulphur
(b) Graphite
(c) PVC
(d) All can be used

34. Which of the following non-metals is a liquid?

(a) Carbon

(b) Bromine

(c) Phosphorus

(d) Sulphur

35. Which of the following can undergo a chemical reaction?

(a) $MgSO_4$ + Fe

(b) $ZnSO_4$ + Fe

(c) $MgSO_4$ + Pb

(d) $CuSO_4$ + Fe

36. Which one of the following figures correctly describes the process of electrolytic refining?

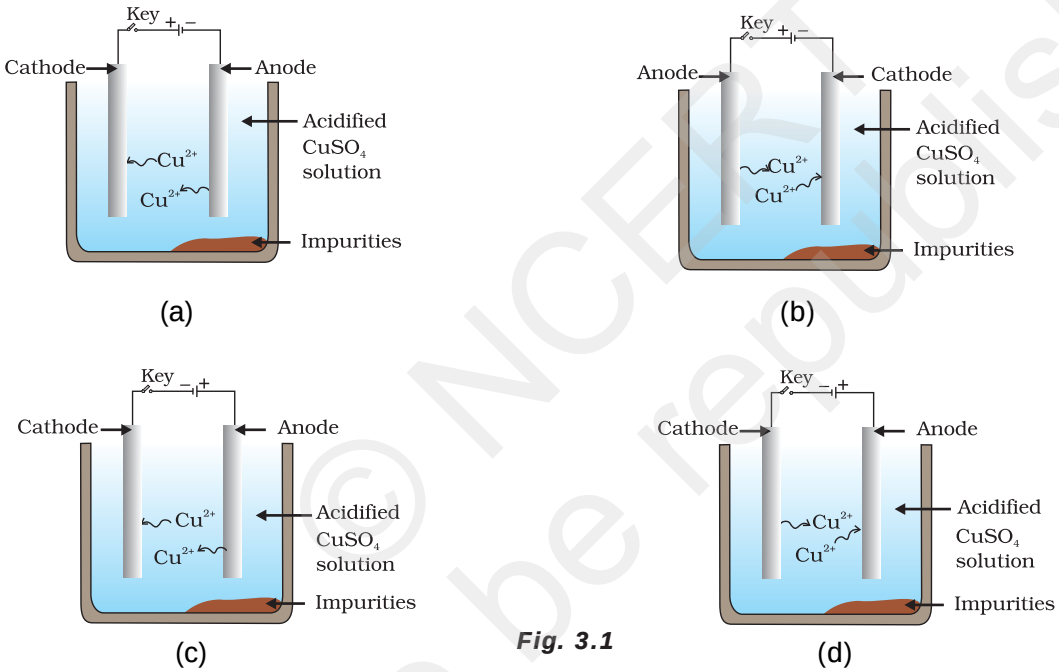


Fig. 3.1

Short Answer Questions

37. Iqbal treated a lustrous, divalent element M with sodium hydroxide. He observed the formation of bubbles in reaction mixture. He made the same observations when this element was treated with hydrochloric acid. Suggest how can he identify the produced gas. Write chemical equations for both the reactions.

38. During extraction of metals, electolytic refining is used to obtain pure metals. (a) Which material will be used as anode and cathode for refining of silver metal by this process? (b) Suggest a suitable electrolyte also. (c) In this electrolytic cell, where do we get pure silver after passing electric current?

39. Why should the metal sulphides and carbonates be converted to metal oxides in the process of extraction of metal from them?

40. Generally, when metals are treated with mineral acids, hydrogen gas is liberated but when metals (except Mn and Mg), treated with HNO_3, hydrogen is not liberated, why?

41. Compound X and aluminium are used to join railway tracks. (a) Identify the compound X (b) Name the reaction (c) Write down its reaction.

42. When a metal X is treated with cold water, it gives a basic salt Y with molecular formula XOH (Molecular mass = 40) and liberates a gas Z which easily catches fire. Identify X, Y and Z and also write the reaction involved.

43. A non-metal X exists in two different forms Y and Z. Y is the hardest natural substance, whereas Z is a good conductor of electricity. Identify X, Y and Z.

44. The following reaction takes place when aluminium powder is heated with MnO_2

$3\ MnO_2\ (s) + 4\ Al\ (s) \rightarrow 3\ Mn\ (l) + 2\ Al_2O_3\ (l) + Heat$

(a) Is aluminium getting reduced? (b) Is MnO_2 getting oxidised?

45. What are the constituents of solder alloy? Which property of solder makes it suitable for welding electrical wires?

46. A metal A, which is used in thermite process, when heated with oxygen gives an oxide B, which is amphoteric in nature. Identify A and B. Write down the reactions of oxide B with HCl and NaOH.

47. A metal that exists as a liquid at room temperature is obtained by heating its sulphide in the presence of air. Identify the metal and its ore and give the reaction involved.

48. Give the formulae of the stable binary compounds that would be formed by the combination of following pairs of elements.

(a) Mg and N_2
(b) Li and O_2
(c) Al and Cl_2
(d) K and O_2

49. What happens when

(a) $ZnCO_3$ is heated in the absence of oxygen?
(b) a mixture of Cu_2O and Cu_2S is heated?

50. A non-metal A is an important constituent of our food and forms two oxides B and C. Oxide B is toxic whereas C causes global warming

(a) Identify A, B and C

(b) To which Group of Periodic Table does A belong?

51. Give two examples each of the metals that are good conductors and poor conductors of heat respectively.

52. Name one metal and one non-metal that exist in liquid state at room temperature. Also name two metals having melting point less than 310 K (37°C)

53. An element A reacts with water to form a compound B which is used in white washing. The compound B on heating forms an oxide C which on treatment with water gives back B. Identify A, B and C and give the reactions involved.

54. An alkali metal A gives a compound B (molecular mass = 40) on reacting with water. The compound B gives a soluble compound C on treatment with aluminium oxide. Identify A, B and C and give the reaction involved.

55. Give the reaction involved during extraction of zinc from its ore by

(a) roasting of zinc ore

(b) calcination of zinc ore

56. A metal M does not liberate hydrogen from acids but reacts with oxygen to give a black colour product. Identify M and black coloured product and also explain the reaction of M with oxygen.

57. An element forms an oxide A_2O_3 which is acidic in nature. Identify A as a metal or non-metal.

58. A solution of $CuSO_4$ was kept in an iron pot. After few days the iron pot was found to have a number of holes in it. Explain the reason in terms of reactivity. Write the equation of the reaction involved.

Long Answer Questions

59. A non-metal A which is the largest constituent of air, when heated with H_2 in 1:3 ratio in the presence of catalyst (Fe) gives a gas B. On heating with O_2 it gives an oxide C. If this oxide is passed into water in the presence of air it gives an acid D which acts as a strong oxidising agent.

(a) Identify A, B, C and D

(b) To which group of periodic table does this non-metal belong?

60. Give the steps involved in the extraction of metals of low and medium reactivity from their respective sulphide ores.

61. Explain the following

(a) Reactivity of Al decreases if it is dipped in HNO_3

(b) Carbon cannot reduce the oxides of Na or Mg

(c) NaCl is not a conductor of electricity in solid state whereas it does conduct electricity in aqueous solution as well as in molten state

(d) Iron articles are galvanised.

(e) Metals like Na, K, Ca and Mg are never found in their free state in nature.

62. (i) Given below are the steps for extraction of copper from its ore. Write the reaction involved.

(a) Roasting of copper (1) sulphide

(b) Reduction of copper (1) oxide with copper (1) sulphide.

(c) Electrolytic refining

(ii) Draw a neat and well labelled diagram for electrolytic refining of copper

63. Of the three metals X, Y and Z. X reacts with cold water, Y with hot water and Z with steam only. Identify X, Y and Z and also arrange them in order of increasing reactivity.

64. An element A burns with golden flame in air. It reacts with another element B, atomic number 17 to give a product C. An aqueous solution of product C on electrolysis gives a compound D and liberates hydrogen. Identify A, B, C and D. Also write down the equations for the reactions involved.

65. Two ores A and B were taken. On heating ore A gives CO_2 whereas, ore B gives SO_2. What steps will you take to convert them into metals?