

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) sonorosity (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) (1) and (ii)
(b) (1) and (iii)
(c) (ii) and (iii)
(d) (1) 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) Fe₂O₃
(c) Fe₃O₄ (d) Fe₂O₃ and Fe₃O₄

6. What happens when calcium is treated with water?

- (i) It does not react with water
- (ii) It reacts violently with water
- (ii) 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) Dilute HCl : Concentrated HNO_3

3 : 1

(b) Concentrated HCl : Dilute HNO_3

3 : 1

(c) Concentrated HCl : Concentrated HNO_3

3 : 1

(d) Dilute HCl : Dilute HNO_3

3 : 1

9. Which of the following are not ionic compounds?

- (i) KCl
- (ii) HCl
- (iii) CCl₄
- (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)

(c) (ii) and (iv)

(b) (ii) and (iii)

(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) (1) and (ii)

(b) (1) 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) $\text{Cu}(\text{NO}_3)_2$

(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, HNO₃, and a mixture of concentrated HCl and concentrated HNO₃, 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) and (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

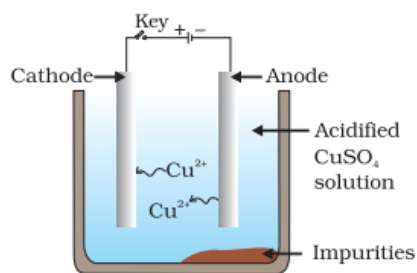
29. Reaction between X and Y, forms compound Z. X loses electron and Y gains electron.

Which of the following properties is not shown by Z?

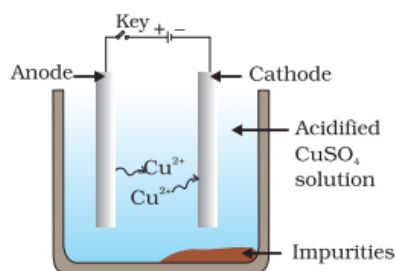
- (a) Has high melting point
- (b) Has low melting point
- (c) Conducts electricity in molten state
- (d) Occurs as solid
30. The electronic configurations of three elements X, Y and Z are X- 2, 8; Y- 2, 8, 7 and Z- 2, 8, 2. Which of the following is correct?
- (a) X is a metal
- (b) Y is a metal
- (c) 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 insulating 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) $\text{MgSO}_4 + \text{Fe}$
 (b) $\text{ZnSO}_4 + \text{Fe}$
 (c) $\text{MgSO}_4 + \text{Pb}$
 (d) $\text{CuSO}_4 + \text{Fe}$

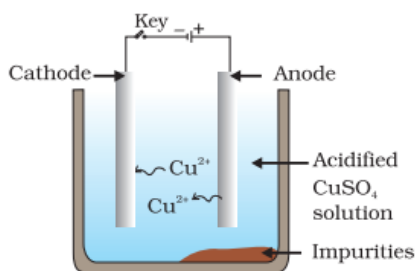
36. Which one of the following figures correctly describes the process of electrolytic refining?



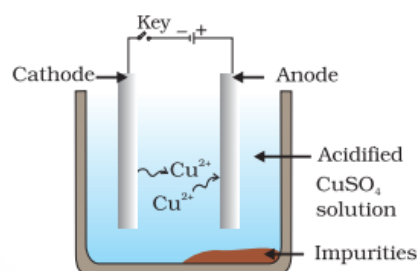
(a)



(b)



(c)



(d)

element was treated with hydrochloric acid. Suggest how he can identify the produced gas. Write chemical equations for both the reactions.

38. During extraction of metals, electrolytic 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?

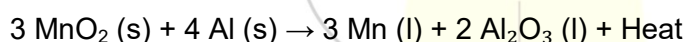
41. Compound X and aluminium are used to join railway tracks.

- (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 MnO₂



- (a) Is aluminium getting reduced?
 - (b) Is MnO₂, 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 N₂
 - (b) Li and O₂
 - (c) Al and Cl₂
 - (d) K and O₂

49. What happens when
- ZnCO₃ is heated in the absence of oxygen?
 - a mixture of Cu₂O and Cu₂S 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
- Identify A, B and C
 - 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
- roasting of zinc ore
 - 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 A₂O₃ which is acidic in nature. Identify A as a metal or non-metal.
58. A solution of CuSO₄ 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.
- Identify A, B, C and D
 - To which group of periodic table does this non-metal belong?
61. Explain the following
- Reactivity of Al decreases if it is dipped in HNO_3
 - Carbon cannot reduce the oxides of Na or Mg
 - NaCl is not a conductor of electricity in solid state whereas it does conduct electricity in aqueous solution as well as in molten state
 - Iron articles are galvanised.
 - 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.
- Roasting of copper (I) sulphide
 - Reduction of copper (I) oxide with copper (I) sulphide.
 - 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 CO₂, whereas ore B gives SO₂, What steps will you take to convert them into metals?

Answers & Solutions

Metals and Non-metals:

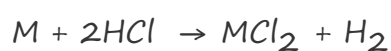
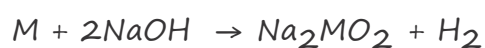
Multiple Choice Questions

1. (c)
2. (a)
3. (d)
4. (d)
5. (c) Hint — $3 \text{Fe} (s) + 4 \text{H}_2\text{O} (g) \rightarrow \text{Fe}_3\text{O}_4 (s) + 4 \text{H}_2 (g)$
6. (d)
7. (c)
8. (c)
9. (b)
10. (b)
11. (c)
12. (a)
13. (c)
14. (c)
15. (a)
16. (b)
17. (d)

18. (d)
19. (d)
20. (b) Hint— Reactivity series $Mg > Zn > Cu > Ag$
21. (b)
22. (c)
23. (b)
24. (a)
25. (b)
26. (d)
27. (b)
28. (d)
29. (b)
30. (d)
31. (c)
32. (b)
33. (c)
34. (b)
35. (d)
36. (c)

Short Answer Questions

37. The produced gas can be identified by bringing a burning match stick near the reaction vessel, a pop sound is produced



The element is a metal

38. (a) Anode : Impure silver

Cathode : Pure silver

(b) Electrolyte: Silver salt, such as AgNO_3

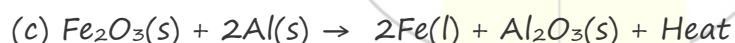
(c) We get pure silver at cathode

39. It is easier to obtain metal from its oxide, as compared from its sulphides and carbonates.

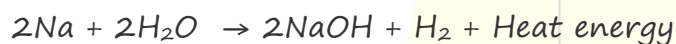
40. It is because HNO_3 is a strong oxidising agent. It oxidises the H_2 produced to H_2O .

41. (a) X — Fe_2O_3

(b) Thermite reaction



42. X — Na, Y — NaOH, Z — H_2



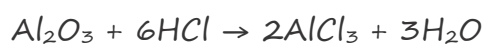
43. X — Carbon; Y — Diamond and Z — Graphite

44. (a) No, because oxygen is added to aluminium therefore, it is getting oxidised

(b) No, since manganese has lost oxygen therefore, it is getting reduced.

45. Solder is an alloy of lead and tin. Low melting point of solder makes it suitable for welding electrical wires.

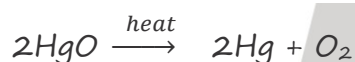
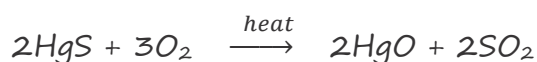
46. A — Al; B — Al_2O_3



47. Metals low in activity series can be obtained by reducing their sulphides or oxides by heating. Mercury is the only metal that exists as liquid at room

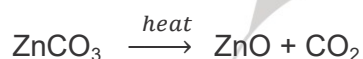
temperature. It can be obtained by heating cinnabar (HgS), the sulphide ore of mercury.

The reactions are as follows:

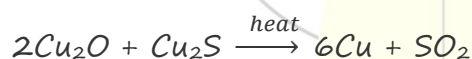


48. (a) Mg_3N_2 (b) Li_2O (c) AlCl_3 (d) K_2O

49. (a) It undergoes calcination. The chemical reaction can be given as



(b) It undergoes auto reduction forming copper and sulphur dioxide



50. (a) A is carbon, B is carbon monoxide and C is carbon dioxide

(b) A belongs to Group - 14 of the Periodic Table

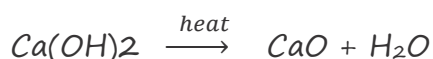
51. (a) Good conductor : Ag and Cu

(b) Poor conductor : Pb and Hg

52. Metal - Mercury (Hg); Non-metal - Bromine (Br)

Two metals with melting points less than 310K are Cesium (Cs) and Gallium (Ga)

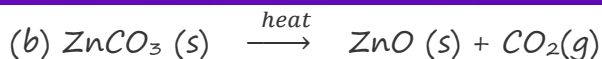
53. A - Ca; B - Ca(OH)_2 ; C - CaO



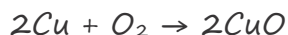
54. A - Na; B - NaOH; C - NaAlO_2



55. (a) $2\text{ZnS(s)} + 3\text{O}_2 \xrightarrow{\text{heat}} 2\text{ZnO(s)} + 2\text{SO}_2(\text{g})$

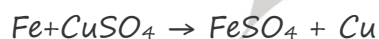


56. $M = \text{Cu}$; Black product— CuO



57. Since an oxide of element is acidic in nature, therefore, A will be a non-metal.

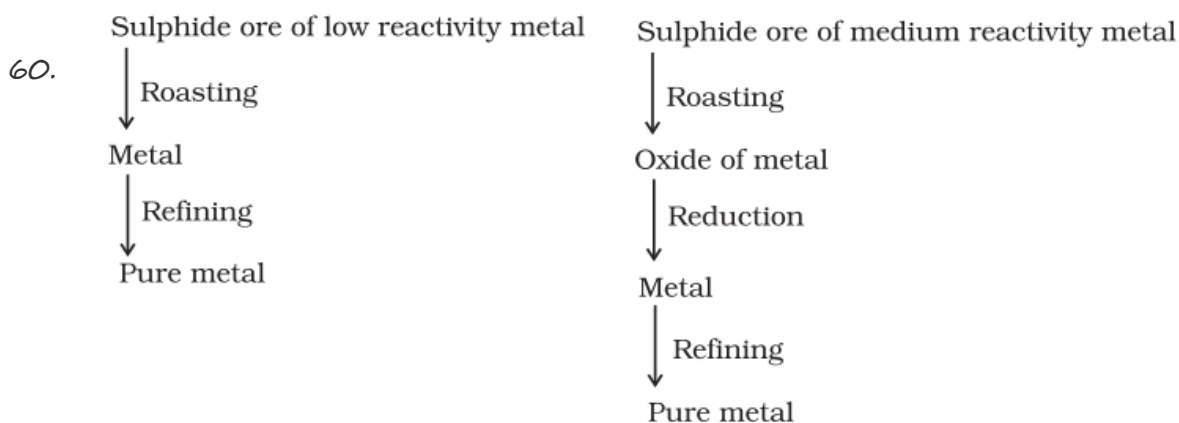
58. Fe is more reactive as compared to Cu. Therefore, Fe displaces Cu from CuSO_4 and forms FeSO_4 .



Long Answer Questions

59. (a) A — N_2 ; B — NH_3 ; C — NO ; D — HNO_3

(b) Element A belongs to Group -15 of the Periodic Table



61. Hint— (a) Due to the formation of a layer of oxide i.e., Al_2O_3

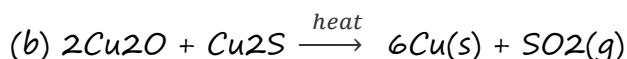
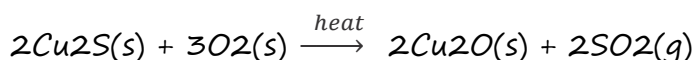
(b) Na or Mg are more reactive metals as compared to carbon

(c) In solid NaCl , the movement of ions is not possible due to its rigid structure but in aqueous solution or molten state, the ions can move freely.

(d) To protect from corrosion

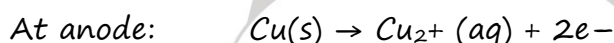
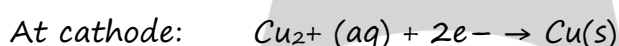
(e) They are highly reactive

62. (i) (a) Roasting of sulphide ore

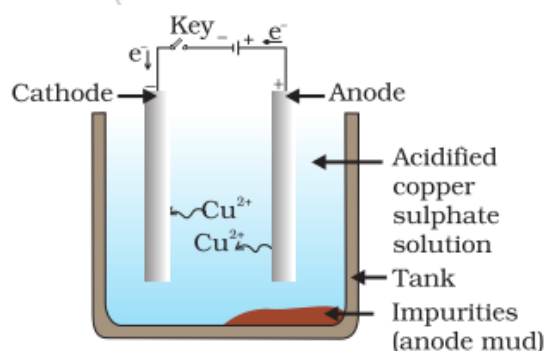


This reaction is known as auto-reduction

(c) Reaction for electrolytic refining



(ii) Diagram for electrolytic refining of copper



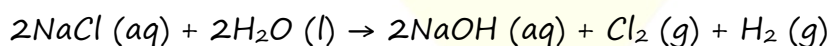
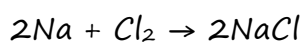
63. X is alkali metal, Na or K

Y is alkaline earth metal, Mg or Ca

Z is Fe

Increasing reactivity series: Na > Mg > Fe

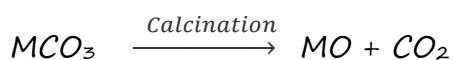
64. A = Na; B = Cl₂; C = NaCl; D = NaOH



65. Since ore A gives CO₂ and ore B gives SO₂. Therefore, ores are

MCO₃ and MS.

A can be obtained





B can be obtained

