METALS AND NON-METALS

VERY SHORT ANSWER TYPE QUESTIONS [1 MARK]

1. **A green layer is gradually formed on a copper plate left exposed to air for a week in a bathroom. What could this green substance be?**
   Answer. It is due to the formation of basic copper carbonate [$CuC0_3.Cu(0H)_2$].

2. **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.**
   Answer. 'X' is carbon, 'Y' is diamond as it is the hardest natural substance and 'Z' is graphite as it is good conductor of electricity.

3. **Metals generally occur in solid state. Name and write symbol of a metal that exists in liquid state at room temperature.**
   Answer. Mercury(Hg) exists in liquid state at room temperature.

4. **Which of the following two metals will melt at body temperature (37 °C) ?**
   Gallium, Magnesium, Caesium, Aluminium
   Answer. Gallium and Caesium

5. **From amongst the metals sodium, calcium, aluminium, copper and magnesium, name the metal (a) which reacts with water only on boiling, and**
   (b) another which does not react even with steam.
   Answer. (a) Magnesium reacts with water only on boiling.
   (b) Copper does not react even with steam.

6. **Which one of the following metals does not react with oxygen even at high temperatures ?**
   (a) Calcium (b) Gold (c) Sodium
   Answer. (b) Gold does not react with oxygen even at high temperatures.

7. **Name any one metal which reacts neither with cold water nor with hot water, but reacts with heated steam to produce hydrogen gas.**
   Answer. Iron; $3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$

8. **Why does calcium float in water?**
   Answer. It is because hydrogen gas is formed which sticks to surface of calcium, therefore it floats.

9. **Name a non-metal which is lustrous and a metal which is non-lustrous.**
   Answer. Iodine is a non-metal which is lustrous, lead is a non-lustrous metal.

10. **Which gas is liberated when a metal reacts with an acid? How will you test the presence of this gas?**
    Answer. Hydrogen gas is formed. Bring a burning matchstick near to it, H2 will burn explosively with 'pop' sound.

11. **Name the metal which reacts with a very dilute HNO_3 to evolve hydrogen gas.**
    Answer. Magnesium

12. **Name two metals which are found in nature in the free state.**
    Answer.(i) Gold (ii) Silver

13. **What is the valency of silicon with atomic number 14?**
Answer. Its valency is equal to 4.

14. **What is the valency of phosphorus with atomic number 15?**
Answer. Phosphorus has valency 3.

15. **What is the valency of an element with atomic number 35?**
Answer. Its valency is 1.

16. **Arrange the following metals in the decreasing order of reactivity: Na, K, Cu, Ag.**
Answer. K > Na > Cu > Ag

17. **An element forms an oxide, A2O3 which is acidic in nature. Identify A as a metal or non-metal.**
Answer. 'A' is non-metal as non-metallic oxides are acidic in nature.

18. **A green layer is gradually formed on a copper plate left exposed to air for a week in a bathroom. What could this green substance be ?**
Answer. It is due to the formation of basic copper carbonate [CuCO3.Cu(OH)2].

SHORT ANSWER TYPE QUESTIONS[I] [2 MARKS]

19. **Write one example of each of**
(i) a metal which is so soft that, it can be cut with knife and a non-metal which is the hardest sustance.
(ii) a metal and a non-metal which exist as liquid at room temperature.
Answer.
(i) Sodium, carbon (diamond).
(ii)Mercury is liquid metal, bromine is liquid non-metal.

20. **Mention the names of the metals for the following:**
(i) Two metals which are alloyed with iron to make stainless steel.
(ii) Two metals which are used to make jewellary.
Answer.
(i) Nickel and chromium.
(ii) Gold and platinum.

21. **Give reason for the following:**
(a) School bells are made up of metals.
(b) Electric wires are made up of copper.
Answer.
(a) It is because metals are sonorous, i.e. they produce sound when struk with a hard substance.
(b) It-is because copper is good conductor of electricity.

22. **Name the following:**
(a) A metal, which is preserved in kerosene.
(b) A lustrous coloured non-metal.
(c) A metal, which can melt while kept on palm.
(d) A metal, which is a poor conductor of heat.
Answer.

(a) Sodium is preserved in kerosene. (b) Iodine is lustrous coloured non-metal.
(c) Gallium. (d) Lead.

23. **Explain why calcium metal after reacting with water starts floating on its * surface. Write the chemical equation for the reaction. Name one more metal that starts floating after some time when immersed in water.**
Answer. Calcium starts floating because the bubbles of hydrogen gas formed stick to the surface of metal.

$$Ca(s) + 2H_2O(l) \longrightarrow Ca(OH)_2 + H_2(g)$$

Magnesium reacts with hot water and starts floating due to the bubbles of hydrogen gas sticking to its surface.

24. **Give reason for the following:**
(a) Aluminium oxide is considered as an amphoteric oxide.
(b) Ionic compounds conduct electricity in molten state.
Answer.
(a) It is because it reacts with acids as well as bases to produce salts and water.'Al' is less electropositive metal. So, it forms amphoteric oxide which can react with acid as well as base.
(b) Ionic compounds can conduct electricity in molten state because ions ' become free to move in molten state.

25. **Write two differences between calcination and roasting.**
Answer.

Calcination	Roasting
(*i*) It is carried out by heating ore in the absence of air.	(*i*) It is carried out by heating ore in the presence of air.
(*ii*) It converts carbonate ores into oxides.	(*ii*) It converts sulphide ores into oxides.

26. **The way, metals like sodium, magnesium and iron react with air and water is an indication of their relative positions in the 'reactivity series'. Is this statement true ? Justify your answer with examples.**
Answer. Yes, sodium reacts explosively even with cold water, it is most reactive. Magnesium reacts with hot water, it is less reactive than Na. Iron reacts only with steam which shows it is least reactive among the three.

27. **$X + YSO_4$——–> XSO_4+ Y**
$Y + XSO_4$ ———> No reaction
Out of the two elements, 'X' and 'Y', which is more reactive and why?
Answer. 'X' is more reactive than 'Y' because it displaces 'Y' from its salt solution.

28. **What is an alloy? State the constituents of solder. Which property of solder makes it suitable for welding electrical wires?**
Answer. Alloy is a homogeneous mixture of two or more metals. One of them can be a non-metal also. Solder consists of lead and tin. It has low melting point which makes it suitable for welding electrical wires.

29. **When a metal X is treated with cold water, it gives a base Y with molecular formula XOH (Molecular mass = 40) and liberates a gas Z which easily catches fire. Identify X, Y and Z.**

Answer.

$$2Na + 2H_2O \longrightarrow 2NaOH + H_2(g)$$

'X' 'Y' 'Z'

'X' is sodium, 'Y' is sodium hydroxide, 'Z' is H_2 (*g*).

30. **Using the electronic configurations, explain how magnesium atom combines with oxygen atom to form magnesium oxide by transfer of electrons.**
Answer.

$Mg(12) = 2, 8, 2$

$$Mg \longrightarrow Mg^{2+} + 2e^-$$

2, 8, 2 2, 8

$O(8) = 2, 6$

$$O + 2e^- \longrightarrow O^{2-}$$

2, 6 2, 8

$(Mg)^{2+}$ $(\dot{\underset{\cdot\cdot}{O}}\cdot)^{2-}$

31. **(a) Give two methods to prevent the rusting of iron.**
(b) Name the ores of the following metals:
(i) mercury, and
(ii) zinc
Answer.
(a)(i) Painting (ii) Galvanisation
(b)(i) Cinnabar (ii) Zinc Blende

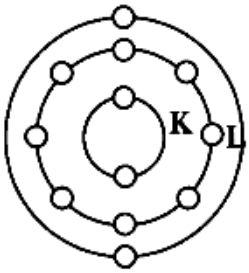
32. **Write chemical equations that shows aluminium oxide reacts with acid as well as base.**
Answer.

$$Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2O$$

$$Al_2O_3 + 2NaOH \longrightarrow 2NaAlO_2 + H_2O$$

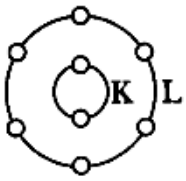
33. **Elements magnesium and oxygen respectively belong to group 2 and group 16 of the Modern Periodic Table. If the atomic numbers of magnesium and oxygen are 12 and 8 respectively, draw their electronic configurations and show the process of formation of their compound by transfer of electrons.**
Answer.

Mg(12)=2,8,2

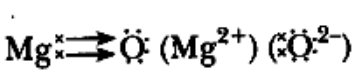


K = 2, L = 8, M = 2

O(8) = 2, 6



K = 2, L = 6



SHORT ANSWER TYPE QUESTIONS[II] [3 MARKS]

34. **State three reasons for the following facts**
(i) Sulphur is a non-metal
(ii)Magnesium is a metal
One of the reasons must be supported with a chemical equation.
Answer.

Sulphur is a non-metal	Magnesium is a metal
(i) Poor conductor of heat and electricity	(i) Good conductor of heat and electricity
(ii) Neither malleable nor ductile	(ii) Malleable nor ductile
(iii) $S + O_2 \rightarrow SO_2$ $SO_2 + H_2O \rightarrow H_2SO_3$ (Sulphurous acid) Sulphur dioxide is acidic oxide.	(iii) $2Mg + O_2 \rightarrow 2MgO_2$ $MgO + H_2O \rightarrow Mg(OH)_2$ (Magnesium hydroxide) Magnesium oxide is basic in nature.

35. **What is cinnabar? How is metal extracted from cinnabar? Explain briefly.**
Answer. Cinnabar is HgS.
Mercury is obtained by roasting cinnabar. HgO formed is thermally unstable and gives mercury.

$$2HgS(s) + O_2(g) \longrightarrow HgO(s) + SO_2(g)$$

$$2HgO(s) \xrightarrow{heat} Hg(l) + O_2(g)$$

or

$$HgS + O_2 \longrightarrow Hg + SO_2$$

Mercury can be purified by distillation.

36. **(a) Write the electron dot structures for potassium and chlorine.**
(b) Show the formation of KCl by the transfer of electrons.
(c) Name the ions present in the compound, KCl.

Answer.

(*a*) K· :Cl:

2, 8, 8, 1 2, 8, 7

(*b*) $K \longrightarrow K^+ + e^-$

$Cl + e^- \longrightarrow Cl^-$

$(K^+)(Cl^-)$ or KCl

(*c*) KCl has K^+ and Cl^-.

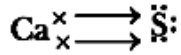
37. **(a)State the electron-dot structure for calcium and sulphur.**
(b) Show the formation of CaS by the transfer of electrons.
(c) Name the ions present in this compound CaS. Atomic number of Ca = 20, O = 16.
Answer.

(*a*) Ca: :S:

2, 8, 8, 2 2, 8, 6

(*b*) $Ca \longrightarrow Ca^{2+} + 2e^-$

$S + 2e^- \longrightarrow S^{2-}$



(Ca^{2+}) (S^{2-})

(*c*) Ca^{2+} and S^{2-} ions are present in CaS.

38. **You are given samples of three metals. Sodium, magnesium and copper. Suggest any two activities to arrange them in order of decreasing activity.**
Answer. Activity 1: Sodium reacts with cold water vigorously to form sodium hydroxide and hydrogen gas

$$2Na\ (s) + 2H_2O\ (l) \xrightarrow[\text{cold}]{} 2NaOH\ (aq) + H_2\ (g)$$

Magnesium does not react with cold water but with hot water to form magnesium ! hydroxide and hydrogen gas.

$$Mg\ (s) + 2H_2O \xrightarrow[\text{(hot)}]{} Mg(OH)_2\ (aq) + H_2\ (g)$$

Hence sodium is more reactive than magnesium.

Activity 2: $Mg\ (s) + CuSO_4\ (aq) \longrightarrow MgSO_4\ (aq) + Cu\ (s)$

$Cu\ (s) + MgSO_4\ (aq) \longrightarrow$ No reaction

39. **You are provided with magnesium ribbon and sulpher powder. Explain with the help of an activity that metal oxides are basic and non-metal oxide are acidic in nature.**
Answer.
Aim: To test the nature of oxides formed by metals and non-metals. Materials Required: Sulphur powder, Mg ribbon, water, blue litmus paper, red litmus paper.
Procedure:
1.Take magnesium ribbon with a pair of tongs and
burn it in flame in the presence of air.
2.Collect the product formed and dissolve it in warm water.
3.Add red litmus paper into it.
4.Observe the change in colour and decide the nature of the oxide formed.
5.Burn sulphur in a deflagrating spoon in the presence of air and dissolve the oxide formed in water.
6.Dip blue litmus paper into the solution and observe the changein the colour and decide the nature of the oxide formed.

Observation: The oxide formed by metal turns red litmus blue whereas oxide of non-metal turns blue litmus red.

Chemical Reaction:

$$2Mg(s) + O_2(g) \xrightarrow{\text{burning}} 2MgO(s)$$

$$MgO(s) + H_2O(\text{hot}) \longrightarrow Mg(OH)_2(aq)$$

Magnesium oxide (Basic oxide) — Water — Magnesium hydroxide

$$S(s) + O_2(g) \longrightarrow SO_2(g)$$

$$SO_2(g) + H_2O(l) \longrightarrow H_2SO_3(aq)$$

Sulphur dioxide (Acidic oxide) — Water — Sulphurous acid

Conclusion: Most of the metallic oxides are basic in nature whereas most of the non-metallic oxides are acidic in nature.

40. **(a) Explain the formation of ionic compound CaO with electron dot structure. Atomic number of calcium and oxygen are 20 and 8 respectively.**
(b) Name the constituent metals of bronze.
Answer.

(a) $Ca \longrightarrow Ca^{2+} + 2e^-$

2, 8, 8, 2 — 2, 8, 8

$O + 2e^- \longrightarrow O^{2-}$

2, 6 — 2, 8

(Ca^{2+}) $(\dot{\underset{\times}{\ddot{O}}}:^{2-})$

(b) Bronze is made up of copper and tin.

41. **A metal 'X' acquires a green colour coating on its surface on exposure to air.**
(i) Identify the metal 'X' and name the process responsible for this change.
(ii)Name and write chemical formula of the green coating formed on the metal.
(iii) List two important methods to prevent the process.
Answer.
(i) Metal is copper. The process is corrosion.
(ii)Basic copper carbonate [$CuCO_3.Cu(0H)_2$].
(iii)
• It should be coated with tin
• It should be mixed with other metals to form alloys

42. **Write balanced equations for the reaction of:**
(i) aluminium when heated in air. Write the name of the product.
(ii) iron with steam. Name the product obtained.
(iii) calcium with water. Why does calcium start floating in water?
Answer.

(*i*) $4Al + 3O_2 \xrightarrow{heat} 2Al_2O_3$.

The product formed is aluminium oxide.

(*ii*) $3Fe + 4H_2O \text{ (steam)} \longrightarrow Fe_3O_4 + 4H_2$

The product obtained is iron(II) iron (III) oxide.

(*iii*) $Ca + 2H_2O \longrightarrow Ca(OH)_2 + H_2$

The bubbles of hydrogen stick to the surface of metal that is why it floats.

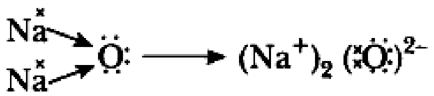
43. **Write balanced chemical equations for the following reactions:**
(a) Dilute sulphuric acid reacts with aluminium powder.
(b) Dilute hydrochloric acid reacts with sodium carbonate.
(c) Carbon dioxide is passed through lime water.
Answer.

(*a*) $2Al(s) + 3H_2SO_4(dil.) \longrightarrow Al_2(SO_4)_3\ (aq) + 3H_2(g)$

(*b*) $Na_2CO_3(s) + 2HCl(dil.) \longrightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$

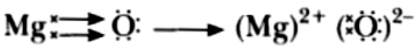
(*c*) $\underset{\text{Lime water}}{Ca(OH)_2(aq.)} + CO_2(g) \longrightarrow \underset{\text{(white ppt)}}{CaCO_3(s)} + H_2O(l)$

44. **(a) Show the formation of Na_2O by the transfer of electrons between the combining atoms.**
(b) Why are ionic compounds usually hard?
(c) How is it that ionic compounds in the solid state do not conduct electricity but they do so when in molten state?
Answer.

(*a*) 

(b) It is due to strong force of attraction between oppositely charged ions.
(c) In solid state, ions are not free to move whereas in molten state ions are free to move, therefore, they conduct electricity in molten state.

45. **(a) Show on a diagram the transfer of electrons between the atoms in the formation of MgO. Write symbols of cation and anion present in MgO.**
(b) Name the solvent in which ionic compounds are generally soluble.
(c) Why are aqueous solutions of ionic compounds able to conduct electricity?
Answer.

(*a*) 

MgO contains Mg^{2+} as cation and O^{2-} as anion.

(b) Ionic compounds are soluble in water.
(c) It is because aqueous solutions consist of ions which can move freely in them and carry current.

46. **What are amphoteric oxides? Choose the amphoteric oxides from amongst the following oxides:**
Na_2O, ZnO, Al_2O_3, CO_2, H_2O
Answer. Those oxides which reacts with acids as well as bases to produce salts and water are called amphoteric oxides, e.g. Na_2O, ZnO, are amphoteric oxides among given oxides.

47. **An ore on heating in air produces sulphur dioxide. Which process would you suggest for its concentration? Describe briefly any two steps involved in the conversion of this concentrated ore into related metal.**
Answer. It is concentrated by froth-floatation process.

(i) Roasting: The concentrated sulphide ore is heated strongly in the presence of oxygen to convert it into its oxide.

$$2ZnS(s) + 3O_2(g) \longrightarrow 2ZnO(s) + 2SO_2(g)$$

(ii)Reduction : This oxide of metal is reduced with suitable reducing agent to get free metal.

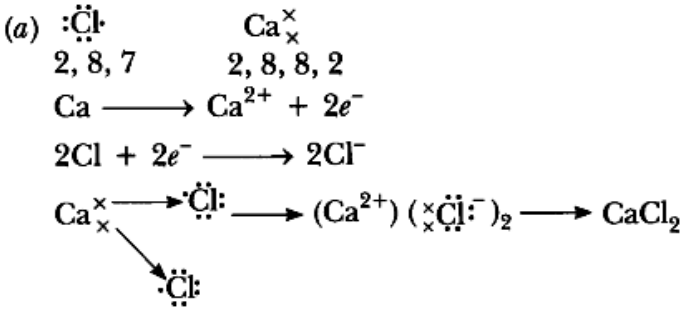
$$ZnO(s) + C(s) \xrightarrow{heat} Zn(s) + CO(g)$$

48. **Give reasons for the following observations:**
(i) Ionic compounds in general have high melting and boiling points.
(ii) Highly reactive metals cannot be obtained from their oxides by heating them with carbon.
(iii) Copper vessels get a green coat when left exposed to air in the rainy season.
Answer. (i) Ionic compounds have high melting and boiling points due to strong force of attraction between oppositely charged ions.
(ii) It is because these metals themselves are strong reducing agents. Therefore, cannot be reduced by reducing agent like carbon.
(iii) Copper vessels react with CO_2, O_2 and moisture to form green-coloured basic copper carbonate [$CuCO_3.Cu(OH)_2$].
49. **State reasons for the following observations:**
(i) The shining surface of some metals becomes dull when exposed to air for a long time.
(ii) Zinc fails to evolve hydrogen gas on reacting with dilute nitric acid.
(iii) Metal sulphides occur mainly in rocks but metal halides occur mostly in sea and lake waters.
Answer.
(i) It is because metal reacts with substances present in atmosphere to form surface compounds which make it dull.
(ii) It is because dil. HNO_3 is an oxidising agent therefore zinc gives NO and not H_2 with dil. HNO_3.
(iii) It is because sea water contains sodium chloride due to which metal halides are formed, whereas sulphur is found below rocks. Therefore, metal – sulphides are formed in rocks.

50. **State reasons for the following:**
(i) Electric wires are covered with rubber like material.
(ii)From dilute hydrochloric acid, zinc can liberate hydrogen gas but copper cannot.
(iii) Sulphide ore of a metal is first converted to its oxide to extract the metal from it.
Answer.
(i) It is because rubber is an insulator and does not allow current to flow through it.
(ii) Zinc is more reactive than hydrogen. Therefore, it can displace hydrogen from dilute HCl whereas copper cannot, because it is less reactive than hydrogen. ,
(iii) It is because it is easier to reduce oxide ore as compared to sulphide ore.

Long Answer Type Question [5 Marks]

51. **(a) Write electron dot diagram for chlorine (At No. 17) and calcium (At No. 20).**
Show the formation of calcium chloride by transfer of electrons.
(b) Identify the nature of above compound'and explain three physical properties of such compound. Answer.

(a) 

2, 8, 7 2, 8, 8, 2

$Ca \longrightarrow Ca^{2+} + 2e^-$

$2Cl + 2e^- \longrightarrow 2Cl^-$

$(Ca^{2+})(Cl^-)_2 \longrightarrow CaCl_2$

(b) It is ionic compound.

Physical properties

1.It is hard and solid.

2.It has high melting and boiling point.

3.It soluble in water.

52. **(a) Define activity series of metals. Arrange the metals gold, copper, iron and magnesium in order of their increase in reactivity.**

(b) What will you observe when:

(i) Some zinc pieces are put in copper sulphate solution.

(ii) Some silver pieces are put into green coloured ferrous sulphate solution.

Answer.

(a) The series of metals in which metals are arranged in decreasing order of their reactivity.

Au < Cu < Fe < Mg is increasing order of reactivity.

(b) (i) The blue solution will become colourless and reddish brown copper metal will be deposited.

$$Zn\ (s) + \underset{\text{Blue}}{CuSO_4\ (aq)} \longrightarrow \underset{\text{colourless}}{ZnSO_4\ (aq)} + \underset{\text{(reddish brown)}}{Cu\ (s)}$$

(ii) $Ag\ (s) + FeSO_4\ (aq) \longrightarrow$ No reaction

Reaction will not take place because Ag' is less reactive than iron.

53. **(a) In the formation of compound between two atoms A and B, A loses two electrons and B gains one electron.**

(i) What is the nature of bond between A and B?

(ii) Suggest the formula of the compound formed between A and B.

(b) On similar lines explain the formation of $MgCl_2$ molecule.

(c) Common salt conducts electricity only in the molten state. Why?

(d) Why is melting point of NaCl high?

Answer.

(a) (i) Ionic bond

(ii) $(A^{2+})(B^-)_2$, *i.e.* AB_2

(b) $Mg \longrightarrow Mg^{2+} + 2e^-$

$2Cl + 2e^- \longrightarrow 2Cl^-$

$(Mg^{2+})(Cl^-)_2$

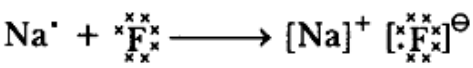
(c) Na^+ and Cl^- are free to move in molten state but not in solid state.

(d) It is due to strong force of attraction between Na^+ and Cl^-.

54. **Write the names and symbols of two most reactive metals. Explain by drawing electronic structure how any one of the two metals react with a halogen. State any four physical properties of the compound formed.**

Answer. K(Potassium) and Na(Sodium) are the two most reactive metals. K' and Na' are electronic structures as they have one valence electron.

or

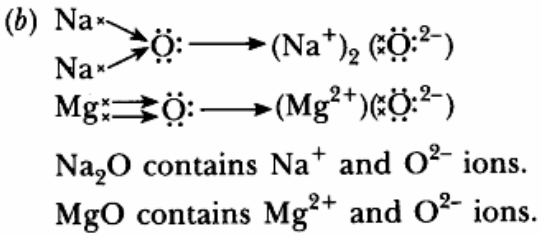


where 'F' is a halogen.

Four physical properties of the compounds formed by these elements and halogens are:
(i) They have high melting point.
(ii)They are soluble in water.
(iii) They conduct electricity in molten state not in solid state.
(iv) They are solid and somewhat hard.

55. **Give reasons for the following:**
(i) Silver and copper lose their shine when they are exposed to air. Name the substance formed on their surface in each case.
(ii) Tarnished copper vessels are cleaned with tamarind juice.
(iii) Aluminium is more reactive than iron yet there is less corrosion of aluminium as compared to iron when both are exposed to air.
Answer.
(i) These metals get corroded. Silver forms black Ag_2S (silver sulphide) and copper form greenish layer of basic copper carbonate $CuCO_3$. $Cu(OH)_2$.
(ii) Tamarind contains acid which reacts with basic copper carbonate and product gets dissolved and removed from copper vessel.
(in) Aluminium forms oxide layer on its surface which does not further react with air.

56. **(a) Write the electron dot structures of sodium, oxygen and magnesium.**
(b) Show the formation of Na_2O and MgO by transfer of electrons. Name the ions present in these compound.
(c) List three properties of ionic compounds.
Answer.
(*a*) Na·, ·Ö·, Mg·
(*b*)



Na_2O contains Na^+ and O^{2-} ions.
MgO contains Mg^{2+} and O^{2-} ions.

(i) They are solids having high melting point.
(ii) They are soluble in water.
(iii) They conduct electricity in molten state as well as in aqueous solution.

57. **A metal (E) is stored under kerosene. When a small piece of it is left open in the air, it catches fire. When the product formed is dissolved in water, it turns red litmus to blue.**
(i) Name the metal (E).
(ii)Write the chemical equation for the reaction when it is exposed to air and when the product is dissolved in water.
(iii) Explain the process by which the metal is obtained from its molten chloride.
Answer.

(i) 'E' is sodium which catches fire in presence of moisture.

(ii) $4Na + O_2 \longrightarrow 2Na_2O$

$Na_2O + H_2O \longrightarrow 2NaOH$

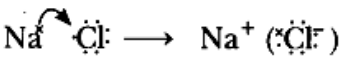
(iii) Electrolytic reduction: Electric current is passed through molten NaCl. Sodium is formed at cathode and chlorine gas is liberated at anode.

$$\underset{\text{Molten}}{2NaCl} \xrightarrow{\text{electrolysis}} 2Na + Cl_2$$

58. **(a) How can the metals at the top of the reactivity series be extracted from their ores? Explain with an example.**
(b) Name any one alloy made from
(i) a metal and a non-metal, and
(ii) two metals.
Answer.
(a) These metals are extracted by electrolytic reduction, e.g. aluminium is obtained from bauxite by electrolytic reduction.
(b) (i) Steel is made up of iron and carbon.
(ii) Brass is made up of copper and zinc.

59. **With the help of a suitable example, explain how ionic compounds are formed. State any three general properties of ionic compounds.**
Answer. Ionic compounds are formed by transfer of electrons from metal to non-metals, e.g.

$Na \longrightarrow Na^+ + e^-$ $\quad Cl + e^- \longrightarrow Cl^-$



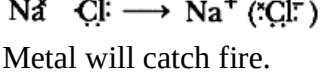
General Properties:
(i) They are the solids having high melting point.
(ii) They are soluble in water.
(iii) They conduct electricity in molten state as well as in aqueous solution.

60. **(a) Explain with an example how the metal (X) which is low in reactivity series and metal (Y) which is high in the reactivity series are obtained from their compounds by reduction process.**
(b) Write the electronic configurations of sodium and chlorine. Show the formation of sodium chloride from sodium and chlorine by the transfer of electrons.
(c) List any two observations when a highly reactive metal is dropped in water.
Answer.
(a) 'X' is obtained by chemical reduction.
'Y' is obtained by electrolytic reduction.

(b) Na (2, 8, 1)
Cl (2, 8, 7)

$Na \longrightarrow Na^+ + e^-$

$Cl + e^- \longrightarrow Cl^-$



(c) (i) Metal will catch fire.
(ii) Alkali solution is formed which turns red litmus blue.

61. **(a) The reaction of metal (X) with ferric oxide is highly exothermic. Metal (X) is obtained from its oxides by electrolytic reduction. Identify (X) and write its reaction with ferric oxide.**

(b) Give reason to justify that aluminium oxide is an amphoteric oxide. Also, give another example of amphoteric oxide.
(c) Mention constituent metals present in bronze.
Answer. (a) 'X' is 'Al'

$$2Al + Fe_2O_3 \longrightarrow Al_2O_3 + 2Fe$$

(b) AI_2O_3 reacts with acid as well as base therefore it is amphoteric oxide.

$$Al_2O_3 + 2NaOH \longrightarrow 2NaAlO_2 + H_2O$$

$$Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2$$

Zinc oxide is also an amphoteric oxide.
(c) Bronze contains' copper and tin.

62. **No reaction takes place when granules of a solid 'A' are mixed with a powder of solid 'B\ However when the mixture is heated, a reaction starts with evolution of much heat. Product 'C' of the reaction settles down as a liquid metal and solid product 'D' keeps floating over the liquid 'C\ This reaction is sometimes used for making metals for ready use in odd places.**
(i) Based on this information, make assumptions about 'A' and 'B' and corresponding deductions about 'C' and 'D' and write a balanced chemical equation for the reaction. Include in the chemical equation about physical states of the reactants and products, need of heating for starting the reaction and the reaction being exothermic.
(ii) Name two types of chemical reactions to which this reaction can belong.
Answer.
(i) 'A' is aluminum, 'B' is ferric oxide [Iron(III) oxide],

$$\underset{\text{'A'}}{2Al(s)} + \underset{\text{'B'}}{Fe_2O_3(s)} \xrightarrow{\text{heat}} \underset{\text{'D'}}{Al_2O_3(s)} + \underset{\text{'C'}}{2Fe(l)} + \text{heat}$$

(ii)This reaction is displacement reaction because AT is displacing 'Fe'. It is also a redox reaction because AT is reducing agent and $Fe2O_3$is oxidising agent.

63. **(a) Distinguish between ionic and covalent compounds under the following properties:**
(i) Strength of forces between constituent elements.
(ii) Solubility of compounds in water.
(iii) Electrical conduction in substances.
(b) Explain how the following metals are obtained from their compounds by the reduction process:
(i) Metal M which is in the middle of the reactivity series.
(ii) Metal N which is high up in the reactivity series.
Give one example of each type.
Answer.

Ionic Compounds	Covalent Compounds
(i) Strength – They have strong forces of attraction	They have weak forces of attraction.
(ii) Solubility – They are soluble in water	They are insoluble in water
(iii) Conduction – They conduct electricity in aqueous solution.	They do not conduct electricity in aqueous solution.

(b) (i) Metal M which is in the middle of the reactivity series is reduced by aluminium, e.g.
$3MnO_2(s) + 4Al(s) \longrightarrow 2Al_{2O3}(s) + 3Mn(l)$
(ii) Metal N will be obtained by electrolytic reduction, e.g. A1 is obtained by electrolytic reduction.

OBJECTIVE TYPE QUESTIONS [1 MARK]

1. Which of the following can be beaten into thin sheets?
(a) Zinc (b) Phosphorus (c) Sulphur (d) Oxygen

2. Which of the following statements is correct?
(a) All metals are ductile. (b) All non-metals are ductile.
(c) Generally, metals are ductile. (d) Some non-metals are ductile.

3. Which of the following is not a metal?
(a) copper (b) sulphur (c) aluminium (d) iron

4. The substance that will be flattened on beating with a hammer is
(a) crystal of iodine (b) lump of sulphur
(c) piece of coal (d) zinc granule

5. Arun has learnt that non-metals on beating with a hammer are generally broken into pieces. Which of the following is a nonmetal?
(a) iron nail (b) aluminium wire (c) copper plate (d) piece of coal

6. Materials which can be drawn into wires are called ductile. Which of the following is not a ductile material?
(a) silver (b) copper (c) sulphur (d) aluminium

7. Metals are generally hard. Which of the following metals is an exception and can be cut with a knife?
(a) iron (b) sodium (c) gold (d) magnesium

8. Metals are generally solid. Which of the following metals is in the liquid state at room temperature?
(a) mercury (b) silver (c) aluminium (d) sodium

9. Metals generally react with dilute acids to produce hydrogen gas. Which one of the following metals does not react with dilute hydrochloric acid?
(a) magnesium (b) aluminium (c) iron (d) copper

10. Which of the following reacts with cold water vigorously?
(a) carbon (b) sodium (c) magnesium (d) sulphur

11. The metal which produces hydrogen gas on reaction with dilute hydrochloric acid as well as sodium hydroxide solution is
(a) copper (b) iron (c) aluminium (d) sodium

12. Which of the following non-metals reacts and catches fire on exposure to air?
(a) phosphorus (b) nitrogen (c) sulphur (d) hydrogen

13. Generally metallic oxides are basic and non-metallic oxides are acidic in nature. Solution of which of the following oxides in water will change the colour of blue litmus to red?
(a) sulphur dioxide (b) magnesium oxide (c) iron oxide (d) copper oxide

14. Which of the following property is not responsible for copper to be used as electrical conduction wires?
(a) ductility (b) colour
(c) good conductor of electricity (d) it is solid

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

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

16. 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)

17. Which of the following property is generally not shown by metals?
(a) Electrical conduction (b) Sonorous in nature
(c) Dullness (d) Ductility

18. Which one of the following metals do not react with cold as well as hot water?
(a) Na (b) Ca (c) Mg (d) Fe

19. 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

20. 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)

21. 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

22. 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)

23. 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

24. 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)

25. 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

26. 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

27. 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

28. 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

29. 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)

30. Generally, non-metals are not lustrous. Which of the following nonmetal is lustrous?
(a) Sulphur (b) Oxygen (c) Nitrogen (d) Iodine

31. 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

32. 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

33. An alloy is
(a) an element (b) a compound
(c) a homogeneous mixture (d) a heterogeneous mixture

34. 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)

35. 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

36. 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

37. Which among the following alloys contain mercury as one of its constituents?
(a) Stainless steel (b) Alnico (c) Solder (d) Zinc amalgam

38. 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

39. 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

40. Although metals form basic oxides, which of the following metals form an amphoteric oxide?
(a) Na (b) Ca (c) Al (d) Cu

41. 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

42. 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

43. Which of the following non-metals is a liquid?
(a) Carbon (b) Bromine (c) Phosphorus (d) Sulphur

44. Which of the following can undergo a chemical reaction?
(a) $MgSO_4 + Fe$ (b) $ZnSO_4 + Fe$ (c) $MgSO_4 + Pb$ (d) $CuSO_4 + Fe$