

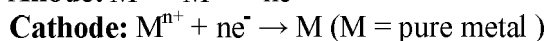
is called refining of the metal. Refining of the metal involves several types of processes. Some refining methods are given below:

- a) Distillation
- b) Poling
- c) Liquation
- d) Electrolysis etc.

The process that has to be adopted for purification of a given metal depends on the nature of the metal and its impurities?

- a) **Distillation:** This method is very useful for purification of low boiling metals like zinc and mercury whether contain high boiling metals as impurities. The extracted metal in the molten state is distilled to obtain the pure metal as distillate.
- b) **Poling:** The molten metal is stirred with logs (poles) of green wood. The impurities are removed either as gases or they get oxidized and form scum (slag) over the surface of the molten metal. Blister copper is purified by this method. The reducing gases, evolved from the wood, prevent the oxidation of copper.
- c) **Liquation:** In this method a low melting metal like tin can be made to flow on a slopy surface to separate it from high melting impurities.
- d) **Electrolytic refining:** In this method, the impure metal is made to act as anode. A strip of the same metal in pure form is used as cathode. They are put in a suitable electrolytic bath containing soluble salt of the same metal. The required metal gets deposited on the cathode in the pure form. The metal, constituting the impurity, goes as the anode mud.

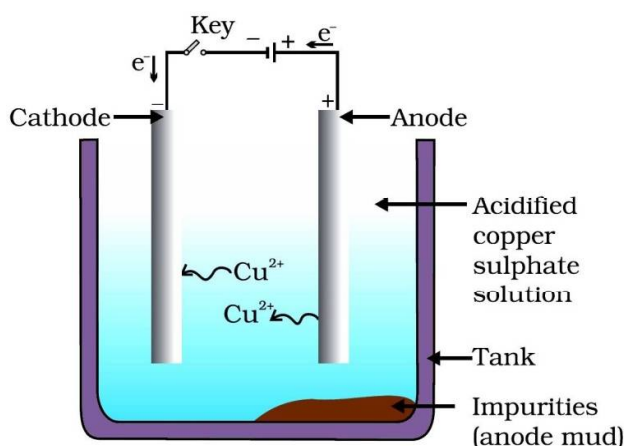
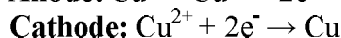
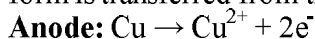
The reactions are:



Where $n = 1, 2, 3, \dots$

We use this electrolytic method to refine copper.

For this an impure copper is taken as anode and pure copper strips are taken as cathode. The electrolyte is a acidified solution of copper sulphate. As a result of electrolysis copper in pure form is transferred from the anode to the cathode.



The suitable impurities go into the solution, whereas insoluble impurities from the blister copper deposited at the bottom of anode as anode mud which contains antimony.

Selenium, tellurium, silver, gold and platinum; recovery of these elements may meet the cost of refining.

Zinc may also be refined this way.

CORROSION

Most of the metals keep on reacting with the atmospheric air. This leads to formation of a layer over the metal. In the long run, the underlying layers of the metal keep on getting lost due to conversion into oxides or sulphides or carbonate, etc. As a result, the metal gets eaten up. This process is called corrosion.

Rusting of Iron: Rusting of iron is the most common form of corrosion. When iron articles; like gate, grill, fencing, etc. come in contact with moisture present in air, the upper layer of iron turns into iron oxide. Iron oxide is brown-red in color and is known as rust. This phenomenon is called rusting of iron.

If rusting is not prevented in time, the whole iron article would turn into iron oxide. This is also known as corrosion of iron. Rusting of iron gives huge loss every year.

Prevention of Rusting: For rusting, iron must come in contact with oxygen and water. Rusting is prevented by preventing the reaction between atmospheric moisture and the iron article. This can be done by painting, greasing, galvanization, electroplating, etc.

METHODS OF PREVENTION OF CORROSION

There are various methods of preventing corrosion and rusting of iron. Our main concern is to know the various methods to prevent the rusting of iron because iron is a strategic metal as it plays a very important role in the development of a nation. Some of the important methods of prevention of corrosion are as follows:

a) Painting

This is a common method of preventing iron from rusting. You might have observed that your parents paint iron gate in the garden and iron grills in your house. This painting prevents rusting by providing a coating over iron objects.

b) Oiling and greasing

To put a layer of oil and grease on the iron objects also prevents them from rusting. Iron parts of various machines and vehicles are oiled and greased to prevent rusting and to minimize friction.

c) Galvanization

In this method we put a layer of zinc metal on the iron objects and this process is known as **galvanization**. This method is used on large scale for making galvanized iron sheets for making boxes and for roof covering. Galvanized iron sheets are used to make drum, trunks and other iron containers. Galvanized iron sheets are also used for building roofs and manhole covers. In brief, galvanization prevents rusting in a big way.

d) Alloying

This is a very good method for improving the quality of different metals. In this method a particular metal with other metal or non-metal is mixed in a fixed proportion to improve its quality like resistance towards corrosion, strength, hardness, shining and high tensile strength. For example iron metal can not be used for making utensils because it will rust but when it is mixed with nickel and chromium metal it becomes **stainless steel**.

INTEXT QUESTIONS PAGE NO. 55

Question 1: Metallic oxides of zinc, magnesium and copper were heated with the following metals.

Metal	Zinc	Magnesium	Copper
Zinc oxide			
Magnesium oxide			
Copper oxide			

In which cases will you find displacement reactions taking place?

Answer :

Answer:

<u>Metal</u>	<u>Zinc</u>	<u>Magnesium</u>	<u>Copper</u>
Zinc oxide	No reaction	Displacement	No reaction
Magnesium oxide	No reaction	No reaction	No reaction
Copper oxide	Displacement	Displacement	No reaction

Question 2: Which metals do not corrode easily?

Answer: More reactive a metal is, more likely it is to be corroded. Therefore, less reactive metals are less likely to get corroded. This is why gold plating provides high resistance to corrosion.

Question 3: What are alloys?

Answer: Alloys are homogeneous mixtures of two or more elements. The elements could be two metals, or a metal and a non-metal. An alloy is formed by first melting the metal and then dissolving the other elements in it. For example, steel is an alloy of iron and carbon.

EXERCISE QUESTIONS PAGE NO. 56 and 57

Question 1: Which of the following pairs will give displacement reactions?

- (a) NaCl solution and copper metal
- (b) MgCl₂ solution and aluminium metal
- (c) FeSO₄ solution and silver metal
- (d) AgNO₃ solution and copper metal.

Answer : (d) AgNO₃ solution and copper metal

Question 2: Which of the following methods is suitable for preventing an iron frying pan from rusting?

- (a) Applying grease
- (b) Applying paint
- (c) Applying a coating of zinc
- (d) all of the above.

Answer : (c) Applying a coating of zinc (We can also apply grease and paint to prevent iron from rusting. However, in case of iron frying pan, grease and paint cannot be applied because when the pan will be heated and washed again and again, the coating of grease and paint would get destroyed.)

Question 3: An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be

- (a) calcium
- (b) carbon
- (c) silicon

(d) iron

Answer : (a) The element is likely to be calcium.

Question 4: Food cans are coated with tin and not with zinc because

(a) zinc is costlier than tin.

(b) zinc has a higher melting point than tin.

(c) zinc is more reactive than tin.

(d) zinc is less reactive than tin.

Answer : (c) Food cans are coated with tin and not with zinc because zinc is more reactive than tin.

Question 5: You are given a hammer, a battery, a bulb, wires and a switch.

(a) How could you use them to distinguish between samples of metals and non-metals?

(b) Assess the usefulness of these tests in distinguishing between metals and non-metals.

Answer : (a) With the hammer, we can beat the sample and if it can be beaten into thin sheets (that is, it is malleable), then it is a metal otherwise a non-metal. Similarly, we can use the battery, bulb, wires, and a switch to set up a circuit with the sample. If the sample conducts electricity, then it is a metal otherwise a non-metal.

(b) The above tests are useful in distinguishing between metals and non-metals as these are based on the physical properties. No chemical reactions are involved in these tests.

Question 6: What are amphoteric oxides? Give two examples of amphoteric oxides.

Answer : Those oxides that behave as both acidic and basic oxides are called amphoteric oxides. Examples: aluminium oxide (Al_2O_3), zinc oxide (ZnO)

Question 7: Name two metals which will displace hydrogen from dilute acids, and two metals which will not.

Answer : Metals that are more reactive than hydrogen displace it from dilute acids. For example: sodium and potassium. Metals that are less reactive than hydrogen do not displace it. For example: copper and silver.

Question 8: In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte?

Answer : In the electrolytic refining of a metal M:

Anode \rightarrow Impure metal M

Cathode \rightarrow Thin strip of pure metal M

Electrolyte \rightarrow Solution of salt of the metal M

Question 9: Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it, as shown in figure below.

(a) What will be the action of gas on

(i) dry litmus paper?

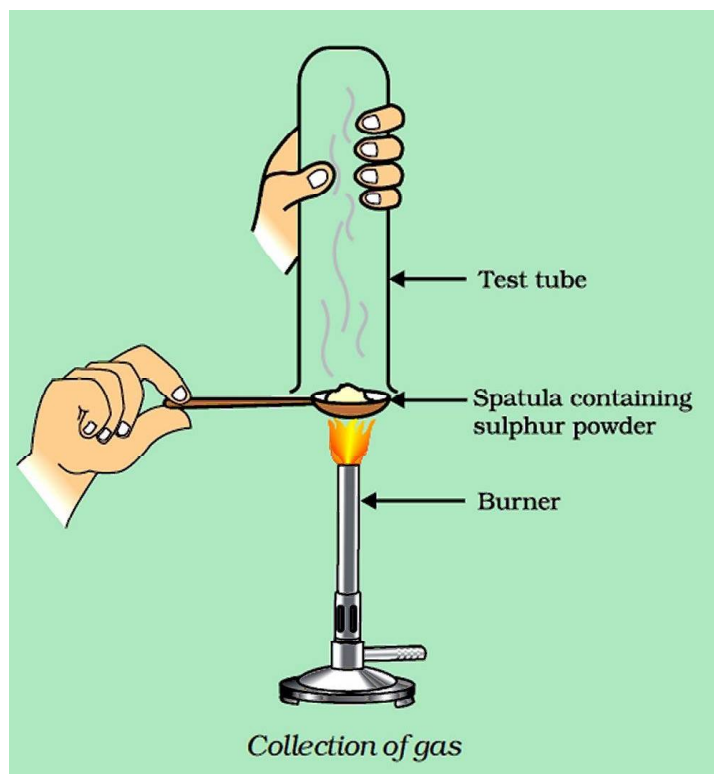
(ii) moist litmus paper?

(b) Write a balanced chemical equation for the reaction taking place.

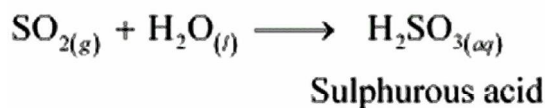
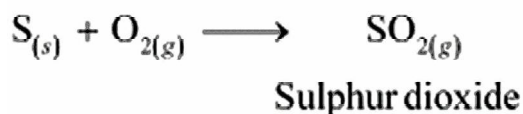
Answer :

(a) (i) There will be no action on dry litmus paper.

(ii) Since the gas is sulphur dioxide (SO_2), it turns moist blue litmus paper to red because sulphur dioxide reacts with moisture to form sulphurous acid.



(b)



Question 10: State two ways to prevent the rusting of iron.

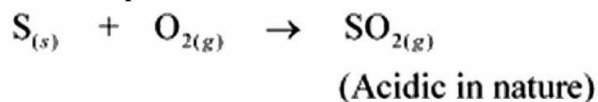
Answer : Two ways to prevent the rusting of iron are:

- (i) Oiling, greasing, or painting: By applying oil, grease, or paint, the surface becomes water proof and the moisture and oxygen present in the air cannot come into direct contact with iron. Hence, rusting is prevented.
- (ii) Galvanisation: An iron article is coated with a layer of zinc metal, which prevents the iron to come in contact with oxygen and moisture. Hence, rusting is prevented.

Question 11: What type of oxides are formed when non-metals combine with oxygen?

Answer : Non-metals combine with oxygen to form acidic oxides.

For example:



Question 12: Give reasons

- (a) Platinum, gold and silver are used to make jewellery.
- (b) Sodium, potassium and lithium are stored under oil.
- (c) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.
- (d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction.

Answer : (a) Platinum, gold, and silver are used to make jewellery because they are very lustrous. Also, they are very less reactive and do not corrode easily.

(b) Sodium, potassium, and lithium are very reactive metals and react very vigorously with air as well as water. Therefore, they are kept immersed in kerosene oil in order to prevent their contact with air and moisture.

(c) Though aluminium is a highly reactive metal, it is resistant to corrosion. This is because aluminium reacts with oxygen present in air to form a thin layer of aluminium oxide. This oxide layer is very stable and prevents further reaction of aluminium with oxygen. Also, it is light in weight and a good conductor of heat. Hence, it is used to make cooking utensils.

(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction because metals can be easily extracted from their oxides rather than from their carbonates and sulphides.

Question 13: You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.

Answer : Copper reacts with moist carbon dioxide in air to form copper carbonate and as a result, copper vessel loses its shiny brown surface forming a green layer of copper carbonate. The citric acid present in the lemon or tamarind neutralises the basic copper carbonate and dissolves the layer. That is why, tarnished copper vessels are cleaned with lemon or tamarind juice to give the surface of the copper vessel its characteristic lustre.

Question 14: Differentiate between metal and non-metal on the basis of their chemical properties.

Answer :

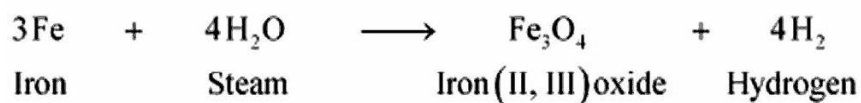
Metals	Non-metals
Metals are electropositive.	Non-metals are electronegative.
They react with oxygen to form basic oxides.	They react with oxygen to form acidic or neutral oxides.
These have ionic bonds.	These have covalent bonds.
They react with water to form oxides and hydroxides. Some metals react with cold water, some with hot water, and some with steam.	They do not react with water.
They react with dilute acids to form a salt and evolve hydrogen gas. However, Cu, Ag, Au, Pt, Hg do not react.	They do not react with dilute acids. These are not capable of replacing hydrogen.
They react with the salt solution of metals. Depending on their reactivity, displacement reaction can occur.	These react with the salt solution of non-metals.
They act as reducing agents (as they can easily lose electrons).	These act as oxidising agents (as they can gain electrons).

Question 15: A man went door to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty retreat. Can you play the detective to find out the nature of the solution he had used?

Answer : He must have dipped the gold metal in the solution of aqua regia – a 3:1 mixture of conc. HCl and conc. HNO₃. Aqua regia is a fuming, highly corrosive liquid. It dissolves gold in it. After dipping the gold ornaments in aqua regia, the outer layer of gold gets dissolved and the inner shiny layer appears. That is why the weight of gold ornament reduced.

Question 16: Give reasons why copper is used to make hot water tanks and not steel (an alloy of iron).

Answer : Copper does not react with cold water, hot water, or steam. However, iron reacts with steam. If the hot water tanks are made of steel (an alloy of iron), then iron would react vigorously with the steam formed from hot water.



That is why copper is used to make hot water tanks, and not steel.

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ASSIGNMENT QUESTIONS SET – 1
CHAPTER – 3
METALS AND NON-METALS

1. Which metal is the best conductor of electricity?
2. Which metal is poorest conductor of electricity?
3. Which metal is best conductor of heat ?
4. Which metal other than mercury is liquid at room temperature?
5. Which metal is poorest conductor of heat?
6. What is the nature of oxides of metal?
7. What is the nature of oxides of non- metal?
8. Which non-metal conduct electricity?
9. Graphite, allotrope of carbon conduct electricity.
10. Which non-metal is lustrous?
11. Why metals are hard and have high melting point?
12. What is an amalgam?
13. What are the constituents of solder?
14. Name the green coloured compound which appears on the surface of copper utensils?
15. Why the item made of silver turns black when exposed to air?
16. Why do silver ornaments loose their shine when kept for some time?
17. Name a metal other than aluminium that is covered with an oxide film layer.
18. Name one metal and one non-metal which exists in liquid state at room temperature?
19. Name a non-metal which is lustrous and a metal which is non-lustrous.
20. Name two metal which have very low melting point.
21. If copper metal is heated over a flame, it develops a coating. What is the colour and composition of this coating?
22. Why is sodium metal kept immersed in kerosene oil?
23. Name one metal which react with very dilute HNO_3 to evolve hydrogen gas.
24. 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.
25. An element A form two oxides AO and AO_2 . The oxide AO is neutral whereas the oxide AO_2 is acidic in nature. Would you call element A a metal or non-metal.
26. In the refining of silver the recovery of silver from silver nitrate solution involves displacement by copper metal. Give the reason for the same.
27. Name two metals which are both ductile as well as malleable.

28. The reaction of iron (III) oxide Fe_2O_3 with aluminium is used to join cracked iron parts of machines.
29. Give reason for the following: (a) Ionic compounds conduct electricity in the molten state.
30. Give reason for the following: Metals can be given different shapes according to our needs.
31. How will you test for the gas which is liberated when hydrochloric acid reacts with an active metal?
32. Which reducing agent is used in the reduction of alumina?
33. What are metalloids?
34. Why are titanium and chromium classified as strategic metals?
35. Which one of the following metals does not react with oxygen even at high temperatures?(i) Calcium (ii) Gold (iii) Sodium
36. Give reasons for the following : Addition of some silver to pure gold for making ornaments.
37. Give reason for the following: Alumina is dissolved in molten cryolite for electrolysis to obtain aluminum metal.
38. Write the chemical equation to represent the reaction taking place between sodium metal and cold water.
39. Why is tungsten metal selected for making filaments of incandescent lamp bulbs?
40. Name a metal which offer higher resistance to the passage of electricity than copper.
41. Write the chemical equation for the reaction of hot aluminium with steam.
42. How does the metal magnesium differ from the metal calcium in their reaction with water?
43. What is seen to happen when a piece of sodium metal is dropped into water?
44. What are amphoteric oxides? Give an example.\
45. Name two metals that react with dil. HNO_3 to evolve H_2 gas ?
46. Why metals like potassium and sodium catch fire when treated with water?
47. Why sodium is kept immersed in kerosene oil?
48. Which gas is produced when dil. HCl is added to a reactive metal? Write the chemical reaction when iron reacts with dil. H_2SO_4 ?
49. What would you observe when zinc is added to a solution of iron(II) sulphate ?write the chemical reaction that takes place.
50. Why ionic compounds have high melting points?

51. What do you mean by roasting? How it is different from calcination? In which types of ores roasting is done?
52. Define :- (i) Ore, (ii) Mineral.
53. Name two metals which are found in nature in the free state.
54. Define :- (i) Enrichment of Ores (ii) Gangue.
55. Write short notes on electrolytic refining of metals.
56. Name the conditions which are essential for corrosion.
57. What is Galvanisation? Write its use.
58. Write suitable example, explain how a metal low in the activity series can be extracted?
59. Write three properties of ionic compounds.
60. What is anodizing? What is its use?
61. What is aqua regia? What is its use?
62. What do you mean by thermite reaction? What is its use?
63. Why active metals do not liberate H_2 gas when treated with dil. HNO_3 ?
64. Sometimes the ore itself acts as a reducing agent. Give an example.
65. 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.
66. 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.
67. A metal which is used in thermite process, when heated with oxygen gives an oxide B, which is amphoteric in nature. Identify the metal and its ore and give the reaction involved.
68. Give reasons
 - (i) Copper is used to make hot water tanks but steel is not.
 - (ii) Tarnished copper vessels being cleaned with lemon or tamarind juice.
 - (iii) Metal sulphides occur mainly in rocks but metal halides occur mostly in sea and lake waters.
 - (iv) A salt which does not conduct electricity in the solid state becomes a good conductor in molten state
 - (v) Why ionic compounds have high melting points?
 - (vi) Why sodium is kept immersed in kerosene oil?
 - (vii) Why metals like potassium and sodium catch fire when treated with water?
 - (viii) Why metals are hard and have high melting point?

69. 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.
70. 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.
 - Draw a neat and well labelled diagram for electrolytic refining of copper.
71. A metal is found in liquid state in nature .It is less reactive than hydrogen .It occurs as sulphide ore .Describe the reactions how can we extract this metal from its ore .Name the ore also.
72. Explain why
- Aluminium cannot be extracted by reducing alumina with carbon.
 - Concentrated HNO_3 can be stored in aluminum containers.
 - Aluminium is used for making transmission wires.
 - 24 carat gold cannot be used for making ornaments.
73. Which of the following property is generally not shown by metals?
- Electrical conduction
 - Sonorous in nature
 - Dullness
 - Ductility
74. The ability of metals to be drawn into thin wire is known as
- ductility
 - malleability
 - sonorousity
 - conductivity
75. Aluminium is used for making cooking utensils. Which of the following properties of aluminium are responsible for the same?
- Good thermal conductivity
 - Good electrical conductivity
 - Ductility
 - High melting point
- (a) (i) and (ii) (b) (i) and (iii)
(c) (ii) and (iii) (d) (i) and (iv)
76. Which of the following property is generally not shown by metals?
- Electrical conduction
 - Sonorous in nature
 - Dullness
 - Ductility
77. The ability of metals to be drawn into thin wire is known as
- ductility
 - malleability

- (c) sonorosity
(d) conductivity
78. 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)
79. Which one of the following metals do not react with cold as well as hot water?
(a) Na
(b) Ca
(c) Mg
(d) Fe
80. 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
81. 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)
82. 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) H₂SO₄
(b) HCl
(c) HNO₃
(d) All of these
83. The composition of aqua-regia is
(a) Dil.HCl : Conc. HNO₃
3 : 1
(b) Conc.HCl : Dil. HNO₃
3 : 1
(c) Conc.HCl : Conc.HNO₃
3 : 1
(d) Dil.HCl : Dil.HNO₃
3 : 1
84. 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)
85. 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
86. 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)
87. 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)
88. 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
89. Galvanisation is a method of protecting iron from rusting by coating with a thin layer of
(a) Gallium
(b) Aluminium
(c) Zinc
(d) Silver
90. 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
91. 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

92. 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
93. 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)
94. Generally, non-metals are not lustrous. Which of the following nonmetal is lustrous?
- (a) Sulphur
 - (b) Oxygen
 - (c) Nitrogen
 - (d) Iodine
95. 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
96. 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
97. An alloy is
- (a) an element
 - (b) a compound
 - (c) a homogeneous mixture
 - (d) a heterogeneous mixture
98. 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)

99. 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
100. 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
101. Alloys are homogeneous mixtures of a metal with a metal or nonmetal. Which among the following alloys contain non-metal as one of its constituents?
(a) Brass
(b) Bronze
(c) Amalgam
(d) Steel
102. 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
103. Which among the following alloys contain mercury as one of its constituents?
(a) Stainless steel
(b) Alnico
(c) Solder
(d) Zinc amalgam
104. 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
105. 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
106. Although metals form basic oxides, which of the following metals form an amphoteric oxide?
(a) Na
(b) Ca
(c) Al
(d) Cu

107. Generally, non-metals are not conductors of electricity. Which of the following is a good conductor of electricity?
- Diamond
 - Graphite
 - Sulphur
 - Fullerene
108. Electrical wires have a coating of an insulating material. The material, generally used is
- Sulphur
 - Graphite
 - PVC
 - All can be used
109. Which of the following non-metals is a liquid?
- Carbon
 - Bromine
 - Phosphorus
 - Sulphur
110. Which of the following can undergo a chemical reaction?
- $\text{MgSO}_4 + \text{Fe}$
 - $\text{ZnSO}_4 + \text{Fe}$
 - $\text{MgSO}_4 + \text{Pb}$
 - $\text{CuSO}_4 + \text{Fe}$
111. 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.
112. During extraction of metals, electrolytic refining is used to obtain pure metals.
- Which material will be used as anode and cathode for refining of silver metal by this process?
 - Suggest a suitable electrolyte also.
 - In this electrolytic cell, where do we get pure silver after passing electric current?
113. Why should the metal sulphides and carbonates be converted to metal oxides in the process of extraction of metal from them?
114. 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?
115. Compound X and aluminium are used to join railway tracks.
- Identify the compound X
 - Name the reaction
 - Write down its reaction.
116. 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.

117. 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.
118. The following reaction takes place when aluminium powder is heated with MnO₂
- $$3 \text{MnO}_2 (\text{s}) + 4 \text{Al} (\text{s}) \rightarrow 3 \text{Mn} (\text{l}) + 2 \text{Al}_2\text{O}_3 (\text{l}) + \text{Heat}$$
- (a) Is aluminium getting reduced?
(b) Is MnO₂ getting oxidised?
119. What are the constituents of solder alloy? Which property of solder makes it suitable for welding electrical wires?
120. 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.
121. 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.
122. 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
123. What happens when
- (a) ZnCO₃ is heated in the absence of oxygen?
(b) a mixture of Cu₂O and Cu₂S is heated?
124. 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?
125. Give two examples each of the metals that are good conductors and poor conductors of heat respectively.
126. 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)
127. 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.
128. 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.
129. Give the reaction involved during extraction of zinc from its ore by
- (a) roasting of zinc ore
(b) calcination of zinc ore

130. 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.
131. An element forms an oxide A_2O_3 which is acidic in nature. Identify A as a metal or non-metal.
132. 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.
133. 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?
134. Give the steps involved in the extraction of metals of low and medium reactivity from their respective sulphide ores.
135. 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.
136. Given below are the steps for extraction of copper from its ore.
Write the reaction involved.
- (a) Roasting of copper (I) sulphide
(b) Reduction of copper (I) oxide with copper (I) sulphide.
(c) Electrolytic refining
137. Draw a neat and well labelled diagram for electrolytic refining of copper
138. 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.
139. 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.
140. 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?

ASSIGNMENT QUESTIONS SET – 2
CHAPTER – 3
METALS AND NON-METALS

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. Fill in the blanks :
(a) Phosphorus is very _____ non-metal.
(b) Metals are _____ conductors of heat and _____.
(c) Iron is _____ reactive than copper.
(d) Metals react with acids to produce _____ gas.
16. A substance is malleable, ductile and electropositive in nature. What type of substance is it?
17. What property of a metal makes it possible to draw it into wires?
18. Why are metals good conductors?
19. Name the metal which is commonly used for making cooking utensils
20. Fill in the blanks:
(a) _____ is liquid metal
(b) _____ is only liquid Non metals
(c) _____, _____ and _____ are soft metal
(d) _____ is the hardest natural substance
(e) _____ and _____ are have low melting points. They melt in the palm of the hand
(f) Metals can be beaten into thin sheets so they are called _____
(g) Non metals are bad conductors of electricity except _____
(h) Metals react with oxygen to form _____ oxides
(i) Some metal oxides show acidic and basic properties. They are called _____.
Eg :- Aluminum oxide, Zinc oxide etc.
(j) $\text{Al}_2\text{O}_3 + 6\text{HCl} \rightarrow \underline{\hspace{2cm}} + 3\text{H}_2\text{O}$
(k) $\text{Al}_2\text{O}_3 + \text{NaOH} \rightarrow \underline{\hspace{2cm}} + \text{H}_2\text{O}$
(l) _____ and _____ does not react with oxygen even at high temperature.
(m) Metals like potassium and sodium react vigorously with oxygen and catch fire if kept in open. Hence they are stored in _____ to prevent burning.

- (n) Magnesium reacts only with _____ water to form magnesium hydroxide and hydrogen.
- (o) Metals like aluminium, iron and zinc react only with _____ to form the metal oxides and hydrogen.
- (p) _____ gas is not evolved when metals react with nitric acid (HNO_3) because it is a strong oxidising agent
- (q) A more reactive metal displaces a _____ reactive metal from its salt solution
- (r) The arranging of metals in the decreasing order of their reactivity is called _____ series of metals.
- (s) Metals lose electrons and become positive ions. So they are called _____ elements
- (t) Non metals _____ electrons and become negative ions. So they are called electro negative elements
- (u) _____ are compounds formed by the transfer of electrons from a metal to a non metal.
- (v) If one of the metals in an alloy is mercury, it is called an _____
- (w) _____ is the damage caused to metals due to the reaction of metals with oxygen, moisture, carbon dioxide etc.
- (x) Some elements show properties of both metals and non metals. They are called _____
- (y) _____ is a mixture of concentrated nitric acid and concentrated hydrochloric acid in the ratio 1:3.

21. Name one electrovalent compounds in each case in which ;

- (i) One atom combines with one other atom
- (ii) One atom combines with two other atoms
- (iii) One atom combines with three other atoms

22. Give reasons for the following :

- (a) Aluminium foils are used to wrap food items.
- (b) Immersion rods for heating liquids are made up of metallic substances.
- (c) Copper cannot displace zinc from its salt solution.
- (d) Sodium and potassium are stored in kerosene.

23. Can you store lemon pickle in an aluminium utensil? Explain.

24. Write the electron dot structure for oxygen and magnesium.

25. Show the formation of Na_2O and CaO by the transfer of electrons.

26. Write an activity to show that ionic compounds are good conductors of electric current in their aqueous solution.
27. Why is aluminum extracted from alumina by electrolytic reduction and not by reducing with carbon?
28. Why is ZnO called an amphoteric oxide? Give the support to your answer. Give equation for the following
- (a) Iron is heated with steam.
 - (b) Magnesium reacts with water.
 - (c) iron reacts with dil.HCl
29. What would you observe when zinc is added to a solution of iron (II) sulphate? Write the chemical reaction that takes place.
30. A trivalent metal X is manufactured by the process of electrolysis, It is the most abundant metal in the earth's crust. Identify the metal and state its two uses.
31. Which gas is always produced when a metal reacts with a dilute acid? Write chemical reaction when iron reacts with dil. H_2SO_4 .
32. What is the activity series of metals? Rearrange the following metals in an increasing order of reactivity: Aluminum, Zinc, Mercury.
33. What is meant by the term 'enrichment of ore' ? name four Methods generally used for enrichment of ores.
34. You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.
35. Write a balanced chemical equation for the reaction of the following metals with water: (i) Ca (ii) Zn (iii) Fe
36. Define the terms: (i) Mineral (ii) Ore and (iii) Gangue
37. Explain how the following metals are obtained from their compounds by the reaction process:
- (i) Metal 'X' , which is low in reactivity series.
 - (ii) Metal 'Y' , which is middle in reactivity series.
 - (iii) Metal 'Z' which is high up in the reactivity series.
38. Give reasons:
- (a) The surface of some metals acquires a dull appearance when exposed to air for a long time.
 - (b) A salt which does not conduct electricity in the solid state becomes a good conductor in molten state
39. What will happen if a :
- (i) Strip of zinc is immersed in a solution of copper sulphate.

- (ii) Strip of copper is kept immersed in a solution of silver nitrate
40. Explain why: (i) Conc. HNO_3 can be stored in aluminium container.
- (ii) Aluminium is used for making transmission wires.
- (iii) 24 carat gold can not be used for making ornaments.
- (iv) Aluminium is used for making cooking utensils.
- (v) Metals generally do not form compounds with hydrogen.
41. An element X on reacting with O_2 forms X_2O . This Oxide dissolves in water and turns blue litmus paper red. Predict the nature of element whether it is a metal or a non metal.
42. An element E combines with O_2 to form an oxide E_2O , which is a good conductor of electricity. i) How many electrons will be present in the outer most shell of E? ii) Write the formula of the compound formed when it combines with Chlorine.
43. What happens when
- (a) Dilute sulphuric acid is poured on a copper plate?
- (b) Iron nails are placed in copper sulphate solution?
- Write word equations of the reactions involved.
44. Saloni took a piece of burning charcoal and collected the gas evolved in a test tube.
- (a) How will she find the nature of the gas ?
- (b) Write down word equations of all the reactions taking place in this process.
45. One day Reeta went to a jeweller's shop with her mother. Her mother gave old gold jewellery to the goldsmith to polish. Next day when they brought the jewellery back, they found that there was a slight loss in its weight. Can you suggest a reason for the loss in weight?
46. Name two soft metals which can be cut with a knife.
47. Which non-metal is essential for our life and all living beings inhale it during breathing?
48. Name two major non-metals which are present in fertilisers and enhance the growth of plants.
49. Which non-metal is used to disinfect water?
50. A purple coloured non-metal forms a brown solution in alcohol which is applied on wounds as an antiseptic. Name the nonmetal.
51. Zinc sulphate forms a colourless solution in water. Will you observe any colour on adding copper turning in it?
52. Why are bells made of metals?
53. Which liquid metal is used for making thermometers?
54. Which of the following metals can displace the other two metals from their salt solutions?
- zinc, iron, copper

55. Arun bought a statue made of copper. To her surprise it acquired a dull green coating after a couple of months. Explain the reason.
56. Find out the names of three metals and three non-metals from the box given below:

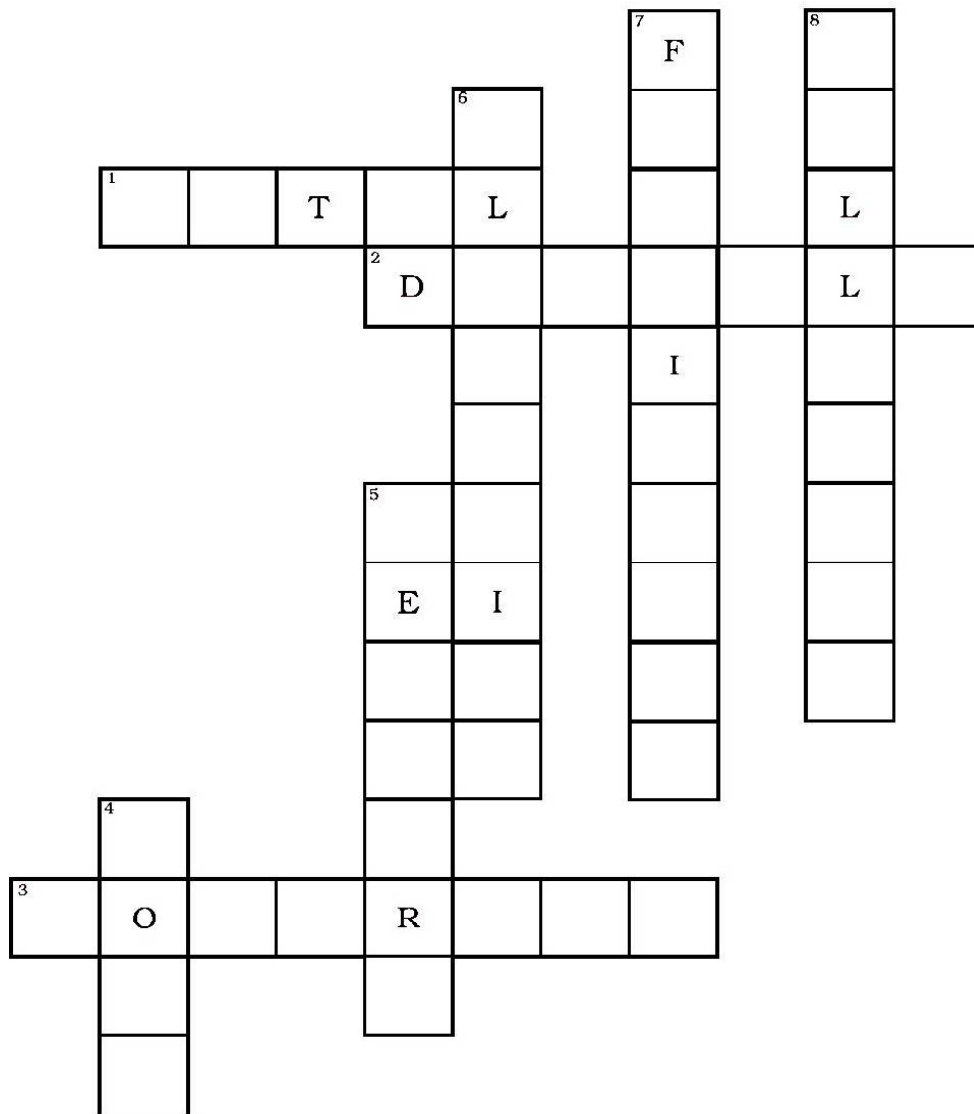
A	X	T	M	S	P	K	L	G
X	T	S	U	L	P	H	U	R
I	L	R	H	M	N	D	I	L
C	I	R	O	N	S	E	J	K
A	L	U	M	I	N	I	U	M
R	M	U	Q	T	R	S	T	U
B	N	P	C	O	P	P	E	R
O	X	Y	G	E	N	V	W	X
N	Y	Z	T	A	B	G	H	K

57. Fill in the blanks to complete the following paragraph.

- The name of the product formed in the reaction of sulphur and _____ is sulphur dioxide gas. When sulphur dioxide is _____, sulphurous acid is formed. The sulphurous acid turns _____ litmus paper to _____.
- Generally oxides of _____ are acidic in nature.

After completing the paragraph write two questions which you can raise on the basis of this information.

58. Arun prepared a blue coloured solution of copper sulphate in beaker A and placed an iron nail in it. Mahesh prepared a yellowish green solution of ferrous sulphate in beaker B and placed a copper wire in it. What changes will they observe in the two beakers after an hour?
59. Complete the crossword given in below with the help of the clues.



Across

1. Which is generally hard, ductile, malleable and sonorous.
2. A metal is called so it can be drawn into wires.
3. Metal bells are used because of this property.

Down

4. A metal generally used for making jewellery.
5. A metal which is liquid at room temperature.
6. A metal which reacts with acid as well as base to form hydrogen gas.
7. Substances used to enhance the growth of plants.
8. Property by virtue of which metals can be beaten into thin sheets.

60. A doctor prescribed a tablet to a patient suffering from iron deficiency. The tablet does not look like iron. Explain.

61. Iron is more reactive than copper. Can you write an activity to show this?
62. In the given figure you find that the bulb glows when an iron nail is placed between two ends of wire. Complete the following sentences on the bases of this fact.



- (a) _____ is a metal.
- (b) Metals are good _____ of electricity.
63. If in the above figure iron nail is replaced by a wooden stick, will the bulb glow or not?
Justify your answer.
64. Why is sodium kept preserved in kerosene?
65. What is the activity series of metals? Arrange the metals Zn, Mg, A;, Cu and Fe in decreasing order of reactivity.
-