Sharya Academy

Science Worksheet Class X
Metals and Non-Metals (Solved)

1. 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.

2. 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
Poor conductor of heat and electricity	Good conductor of heat and electricity
Neither malleable nor ductile	Malleable and ductile
$S + O_2 \rightarrow SO_2$ $SO_2 + H_2O \rightarrow H2SO_3$ (Sulphurous acid) Sulphur dioxide is acidic oxide.	$2Mg + O_2 \rightarrow 2MgO_2$ $MgO + H_2O \rightarrow Mg(OH)_2$ (Magnesium hydroxide) Magnesium oxide is basic in nature.

3. (a) An ore on treatment with dilute hydrochloric acid produces brisk effervesces. What type of ore is this? What steps will be required to obtain metal from the enriched ore. ,

(b) Copper coin is kept immersed in silver nitrate solution for some time. What change will take place in coin and colour of the solution? Write balanced chemical equation of the reaction involved.

Answer.

(a) Carbonate ore:

(i) Calcination: Carbonate ore is heated in limited supply of air and oxide is obtained, e.g.

$$ZnCO_3\ (s) \xrightarrow{\text{heat}} ZnO\ (s) + CO_2\ (g)$$

(*ii*) **Reduction with carbon:** Oxide ore is heated with carbon

$$ZnO\ (s) + C\ (s) \longrightarrow Zn\ (s) + CO\ (g)$$

(b) Copper, being more reactive than silver will displace silver from silver nitrate solution and there will be deposition of silver on copper coin. The colour of solution will turn to blue.

$$Cu\ (s) + 2AgNO_3\ (aq) \longrightarrow Cu(NO_3)_2\ (aq) + 2Ag\ (s)$$

4. (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.

5. 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 [$CuC0_3.Cu(0H)_2$].

6. 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.

7. 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.

8. 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.

9. (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) $\underset{2,8,8,2}{Ca} \longrightarrow \underset{2,8,8}{Ca^{2+}} + 2e^-$

$\underset{2,6}{O} + 2e^- \longrightarrow \underset{2,8}{O^{2-}}$

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

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

10. 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 [$CuCO_3.Cu(OH)_2$].

(iii) • It should be coated with tin

- It should be mixed with other metals to form alloys.

11. 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) $3Fe + 4H_2O\ (steam) \longrightarrow Fe_3O_4 + 4H_2$

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.

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

13. (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) $Na^{\times} \rightarrow \underset{Na^{\times} \rightarrow}{\overset{\cdot\cdot}{\underset{\cdot\cdot}{O}}:} \longrightarrow (Na^+)_2\ (\overset{\times}{\underset{\times}{O}})^{2-}$

(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.

14. (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) $Mg \overset{\times}{\underset{\times}{\rightarrow}} \overset{\cdot\cdot}{\underset{\cdot\cdot}{O}}: \longrightarrow (Mg)^{2+}\ (\overset{\times}{\underset{\times}{O}})^{2-}$

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.

15. .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.

16.

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

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

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

$(Mg^{2+})\ (:\ddot{\underset{\times}{Cl}}:^{-})_2$

(*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^-.

17. (a) Carbon cannot be used as reducing agent to obtain Mg from MgO. Why?

(b) How is sodium obtained from molten sodium chloride? Give equation of the reactions.

Answer.

(a) It is because 'Mg' is stronger reducing agent than carbon.

(b) Sodium is obtained from molten NaCl by electrolysis.

$$\underset{\text{(Molten)}}{2NaCl} \xrightarrow{\text{electrolysis}} 2Na(s) + Cl_2(g)$$

(*c*) Copper ore is concentrated by froth-floatation process.

Roasting: $2Cu_2S + 3O_2 \longrightarrow 2Cu_2O + 2SO_2$

Bassemerisation: Copper oxide reacts with Cu_2S on heating to form Blister copper and SO_2.

$$Cu_2S + 2Cu_2O \longrightarrow 6Cu + SO_2$$

Blister Copper is purified by electrolytic refining

18. 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.

(a) It is because 'Mg' is stronger reducing agent than carbon.

(b) Sodium is obtained from molten NaCl by electrolysis.

$$\underset{\text{(Molten)}}{2NaCl} \xrightarrow{\text{electrolysis}} 2Na(s) + Cl_2(g)$$

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19. Name two metals which are found in nature in the free state.

Answer. (i) Gold (ii) Silver

20. 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.

(iii) Aluminium forms oxide layer on its surface which does not further react with air.

21. 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.

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

22. Why does calcium float in water?

Answer. It is because hydrogen gas is formed which sticks to surface of calcium, therefore it floats

23. 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.

24. Name the metal which reacts with a very dilute HNOs to evolve hydrogen gas.

Answer. Magnesium

25. 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 substance.

(ii) a metal and a non-metal which exist as liquid at room temperature.

Answer:

(i) Sodium is soft metal and carbon (diamond) is hardest substance.

(ii)Mercury is liquid metal, bromine is liquid non-metal.