Materials Metals and Non-Metals

Very Short Answer Type Questions

Q.1. What is the general name of the elements whose properties are intermediate between those of metals and nonmetals?

Answer: The elements whose properties are intermediate between the properties of metals and nonmetals are called Metalloids. For example, Boron, Silicon and Germanium are metalloids. Heat and electricity can pass through metalloids but not as easily as in metals. Metalloids are also called semiconductors.

Q.2. Name one metals and one nonmetal which exist in liquid state at room temperature.

Answer: The metal which is liquid at room temperature is Mercury (Hg). Another metal called Gallium also exists as liquid at room temperature. Its melting point is very low and it changed into a liquid when touched.

The nonmetal which is liquid at room temperature is Bromine.

Q.3. Name the property;

(a) Which allows metals to be hammered into thin sheets.

(b) Which enables metals to be drawn into wires.

Answer: (a) The property of metals which allows metals to be hammered into thin sheets is called Malleability. Due this unique property, metals can be flattened into thin sheets by hammering and rolling.

(b) The property of metals which enables them to be drawn into wires is called Ductility. Due to this property metals can be stretched without breaking and drawn into thin wires. For example, Aluminum and copper are examples of highly ductile metals.

Q.4. Name two metals which are soft and can be easily cut with a knife.

Answer: The two metals which are soft and easily cut with a knife are Sodium and potassium. The freshly cut surface of these metals is shiny but it tarnishes quickly on contact with air. This is because these metals react with oxygen and water and becomes dull grey in colour.

Q.5. If a metal coin is dropped on hard floor, it produces a ringing sound. What is this property of metals known as?

Answer: The property of metals to produce sound is called Sonority. Metals produce ringing sound and are sonorous in nature.

Q.6. Name the property of iron metal due to which it can be hammered to make objects of different shapes such as an axe, a spade or a shovel.

Answer: The property by which iron metal can be hammered to make objects of different shapes such as axe, spade etc. is called Malleability. As a result of high malleability, iron can be flattened or beaten into thin sheets and desired objects can be made by using it.

Q.7. Name a non-metal which is very hard.

Answer: Diamond is the hardest non-metal. It is made of carbon atoms.

Q.8. Name a non-metal which is good conductor of electricity?

Answer: Carbon, in the form of Graphite is a good conductor of electricity. It conducts heat and electricity like a metal or a metalloid.

Q.9. State on chemical property which can be used to distinguish a metal from a non-metal.

Answer: The chemical property which can be used to distinguish between a metal and a nonmetal is the formation of positive ions by metals. Metals form positive ions whereas nonmetals form negative ions. As a result, oxides of metals are basic whereas the oxides of nonmetals are acidic in nature.

Q.10. How do metal oxides differ from non-metal oxides?

Answer: Metals react with oxygen to form metallic oxides. These metallic oxides are basic because they react with water to form bases. On the other hand, nonmetals react with oxygen to form nonmetallic oxides. These oxides differ from metallic oxides because they are acidic in nature. Nonmetallic oxides react with water to form acids.

Q.11. An element forms an oxide which is acidic in nature. State whether the element is a metal or a non-metal?

Answer: An element which forms oxide which is acidic in nature is a non-metal. This is because nonmetallic oxides react with water to form acids.

Q.12. An element forms an oxide which is basic in nature. State whether the element is a metal or a non- metal?

Answer: An element which forms oxide which is basic in nature is a metal. This is because metallic oxides are basic in nature and they react with water to form bases.

Q.13. Write a word equation for the reaction of magnesium with oxygen.

Answer: Metals react with oxygen in the air to produce metal oxides. For example, magnesium reacts with oxygen to produce magnesium oxide when it is heated in air:

Magnesium + oxygen → Magnesium oxide

It can also be written as:

$Mg + O_2 \rightarrow 2MgO$

Q.14. Iron metal reacts slowly with the oxygen and moisture of damp air to form rust. State whether the rust formed is acidic, basic or neutral.

Answer: Iron is metal. It reacts with oxygen to form rust. Rust is chemically known as iron oxide. Since, rust is a metal oxide, it will be basic in nature.

Q.15. Name the gas evolved when a metal reacts with water.

Answer: Metals react with water to produce hydrogen gas. For example, sodium reacts with water to form sodium hydroxide and hydrogen gas.

Q.16. Name the gas evolved when a metal reacts with a dilute acid.

Answer: Metals react with dilute acids to form metallic salts and hydrogen gas. For example, zinc reacts with dilute hydrochloric acid to form zinc chloride and hydrogen gas.

Q.17 A. Name one metal which reacts with dilute hydrochloric acid to produce hydrogen gas.

Answer: Sodium reacts vigorously with dilute hydrochloric acid because it is above hydrogen in the reactivity series of metals.

Q.17 B. Name one metal which does not react with dilute hydrochloric acid.

Answer: Copper does not react with dilute hydrochloric acid because it is below hydrogen in the reactivity series of metals.

Q.18. Which metal is more reactive: iron or zinc?

Answer: Zinc is more reactive than iron. Zinc is placed above iron in the reactivity series. For example, Zinc can displace iron from ferrous sulphate solution to form zinc sulphate and iron.

Q.19. Which metal is less reactive: copper or iron?

Answer: Copper is less reactive than iron. For example, if we put Iron nail into copper sulphate solution. Iron nail will displace copper from copper sulphate solution.

Q.20. Name any five objects used in our everyday life which are made of metals.

Answer:

Following are the objects in our daily life which are made of metals:

Utensils - The utensils we use daily are made from copper, aluminum and iron.

Jewellery - The jewellery is made from gold and silver.

Electric wires - These are made from copper and aluminum.

Mercury- It is used in thermometers.

Table salt- Sodium is used in making table salt.

Q.21. Name two metals which are used for making cooking utensils and water boilers for factories.

Answer: Copper, aluminium and iron are used for making cooking utensils. Iron is used for making water boilers in factories.

Q.22. Name two metals which are used for making electric wires.

Answer: Copper and aluminium are used for making electric wires due to their high ductility.

Q.23. Name the metal which is used in making thermometers.

Answer: Mercury is used for making thermometers. It is liquid at room temperature and is a very good conductor of heat. Even a slightest change in temperature can be noted by using mercury.

Q.24. Which metal is used to galvanize iron to protect it from rusting?

Answer: Zinc is used to galvanize iron to protect it from rusting. In this process, a thin layer of zinc is coated on the surface of iron. Zinc acts as a barrier against corrosion so that iron does not come in contact with water or moisture in the air.

Q.25. Name the metal which is used to make thin foils for packaging medicines, chocolates, and food items, etc.

Answer: Aluminum is used to make thin foils for packaging medicines, chocolates and food items. This is because it provides a complete barrier to light, oxygen, moisture and bacteria.

Q.26. Name two metals which are used to make jewellery.

Answer: Gold and silver are used to make jewellery. This is because these metals are attractive due to their luster and rarity. These metals do not tarnish or react with air.

Q.27. Where is iron present in our body?

Answer: Iron is a very important component of hemoglobin in our body. Hemoglobin is the substance in red blood cells that carries oxygen from our lungs and transports it throughout our body.

Q.28. Name the non-metal which is essential for maintaining life and inhaled during breathing.

Answer: Oxygen is the nonmetal which is essential for maintaining life and is inhaled during breathing. Oxygen is brought into our lungs via breathing. It is then transported by red blood cells to the entire body to be used to produce energy.

Q.29. Name one non-metal used for making fertilizers.

Answer: Phosphorus is used in making fertilizers.

Q.30. Which non-metal is used in water purification process to make drinking water supply germ-free?

Answer: Chlorine is used in water purification process to make drinking water supply germ-free. Chlorine kills pathogens such as bacteria and viruses by breaking the chemical bonds in their molecules.

Q.31. Name the non-metal used to make purple coloured solution which is applied on cuts and wounds as an antiseptic.

Answer: Iodine is used to make purple coloured solution which is applied on cuts and wounds as an antiseptic. It is used in the treatment and prevention of wound infection.

Q.32. Name two non-metals which are used in fireworks (crackers, etc.)

Answer: Sulphur and sodium are used in fire crackers. Fireworks contains metal salts and metal oxides which react to produce an array of colours.

Q.33. Which non-metals is used as a fuel?

Answer: Carbon is used as a fuel in the form of coke or charcoal.

Q.34. State whether the following statements are true or false?

(a) All metals exist in solid form at room temperature.

(b) Coal can be drawn into wires.

(c) Non-metals react with dilute acids to produce hydrogen gas.

(d) Sodium is a very reactive metal.

(e) Copper displaces zinc from zinc sulphate solution.

(f) Rust formed on iron objects is basic in nature.

(g) Non-metals react with water to form a gas which burns with a ‘pop’ sound.

Answer:

(a) False

The metal which is liquid at room temperature is Mercury (Hg). Another metal called Gallium also exists as liquid at room temperature.

(b) False

Coal is made up of carbon. Carbon is a nonmetal. It is non-malleable and non-ductile; hence, coal cannot be drawn into wires.

(c) False

Metals react with dilute acids to form metallic salts and hydrogen gas. For example, zinc reacts with dilute hydrochloric acid to form zinc chloride and hydrogen gas.

(d) True

Sodium is a very reactive metal. It can even react with the moisture in the air. The reaction of sodium with water is exothermic. It produces a lot of heat.

(e) False

Copper is less reactive than zinc. It is placed below zinc in the reactivity series of metals. Hence, copper cannot displace zinc from zinc sulphate solution.

(f) True

Rust is a chemically known as iron oxide. Metal oxides are basic in nature. Since, rust is a metal oxide, it will be basic in nature.

(g) False

Metals react with water to produce hydrogen gas. For example, sodium reacts with water to form sodium hydroxide and hydrogen gas.

Q. 35. Fill in the following blanks with suitable words:

(a) Metals are……. conductors of heat and……...

(b) Most non-metals are……. conductors of heat and electricity.

(c) Phosphorous is a very……. Non-metal.

(d) Metals react with acids to produce……... gas.

(e) Iron is more……. than copper.

(f) Metals form……...oxides whereas non-metals form……oxide.

(g) Sulphur forms……oxide whereas magnesium forms……...oxide.

(h) A non-metal is used to make an antiseptic solution called tincture……...

Answer:

(a) good; electricity

Metals are used to make wires because they are good conductors of electricity. Due to good conductors of heat, metals are used to make utensils.

(b) poor

Non- metals do not have free electrons; hence, they are non-conductors of heat and electricity.

(c) reactive

Phosphorus cannot be kept open in the air because it combines with oxygen so easily that it catches fire automatically. For safety, phosphorus is stored under water in chemical laboratories.

(d) hydrogen.

Metals react with dilute acids to form metallic salts and hydrogen gas. For example, zinc reacts with dilute hydrochloric acid to form zinc chloride and hydrogen gas.

(e) reactive

Iron is more reactive than copper. For example, if we put Iron nail into copper sulphate solution. Iron nail will displace copper from copper sulphate solution.

(f) basic; acidic

Metallic oxides are basic because they react with water to form bases. Nonmetals react with oxygen to form nonmetallic oxides which are acidic in nature because they react with water to form acids.

(g) acidic; basic

Metallic oxides are basic because they react with water to form bases. Nonmetals react with oxygen to form nonmetallic oxides which are acidic in nature because they react with water to form acids.

(h) iodine

Iodine is used to make purple coloured solution which is applied on cuts and wounds as an antiseptic. It is used in the treatment and prevention of wound infection.

Short Answer Type Questions

Q.36. State two physical properties on the basis of which metals can be distinguish from non-metals.

Answer: The two physical properties on the basis of which metals can be distinguished from non-metals are Malleability and Ductility.

The property of metals which allows metals to be hammered into thin sheets is called Malleability. Due this unique property, metals can be flattened into thin sheets by hammering and rolling.

The property of metals which enables them to be drawn into wires is called Ductility. Due to this property metals can be stretched without breaking and drawn into thin wires. For example, Aluminum and copper are examples of highly ductile metals.

Q.37. Name the gas produced when aluminum foil reacts with:

(a) dilute hydrochloric acid.

(b) Sodium Hydroxide solution.

Answer: When aluminum foil reacts with sodium hydroxide, sodium aluminate is formed. Metals react with dilute acids to form metallic salts and hydrogen gas. For example, Aluminum foil reacts with dilute hydrochloric acid to produce aluminum chloride and hydrogen gas.

The balanced chemical equation for the reaction is:

2Al(s) + 6HCl(aq) 2AlCl3(aq) + 3H2(g).

Aluminum is an amphoteric metal. It reacts with both acids and bases. The reaction is highly exothermic and produces a lot of heat. There is rapid evolution of hydrogen gas during this reaction.

Q.38. State any two physical properties for believing that aluminium is a metal.

Answer: Aluminium is highly malleable and ductile. Due to this property, aluminium is used in the production of utensils and wire. Aluminium is a good conductor of heat which makes it ideal for making utensils.

Q.39. Compare the properties of metals and nonmetals with respect to:

(i) malleability **(ii)** ductility and

(iii)conduction of heat and electricity

Answer: The property of metals which allows metals to be hammered into thin sheets is called Malleability. Due this unique property, metals can be flattened into thin sheets by hammering and rolling.

The property of metals which enables them to be drawn into wires is called Ductility. Due to this property metals can be stretched without breaking and drawn into thin wires. For example, Aluminium and copper are examples of highly ductile metals.

Metals have free electrons which makes them good conductors of heat and electricity. Non- metals do not have free electrons; hence, they are nonconductors of heat and electricity.

Properties	Metals	Nonmetals
Malleability	Metals are highly malleable.	Nonmetals do not have malleability.
Ductility	Metals are highly ductile.	Nonmetals do not have ductility.
Conduction of heat and electricity	Good conductors of heat and electricity.	Poor conductors of heat and electricity.

Q.40. Give reason why.

(a) Copper metals used for making electric wires.

(b) Graphite is used for making electrode in a cell.

(c) Immersion rods for heating liquids are made of metallic substances.

Answer: (a) Copper metal is used for making electric wires because it is highly ductile in nature. It is a good conductor of electricity.

The property of metals which enables them to be drawn into wires is called Ductility. Due to this property metals can be stretched without breaking and drawn into thin wires. Metals have free electrons which makes them good conductors of heat and electricity.

(b) Graphite is a good conductor of electricity. Graphite is made of carbon. Its valence electrons are free to move. As a result, graphite is able to conduct electricity which makes it useful for making electrode in a cell.

(c) Immersion rods for heating liquids are made of metallic substances because metallic substances are good conductors of electricity and heat. Metals have free electrons which makes them good conductors of heat and electricity.

Q.41. Define (a) malleability, and (b) ductility.

Answer:(a) Malleability: The property of metals which allows metals to be hammered into thin sheets is called Malleability. Due this unique property, metals can be flattened into thin sheets by hammering and rolling.

(b) Ductility: The property of metals which enables them to be drawn into wires is called Ductility. Due to this property metals can be stretched without breaking and drawn into thin wires.

Q.42. What is meant by saying that metals are:

(i) Malleable **(ii)** Ductile **(iii)** Lustrous and **(iv)** Sonorous

Answer: (i) The property of metals which allows metals to be hammered into thin sheets is called Malleability. Due this unique property, metals can be flattened into thin

sheets by hammering and rolling. For example, aluminium due to its high ductility, it can be changed into thin sheets to make aluminium foil.

(ii) The property of metals which enables them to be drawn into wires is called Ductility. Due to this property metals can be stretched without breaking and drawn into thin wires. For example, Copper metal is used for making electric wires because it is highly ductile in nature.

(iii) Metals have quality to reflect light. As a result, metals are lustrous in nature. It makes metals attractive due to their luster and rarity. Hence, metals like, gold and silver are used to make jewellery. These metals do not tarnish or react with air.

(iv) Metals are sonorous because they produce a unique sound when something hard strikes their surface. As a result, metals are used in making bells or gongs.

Q.43. There are two boxes, one made of metal and the other made of wood, which are similar in appearance. How will you find out which box is made of metal?

Answer: The box made of metal can be identified by striking hard on its surface. Metals are sonorous because they produce a unique sound when something hard strikes their surface. The box which is made of metal will produce a sound on striking its surface.

Q.44. Consider the following materials:

Copper, Sulphur, Phosphorus, Carbon (such as: pencil lead), Gold, Silver: Which of these materials are: Malleable and ductile; and brittle.

Answer: Copper, gold and silver are Malleable and ductile because these are metals. The property of metals which allows metals to be hammered into thin sheets is called Malleability. Due this unique property, metals can be flattened into thin sheets by hammering and rolling. The property of metals which enables them to be drawn into wires is called Ductility. Due to this property metals can be stretched without breaking and drawn into thin wires. All of these metals can be used to make wires and sheets.

Sulphur, phosphorous and carbon are brittle. These are nonmetals and cannot be rolled into wires or drawn into sheets.

Q.45. Can you hold a hot metallic pan which is without a plastic or a wooden handle? Give reason for your answer.

Answer: It is difficult to hold a metallic pan without a plastic or wooden handle. This is because it will result into burning of fingers or hand due to high heat. If the metallic pan has a wooden handle, it will help to hold it. Wood is made of nonmetal which is a poor conductor of heat. Hence, wooden handle is very useful in metallic pan.

Q.46. The screw driver used by an electrician has a plastic or wooden handle. Why?

Answer: Screwdriver is made of metal which is a good conductor of electricity. In order to prevent electric shocks by the screw driver its handle is made of wood. Wood is a poor conductor of electricity which protects from electric shocks and makes the screw driver safe from electric shocks.

Q.47. What is the nature (acidic/basic) of the following oxides?

(a) Magnesium oxide

(b) Sulphur dioxide

Given reason for your choice.

Answer: Magnesium is a metal. Metals react with oxygen to form metallic oxides. These Hence, Magnesium oxides are basic in nature. On the other hand, nonmetals react with oxygen to form nonmetallic oxides. These oxides differ from metallic oxides because they are acidic in nature. Nonmetallic oxides react with water to form acids. Therefore, Sulphur dioxide is acidic in nature. Magnesium oxide is basic in nature.

Q.48. What type of oxides are formed?

(a) when metals combine with oxygen?

(b) when non-metals combine with oxygen?

Answer: (a) Metals react with oxygen to form metallic oxides. These metallic oxides are basic because they react with water to form bases. For example, Magnesium is a metal and magnesium oxide are basic in nature.

(b) Nonmetals react with oxygen to form nonmetallic oxides. These oxides differ from metallic oxides because they are acidic in nature. Nonmetallic oxides react with water to form acids. For example, Sulphur is a nonmetal. Sulphur dioxide is acidic in nature.

Q.49. Element A is soft, brittle and does not conduct electricity. Element B is hard, malleable and 'ductile; and also conducts electricity. Which of the two elements, A or B, is a non-metal?

Answer: Element A is a nonmetal. Since, it is soft and brittle in nature.

Element B is a metal because it is malleable and ductile and it also conducts electricity. The property of metals which allows metals to be hammered into thin sheets is called Malleability. Due this unique property, metals can be flattened into thin sheets by hammering and rolling. The property of metals which enables them to be drawn into wires is called Ductility. Due to this property metals can be stretched without breaking and drawn into thin wires. All of these metals can be used to make wires and sheets.

Q.50. Consider the following elements:

Sodium, Sulphur, Carbon, Magnesium

Which of these elements will form?

(a) acidic oxides.

(b) Basic oxides.

Answer: (a) Carbon and Sulphur will form acidic oxides. Nonmetals react with oxygen to form nonmetallic oxides. These oxides differ from metallic oxides because they are acidic in nature. Nonmetallic oxides react with water to form acids. Therefore, oxides of sulphur and carbon i.e. sulphur dioxide and carbon dioxide are acidic in nature.

(b) Sodium and magnesium oxides will be basic in nature. Metals react with oxygen to form metallic oxides. These metallic oxides are basic because they react with water to form bases.

Q.51. What happens when a copper vessel is exposed to moist air for a long time?

Answer: When copper vessel is exposed to moist air for a long time it develops a green layer on its surface. Copper corrodes by oxidation in which it reacts with oxygen in the air to form copper oxide. Copper oxide then combines with carbon dioxide to make copper carbonate, which gives it a green colour. This process is called corrosion of copper.

The green material is a mixture of copper hydroxide ($Cu(OH)_2$) and copper carbonate ($CuCO_3$). The following is the reaction

$$\mathbf{2Cu+H_2O+CO_2+O_2 \rightarrow Cu(OH)_2 + CuCO_3}$$

moist air

Q.52. When a copper object is exposed to moist air for a long t e, then a green coating is formed on its surface.

(a) What is the material of the green coating?

(b) State whether the green coating is acidic or basic.

Answer: (a) When copper vessel is exposed to moist air for a long time it develops a green layer on its surface. Copper corrodes by oxidation in which it reacts with oxygen in the air to form copper oxide. Copper oxide then combines with carbon dioxide to make copper carbonate, which gives it a green colour. This process is called corrosion of copper. The green material is a mixture of copper hydroxide ($Cu(OH)_2$) and copper carbonate ($CuCO_3$). The following is the reaction

$$2Cu+H_2O+CO_2+O_2 \rightarrow Cu(OH)_2 + CuCO_3$$

moist air

(b) The green coating will be basic in nature. Green coating is made of copper oxide which is an oxide of metal. Metals react with oxygen to form metallic oxides. These metallic oxides are basic because they react with water to form bases.

Q.53. Sodium metal reacts vigorously with water.

(a) Name the gas evolved when sodium reacts with water.

(b) State whether the solution formed by the reaction of sodium with water is acidic or basic.

Answer: (a) Metals react with water to produce hydrogen gas. Sodium reacts with water to form sodium hydroxide and hydrogen gas. Sodium is a highly reactive metal. It even reacts with the moisture present in air. The reaction of sodium with water is highly exothermic in nature. It produces a lot of heat energy and this heat energy can cause the hydrogen gas produced during the reaction, to catch fire. In order to keep it safe, sodium metal is stored in kerosene.

(b) Metals reacts with water to form metal hydroxides and hydrogen gas. These metallic hydroxides are basic. Sodium reacts with water to form sodium hydroxide and hydrogen gas. Sodium hydroxide is basic in nature.

Q.54. How do metals react with dilute acids? Explain with the help of an example.

Answer: Metals react with dilute acids to form metallic salts and hydrogen gas. For example, Aluminium foil reacts with dilute hydrochloric acid to produce aluminum chloride and hydrogen gas.

The balanced chemical equation for the reaction is:

$2Al(s) + 6HCl(aq)\ 2AlCl_3(aq) + 3H_2(g)$.

Q.55. What would you observe when a strip of zinc is placed in copper sulphate solution? Write a word equation of the reaction which takes place.

Answer: When a strip of zinc is placed in copper sulphate solution it will displace copper from copper sulphate solution. Zinc is placed above copper in reactivity series of metal. Hence, it will be able to replace copper from copper sulphate solution.

Zinc + Copper Sulphate → Copper + Zinc sulphate

Q.56. Can copper displace iron from iron sulphate solution? Give reason for your answer.

Answer: Copper cannot displace iron from iron sulphate solution. Copper is less reactive than iron. Iron is placed above the copper in reactivity series of metals. Therefore, copper cannot displace iron from iron sulphate solution. But if we put Iron nail into copper sulphate solution. Iron nail will displace copper from copper sulphate solution.

Q.57 A. Name one metal which can displace iron from iron sulphate solution.

Answer: Zinc is placed above iron in the reactivity series of metals. Hence, zinc will be able to displace iron for iron sulphate solution.

Q.57 B. Name one metal which cannot displace iron from iron sulphate solution.

Answer: Copper cannot displace iron from iron sulphate solution. Copper is less reactive than iron. Iron is placed above the copper in reactivity series of metals. Therefore, copper cannot displace iron from iron sulphate solution.

Q.58. Can you store lemon pickle in an aluminium utensil? Explain.

Answer: Lemon pickle is acidic in nature. Aluminium metal is highly reactive in nature. If the pickle is stored in an aluminium container, the acid present in pickle will react with aluminium and the pickle will be spoiled.

Hence, we cannot store lemon pickle in aluminium container.

Q.59. Why should the foodstuffs like orange juice, pickles, chutney and curd not be kept in iron or aluminium containers?

Answer: Food stuff like orange juice, pickles, chutney and curd are acidic in nature. Iron and aluminium are highly reactive metals. If any of this stuff is stored in iron or aluminium container the acid inside these food stuffs will react with iron or aluminium to produce toxins. Hence, we cannot store foodstuffs like orange juice, pickles, chutney and curd not be kept in iron or aluminium containers.

Q.60. Give reasons for the following:

(a) Sodium and potassium are stored in kerosene.

(b) Copper cannot displace zinc from its salt solution (zinc sulphate solution).

Answer: (a) Metals react with water to produce hydrogen gas. Sodium reacts with water to form sodium hydroxide and hydrogen gas. Similarly, potassium also reacts with water to potassium hydroxide and hydrogen gas. Both Sodium and potassium are highly reactive metals. They can even react with the moisture present in air. The reaction of sodium and potassium with water is highly exothermic in nature. It produces a lot of heat energy and this heat energy can cause the hydrogen gas produced during the reaction, to catch fire. In order to keep it safe, sodium and potassium are stored in kerosene.

(b) Copper cannot displace zinc from zinc sulphate solution. Zinc is placed above copper in reactivity series of metal. Hence, it will be able to replace copper from copper sulphate solution.

Zinc + Copper Sulphate → Copper + Zinc sulphate

Q.61 A. Why are metals used for making bells?

Answer: Metals are sonorous because they produce a unique sound when something hard strikes their surface. As a result, metals are used in making bells or gongs.

Q.61 B. Why is phosphorus kept under water?

Answer: Metals react with water to produce hydrogen gas. Phosphorus cannot be kept open in the air because it combines with oxygen so easily that it catches fire automatically. For safety, phosphorus is stored under water in chemical laboratories.

Q.62. Which of the following can be beaten into thin sheets? Why?

(a) Zinc

(b) Phosphorus

(c) Sulphur

(d) Oxygen

Answer: The correct answer is **(a).**

Zinc is metal and it can be beaten into thin sheets. The property of metals which allows metals to be hammered into thin sheets is called Malleability.

Q.63. Match the substances given in column A with their uses given in column B:

Column A	Column B
(i) Gold	**(a)** Thermometers
(ii) Iron	**(b)** Electric wires
(iii) Aluminium	**(c)** Wrapping food
(iv) Carbon	**(d)** Jewellery
(v) Copper	**(e)** Machinery
(vi) Mercury	**(f)** Fuel

Answer:

(i) Gold - (d) Jewellery

Gold is used to make jewellery. This is because these metals are attractive due to their luster and rarity. These metals do not tarnish or react with air.

(ii) Iron - (e) Machinery

Iron is a very strong metal. It is highly malleable and ductile and hence, can be changed into desired shapes.

(iii) Aluminium - (c) Wrapping food

Aluminium is used to make thin foils for packaging medicines, chocolates and food items. This is because it provides a complete barrier to light, oxygen, moisture and bacteria.

(iv) Carbon - (f) Fuel

Carbon can be used as a fuel in the form of coke and charcoal.

(v) Copper - (b) Electric wires

The property of metals which enables them to be drawn into wires is called Ductility. Due to this property metals can be stretched without breaking and drawn into thin wires. For example, Aluminium and copper are examples of highly ductile metals.

(vi) Mercury - (a) Thermometers

Mercury is used for making thermometers. It is liquid at room temperature and is a very good conductor of heat. Even a slightest change in temperature can be noted by using mercury.

Q.64. Give one use each of the following metals:

(a) Iron **(b)** Copper **(c)** Aluminium **(d)** Zinc **(e)** Mercury

Answer:

(a) Iron is used for making machinery and heavy equipment.

(b) The copper is used in making electric wires because it is a good conductor of electricity.

(c) Aluminium is used to make thin foils for packaging medicines, chocolates and food items. This is because it provides a complete barrier to light, oxygen, moisture and bacteria.

(d) Zinc is widely used in the manufacture of many products such as paints, rubber, cosmetics, pharmaceuticals, plastics, inks, soaps, batteries, textiles and electrical equipment.

(e) Mercury is used for making thermometers. It is liquid at room temperature and is a very good conductor of heat. Even a slightest change in temperature can be noted by using mercury.

Q.65. State one use each of the following non-metals:

(a) Oxygen **(b)** Nitrogen **(c)** Sulphur **(d)** Chlorine **(e)** Iodine

Answer:

(a) Oxygen is the nonmetal which is essential for maintaining life and is inhaled during breathing. Oxygen is brought into our lungs via breathing. It is then transported by red blood cells to the entire body to be used to produce energy.

(b) It can be used to replace air which helps to reduce or eliminate oxidation of materials. It is also used to make fertilizers and explosives.

(c) It is used for making fire crackers.

(d) Chlorine is used in water purification process to make drinking water supply germ-free. Chlorine kills pathogens such as bacteria and viruses by breaking the chemical bonds in their molecules.

(e) Iodine is used to make purple colored solution which is applied on cuts and wounds as an antiseptic. It is used in the treatment and prevention of wound infection.

Long Answer Type Questions

Q.66 A. What are metals? Name five metals.

Answer: Metals are the elements which lose electrons to form cations and are electropositive in nature. For example, Sodium, potassium, Iron, Zinc and Calcium are metals. Metals are good conductors of heat and electricity. Metals are highly malleable and ductile. The property of metals which allows metals to be hammered into thin sheets is called Malleability. Due this unique property, metals can be flattened into thin sheets by hammering and rolling. The property by which iron metal can be hammered to make objects of different shapes such as axe, spade etc. is called Malleability. As a result of high malleability, iron can be flattened or beaten into thin sheets and desired objects can be made by using it. Sodium, Potassium, Copper, Aluminium, Mercury and sodium are metals.

Q.66 B. What are non-metals? Name five non-metals.

Answer: Nonmetals are the elements that gain electrons and form negative ions. They are also called electronegative elements. For example, chlorine, Sulphur, oxygen, bromine, phosphorus and nitrogen are nonmetals. Nonmetals are not malleable and ductile but they are brittle. Nonmetals are bad conductors of heat and electricity. They have low melting and boiling points and are soft. Sulphur, Oxygen, Nitrogen, Fluorine and Chlorine are nonmetals.

Q.67 A. What are metalloids? Name two metalloids.

Answer: The elements whose properties are intermediate between the properties of metals and nonmetals are called Metalloids. For example, Boron, Silicon and Germanium are metalloids. Heat and electricity can pass through metalloids but not as easily as in metals. Metalloids are also called semiconductors.

Q. 67 B. Classify the following elements into metals, nonmetals and metalloids:

Copper, Sulphur, Aluminium, Oxygen, Silicon, Nitrogen, Germanium, Mercury, Chlorine, Sodium.

Answer: Metals: Metals are the elements which lose electrons to form cations and are electropositive in nature. For example, Sodium, potassium, Iron, Zinc and Calcium are metals. Metals are good conductors of heat and electricity. Metals are highly malleable and ductile.

Copper, Aluminium, Mercury and sodium are metals.

Nonmetals: Nonmetals are the elements that gain electrons and form negative ions. They are also called electronegative elements. For example, chlorine, sulphur, oxygen, bromine, phosphorus and nitrogen are nonmetals. Nonmetals are not malleable and ductile but they are brittle. Nonmetals are bad conductors of heat and electricity. They have low melting and boiling points and are soft.

Sulphur, Oxygen, Nitrogen and Chlorine are nonmetals.

Metalloids: The elements whose properties are intermediate between the properties of metals and nonmetals are called Metalloids. For example, Boron, Silicon and Germanium are metalloids. Heat and electricity can pass through metalloids but not as easily as in metals. Metalloids are also called semiconductors.

Silicon and Germanium are metalloids.

Q.68 A. What happens when sulphur dioxide is dissolved in water? Write a word equation for the reaction which takes place.

Answer: When sulphur dioxide is dissolved in water, then it forms sulphurous acid (H_2SO_3).

Explanation: Metals react with oxygen to form metallic oxides. These metallic oxides are basic in nature because they react with water to form bases. On the other hand, non-metals react with oxygen to form non-metallic oxides and these oxides differ from metallic oxides because they are acidic in nature. Also, non-metallic oxides react with water to form acids.

Sulphur is non-metal, and Sulphur dioxide (SO_2) is acidic in nature. Thus, it reacts with water to form sulphurous acid (H_2SO_3 or $H_2O.SO_2$)

The chemical reaction is: $SO_2 + H_2O \rightarrow H_2SO_3$

Q.68 B. What happens when an iron nail is placed in copper sulphate solution? Write word equation of the reaction involved.

Answer: If we put Iron nail into copper sulphate solution, the iron nail will displace copper from copper sulphate solution. The following changes will be observed:

i) The colour of copper sulphate changes from blue to green after putting iron nails in it.

ii) Reddish brown colour is deposited on the iron nails. This reddish brown colour is of copper.

Because (Fe) is more reactive than copper (Cu) and is placed above copper in reactivity series of metals, thus and it changes into iron sulphate and copper.

The chemical reaction is given below: Fe (Iron) + $CuSO_4$ (Copper Sulphate) → $FeSO_4$ (Iron Sulphate) + Cu (Copper)

Q.69 A. State five characteristics of metals and five characteristics of nonmetals.

Answer: Metals are the elements which lose electrons to form cations and are electropositive in nature. For example, Sodium, potassium, Iron, Zinc and Calcium are metals. Following are characteristics of metals:

1. Metals are good conductors of heat and electricity.

2. Metals are highly malleable and ductile.

3. They have very high melting and boiling points.

4. Metal oxides are basic in nature.

5. Metals displace hydrogen from dilute acids.

Nonmetals: Nonmetals are the elements that gain electrons and form negative ions. They are also called electronegative elements. For example, chlorine, sulphur, oxygen, bromine, phosphorus and nitrogen are nonmetals. Following are the characteristics of nonmetals:

1. Nonmetals are not malleable and ductile but they are brittle.

2. They are bad conductors of heat and electricity.

3. They have low melting and boiling points and are soft.

4. They form acidic or neutral oxides when they react with oxygen.

5. Nonmetals do not displace hydrogen with dilute acids.

Q.69 B. State five uses of metals and five uses of non-metals.

Answer: The five uses of metals are given below:

1) Used for making machinery and heavy equipment. Ex-Iron.

2) Used in making electric wires because it is a good conductor of electricity. Ex- copper

3) Used to make thin foils for packaging medicines, chocolate, and food items. This is because it provides a complete barrier to light, oxygen, moisture, and bacteria.

4) Used in the manufacture of many products such as paints, rubber, cosmetics, pharmaceuticals, plastics, inks, soaps, batteries, textiles and electrical equipment.

5) Mercury is a liquid metal and is used for making thermometers. It is liquid at room temperature and is a very good conductor of heat.

The five uses of non-metals are given below:

1) Used for making fire crackers.

2) Oxygen is an essential non-metal for life. It helps in maintaining life and is inhaled during breathing.

3) Chlorine is used in water purification process to make drinking water supply germ-free. Chlorine kills pathogens such as bacteria and viruses by breaking the chemical bonds in their molecules.

4) Iodine is a non-metal. It is used to make purple coloured solution which is applied on cuts and wounds as an antiseptic.

5) Nitrogen is also a non-metal is used to make fertilizers and explosives.

Q.70. Compare the Chemical Properties of Metals and Non- metals in tabular form.

Answer: Metals are the elements which lose electrons to form cations and are electropositive in nature. For example, Sodium, potassium, Iron, Zinc and Calcium are metals. Metals are good conductors of heat and electricity. Metals are highly malleable and ductile.

Nonmetals are the elements that gain electrons and form negative ions. They are also called electronegative elements. For example, chlorine, sulphur, oxygen, bromine, phosphorus and nitrogen are nonmetals. Nonmetals are not malleable and ductile but they are brittle. Nonmetals are bad conductors of heat and electricity. They have low melting and boiling points and are soft. Following are the difference in chemical properties between metals and nonmetals.

Nonmetals	**Metals**
1. Nonmetals form acidic or neutral oxides when they react with oxygen.	1. Metals react with oxygen to form metal oxides which are basic in nature
2. Nonmetals do not displace hydrogen with dilute acids	2. Metals displace hydrogen from dilute acids
3. Nonmetals do not react with water and steam.	3. Metals react with water and steam.
4. Nonmetals form negative ions.	4. Metals form positive ions.

Multiple Choice Questions (MCQs)

Q.71. An element is soft and can be cut easily with a knife. It is very reactive and cannot be kept open in the air. It reacts vigorously with water. This element is most likely to be:

Answer: Potassium reacts with water to potassium hydroxide and hydrogen gas. The reaction potassium with water is highly exothermic in nature. It produces a lot of heat energy and this heat energy can cause the hydrogen gas produced during the reaction, to catch fire. In order to keep it safe potassium is stored in kerosene.

Q.72. Which one of the following four metals would be displaced from the solution of its salt by the other three metals?

Answer: Silver is less reactive than zinc, copper and magnesium. It is below all these metals in the reactivity series of metals.

Q.73. Sulphur element is said to be:

Answer: Sulphur is a nonmetal. It cannot be drawn into wires or changed into sheets. It is very soft and hence, is brittle in nature.

Q.74. An element Z reacts with water to form a solution which turns phenolphthalein indicator pink. The element X is most likely to be:

Answer: Phenolphthalein is an indicator used in acid-base titrations. It turns colorless in acidic solutions and pink in basic solutions. Sodium is a metal which reacts with water to form sodium hydroxide, which is a base. Hence, phenolphthalein turns the solution pink.

Q.75. The non-metal which exists in the liquid state at room temperature is:

Answer: Bromine is the nonmetal which is a red-brown liquid at room temperature. It evaporates readily to form a similarly coloured gas.

Q.76. A basic oxide will be formed by the element:

Answer: Potassium is a metal. Metallic oxides are basic in nature.

Q.77. “Is malleable and ductile”. This best describes:

Answer: The property of metals which allows metals to be hammered into thin sheets is called Malleability. Due this unique property, metals can be flattened into thin sheets by hammering and rolling.

Q.78. The metal which will not produce hydrogen gas on reacting with dilute sulphuric acid is:

Answer: Silver is least reactive will not produce hydrogen gas with sulphuric acid.

Q.79. The element which is stored under kerosene is:

Answer: Sodium is stored in kerosene because it is highly reactive and it even reacts with moisture from air and catches fire.

Q.80. Which of the following pairs cannot undergo displacement reaction?

Answer: Zinc sulphate solution and calcium cannot undergo displacement reaction.

This is because zinc is more reactive than iron. Hence, iron cannot displace zinc from zinc sulphate solution.

Q.81. Which of the following metal exists in the liquid state at room temperature?

Answer: Mercury is used for making thermometers. It is liquid at room temperature and is a very good conductor of heat.

Q.82. The element Z burns in air to form an oxide. The aqueous solution of this oxide turns blue litmus to red. The element Z is most likely to be:

Answer: Carbon is a nonmetal. Nonmetals form oxides which are acidic in nature. Oxide of carbon is acidic and hence, its aqueous solution will turn blue litmus to red.

Q.83. Which of the following element is a metalloid?

Answer: Silicon is a metalloid. The elements whose properties are intermediate between the properties of metals and nonmetals are called Metalloids.

Q.84. Which of the following elements will produce an oxide that will dissolve in water to form an acid?

Answer: Carbon is a nonmetal. Nonmetals form oxides which are acidic in nature. Oxide of carbon is acidic.

Q.85. The least reactive metal among the following is:

Answer: Silver is least reactive and is placed below all these metals in reactivity series of metals.

Q.86. You are given a solution of iron sulphate. Which of the following do you think cannot displace iron from iron sulphate?

Answer: Copper cannot displace iron from iron sulphate solution because copper is less reactive than iron.

Q.87. When a vessel is exposed to moist air for a long time, then a green coating is formed on its surface. The vessel must be made of:

Answer: Copper corrodes by oxidation in which it reacts with oxygen in the air to form copper oxide. Copper oxide then combines with carbon dioxide to make copper carbonate, which gives it a green colour. This process is called corrosion of copper.

Q.88. Which among the following is the most reactive metal?

Answer: Calcium is the most reactive metal than copper, iron and magnesium. It lies above all of these metals in reactivity series.

Q.89. The element whose oxide will turn red litmus solution to blue will be:

Answer: Metals react with oxygen to form metallic oxides. These metallic oxides are basic because they react with water to form bases. Sodium is a metal; its oxide will be basic in nature and it will turn red litmus solution to blue.

Q.90. Which of the following is not a characteristic property of iron?

Answer: Brittleness is not a characteristic property of Iron because it is a metal. Malleability, ductility, and sonorousness are the properties of metals.

Questions Based on High Order Thinking Skills (HOTS)

Q.91. Which of the following reactions will not occur? Why not?

(a) Zinc sulphate + Copper → Copper Sulphate + zinc

(b) Copper Sulphate + Iron → iron Sulphate + copper

Answer:

(a) This reaction will not occur. Zinc is more reactive than copper. Copper will not be able to replace zinc from zinc sulphate solution. A more reactive metal can replace a less reactive metal, but a less reactive one cannot replace a more reactive metal. On the other hand, if we take copper sulphate solution and zinc, then zinc will be able to replace copper from copper sulphate solution. Hence, the above reaction will not take place.

(b) A more reactive metal can replace a less reactive metal, but a less reactive one cannot replace a more reactive metal. This reaction will take place. In this case, Iron is more reactive than copper. In a solution of copper sulphate, iron will react and will be able to displace copper from its solution. In this reaction, iron will change into iron sulphate and copper metal will be produced.

Q.92. One day Reeta went to a jeweller's shop with her mother. Her mother gave an old gold jewellery to 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?

Answer: When gold jewellery is sent for polishing, it loses weight. While polishing, the outer thin layer of gold which is dull is removed by treatment with a chemical. The chemical treatment of this layer causes a reduction in weight of gold ornaments. This leads to a slight loss in the weight of jewellery.

Q.93. An element burns in air to form an oxide. The aqueous solution of this oxide turns blue litmus paper red. State whether the element is a metal or nonmetal. Name one such element.

Answer: The aqueous solution of the oxide turns blue litmus paper red. This means the aqueous solution is acidic in nature. Metals react with oxygen to form metallic oxides. These metallic oxides are basic because they react with water to form bases. On the other hand, nonmetals react with oxygen to form nonmetallic oxides. These oxides are different from metallic oxides because they are acidic in nature. Nonmetallic oxides react with water to form acids. Since, the aqueous solution of this oxide is acidic in nature, the element is a nonmetal. For example, Sulphur is a nonmetal. It will form an oxide called sulphur dioxide which is acidic in nature.

Q.94. An element burns in air to form an oxide. The aqueous solution of this oxide turns turmeric paper red. State whether the element is a metal or nonmetal. Name one such element.

Answer: Turmeric is used as a natural indicator. Turmeric is yellow in colour. Turmeric paper turns into red when it is dipped into basic solution. Turmeric paper does not change its colour with acid. The aqueous solution of this oxide turns turmeric paper red. It indicates that the oxide is basic in nature. Metals react with oxygen to form metallic oxides. These metallic oxides are basic because they react with water to form bases. On the other hand, nonmetals react with oxygen to form nonmetallic oxides. These oxides are different from metallic oxides because they are acidic in nature. Nonmetallic oxides react with water to form acids. Hence, the element is a metal. For example, magnesium is a metal, it reacts with oxygen to magnesium oxide, which is basic in nature.

Q.95. The metal X reacts with dilute hydrochloric acid to form a gas Y. The metal X also reacts with sodium hydroxide solution (on heating) to form the same gas Y. When a lighted matchstick is applied, this gas burns by producing a 'pop' sound.

(a) name two metals which could behave like X

(b) Name the gas Y

Answer: (a) The 'pop' sound indicates the presence of hydrogen gas. Metals react with dilute acids to form metallic salts and hydrogen gas. Some metals react with bases to produce hydrogen gas. Generally, non-metals do not react with acids. For example, Aluminium reacts with dilute hydrochloric acid to form Aluminium chloride and hydrogen gas. The balanced chemical equation for the reaction is:

$2Al(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq) + 3H_2(g)$.

Aluminium is an amphoteric metal. It reacts with both acids and bases. The reaction is highly exothermic and produces a lot of heat. There is rapid evolution of hydrogen gas

during this reaction. Aluminium metal reacts with a base called sodium hydroxide to produce sodium aluminate and hydrogen gas.

(b) The name of the gas is hydrogen.