Metals and Non-metals

Points to Remember :

1. Knowledge of chemistry plays a vital role in the development of human society and civilization.
2. Metals are known to man from ancient times. Metals are used to make our life comfortable.
3. Non-metals form another class of elements, e.g. hydrogen, oxygen, carbon, etc. They are used for various purposes.
4. Alloys are homogeneous solid mixtures containing two or more metals e.g. steel, brass, bronze.
5. Common salt, hydrocloric acid, carbohydrates, fats, proteins, vitamins, occur naturally and can also be prepared artificially.
6. Fertilizers are artificially prepared substances, which are necessary for the proper growth of crops.
7. There are a number of man-made materials that are used in our daily life for various purposes, e.g., cement, plaster of pairs, plastics.
8. Medicines are used to cure diseases.
9. Solution is a homogenous mixture of solute and solvent.
10. Soda water is prepared by dissolving carbon dioxide in water under high pressure.
11. Syrup is a highly concentrated sugar solutions. It contains a specific flaviour.

EXERCISE

1. Name a metal

1. that is most malleable : **Pure gold**
2. that is brittle : **Zinc**
3. as precious as gold : **Platinum**
4. that can be cut with knife : **Sodium**
5. used in making electric cables : **Copper**
6. used as a thermometric liquid : **Mercury**
7. that is the best conductor of electricity : **Silver**

2. Name a non-metal that is :

1. a good conductor of heat and electricity : **Graphite (Carbon)**
2. hardest naturally occurring substance : **Diamond (Carbon)**
3. used to kill germs in water : **Chlorine**
4. lustrous : **Iodine**
5. used for filling into electric bulbs : **Argon**
6. used for cancer therapy : **Radon**
7. liquid at room temperature : **Bromine**

3. Mention two uses of the following metals and non-metals

(a) Iron :
It is used to make pipes, tanks, railing, etc.
It is used in the construction of power transmission towers.

(b) Aluminium :
It is used to make electric wires.
It is used to make utensils, cans, window fram'es, etc.

(c) Gold :
It is used for making ornaments and coins.
It is used in the manufacture of electronic devices like computers, telephones, home appliances, etc.

(d) Oxygen :
It is used by all living beings for breathing.
It is important for combustion.

(e) Iodine :
It is used in photographic films in the form of potassium iodide.
It is added to salt to make it iodized salt which is necessary for the growth of human body.

4. Give reasons :

(a) Magnesium is used in fire works.
Ans : Magnesium is used in fire works because it bums with a dazzling light.

(b) Aluminium is used in making aircrafts.
Ans : Aluminium is used in making aircrafts because it is light and strong. It is mixed with other metals to make it stronger.

(c) Copper is used in making electric cables.
Ans : Copper is ductile and a very good conductor of heat and electricity. This is the reason that copper is used in making electric cables.

(d) Graphite is used in the leads of pencils
Ans : Graphite turns paper black that is why it is used in the leads of pencils.

(e) Impure diamond is used to cut glass
Ans : Impure diamond is used to cut glass becuase it is the hardest substance and can easily exert force required for cutting.

(f) Gold is mixed with copper and nickel.
Ans : Pure gold is a very soft metal. It cannot be moulded into ornaments so it is mixed with copper and nickel so that it becomes harder and bit cheaper also.

(g) Tungsten is used in electric bulbs.
Ans : It is a shiny grey metal, in solid state at room temperature. It can withstand high temperature because it has highest melting point among metals. Hence, it is used in electric bulbs.

5. Name the metals present in the following alloys

1. **Brass—** Copper and zinc
2. **Bronze—** Copper and tin
3. **Duralumin—** Aluminium and copper
4. **Stainless steel—** Iron, chromium, nickel

6. Give four differences between metals and non-metals with reference to their
(a) Melting point and boiling point,
(b) Conductivity of heat and electricity,
(c) Malleability
(d) Solubility

Metals		Non-metals
Melting point and boiling point	Metals have both high high melting point and boiling point.	Non-metals have both low melting and low boiling point.
Conductivity of heat and electricity	They are good conductors of heat and electricity.	Nofi-metals are bad conductors of heat and electricity.
Malleabi lity	Metals are ususally malleable.	All non-metal are non- malleable.
Solubility	Metals are generally insoluble in water and other organic solvents.	They are both soluble and insoluble

7. What are metalloids?
Ans : Metalloids are the elements which show some properties of metals and some properties of non-metals. They all are solids. They are silicon, boron, arsenic, antimony, germanium, tellurium and polonium.

8. Give two uses of

(a) Silicon :

- Highly pure silicon is used in making microchips for computers, transistors, solar cells, rectifiers and other solid state devices that are used extensively in the electronic and present space age industries.
- It is used in the manufacture of a waterproof material called “silicone”. Silicone is used to make bags, umbrellas, raincoats, etc.
- It is an important substance present in steel, an alloy of carbon.

(b) Antimony :

- Antimony is used in electric industry to make semiconductor devices.
- It is alloyed with lead to improve its hardness and strength and is used in batteries.
- It is also used in printing presses as type metal.

(c) Tungsten :

- It is used in making electrodes.
- It is used in heating elements.
- It is used as filaments in electric bulbs and cathode ray tubes.

(d) Germanium:

- Germanium is used as a semiconductor.
- It is used as a transistor in many electronic applications when mixed with arsenic, gallium, antiomony, etc.
- Germanium is also used to form alloys and as a phosphor in fluorescent lamps

OBJECTIVE TYPE QUESTIONS

1. Fill in the blanks :

(a) The most ductile metal is **silver.**
(b) A metal stored in kerosene oil is **sodium.**
(c) Tungsten metal is a poor conductor of **heat.**
(d) **Pure gold** is a soft metal.
(e) **Silicon carbide** is the hardest compound known to us.
(f) A non-metal used to purify water is **phosphorus**.
(g) A metal that gives dazzling effect to crackers when they explode is **magnesium.**
(h) A chemical compound that makes up the striking heads of match sticks is **sulphur**.

2. Match the following :

	Column A		**Column B**
(a)	**Helium**	**(1)**	**Electric bulb**
(b)	**Neon**	**(2)**	**Thermometer**
(c)	**Argon**	**(3)**	**Semiconductor**
(d)	**Germanium**	**(4)**	**Weather balloons**
(e)	**Mercury**	**(5)**	**Advertising signboards**

	Column A		**Column B**
(a)	Helium	(4)	Weather balloons
(b)	Neon	(5)	Advertising signboards
(c)	Argon	(1)	Electric bulb
(d)	Germanium	(3)	Semiconductor
(e)	Mercury	(2)	Thermometer

3. Write 'true' or 'false' for the following statements :
(a) Silver is used to make electric cables : **False**
(b) Iodine acts as an antiseptic in the form of tincture of iodine : **True**
(c) Sodium can be cut with a knife : **True**
(d) Antimony is a metal : **False**
(e) Sand is an oxide of silicon : **True**

MULTIPLE CHOICE QUESTIONS

1. The noble gas used in advertising signboards is
(a) Helium
(b) **Neon**
(c) Argon
(d) Krypton

2. A metal with melting point less than 50°C is
(a) **Gallium**
(b) Iron
(c) Gold
(d) Aluminium

3. A metal which is neither ductile nor malleable is
(a) Copper
(b) Silver
(c) **Zinc**
(d) Aluminium

4. Rust is a hydrated oxide of iron which is
(a) Reddish brown
(b) Green
(c) White
(d) Black

5. Aluminium is not used to make :
(a) Foils
(b) Wires
(c) **Fireworks**
(d) Utensils

6. A metalloid used in the manufacture of microchips used in computer is :
(a) Antimony
(b) Germanium
(c) **Silicon**
(d) Arsenic

7. A metalloid used to make glass :
(a) Sulphur
(b) Germanium
(c) Silicon
(d) **Antimony**

ADDITIONAL QUESTIONS

A. Fill in the blank spaces by choosing the correct words from the given list.
List: amalgam, chlorine, gallium, sodium chloride, silver chloride

1. **Gallium** is a liquid metal.
2. Salt of silver, such as **silver chloride** is used for making photographic films.
3. A solution of a metal in mercury is called **amalgam.**
4. A gas used to sterilisation of drinking water is **chlorine.**
5. Saline glucose is a solution of glucose and **sodium chloride.**

B. Statements given below are incorrect. Write the correct statements :
Question 1.
Chlorine gas is used in the manufacture of sulphuric acid.
Answer:
Chlorine gas is used in the manufacture of hydrochloric acid.

Question 2.
Bronze is a mixture of 10% copper, 80% zinc and 10% tin.

Answer:
Bronze is a mixture of 80% copper, 10% zinc and 10% tin.

Question 3.
Soda water is prepared by dissolving washing soda in water.
Answer:
Soda water is prepared by dissolving carbon dioxide in water.

Question 4.
Aluminium is best conductor of electricity.
Answer:
Silver is best conductor of electricity.

Question 5.
Zinc is used for making power transmission wires.
Answer:
Copper is used for making power transmission wires.

C. Match the statements in Column A, with those in Column B.

	Column A		**Column B**
1.	**A metal used for making high quality mirrors.**	**(a)**	**Chlorine**
2.	**A metal which neither malleable nor ductile.**	**(b)**	**Graphite**
3.	**A non-metal used in the sterilisation of water.**	**(c)**	**Iodine**
4.	**A non-metal, whose deficiency can lead to disease like goitre.**	**(d)**	**Silver**
5.	**A non-metal which can be used as dry lubricant.**	**(e)**	**Zinc**

Ans.	**Column A**		**Column B**
1.	A metal used for making high quality mirrors.	(d)	Silver
2.	A metal which neither malleable nor ductile.	(e)	Zinc
3.	A non-metal used in the sterilisation of water.	(a)	Chlorine
4.	A non-metal, whose deficiency can lead to disease like goitre.	(c)	Iodine
5.	A non-metal which can be used as dry lubricant.	(b)	Graphite

D. Write 'True' or 'False' in front of following statements.

Question 1.
Stainless steel is used for making power transmission wires.
Answer:
False. Copper is used for making power transmission wires.

Question 2.
Brass is an alloy of copper and zinc and has lustrous yellow colour.
Answer:
True.

Question 3.
Graphite is used in making filaments of electric bulb.
Answer:
False. Tungsten is used in making filaments of electric bulb.

Question 4.
Magnesium is used in making light weight alloys of aluminium.
Answer:
True.

Question 5.
Non-metals are poor conductors of electricity.
Answer:
True.

E. Tick (√) the most appropriate answer.
1. Copper metal is used in :
(a) **making electric wires**
(b) filling tooth cavities
(c) making fuse wires
(d) preparation of hydrogen

2. Sodium amalgam is prepared by dissolving sodium in :
(a) molten copper
(b) dilute vinegar
(c) **mercury**
(d) molten silver

3. Bronze is an alloy of :
(a) **copper and tin**
(b) copper and zinc

(c) tin and zinc
(d) copper, zinc and tin

4. Graphite is used :
(a) for sterilisation of water
(b) for making stainless steel
(c) **as dry lubricant**
(d) in making electric bulbs

5. A metal which is a poor conductor of electricity is :
(a) zinc
(b) aluminium
(c) **tungsten**
(d) iron

STUDY QUESTIONS

1. (a) What do you understand by the term metal?
Ans : The elements which are generally hard solids, have lusture, are malleable and ductile and good conductors of heat and electricity are called metals.

(b) State any five physical properties of a metal.
Physical properties of a metal :

1. **State :** Metals are generally solid at room temperature. Mercury and gallium are liquid metals.
2. **Hardness :** Metals are generally hard.
3. **Conductivity :** Metals in general are good conductors of heat and electricity. Bismuth and tungsten are exceptions.
4. **Malleability :** The property by which metals can be beaten into sheets is called malleability. Metals are generally malleable.
5. **Ductility :** Metals are generally ductile i.e., can be drawn into wires.

2. (a) Name one metal which is a liquid at room temperature : **Mercury**
(b) Name a metal which can be cut with a knife : **Sodium**
(c) Name a metal which is lighter than water : **Sodium**
(d) Name a metal which is not malleable : **Zinc**
(e) Name a metal which is best conductor of electricity : **Silver**
(f) Name a metal which is poor conductor of electricity : **Tungsten**

3. State two important uses of following metals :

(a) Uses of gold :

- It is used for making jewellery and coins.
- It is used in dentistry for filling cavities in teeth

(b) Uses of silver :

- It is used for making coins and ornaments.
- It is used for making high quality glass mirrors.

(c) Uses of copper :

- It is used for making electric transmission wires.
- It is used for making utensils.

(d) Uses of iron :

- It is used in the construction of buildings.
- It is used in the construction of automobiles, railway bridges and many kinds of machines.

(e) Uses of tin :

- It is used for tinning food cans and the cooking vessels made from copper or iron.
- It is used for making alloys, such as brass and bronze.

(f) Uses of zinc :

- It is used for galvanizing iron sheets to prevent iron from rusting.
- It is used for making alloys such as brass and bronze.

(g) Uses of aluminium :

- Aluminium foils are used for packing food stuff, medicines etc.
- It is used for making high voltage electric transmission wires.

(h) Uses of lead :

- It is used for making lead acid batteries used in all kinds of automobiles.
- It is used for making sanitary pipes.

(i) Uses of magnesium :

- It bums with dazzling white flame and hence is used in fire works.
- It is used in the making of alloys, such as magnalium. This alloy is used in making frame of aeroplanes.

(j) Uses of mercury :

- It is used as a thermometric liquid in laboratory as well as clinical thermometers.
- Gold amalgam and silver amalgam are used in dentistry for filling tooth cavities.

4. (a) What do you understand by the term non-metal?
Ans: The elements which are either gases or soft solids, have no lustre, are non-malleable and non-ductile and bad conductors of heat and electricity are called non-metals.

(b) State any five physical properties of a non-metal.
Ans: **Physical properties of a non-metal :**

1. **State :** Non-metals are generally gases at room temperature.
2. **Hardness :** Non-metals are not hard (being gases). In case of solid non-metals, they are hard but brittle in nature.
3. **Conductivity :** Non-metals are poor conductors of heat and electricity except graphite.
4. **Malleability :** Non-metals are non-malleable, i.e., they cannot be drawn into sheets.
5. **Ductility:** Non-metals are non-ductile, i.e., cannot be drawn into wires.

5. (a) Name the non-metal and its natural form, which is the hardest substance.
Ans : Diamond is a form of carbon which is the hardest substance.

(b) Name a non-metal which is liquid form at room temperature.
Ans : Bromine is liquid at room temperature.

(c) Name a non-metal which is good conductor of electricity.
Ans : Graphite (form of carbon).

(d) Name a gaseous non-metal,. having greenish yellow colour.
Ans : Chlorine.

(e) Name a non-metal whose compounds help in the growth of plants.
Ans : Nitrogen.

6. State two important uses of following non-metals

(a) Uses of nitrogen :

- It dilutes the activity of oxygen.
- The compounds of nitrogen are of vital importance to plant for growth.

(b) Uses of oxygen :

- It is essential for respiration in plants and animals.
- It is essential for combustion of fuels.

(c) Uses of chlorine :

- It is used for bleaching cotton and jute fabrics.
- It is used in the sterilization of drinking water.

(d) Uses of iodine :

- Tincture of iodine is used for dressing wounds.
- Small quantities of iodine as sodium iodide or potassium iodide are extremely essential for the proper functioning of human body. It is used in the form of iodized salt.

(e) Uses of graphite :

- Graphite is used as pencil lead.
- It is used as a dry lubricant because it is extremely soft and does not bum even at high temperature.

7. (a) What are noble gases? Name all in the order of their increasing density.
Ans : A group of gases which do not react chemically with any other substance are called noble gases. They are helium, neon, argon, krypton, xenon and radon.

(b) State one use each of

- **Use of helium :** Helium is used for filling weather observation balloons.
- **Use of argon :** It is used for filling electric bulbs.

8. (a) What is an alloy?
Ans : A homogeneous mixture of two or more molten metals (or a non-metal) is called an alloy.
(b) Why are alloys made?

Ans : Pure metals generally do not have all the properties of a good metal, such as malleability, ductility, tensile strength, hardness, resistance to corrosion etc. Hence, alloys are made to enhance these properties. An alloy will have a better quality than the individual metals (or a non-metal) that form it.

9. State the composition and two uses of following alloys :

(a) Stainless steel: It is an alloy of 83% iron, 1% carbon, 15% chromium and 1% nickel.
Uses of stainless steel :

- It is used for making household utensils.
- It is used for making surgical instruments.

(b) Duralumin : It is an alloy of 95% aluminium, 4% copper, 0.5% manganese and 0.5% magnesium.
Uses of duralumin :

- It is used for making aircraft frames.
- It is used for making household articles.

(c) Brass : It is an alloy of 40% to 20% zinc and 60% to 80% copper.
Uses of brass :

- It is used for making tap and electric switches,
- It is used for making household utensils.

(d) Bronze : It is an alloy of 80% copper, 10% zinc and 10% tin.
Uses of bronze :

- It is used for making statues.
- It is used for making household utensils.

10. What is an amalgam? How does an amalgam different from an alloy?
Ans. An amalgam is a homogeneous mixture of a metal in mercury whereas an alloy is a homogeneous mixture of two or more molten metals (or a non-metal) generally made for improving one or more properties of metals.
Example: When sodium dissolves in mercury, it forms sodium amalgam.
When zinc and copper are combined, alloy named brass is formed.