# Chapter - 3

# Metals & Non-Metals

**MULTIPLE CHOICE QUESTIONS**

**1. The most abundant metal in the earth's crust is**

(a) Iron

(b) Aluminium

(c) Calcium

(d) Sodium

**2. The electronic configuration of three elements X, Y and Z are as follows: X = 2, 4 Y = 2, 7 Z = 2,1 Which two elements will combine to form an ionic compound and write the correct formula,**

(a) X2Y (b) ZY (c) XZ3 (d) Y2Z

**3. Which of the following property is generally not shown by metals?**

(a) Electrical conduction

(b) Sonorous

(c) Dullness

(d) Ductility

**4. Which one of the following metals do not react with cold as well as hot water?**

(a) Na (b) Ca (c) Mg (d) Fe

**5. Which of the following pair of metals exist in their native state in nature?**

(a) Ag and Au

(b) Ag and Zn

(c) Au and Hg

(d) Au and Fe

**6. Which property of metals is used for making bells and strings of musical instruments like Sitar and Violin?**

(a) Sonorousness

(b) Malleability

(c) Ductility

(d) Conductivity

**7. The atomic number of an element 'X' is 12. Which inert gas is nearest to X?**

(a) He (b) Ar (c) Ne (d) Kr

**8. The process in which a carbonate ore is heated strongly in the absence of air to convert it into metal oxide is called_____**

(a) Roasting

(b) Reduction

(c) Calcination

(d) Smelting

**9. 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)

**10. The chemical reaction between a piece of copper and nitric acid is given by the chemical equations,**

**$Cu + HNO_3$ $Cu(NO_3)_2 + H_2$**

**$H_2 + HNO_3$ $H_2O + NO_2$**

**What can be inferred from the chemical equation?**

(a) Copper causes the oxidation of $HNO_3$ to form $NO_2$.

(b) Hydrogen gas gets oxidized by $HNO_3$ to form water.

(c) gas reacts with oxygen in the air to form water.

(d) Nitrate reacts with hydrogen to form $NO_2$ and $H_2O$.

**11. Which of the following is the correct arrangement of the given metals in ascending order of their reactivity?**

**Zinc, Iron, Magnesium, Sodium**

(a) Zinc > Iron > Magnesium > Sodium

(b) Sodium > Magnesium > Iron > Zinc

(c) Sodium > Zinc > Magnesium > Iron

(d) Sodium > Magnesium > Zinc > Iron

**12. Which one among the following is an acidic oxide?**

(a) $Na_2O$ (b) CO (c) $CO_2$ (d) $Al_2O_3$

**13. Which of the given non-metal is a liquid?**

(a) Hydrogen

(b) Bromine

(c) Chlorine

d) Mercury

**14. Metallic oxide are generally _____ in nature.**

(a) Acidic

(b) Basic

(c) Neutral

(d) Amphoteric

**15. Galvanisation is a method of protecting iron from rusting by coating with a thin layer of**

(a) Gallium

(b) Aluminium

(c) Zinc

(d) Silver

**16. Non-metals form covalent chlorides because**

(a) they can give electrons to chlorine

(b) they can share electrons with chlorine

(c) they can give electrons to chlorine atoms to form chloride ions

(d) they cannot share electrons with chlorine atoms

**17. An element X 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

**18. Sodium chloride is a_____ compound**

(a) Covalent

(b) Ionic

(c) Non-ionic

(d) None of these

**19. A student adds some metallic ash in water taken in a test tube. The ash gets completely dissolved in water and the solution changes its colour. What should the student do next to test the chemical properties of the product formed?**

(a) Evaporate the solution to get crystals.

(b) Measure the temperature change using a thermometer.

(c) Test the acidity using a blue litmus paper.

(d) Test the basicity using a red litmus paper.

**20. Which of the following is the correct arrangement of the given metals in ascending order of their reactivity?**

**Zinc, Iron, Magnesium, Sodium**

(a) Zinc > Iron > Magnesium > Sodium

(b) Sodium > Magnesium > Iron > Zinc

(c) Sodium > Zinc > Magnesium > Iron

(d) Sodium > Magnesium > Zinc > Iron

**21. Which of the following are not ionic compounds?**

**(i) KCl (ii) HCl (iii) CCl4 (iv) NaCl**

(a) (i) and (ii)

(b) (ii) and (iii)

(c) (iii) and (iv)

(d) (i) and (iii)

**22. 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

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

(a) ductility

(b) malleability

(c) sonorousity

(d) conducitivity

**24. 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)

**25. A student makes an electric circuit using an LED, a battery and connecting wires to test the conductivity of distilled water. The student notices that the LED does not glow. He replaces the distilled water with a salt solution and observes that the LED glows. How does the salt solution help the LED to glow?**

(a) Salt solution is covalent in nature and conducts electricity.

(b) Salt solution has a low melting point which allows the current to flow through it.

(c) Salt solution has a high boiling point which allows the flow of current in the circuit without getting hot.

(d) Salt solution contains ions which makes it conductive and allows the electricity to flow through it.

**ASSERTION AND REASON QUESTIONS**

**DIRECTION:** Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(a) Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.

(b) The Assertion and the Reason are correct but the Reason is not the correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) The statement of the Assertion is false but the Reason is true.

**1. Assertion:** iron is found in the free state in nature.

**Reason:** iron a highly reactive element.

**2. Assertion (A):** Ionic compounds have high melting and boiling points.

**Reason (R):** A large amount of energy is required to break the strong inter-ionic attraction in ionic compounds.

**3. Assertion (A):** Silver becomes black in colour when exposed to atmosphere.

**Reason (R):** Silver reacts with $H_2S$ gas to form $Ag_2S$ which is black in colour.

**4. Assertion (A):** Ionic compounds and solids are somewhat hard.

**Reason (R):** They are electrovalent compounds and have strong force of attraction between oppositely charged ions.

**5. Assertion (A):** Copper does not reacts with the $H_2SO_4$.

**Reason (R):** Copper is more reactive than hydrogen.

**6. Assertion (A):** Rusting of iron is a slow combustion

**Reason (R):** Iron slowly reacts with oxygen and form iron oxide.

**7. Assertion (A):** Nitrogen is a non-metal.

**Reason (R):** Nitrogen has 5 valence electrons.

**8. Assertion (A):** $Al_2O_3$, is an amphoteric oxide.

**Reason (R):** $Al_2O_3$ reacts with acid as well as base to form salt and water.

**9. Assertion (A):** Iron is the most widely used metal. But it is never used in its pure state.

**Reason (R):** Pure iron is very soft and stretches easily when hot.

**10. Assertion (A):** All non metals are insulators.

**Reason (R):** Graphite is a good conductor of electricity.

**CASE STUDY QUESTIONS**

**1.** Read the following and answer the questions:

On the basis of reactivity of different metals with oxygen, water and acids as well as displacement reactions, the metals have been arranged in the decreasing order of their reactivities. This arrangement is known as activity series or reactivity series of metals.

The basis of reactivity is the tendency of metals to lose electrons. If a metal can lose electrons easily to form positive ions, it will react readily with other substances. Therefore, it will be a reactive metal.

On the other hand, if a meal loses electrons less rapidly to form a positive ion, it will react slowly with other substances. Therefore, such a metal will be less reactive.

**(i) Which of the following metals is less reactive than hydrogen?**

(a) Copper

(b) Zinc

(c) Magnesium

(d) Lead

**(ii) Which of the following elements is not present in stainless steel?**

(a) Iron

(b) Chromium

(c) Tungsten

(d) Nickel

**(iii) Which of the following metals reacts vigorously with oxygen?**

(a) Zinc

(b) Magnesium

(c) Sodium

(d) Copper

**(iv) Which of the following represents the correct order of reactivity for the given metals?**

(a) Na > Mg > Al > Cu

(b) Mg > Na > Al > Cu

(c) Na > Mg > Cu > Al

(d) Mg > Al > Na > Cu

**(v) Hydrogen gas is not evolved when a metal reacts with nitric acid. It is because $HNO_3$, is a strong oxidising agent. It oxidises the H, produced to water and itself gets reduced to any of the nitrogen oxides ($N_2O$, NO, $NO_2$). But _____ and _____ react with very dilute $HNO_3$ to evolve $H_2$ gas.**

(a) Pb, Cu

(b) Na, K

(C) Mg, Mn

(d) Al, Zn

**2.** Alloying is a very good method of improving the properties of a metal. This gives the desired properties of the metal. For example, iron is the most widely used metal. But it is never used in its pure state. This is because pure iron is very soft and stretches easily when hot. But, if it is mixed with a small amount of carbon (about 0.05%), it becomes hard and strong. When iron is mixed with nickel and chromium, we get stainless steel, which is hard and does not rust. Thus, if iron is mixed with some other substance, its properties change. In fact, the properties of any metal can be changed, if it is mixed with some other substance. The substance added may be a metal or a non-metal.

**(i) Which among the following alloys contain non-metal as one of its constituents?**

(a) Brass

(b) Bronze

(c) Amalgam

(d) Steel

**(ii) An alloy can be one of the following types:**

(a) Homogenous

(b) Heterogeneous

(c) Intermetallic

(d) All of the above

**(iii) By adding silicon to stainless steel which of the following property is enhanced?**

(a) Resistance to corrosion

(b) Electrical characteristics

(c) Ductility

(d) Magnetic property

**(iv) Which of the following alloy(s) contain mercury as one of its constituents?**

(a) Zinc amalgam

(b) Alnico

(c) Solder

(d) Bronze

**3.** When a silvery grey powder of a solid (A) is mixed with a powder solid (B) no reaction occurs. But if the mixture is ignited and lighted using magnesium ribbon a reaction occurs with evolution of large amount of heat forming product (C) which settles down as liquid metal and the solid product (D) formed floats on the liquid (C). (C) in solid form reacts with moisture to form rust. The amount of heat generated during the reaction is so high that the reaction is used in welding of electric conductors, joints in railway tracks.

Based on this information, answer the following questions.

**i. Identify A and C?**

1. A- Al and C- Fe
2. A-Fe and C—Al
3. A-Mg and C -Al
4. A-Al and C -Cu

**ii. Identify B and D which are oxides of**

1. B- Fe, D- Al
2. B. B- Mg, D-Al
3. B- Al, D- Cu
4. D. B-Al, D –Fe

**iii. Amphoteric oxides are**

1. metal oxides which do not react with acids but react with bases
2. metal oxides which reacts with both acids as well as bases
3. metal oxides which reacts with acids but do not react with bases
4. metal oxides which shows no reaction with either acids or bases

**iv. Which of the following is amphoteric in nature?**

1. both aluminium oxide and zinc oxide
2. Only Zinc oxide
3. Only Aluminium oxide
4. Neither of them

**4.** Metals as we know, are very useful in all fields, industries in particular. Non-metals are no less in any way. Oxygen present in air is essential for breathing as well as for combustion. Non-metals form a large number of compounds which are extremely useful, e.g., ammonia, nitric acid, sulphuric acid, etc. Non-metals are found to exist in three states of matter. Only solid non-metals are expected to be hard however, they have low density and are brittle. They usually have low melting and boiling points and are poor conductors of electricity.

**(i) _____ is a non-metal but is lustrous**

(a) Phosphorus

(b) Sulphur

(c) Bromine

(d) Iodine

**(ii) Which of the following is known as 'King of chemicals'?**

(a) Urea

(b) Ammonia

(c) Sulphuric acid

(d) Nitric acid

**(iii) Which of the following non-metals is a liquid?**

(a) Carbon

(b) Bromine

(c) Iodine

(d) Sulphur

**(iv) Hydrogen is used**

(a) for the synthesis of ammonia

(b) for the synthesis of methyl alcohol

(c) in welding torches

(d) all of these

**(v) Generally, non-metals are bad conductors of electricity but 'X' which is a form of carbon is a good conductor of electricity and is an exceptional non-metal. 'X' is**

(a) diamond

(b) graphite

(c) coal

(d) coke

**5.** On the basis of reactivity of different metals with oxygen, water and acids as well as displacement reactions, the metals have been arranged in the decreasing order of their reactivities. This arrangement is known as activity series or reactivity series of metals. The basis of reactivity is the tendency of metals to lose electrons. If a metal can lose electrons easily to form positive ions, it will react readily with other substances. Therefore, it will be are active metal. On the other hand, if a meal loses electrons less rapidly to form a positive ion, it will react slowly with other substances. Therefore, such a metal will be less reactive.

**i. Which of the following metal is less reactive than hydrogen?**

1. Copper
2. Zinc
3. Magnesium
4. Lead

**ii. Which of the following represents the correct order of reactivity for the given metals?**

1. Na>Mg>Al>Cu
2. Mg>Na>Al>Cu
3. Na>Mg>Cu>Al
4. Mg > Al > Na > Cu

**iii. Hydrogen gas is not evolved when a metal reacts with nitric acid. It is because HNO, is a strong oxidising agent. It oxidises the H, produced to water and itself gets reduced to any of the nitrogen oxides (N, O, NO, NO2). But _____ and _____ react with very dilute HNO3 to evolve H2 gas.**

1. Pb, Cu
2. Na, K
3. Mg, Mn
4. Al, Zn

**iv. Which of the following metals reacts vigorously with oxygen?**

1. Zinc
2. Magnesium
3. Sodium
4. Copper

# Answers Key

## MULTIPLE CHOICE QUESTIONS

| | | | | |
|---|---|---|---|---|
| 1. b | 2. b | 3. c | 4. d | 5. a |
| 6. a | 7. c | 8. c | 9. c | 10. b |
| 11. d | 15. c | 13. b | 14. b | 15. c |
| 16. b | 17. b | 18. b | 19. d | 20. d |
| 21. b | 22. b | 23. a | 24. d | 25. d |

## ASSERTION AND REASON QUESTIONS

| Question number | Answer |
|---|---|
| 1 | d |
| 2 | a |
| 3 | a |
| 4 | a |
| 5 | c |
| 6 | a |
| 7 | b |
| 8 | a |
| 9 | a |
| 10 | d |

## CASE STUDY QUESTIONS

**1.**

i) a

ii) c

iii) c

iv) a

v) c

**2.**

i) d

ii) a

iii) b

iv) a

**3.**

**i**) a

ii) a

iii) b

iv) a

**4.**

i) d

ii) c

iii) b

iv) d

v) b

**5.**

i) a

ii) a

iii) c

iv) c