

TOPIC 1: METALLIC CHARACTER

Recall Question (3 marks)

Q1. Define metallic character. Write its trend in a period and in a group.

Answer: Metallic character is the tendency of an atom to lose electrons easily and form positive ions.

Trend in a period: Metallic character decreases from left to right in a period because nuclear charge increases and atomic size decreases, making it difficult to lose electrons.

Trend in a group: Metallic character increases from top to bottom in a group because atomic size increases and shielding effect increases, making it easier to lose electrons.

Q2. Explain why metallic character decreases from left to right in a period with suitable examples.

Answer: Metallic character decreases from left to right in a period due to increase in nuclear charge and decrease in atomic size.

For example, in the third period, sodium (Na) has 1 electron in its outermost shell and loses it easily, showing high metallic character. However, chlorine (Cl) has 7 electrons in its outermost shell and prefers to gain electrons rather than lose them.

Q3. Arrange the following elements in order of decreasing metallic character: Mg, Al, Na, S. Justify your answer.

Answer: The order of decreasing metallic character is: **Na > Mg > Al > S**

All four elements belong to the third period of periodic table. Sodium is in Group IA with 1 valence electron, magnesium in Group IIA with 2 valence electrons, aluminium in Group IIIA with 3 valence electrons, and sulphur in Group VIA with 6 valence electrons.

As we move from left to right in a period, nuclear charge increases and atomic size decreases. Therefore, sodium loses electrons most easily and has the highest metallic character, while sulphur is a non-metal with the lowest metallic character.

Topic 2: Reactivity

Q4. Define reactivity. Write the trend of reactivity of metals and non-metals in a group.

Answer: Reactivity is the ability of an element to take part in a chemical reaction by losing or gaining electrons.

Reactivity of metals in a group: The reactivity of metals increases down the group because atomic size increases and shielding effect increases, making it easier to lose electrons.

Reactivity of non-metals in a group: The reactivity of non-metals decreases down the group because atomic size increases and nuclear attraction decreases, making it difficult to gain electrons.

Reactivity across the period: Reactivity tends to vary across a period. Elements on the left side of the period (Group 1 , Group 2) are highly reactive due to their strong tendency to lose electrons. Elements on the right side (Group 16, Group 17) are also highly reactive but they tend to gain electrons.

Q5. Explain why fluorine is more reactive than chlorine, even though both belong to the same group.

Answer: Fluorine is more reactive than chlorine because of its smaller atomic size and position in the periodic table. Fluorine has 2 shells while chlorine has 3 shells. Due to smaller atomic size, the nucleus of fluorine has stronger attraction for incoming electrons. The shielding effect in fluorine is also less compared to chlorine.

Therefore, fluorine can gain electrons more easily than chlorine and is more reactive. This shows that reactivity of non-metals decreases down the group.

Q. Chlorine and Bromine both belong to Group VIIA (Halogens). Which element is more reactive? Explain your answer with proper reasoning.

Chlorine is more reactive than bromine.

Chlorine has 3 shells while bromine has 4 shells. In chlorine, the atomic size is smaller, so the incoming electron experiences stronger nuclear attraction with less shielding effect. Therefore, chlorine gains electrons more easily than bromine.

This shows that reactivity of non-metals decreases down the group.

Topic 3: Density

Q7. Define density. Write its formula, unit and trend down the group in periodic table.

Answer: Density is defined as mass per unit volume of a substance.

Formula: Density = Mass ÷ Volume

Unit: g/cm³ or kg/m³

Trend down the group: Density generally increases down the group because atomic mass and size of an atom increases, resulting in higher density.

Trend across the period: Density vary across the period, generally it increases from left to right until it reaches non metal onwards that it starts decreasing

Q8. Explain why metals have higher density than non-metals. Give two examples.

Answer: Metals have higher density than non-metals because of their atomic structure and arrangement.

Metal atoms are closely packed together with strong metallic bonds and have higher atomic masses. For example, iron has density of 7.9 g/cm³ and copper has 8.9 g/cm³. Non-metals have weaker forces between particles and more empty spaces. For example, sulphur has density of only 2.1 g/cm³.

Therefore, metals have more mass concentrated in smaller volume compared to non-metals, resulting in higher density.
