

## PROBLEM SOLVING TACTICS

The correct order of stability of for the following supper oxides is:

- (A)  $\text{KO}_2 > \text{RbO}_2 > \text{CsO}_2$       (B)  $\text{RbO}_2 > \text{CsO}_2 > \text{KO}_2$       (C)  $\text{CsO}_2 > \text{RbO}_2 > \text{KO}_2$       (D)  $\text{KO}_2 > \text{CsO}_2 > \text{RbO}_2$

**Solution:** The approach should be as follows

- (i) The stability of super oxides depend on the polarizing power of the cation. Lesser the polarizing power, greater is the stability of the superoxide ion.
- (ii) The polarizing power of cations of the same charge decreases with the increase in the size.
- (iii) Therefore, the stability of super oxides increases with increase in the size of cations.
- (iv) The increasing order of size of ions is:  $\text{K}^+ < \text{Rb}^+ < \text{Cs}^+$ .
- (v) The correct order of stability is:  $\text{CsO}_2 > \text{RbO}_2 > \text{KO}_2$

Which one of the following orders presents the correct sequence of the increasing basic nature of the given oxides?

- (A)  $\text{K}_2\text{O} < \text{Na}_2\text{O} < \text{Al}_2\text{O}_3 < \text{MgO}$       (B)  $\text{Al}_2\text{O}_3 < \text{MgO} < \text{Na}_2\text{O} < \text{K}_2\text{O}$   
 (C)  $\text{MgO} < \text{K}_2\text{O} < \text{Al}_2\text{O}_3 < \text{Na}_2\text{O}$       (D)  $\text{MgO} < \text{K}_2\text{O} < \text{Na}_2\text{O} < \text{Al}_2\text{O}_3$

**Explanation:** (i) Basic nature of oxides increases with increase in the size of cation.

(ii) The increasing order of cations is:  $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{K}^+$

(iii) Therefore the increasing correct order of basic strength is:  $\text{Al}_2\text{O}_3 < \text{MgO} < \text{Na}_2\text{O} < \text{K}_2\text{O}$

**Conclusion:** Correct option is: 'B'.

## POINTS TO REMEMBER

Trends in Physical Properties of Alkaline Earth Metals:

Characteristic	Trend
Oxidation state	All elements show +2 oxidation state
Atomic / ionic radii	Be < Mg < Ca < Sr < Ba Size of the alkaline earth metals increases from top to bottom due to increase in the number of shells.
Ionization enthalpy	Be > Mg > Ca > Sr > Ba As the size increases it becomes easier to remove an electron from the outermost shell.